AN OVERVIEW OF SOME KEY RESEARCHERS AND TOPICS IN ENVIRONMENT-BEHAVIOR STUDIES AND SOME IMPLICATIONS FOR ARCHITECTURAL AND ENVIRONMENTAL DESIGN

by

JAMSHID HABIB

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Major Professor
David Seamon

Abstract

This thesis provides an overview of some key researchers and research topics in the field of environment-behavior studies (EBS), an interdisciplinary field that examines ways in which the natural and human-made environments contribute to human well-being. A key aim of environment-behavior studies is to better understand clients' and users' environmental needs, and to design the physical environment accordingly. Specifically, this thesis highlights two key research questions: (1) What are environment-behavior studies and why are they relevant to architecture and environmental design? and (2) How can environment-behavior studies be drawn upon practically to generate more effective architectural and environmental design?

To provide answers to these two questions, the thesis first introduces five "pioneers" in environment-behavior studies— psychologist Roger Barker, anthropologist Edward Hall, psychologist Robert Sommer, urban designer Kevin Lynch, and architect Christopher Alexander—and reviews their major work. This discussion provides a general understanding as to what environment-behavior studies involve and how they have design significance.

Next the thesis overviews three major theories developed in environment-behavior studies: (1) territoriality theory; (2) cognitive-mapping theory; and (3) prospect-refuge theory. Each of these theories is overviewed, and pragmatic examples are provided to indicate each theory's value for architecture and environmental design.

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Dedication

To my parents.

CHAPTER 1 - Introduction

This thesis overviews several major researchers and research topics in environment-behavior studies and discusses their value for architecture and environment design. Environmental-behavior studies (henceforth EBS) focus on the relationship between humans and their surroundings and examine how the environment affects human ways of life and vice versa. A main focus of EBS is improving the quality of human life through understanding the role of the designed environment in human behavior and experience. This thesis will identify and overview several major works in EBS, emphasizing the fact that research focuses on the "study of the mutual relations between human beings and the physical environment at all scales and application of this knowledge thus gained to improving the quality of life through better environmental policy, planning, design and education" (Moore, 1985 p.4). This thesis addresses issues related to environment and space, particularly psychological and social dimensions in relation to architecture and environmental design. Originally, the aim of this thesis was to present a justification and outline for an introductory course in environment-and-behavior (EB) studies to be taught at Kabul University in Afghanistan. As the thesis proceeded, it became clear that organizing EB course was a separate project, and the aim of the present became an introductory review of EB research.

Key Questions

The purpose of overviewing EBS is to get readers to think about the design of the physical environment through studying human behavior, to find ways to better understand client and user needs, and to design the physical environment accordingly. Two key research questions

are asked in order to construct a concise study of EBS argued for here. First, I list these two questions and then provide preliminary answers that will be extended in following chapters:

1. What are EBS and how are they relevant to architecture and environmental design?
2. How might EBS be drawn upon practically to better design everyday environments?

Question 1: What are EBS and how are they relevant to architecture and environmental design?

The word "behavior" refers to the way in which a person, organism, or group responds to a specific set of conditions or an environment. In turn, "environment" is a set of external conditions and often acts as a stimulus for human experience and behavior. From prehistoric times until present, people have worked to facilitate their needs and move their way of life toward a more soothing and comfortable condition. Humans' purposive behaviors are stimulated by needs to be fulfilled. Fulfilling needs is an intrinsic and nurturing property of human beings. Behavior is an overt action which is not only controlled by needs but also by various subsystems such as physiological, social, cultural, and personality dimensions of human experience (Porteous, 1977).

As people try to satisfy their needs, they shape their environment in such a way that is responsive to their needs. Similarly, in some ways, the environment shapes people's ways of life. In this sense, one can infer that architecture should be a product of how people behave in their environment and how it is shaped based on their needs. Architecture can be something of no value and little significance if it doesn't contribute to our behavioral requirements: "When men designed and built their own houses, no matter how crudely, they intuitively shaped them to

behavioral requirements" (Ittelson, 1974 p. 10). Chapters 2-5 of the thesis explain key themes in EBS and discuss their relevance to architecture.

Question 2: How might EBS be drawn upon practically to better design people's everyday environments?

To answer this question, mere theoretical introduction of issues cannot be sufficient; therefore, it is important to provide practical examples and design implications related to architecture. For this reason, topics selected in this thesis are all deeply related to practical design issues that people encounter in their everyday lives. The topics reviewed in this thesis are: (1) territoriality; (2) cognitive mapping; and (3) prospect-refuge theory; these three topics are discussed in chapters 3-5, which attempt to demonstrate their value for architecture and environmental design.

Thesis Outline

The second chapter of this thesis introduces and reviews the work of five key researchers who have played an important role in developing EBS. These researchers, considered as "pioneers" by Bechtel (1997), are psychologist Roger Barker, anthropologist Edward Hall, psychologist Robert Sommer, urban designer Kevin Lynch, and architect Christopher Alexander. In turn, chapters 3-5 discuss three major topics in EBS, beginning with chapter 3, which discusses territoriality. Here, four types of territory are explained: (1) personal space; (2) primary territory; (3) secondary territory; and (4) public territory. Also, this chapter lays out architect Oscar Newman's argument for defensible space and communities of interest as ways to design urban neighborhoods. This chapter ends by discussing how theories of territoriality can be applied so that designed evironments are safer and better functioning.

Chapter 4 discusses cognitive mapping, which is overviewed at three different levels: (1) the macro-level, focused on urban areas; (2) the meso-level, focused on buildings; and (3) the micro-level, focused on how everyday things can be made more responsive. In turn, chapter 5 discusses prospect-refuge theory and draws on Frank Lloyd Wright's Kuafmann house ("Fallingwater") as one interpretive context. As a conclusion, chapter 6 reviews the main issues discussed in earlier chapters and draws implication for architecture and environmental design.

CHAPTER 2 - An Introduction to Environment-and-Behavior Studies

Introduction

This chapter presents an overview of EBS. It starts with a brief history of the field and how this area of study came into being and developed. To provide an introductory sense of the kinds of topics that EBS cover, this chapter reviews five key researchers who played an important role in creating and developing EBS– Roger Barker, Edward Hall, Robert Sommer, Kevin Lynch, and Christopher Alexander.

A Brief History of EBS

Human-environment interaction goes back to primitive times. Since the primitive-man era until now, people must satisfy their needs under the environmental conditions of their regions and surrounding environments. Because the characteristics of all regions are not similar, people in different areas developed a variety of ways to cope with the environmental problems they faced in attempting to fulfill their needs. Environmental psychologist Robert Bechtel, however, rejects any human evolution theory; he states that one important concept is the "Rich Response Repertoire" (RRR), which involves developing many different responses or reactions to a single situation. He states that "The richness to responses is the key to evolutionary success, and collecting them into a repertoire provides the kit for survival" (Bechtel, Environment & Behavior An Introduction, 1997, p. 49). Examples of this concept can be seen everywhere around the world. For example, in hot and arid regions people mostly developed hunting techniques for their survival while in tropical regions rich with vegetation, people often came to depend on agriculture. In these earlier times, nature was the ultimate power, and people were required to adjust themselves to it. Similarly, in Afghanistan the customs and the ways people fulfill their

needs is quite diverse due to geographic variations in climate, terrain and locations within the country.

In order for this relationship of human-environment interaction to be academically studied, it is named environment-behavior (EB) studies. In general, EBS discuss reciprocal relationships of humans and their physical environments, in which both human and environment affect each other. It is an interdisciplinary field that incorporates many disciplines, for example, anthropology, social geography, environmental sociology, ecology and psychology. A main purpose of EBS is to improve quality of life and create better places for people.

How did EBS come into being? For thousands of years humans have interacted with their environments, but EBS only started after World War II. At that time there were shifts in society that caused high demand for places never encountered before (Stokols & Altman, 1987, p. 1468). In addition, some thinkers criticized the experimentation in laboratories, and a progressive social movement began to influence Western society (Stokols & Altman, 1987, p. 1470). In addition, the campaign to improve mental hospitals in the 1950s was an important development, since architects of these hospitals had mainly focused on architectural structure, not human needs. For this reason, psychologists began to generate necessary data regarding humans' social and individual behavior so that the design might become more responsive to users' needs.

EBS further developed in the 1960s, but not under a single title. Psychologists studied man-and-environment relations and called their work "environmental psychology", while sociologists used the label "environmental sociology." Bechtel states that EB research slowly became a movement that is an interrelated study of many fields in order to fulfill humans' behavioral needs by improving the quality of the physical environment. He argues that it largely came into being because of the work of five researchers: Roger G. Barker, Edward Hall, Robert

Sommer, Christopher Alexander and Kevin Lynch. Bechtel calls these five men "the five pioneers" (Bechtel, 1997, p. 77).

These five researchers focused on different aspects of EBS and helped enrich this new field of study. Roger Barker started with recording children's environmental behaviors and actions. This technique was the method he developed eventually into "ecological psychology." Edward Hall, an anthropologist, introduced the concept of personal space and social distances. He divided the everyday social distances people experience into intimate (from touching to 46cm), personal (from 46cm to 122cm) and social (from 1,22m to 3.67m). Robert Sommer extended Hall's ideas and provided EBS with a valuable contribution in his book *Personal Space* (Hall, 1974). Christopher Alexander focused on architecture and buildings from the users' perspective and sought to empower users to design and build themselves. Kevin Lynch's work was published in the 1960, *The Image of the City,* which examined the way urbanites perceive and arrange spatial information. According to Bechtel, the studies of these five pioneers enabled EBS to become an autonomous field of research. In the following section, I review each of these men's work in detail as a way to highlight some key themes in EBS.

Roger Barker's Ecological Psychology

Roger Barker was a psychologist who generated a large body of work on human behavior and the everyday environment. Barker and his colleague Herbert F. Wright were faculty at The University of Kansas and founded a field station in 1947 in Oskaloosa Kansas, a small town located west of Lawrence. At this station, Barker collected observational data on children's behaviors. Barker's way of recording behaviors was holistic in that he observed every single behavior a child made in his or her environment.

This method of recording behavior led Barker and his colleagues to a new observation unit that they called a “behavior setting” which includes the units of behavior within an environment in a certain period of time. As Ittelson states, “a behavior setting is bound in space and time and has a structure which interrelates physical, social, and cultural properties” (Ittelson, 1974, p. 70). In addition to time and a physical dimension, a behavior setting includes a human behavior in regard to social and cultural values. This new way of studying human behavior is, in many ways, more effective than studying human behavior in laboratories because in laboratories people are observed in a new setting which isolates them from their natural setting where they make use of their own value systems and behavioral needs. The results that Barker and his researchers obtained from comparing human behavior in laboratories with that in natural settings were often different. For example, one of Barker’s students studied children’s reactions to frustration and aggression. He found that the level of aggression and frustration children suffered was greater in the laboratory than in natural settings (Bechtel, Environment & Behavior An Introduction, 1997, p. 228) because, in the laboratory situation, children were exposed to stimuli much different from those in their everyday environment. Since the children in the laboratory situation could not find other positive distractions, they showed more aggression and frustration. In short, behavior settings often predict human behavior more accurately than a laboratory environment can.

This theory of behavior setting helped Barker and his colleagues to observe the behaviors of many individuals in an environment and develop environmental descriptions more accurate and generalizable. Data collected in this research could be used for a variety of topical interests. Barker called his approach “ecological psychology.”

The behavior setting was ecological theory's main focus, and it led Baker to the development of staffing theory which focused on organizational variables of an environment in terms of the number of users in a certain area or facility. These variables were studied through examining the degree of understaffing and overstaffing. Understaffing is a situation in which there is a limited number of people to run a system. Barker became interested in understaffing because of data collected from a comparative study of residents in Oskaloosa, a Midwestern town in the United States; and Leyburn, a town in England. As Barker examined the inhabitant of these two places, he found that understaffing makes people work harder and increases their environmental awareness because they have limited behavioral resources. However, he found that the work quality of the understaffed facilities was not always efficient because one person had to play many roles with the result that quality of work suffered. On the other hand, overstaffing is a condition where too many people use a facility with the result of limited opportunities to participate and the better workers' overperforming. Overstaffing can increase the efficiency of a facility, but it can also erode the overall quality of the environment.

Barker's research is important in EBS especially in terms of studying everyday environments like housing. Nagar explains, "The ecological theory of behavioral setting can be applied in assessing the layout and design of residential areas" (Nagar, 2006, p. 80). The assumption here is that, if we observe people in their everyday surroundings, we can find out about their needs. In addition, Staffing theory can enable as think about how physical settings can be designed so that they become comfortable for the users.

Edward Hall

A second important "pioneer" in EBS is Edward T. Hall, an anthropologist whose major works are *The Silent Language* published in 1959; and *The Hidden Dimension* published in

1966. In his first publication, Hall discloses great paradoxes of cultures and explores how people's behaviors convey messages and communicates in juxtaposition to words in different cultures. He also introduces what he calls "primary message systems," which incorporate ten separate kinds of human activities and are the criteria for studying cultures from an anthropological view point. These primary message systems relate to the following points:

1. Interaction is the central part of every culture, and it incorporates all of what people do to communicate and covey messages in an environment.
2. Association relates to how all living things arrange their lives in specific a pattern that expresses their association to one another – e.g., talking among higher and lower ranked individuals.
3. Subsistence is what one eats and drinks and includes eating habits.
4. Sexuality relates to relationship of male and female and the way they behave and are understood in different cultures.
5. Territoriality relates to the space that individuals and groups identify with and protect; it varies from culture to culture.
6. Temporality combines time and association, and it helps us know the temporal relationship among events.
7. Learning and acquisition relate to how people acquire knowledge about their surroundings and transfer knowledge in different cultures.
8. Play is closely related to the process of learning and level of intelligence; it is also associated with defense in order to hide one's vulnerabilities.
9. Defense relates to the way people defend themselves against environmental threats.
10. Exploitation relates to the way people make use of environmental conditions.

The main focus of Hall's second work, *The Hidden Dimension*, published in 1966, is what he calls *proxemics*, which examines the distances people keep from one another and their environment while performing different activities like conversing, greeting and other forms of human discourse (Bechtel, Environment & Behavior An Introduction, 1997, p. 79). In this book, Hall introduces different spaces that humans experience and that vary in different cultures. In term of humans' perception of their surroundings he identifies *thermal space, tactile space, olfactory space, auditory space* and *visual space*. In discussing *thermal space*, he describes how humans regulate their body temperature and react to higher and lower temperatures. For instance, people sit close together when it is cold, and they prefer to sit apart when the weather is hot. Thermal distance plays a major role in how people experience crowding.

There is also *tactile space*, which separates us from the objects around us: "In spite of all that is known about skin as an information-gathering device, designers and engineers have failed to grasp the deep significance of touch, particularly active touch." (Hall, 1996, p. 66) In regard to *olfactory space*, Hall discusses difference between American and Arab cultures. Since Arabs position themselves very close while talking, they can smell one another's breath and body clearly. On the other hand, Americans give less attention to olfaction with the result that American environments are often bland smell-wise and deprived from richness and variety. Hall also discusses auditory space which is experienced differently from culture to culture. Some cultures depend on thick wall in order to screen sounds, but in other cultures, spaces are open to sounds. People are used to these diverse situations because they have adjusted to them culturally from childhood. *Vision* is the principal means by which people gather information. Vision is the most important sense, according to Hall, because it performs a variety of functions—"a look can

punish, encourage and establish dominance" (Hall, 1996, p. 68). Vision is a great source of learning for humans.

After studying all these types of sensuous spaces, Hall then discusses space based on proxemics or "distance in man," he identifies the following four personal distances:

1. Intimate distance relates to touching that can be observed in wrestling and love-making, and distances in automobiles, elevators, and among friends. (From touching to 18 inches)
2. Personal distance relates to a person's personal interests and contacts, including friendship. (From two and half to four and a half feet)
3. Social distance refers to the distance of business and social discourse. (From four to twelve feet)
4. Public distance refers to the distance of public speaking and refers to a distance where loud voice or amplifiers are required. (twelve to more than twenty five feet)

Hall emphasizes that culture is the one of the important factors that needs to be considered while designing. Anthropological studies like Hall's enable designers to study their own culture and find ways to design architectural and urban spaces accordingly. For instance, a description of perceptual spaces and proxemics is a good guide for architects and designers to think about designs more holistically, and it also tells them how architectural designs come into being. As Hall explains, "the architecture and urban environments people create are expressions of this filtering screening process" (Hall, 1996, p. 2).

Robert Sommer

A third pioneer in EBS is psychologist Robert Sommer, who extended Edward Hall's ideas regarding personal space. Sommer's most famous work is *Personal Space: the Behavioral Basis of design* (Sommer, 1969), written in 1969. This book explains, first, what personal space is, and, second, how people protect their personal space. The following discussion examines these two questions as a way to present a concise summary of Sommer's work.

1. ***What is personal space?***

In describing personal space, Sommer points out that it is a sphere around the human body and doesn't have visible boundaries. It also doesn't have a universal shape; rather, its shape depends on such characteristics as culture, density, and dominance level. Under certain circumstances, personal space can reduce itself almost to nothing. For instance, if an area is crowded, personal space become very small. Each individual feels his/her personal space around his body wherever he/she goes; therefore, it is also called "portable territory." Sommer discusses the "invasion" of personal space in terms of two criteria: (1) ways of approaching an individual; and (2) perceptual spaces—i.e., visual, auditory and olfactory aspects of space as discussed by Edward Hall. The former criterion describes ways of approaching someone and describes how he/she is affected. As one approaches a subject, his/her reaction in order to defend his/her personal space is not the same in all directions or sides. For instance, if an individual is approached from the side, he will not be affected or react the same way when he/she is approached from behind or directly at the front.

The second criterion describing personal space invasion involves visual, auditory and olfactory aspects. If someone is stared at, his personal space is invaded because he doesn't feel relaxed. Similarly, auditory space invades people's personal space when they hear what they

don't want to listen to –e.g. when passenger's personal space is invaded by strangers' talking. Likewise, personal space is invaded by olfaction. In different cultures, individuals use a variety of olfactory substances so that smells often surround them. For some individuals, these smells are distracting and sometimes unpleasant. This olfactory zone around an individual can invade other individual's personal space. Each individual, in almost all circumstances, tries to protect his/her personals space whether he is invaded physically or through perceptual stimuli.

2. ***How do people protect their personal space?***

Sommer describes two ways by which people protect their personal space from being invaded—defensive measures and offensive displays. Defensive measures include retreat positions like sitting in a remote corner of a room so that no one else approaches. In contrast, offensive displays include showing overtly aggressive reactions and dominance and control over access and egress. As Sommer explains, "Retreat usually requires a person to go to some remote and less desirable section whereas an offensive posture can conceivably hold the best location" (Sommer, 1969, p. 47). The overall concept of protecting one's personal space is based on a combination of position, posture and gesture that are all used in both defensive measures and offensive displays. Invasion and protection are two important aspects of personal space. Sommer's research enables designers to take into account peoples' behavioral needs—specifically (respect for personal space)—while designing a facility.

Kevin Lynch

Kevin Lynch is the forth pioneer in EBS. His innovative research motivated urban designers to think about making cities legible for their inhabitants as well as for strangers so that they might have a clear urban image and can orient themselves easily. In his *Image of the City* (Lynch 1961), Lynch identifies three components of any urban image: identity, structure, and

meaning. He then introduces certain image elements—paths, edges, districts, nodes, and landmarks—that are repetitively used to perceive urban places. Finally, he presents certain guidelines for urban designers so that they can improve urban form qualities in such a way that inhabitants can have a clear image of their town or city.

According to Lynch, an "Environmental images are the result of a two-way process between observer and his environment" (Lynch, 1964, p. 6). An environmental image can be analyzed in greater detail according to three components: *identity, structure,* and *meaning*. Identity refers to the existence of objects and their recognition by the observer in an environment. Every object needs to be a single physical entity so that it holds its individual identity. Structure refers to the way things are related spatially to the observer and his/her surroundings. Lastly, meaning is the personal significance a thing in the environment has for the observer. Among these three components, identity and structure can be manipulated by designers, but meaning is much more based on how individuals personally value objects in their environment. Lynch's main focus is design of the physical environment in order to help urbanites develop a clear mental image; therefore, he discusses identity and structure in detail throughout his book, but gives less attention to meaning, since it is largely independent of designable physical qualities.

When urbanites picture the mental image of their city, they try to make it as readable as possible. In order to have a clear mental image, objects in the environment need to have their own identity and have a clear relationship to the surrounding environment and people—in other words, have a clear structure. When a physical environment enables urbanites to have a clear mental image of their city, this is called by Lynch high *imageability*: the ability of the physical

environment that can evoke a strong mental image. Imageability can be improved if identity and structure is emphasized in urban design.

In order to make cities with a high imageability, Lynch identifies five specific image elements.

1. *Paths* are places where people move, like streets, canals, roads; while moving, people observe their environment and relate and organize other environmental elements.
2. *Edges* are linear elements that function as borders or barriers--i.e., walls, shores or rivers.
3. *Districts* are areas of the city that have their own special character; they can be experienced from inside and used for external reference as well.
4. *Nodes* are places that concentrate activities; they can be entered by the observer. Typically, nodes are the intersection of two paths, or they can be busy foci along paths.
5. *Landmarks* are external reference points like buildings, trees, or topographic features.

These five element types shape the city environment into distinguishable entities that have a collective identity. These image types led Lynch to formulate guidelines that can help facilitate stronger urban imageability. These guidelines include singularity, form simplicity, singularity, continuity, and dominance, directional differentiation, visual scope, and motion awareness. Singularity refers to how strongly an object stands out in terms of its figure-ground relationship. Form simplicity refers to the fact that form needs to be geometrically simple and easy to include in one's mental image. Continuity refers to the harmony and repetition of certain patterns. Dominance indicates that certain objects in the environment need to stand out from their surroundings (like landmarks) so that they can improve readability of the whole. Directional differentiation provides the environment with qualities that are differentiable so that urbanites recognize the direction they are taking. Visual Scope refers to qualities that increase visual

permeability. Motion awareness refers to qualities that help the observer shape a mental image of his/her environment through both visual and kinesthetic senses based on his/her own motion.

Lynch's pioneering work provides urban designers with a new way of thinking about urban design. Considering the three components of environmental image analysis, the five elements, and design guidelines can help urban designers to provide urbanites with a clear and vivid mental image of their city.

Christopher Alexander

Alexander, an architect, is said by Bechtel to be the fifth pioneer in EBS. Among his large body of work is *Pattern Language (Alexander, 1977),* which works to empower both professionals and nonprofessionals to design and construct livable buildings and places. *Pattern Language* was first published in 1977 and it is currently used in many architectural schools in the United States and in other Western countries. This summary will briefly discuss what pattern language is, where and how it can be used, and what its significance is.

In order to know what pattern language is, we need to understand what a pattern is. A pattern is a way of solving a design problem. If a designer tries to design, he or she needs to decide how to approach and solve a design problem. The way of approaching and solving a problem is considered a pattern. The more problems one has to solve, the more patterns he/she needs to develop. The use of many patterns creates a language with which we can communicate the design and implementation process of a project. Patterns are the structure of every language; they made sense when they are used in a certain order. Therefore, Alexander developed a certain format for both patterns and the language.

The format of each pattern includes, first, the title of the pattern. After the title, each pattern displays a picture that indicates a most common model of the pattern. A context is then

set for each pattern to explain the way it complements and relates to larger patterns. Next, Alexander provides the significance of the problem in two or three sentences in bold type. This is followed by the body of the problem, which is the longest section and includes background information, proofs for validity, and other detailed information about the pattern. Then the design solution for the problem is provided in bold type and illustrated in the form of a graphic diagram. Finally, there is a list of smaller patterns to which the present pattern may relate.

Alexander selected this organizational format to connect all 253 patterns and thereby form a language. Since each pattern is linked to broader patterns and smaller patterns, the overall arrangement of the book is from larger to smaller scale; it begins with town and regions and ends with construction details. Therefore, all patterns in this language have relationship with each other, and no pattern is considered an entity by itself.

The use of these patterns is not limited to any one situation but applies to any design or construction project. In the introduction to the book, Alexander exemplifies a porch-design project in order to explain how pattern language can be used. He writes a list of ten patterns to be included in the porch design—e.g., private terrace on the street (140), outdoor room (161), Six foot balcony (167) and so forth. This list shows how, holistically, one can approach a design problem by developing a pattern language for his/her project.

It is sometimes argued that using pattern language will limit the number of possibilities a designer may think of for a design. Alexander denies this criticism and states that this is just a set of patterns that are the most common. He argues that they provide us with one way for tackling a design problem. He also emphasizes that there are thousands of ways for solving problems in a project. Individuals are not limited to the use of certain combinations of the pattern in this book;

they can develop their own new patterns and created their own new languages in order to solve their design and construction problems based on the particular context.

In Pattern Language, Alexander not only established a process of organizing ones' thoughts for solving design and construction problems; he also encourages non-designers to participate in the building and design process. Non-professionals can study Pattern Language and exchange useful ideas when discussing issues with the designer.

Conclusion

This chapter has provided a brief environment-and-behavior-studies history by reviewing major works of five pioneers in this field. Since EBS are interdisciplinary, these pioneers represent different professional backgrounds—i.e., Roger Barker and Robert Sommer are psychologists; Edward Hall, an anthropologist; Kevin Lynch, an urban designer; and Alexander, an architect. These pioneers focused on different aspects of human-environment relations and tried to find ways for making the designed environment more life-enhancing and soothing for people.

For example, Roger Barker has helped designers learn more about people's needs by observing them in their everyday settings. Robert Sommer's concept of personal space has helped interior designers to think more holistically about designing interior spaces. Kevin Lynch's work has been a key to making cities more legible, and Christopher Alexander's efforts have helped make the design and construction process more viable and accessible for user participation. These pioneers' accomplishments have introduced many important topics to environment-and-behavior studies. The next chapter examines some of these topics in greater detail.

CHAPTER 3 - Territoriality

Introduction

This chapter overviews the concept of territoriality, which relates to human environmental identification and attachment. This discussion begins with what territoriality is and how the concept emerged and developed. The chapter then explains various kinds of territoriality, the types of markers that delimit territories, and territorial infringement. Next, it lays out Newman's arguments of his two major works—(1) *Defensible space*; and (2) *Community of interest*—that are considered crucial in the concept of territoriality. Finally, the chapter explains how the concept of territoriality can be applied in practice for designing well-functioning, safe, and stress-free environments. Before discussing territoriality, it is useful to define territory as a concept.

Defining Territory

Many living beings in the world have a territory that they control and do not want to be intruded by outsiders. Territory can be as big as a country or as small as the personal space of humans. In the case of country, territory is considered to be all the regions inside geographic and political borders. In the case of a single individual, territory is an invisible bubble that surrounds him/her. There is a range in definitions of territory. For instance, Parr (Edney, 1974, p. 962) states that territory is a space which one claims as his/her property and defends it, while Sommer (Edney, 1974, p. 962) suggests that any defined, personalized area is a territory. Yet again, Pastalan (Edney, 1974, p. 962) claims that territory is a space delimited and defended as an exclusive preserve by an individual or group, while Delaney (2005, p.33) argues that territory is a social, historical, cultural, political, and conceptual phenomenon.

Territory can also be defined as a geographic place that animals and humans control and feel stressed in regard to if they lose control over it or when it is invaded. The next section discusses four kinds of territories that will be explained under the concept of territoriality.

Defining Territoriality

In the 1920s, English ornithologist Eliot Howard proposed the concept of territoriality. He wrote, "aggression among individual animals of the same species is involved in the securing of property rights which confer upon the individual animals of the same species of valuable advantages" (Porteous, 1977, p. 19). As Howard's description suggests, territoriality is the phenomenon of how an organism behaves and controls a space or a territory.

A major question regarding territoriality is whether territorial behavior is innate or learned. This issue has been studied in biology, ethology, anthropology, psychology, and geography. Broadly, the literature suggests that animals' territorial behavior is genetically embedded, while humans' territorial behavior is greatly modified by learning and environmental factors (Porteous, 1977, p. 21). As Porteous (ibid.) explains, "man, then, exhibits territorial behavior to some degree and this pattern may possibly have some instinctual base, though heavily modified by cultural conditioning."

Broadly, it can be concluded that territoriality in humans is at least partly driven by learned factors like culture, social values, technology and so on. Delaney (2005, p. 12) states that territoriality involves "ways of world-making informed by beliefs, desires, and culturally and historically contingent ways of knowing." In other words, human territoriality is influenced by needs that people are obliged to fulfill and, in this sense, human territoriality is multi-layered: "it provides for a variety of needs, including safety and security, mating, raising of children,

acquisition of food, development of self-identity, and even indicator of status" (Stewart-Pollack & Menconi, 2005, p. 26).

Types of territoriality

As mentioned above, there can be various kinds of territories all partly focused on the way our built environment is designed and functions. Here I describe four types: (1) personal space; (2) primary territory; (3) secondary territory; and (4) public territory.

1.Personal Space

Among all four types of territories, personal space is a territory that humans carry with themselves and is not related to a particular place. Robert Sommer calls personal space a portable territory that every human owns and carries wherever he/she goes. Edward T. Hall, in his discussion of proxemics, explains that personal space is influenced by social and cultural values. In addition, he "examines the spacing or distance that we naturally place between ourselves and others in different situations" (Stewart-Pollack & Menconi, 2005, p. 23).

2.Primary Territory

Unlike personal space, the remaining three types of territories are stationary in that they are related to a particular place over which one claims permanent or temporary ownership. Primary territory is the primary place of retreat for its occupants. It is considered a permanent territory where occupants have a strong sense of ownership, and invasion in this territory is often prohibited by law. A good example of this type of territory is one's home because it can provide the territorial satisfactions which Porteous identifies as *security*, *identity* and *stimulation*.

By *security*, Porteous refers to a safe and secure living environment. Since home is a place to retreat to and perform activities that are vulnerable to intrusion like sleeping, grooming,

concentrating and so on, a primary territory needs to be secure enough that its occupants do not feel exposed to outside threats while performing such activities.

Porteous exemplifies security in terms of houses in three different cultural contexts—Muslim, British, and North American dwellings. Porteous argues that North American houses are the least defensible in terms of security. Occupants typically share some of their turf (front yard) which is neither surrounded by walls nor fences. Occupants do not feel offended if one walks in their yard until he/she approaches the dwelling. In contrast, British houses typically have a low fence or wall that surrounds the main house. These occupants feel offended if one crosses the low wall or the fences. The yards of both North American and British houses are visually permeable but in Muslim houses, due to cultural reasons, occupants would not feel secure if their yards (territories) are visually permeable. Therefore, all Muslim houses have high boundary walls and occupants feel extremely offended if someone enters their primary territory without permission.

Second, Porteous points to *identity* as an important component of primary territory. Once security is provided, occupants then have the chance to personalize their territories. This personalization relates to individual rooms as well as to the house as a whole. The house is a major territory that express its occupants' identity in a neighborhood. As Porteous explains, "the house as a whole, and especially its external appearance, is a major vehicle for expressing identity" (Porteous, 1977, p. 65).

In this sense, personalization is grounded in cultural and social values; however, it also very much depends on individual preferences and habits. Within a house one can find a range of territorial arrangement based on how each individual behaves and performs activities. Personalization in common areas of a house is done in accordance with family members'

choices. Family members need to agree on what modifications are acceptable in common areas inside and outside.

Third, Porteous identifies *stimulation* as playing an important role in personalizing, modifying and defending a primary territory. Home owners sometimes involve themselves in competitive behavior and copy their peers. In terms of territorial satisfaction, copying "good things" can facilitate a supportive environment. On the other hand, competition for doing something ineffective may lead to environmental problems and failures—for example, conflict among neighbors.

3.Secondary Territories

Compared to primary territories, secondary territories have a less strong sense of ownership. They cannot be personalized to the extent that primary territories can be because they are not considered permanent and cannot be continuously occupied. As Stewart-Pollack & Menconi explain, "occupancy in secondary territories is temporary" (Stewart-Pollack & Menconi, 2005, p. 28). The three territorial components elaborated by Porteous in primary territory (security, identity, and stimulation) are not present in secondary territories. In regard to secondary territory, occupants cannot claim permanent ownership because they cannot personalize the space because they do not "own" the space.

Examples of secondary territory can be "second places"—a secondary territory not only confined to offices or other work places but also applicable to schools, retail establishments, and so on (Oldenburg, 1989). Each of these secondary territories can be personalized to some degree, and in this sense the personalization and claiming ownership in secondary territories can perhaps most clearly be seen in workplaces. While working in an international company, I observed that employees used small toys or other personal items to mark their work territory. Each individual's

workspace was personalized to express the occupant's identity and position. For this reason, territoriality has direct relation to human organizational hierarchy, and the environment needs to be designed in such a way that any social and organizational hierarchy is taken in to account. More about this topic will be said later in this chapter.

4. Public territory

"Third places" like parks, cafes, restaurants, recreational centers, shopping malls, places for worship, and streets are all considered public territories (Oldenburg, 1989). Levels of ownership in this type of territory are the least pronounced or observable because they cannot be personalized. These territories function according to certain formal regulations. As Stewart-Pollack & Menconi explain, "use of these territories is restricted by laws, codes, customs and regulations" (Stewart-Pollack & Menconi, 2005, p. 28).

In order to have a place of our own in a public territory, we need to mark it in some way: "Once we have placed our blanket or towel on the beach, we have marked our territory and expect that territory to be ours for as long as we have it marked" (Stewart-Pollack & Menconi, 2005, p. 28). Privacy in public territories cannot be readily controlled, for people need to act in accordance with the norms and customs of the area: "Public territories are open to anyone in good standing within the community and occupants cannot expect to have much control" (Kopec, 2006, p. 65).

Infringement and Markers

Conflict over territories can occur when territorial boundaries are not well defined or unclear for occupants. According to Kopec (2006, p.66), territorial infringement can be of three types: *invasion*, *violation*, and *contamination*. Territorial *invasion* occurs when a stranger or outsider forcefully enters a territory and attempts to gain control. Such encroachment can

sometimes lead to violence or not. As Kopec explains, “invasion need not be violent; members of blended families often feel invaded when forced to share their primary territories with new parents or siblings” (Kopec, 2006, p. 66). There can be many causes for territorial invasions, but to some extent strong boundaries can help minimize opportunities for invasion.

In contrast, territorial *violation* occurs when an intruder temporarily enters someone else’s territory but does not claim any sort of ownership. This type of encroachment happens when one tries to harm, annoy, or express power. Yet again, territorial *contamination* occurs when a territory is intentionally fouled. Examples of territorial contamination as listed by Kopec (ibid.) can be vandalism, graffiti, or excessive noise.

It is possible to control or avoid these infringements with careful use of boundaries or territorial markers which are used to define occupants’ territories: “From a practical viewpoint, territorial markers are used to communicate ownership and to personalize a space” (Stewart-Pollack & Menconi, 2005, p. 26). Newman in his book, *Defensible Space: Crime Prevention through Urban Design*, classified territorial markers as two types—*real barriers* and *symbolic barriers*. Real barriers are building shapes, wall, gates, fences, and so forth. These territorial markers physically restrict outsiders, whereas symbolic barriers like open gateways, light standards, steps, planting, and changes in the texture of walking surfaces (Newman, 1973, p. 63) are used to give outsiders a sense of moving from one territorial space to another.

In terms of real barriers, a good example is building shapes and gates. Building shapes as real barriers can make a considerable difference in providing their occupants with zones that have less disturbance from outsiders. A good example of how building shapes can help to reinforce territorial control are New York City’s Breukelen houses as interpreted by Newman: “Buildings are L-shaped and are positioned so as to touch the street at two extreme points of the

“L.” The area enclosed by the right angle is defined as semiprivate territory on to which two or four entries to the building open” (Newman, 1973, p. 54). The shape of these buildings gives a strong territorial sense to its users because they provide users with a space that is not totally open to the public area but enclosed by their primary territories (apartments). When entering this space, outsiders are also given a sense of moving from a public space to a semiprivate realm.

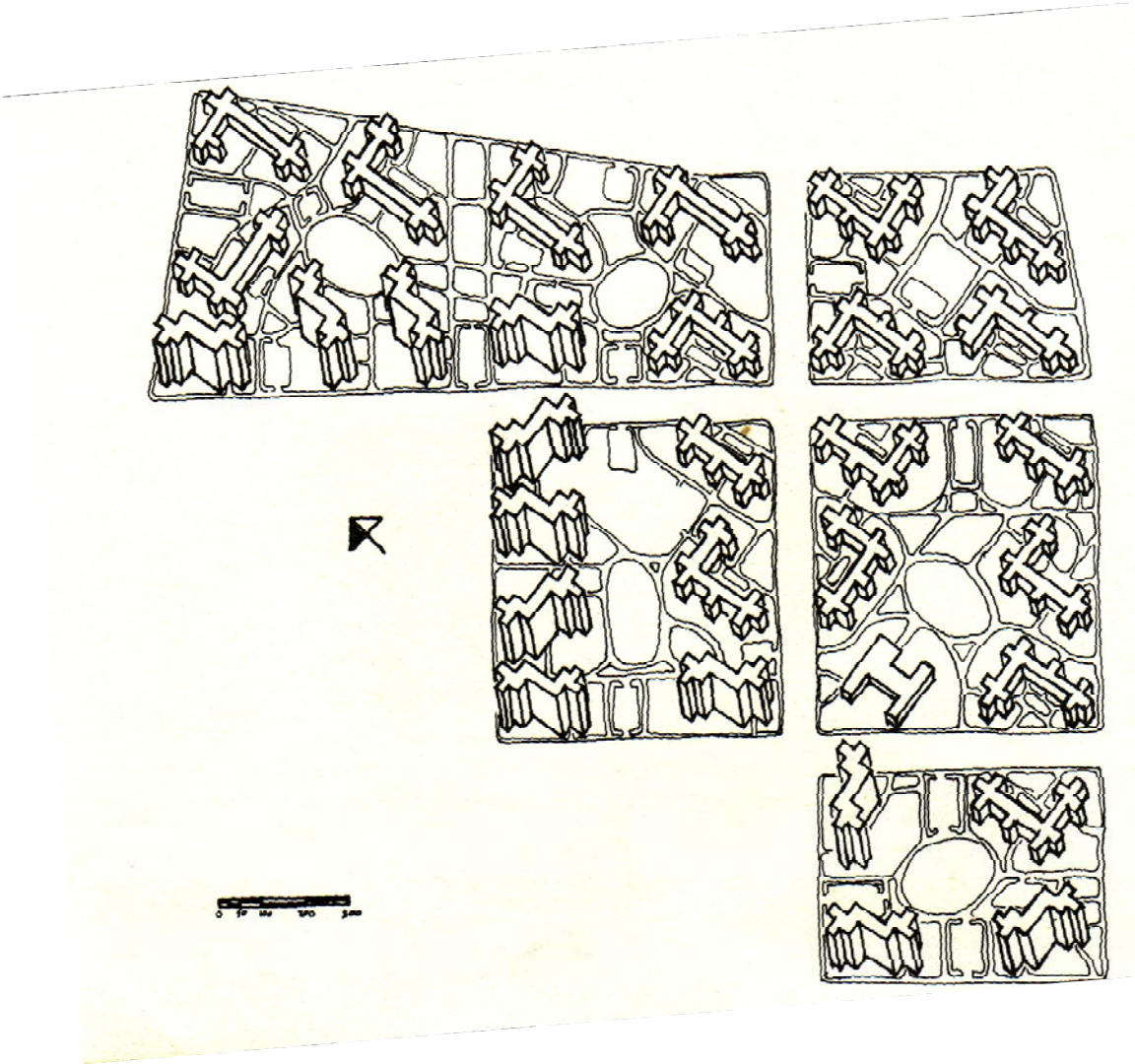

Figure 3.1 New York City’s Breukelen Houses (from Newman, 1972, p.54). (Courtesy Oscar Newman)

What strengthens this enclosure is not the “L-shape” only but the buildings’ side extensions which play an important role in giving users a strong sense of territory. The strongest sense of territoriality in these building blocks is the interior corner of the “L,” and Newman explains that this area is used as a place for recreational activities. This L-shape is not the only shape that can be effective. Other parts of the “L,” with the help of the other extensions, create other semiprivate areas—for example, the exterior part of the long side of the “L” in combination with extensions creates a shallow “c” shape that helps enhance the sense of territoriality and also defines a semiprivate area. As this example demonstrates, If we think innovatively, we can come up with building shapes that can make our surroundings or semiprivate areas even safer.

Gates can be another example of real barriers that can help enhance territorial security. gates were used in ancient settlements to secure communities but they are also used today to make neighborhoods safe and secure. In the United States presently people turn to gates and walls for creating what are called “gated communities.” As Kopec explains, “in many parts of the United States, a growing trend is the development of gated and walled communities” (Kopec, 2006, p. 299). Because of occupants’ lack of control over their territories which has led to an increase in crime, residents turned to gated communities. This concept of gated communities can be effective in non-urban areas, but are less successful in cities for many reasons, first because they segregate people. In addition, police departments’ control over suspicious activities going on in the community is weakened: “for residents of gated communities, the current state of urban America justifies their selecting a neighborhood for the security it provides; for opponents of gated communities, sealing off neighborhoods and creating walled enclaves further fragments our fragile social and economic fabric” (Wilson-Doenges, 2000, p. 598).

Oscar Newman's Theory of Defensible Space

The initial studies that examined links between territoriality and environmental design is the work of American architect, Oscar Newman, whose two major works are *Defensible Space: Crime Prevention Through Urban Design*, published in 1972; and *Community of Interest*, published eight years later. Newman's concept of defensible space works to strengthen territoriality through the design of places in such a way that they enable residents to control their semiprivate and semi-public spaces. As Robert Sommer (1974, p. 98) writes, "defensible space is a territorial concept involving a range of mechanisms that occupants use to control their own spaces." Poyner (1983, p. 8) listed four core mechanisms (what he calls elements) on which Newman's theory of defensible space is based: 1) territoriality, (2) natural surveillance, (3) image, and (4) milieu. Each of these mechanism is discussed in turn.

1. Territoriality

In order to give residents of multi-family apartment buildings a strong sense of territoriality, Newman emphasized both semiprivate and semi-public spaces, both inside and outside the residential buildings. To enhance the sense of territoriality in semiprivate common spaces of residential blocks, Newman (1973, p. 71) emphasized several scales of subdivision, including number of apartments per hallway, number of apartments per building, and number of buildings per project. The less people responsible for an area, the more-crime free it potentially is because residents can more easily identify strangers and survey their semiprivate spaces more effectively. Therefore, Newman subdivided residential walk-ups so that a smaller number of families would share a common entrance. By doing this, a maximum number of 12 families can use one staircase and avoid a large common corridor that is shared by all families in each level of the block. These sub-division do not create economic disadvantage because Newman explains

that, in walk-up buildings, by providing three staircases rather than two with a long corridor, saves space and is more economical; in medium rise and high rise buildings, too, subdivision of one central lobby and large corridor can save space and increase efficiency.

2. Natural surveillance

Natural surveillance is a mechanism that enables residents to survey not only their interior semiprivate areas but also semi-public areas, both from residents' primary territories and from outside. In terms of natural surveillance, Newman focuses on three major design issues that relate to residents' ability to control probable criminal activities: (a) design of external semi-public areas; (b) design of internal semiprivate areas; and (c) design of internal spaces of private areas (primary territory).

In regard to strengthening natural surveillance in external areas, Newman criticized the random position of residential blocks because they create pathways with blind corners, specifically, when they have greenery on both sides. To exemplify this idea, he describes Baruch Houses in New York City. Due to their random positioning, these houses create circuitous pathways hidden by shrubs. Therefore, these pathways create places for criminals to hide and threaten residents. Newman explains that shape of the buildings also plays an important role in proper surveillance of the lobby entry. He points out that, if a lobby entrance is placed in the middle of a single rectangular block, it cannot be well controlled because there are no windows; but if an entrance is placed in the interior corner of two blocks meeting in an angle, the result is an increase in the visibility of the entrance lobby, for it can be well watched.

In order to improve natural surveillance in internal semiprivate spaces, Newman focuses on lobbies, elevators, hallways, and fire stairs. If lobbies are placed in such a way that they can have strong visibility both from internal semiprivate and private parts of the building and also

from nearby spaces outside, potential criminal activities will be better controlled. In many residential building corridor spaces, there are leftovers spaces that can shelter criminal activities. Fire stairs, too, are a major concern in regard to lack of visibility because they are the least visible part of high-rise residential buildings. As Newman states, “due to fire codes requirements, the stairs are virtually sealed off from heavily traversed areas of the buildings they serve” (Newman, 1973, p. 89). To solve this problem, he suggests windows that can provide the fire staircase enough visibility to be viewed from the street.

Newman also recommends that architects design high-activity areas so that residents can easily see from inside their apartments what is going on outside. As he explains, “the architects of Breukelen located kitchen windows in each apartment so that they face the building entries, and then incorporated play areas and parking lots adjacent to these entries” (Newman, 1973, p. 91). This may seem to violate privacy rules, but there can be various design solutions—for instance, use of single-side transperant glass, prefabricated or built-on-site screens and so forth—that enable residents to see outside without being seen.

3. Image

Under image, Newman discusses features that negatively isolate or differentiate housing projects from their surroundings. Newman explains one of the factors that causes negative isolation and stigma in large residential projects is closing streets in order to strengthen territorial sense and security; but this factor causes the areas to be singled out as an isolated unit that and becomes vulnerable to vandalism. A major reason why vandalism occurs, according to Newman, is because these areas have many spaces with weak visibility and are too large for residents to control.

Building height, project size, materials, and amenities are other factors that cause public housing to stand out, and thus residents feel isolated and placeless. This feeling of placelessness and isolation in turn contributes to negative behaviors. Newman writes, “instead of being provided with an environment in which they can take pride and might desire to keep up, they are provided with one that begs them to test their abilities in wearing it down” (Newman, 1973, p. 105). Instead, residents of public housing areas need to be provided with flexibility to personalize their spaces so that they can feel at home. Being placed in an institutional-like building, residents may behave negatively. As Newman explains, “Unable to camouflage their identities and adopt the attitudes of private apartment dwellers, they sometimes overreact and treat their dwellings as prisoners treat the penal institutions in which they are housed” (Newman, 1973, p. 107).

4. Milieu

Milieu is a French word meaning “environment.” Newman uses this term to explain that residential blocks can be made safer if they are near safer areas. This explanation has two aspects: (a) linking residential areas with other “safe” functional facilities like commercial, institutional, industrial and entertainment; and (b) placing residential areas with safe public streets.

Newman suggests that safe functional facilities are safety inducers; they involve the presence of people involved in activities like shopping, playing, jogging, sitting etc. Places with high activity areas supporting the presence of people are safer because people can work as a strong surveillance force and play an important role in discouraging criminal activities. As Newman explains, “the presence of many people is seen as a possible force in deterring criminals” (Newman, 1973, p. 109).

However, the presence of people can also adversely affect the safety of residential areas. Newman describes this situation in regard to his Outhwiate project in Cleveland, a residential project next to three schools, the students of which poses a threat to the safety of residents by invading both exterior semi-public spaces as well as some interior semi-private spaces. Newman explains that the students "harass and are occasionally involved in the mugging of residents" (Newman, 1973, p. 111). Considering these problems, it can be argued that every functional facility cannot be considered safe. Therefore, locating facilities near residential projects requires careful study and analysis in terms of their effects on residential safety. In this sense, Newman disagrees with the New York City Housing Authority's claims that public streets are unsafe. He writes that, "consistently, tenants have scale-rated their buildings as safer when the entry, entry grounds, and lobby of the buildings face directly onto city streets" (Newman, 1973, p. 114). The degree of safety here is also related to the type of facilities these streets house.

Community of interest

As explained above, Newman's theory of defensible space was focused on designing residential environments so that residents easily control them in terms of security. Newman later argued in his 1980 *Community of Interest* that his theory of defensible space does not pay enough attention to making residential environments responsive to residents' needs for a socially interactive and well-functioning community having strong social relationships. According to Newman, a "community of interest is a mechanism for the creation of intermediary zones between the private home and the public street—zones which are the shared terrain of a small group of neighboring residents, which address their common interests and provide them with a form of 'collective identity' " (Newman, 1980, p. 17). Newman writes: "community of interest is a concept for creating contemporary physical communities structured around the satisfaction of

the shared needs of similar types of residents—needs which can only be met as a consequence of the common geographical location of community members" (Newman, 1980, pp. 16-17).

In designing for a community of interest, Newman emphasizes two aims: (1) cluster together residents of the same lifestyles; and (2) integrate them socio-economically. First, I focus on Newman analysis of lifestyle clustering. Newman discusses three lifestyles—family with children, elderly, and working adults (singles or couples without children). In order to provide residents who have different lifestyles with the opportunity to share common neighborhood needs, Newman studies four dwelling types: single-family housing, walk-ups, medium-rise buildings, and high-rise residential buildings. What building works better for which lifestyle, according to Newman, is illustrated in table 3.1.

Family Type	Building Types					
	1. Single-family	2. Walk-ups	3. Medium High-Rise		4. Elevator High-Rise	
			Doorman	Non-doorman	Doorman	Non-doorman
Families with children	**	**	*	●	●	■
Elderly	*	■	**	*	**	*
Working adults	■	●	**	■	**	■

** strongly recommended ● barely acceptable
* recommended ■ not recommended

Table 3.1 The Assignment of Family Types to Building Types (from Newman, 1980, p.163). (Courtesy Oscar Newman)

This table suggests that single-family houses and walk-ups work best work for families with children, while medium-rise and high-rise buildings work best for elderly and working adults. The reason why Newman considers single-family houses and walk-ups better environments for the families with children is because "for families with children, the home and its environs is where much of the daily activity is centered" (Newman, 1980, p. 159). When

children are home, they need a place to play and to have an outdoor social life. For this reason, it is important to provide children with a dwelling whose environs can afford play. Newman argues that no other types of buildings except single-family houses and walk-ups can provide children with a safe and crime-free environment because residents living in these buildings are attached to the grounds in their environs and they can easily control their surroundings. Therefore, the natural surveillance of children playing near the walk-ups can be well insured in these types of buildings.

Unlike single-family housing and walk-ups, high-rise and medium-rise buildings detach their occupants, specifically those who live in higher floors, from their neighborhood because grounds of these building types are usually shared by many residents; this transforms the ground into semi-public places, and no one feels responsible for them. Therefore, residents' controllable territory is limited to their apartments only, and they feel detached from their environs. Interior circulation spaces like stairs, lobby, elevators and corridors areas are also considered semi-public because they, too, are shared by many people. If families with children reside in these building types, their children will use interior circulation areas as play areas; this can lead to vandalism if no doorman is available.

On the other hand, Newman does consider high-rise and medium-rise buildings a suitable residential building type for the elderly and working adults without children. The reason why he considers high-rise workable for working adults without children is because "working adults do not perceive their home environments as their living milieu, but rather like a base of operations" (Newman, 1980, p. 162). They consider their home environment as travelers consider their hotel rooms (ibid.). For this reason medium-rise and high-rise buildings with doormen for security are considered workable.

For the retired elderly, too, high-rise buildings are workable for two reasons: (1) providing easy and effortless access from floor to floor via elevators; and (2) providing easy social interation among residents. Newman does not consider walk-ups workable for elderly, because “as the retired elderly grow still older, the problem of climbing a fight or two of stairs—particularly with groceries—can become severe” (Newman, 1980, p. 161).

A second reason why high-rise buildings work well for elderly is because they “tend to seek out the companionship of other families—most often, other elderly” (Newman, 1980, p. 160). The more neighbors they feel connected to, the stronger the sense of companionship and social support. Use of elevators can ease connection and interaction with other residents in a building and work as a useful tool in providing elderly enough social support.

Crime Prevention through Environment Design (CPTED)

According to Newman, socio-economic integration along with clustering by lifestyle can play an important role in making residential environments more responsive to people’s communal needs and thus humanize their environs. This humanization leads to the creation of a stronger sense of community and territoriality, which should be considered an important part in the process of making residential areas more defensible. Newman‘s works, specifically his earlier *Defensible Space*, set the stage for the eventual development of what is called *Crime Prevention Through Environment Design* (CPTED; “pronounced sep ted”), a research program backed by the US federal government through the National Institute of Law Enforcement and Criminal Justice. According to the National Crime Prevention Institute, “the proper design and effective use of the built environment can lead to a reduction in the fear and incidence of crime, and an improvement in the quality of life” (Crowe, 2000, p. 46).

A key work in CPTED research is Timothy Crowe's *Crime Prevention Through Environment Design: Applications of Architectural Design and Space Management Concepts* published in 2000. In this book, Crowe tries to improve sense of territoriality through physical design. Crowe writes: "the concept of territoriality suggests that physical design can contribute to a sense of territoriality" (Crowe, 2000, p. 37). In order to have a strong sense of territoriality and well-controllable spaces, Crowe argues for three key strategies: (1) natural access control; (2) natural surveillance; and (3) territorial reinforcement. These three strategies are considered crucial in controlling crime in built environments. Since these three strategies overlap, they are considered here under the umbrella of territoriality. As Crowe writes, "it was recognized that natural access control and surveillance contribute to a sense of territoriality , making it effective for crime prevention" (Crowe, 2000, p. 37); and "it is perhaps most useful to think of territorial reinforcement as the umbrella concept, comprising all natural surveillance principles, which in turn comprises all access control principles" (Crowe, 2000, p. 38).

In order to reinforce territorial control in our built environment, Crowe argues for a focus on two strategies—natural access control and natural surveillance—as major tools for defining territories with either real or symbolic territorial markers. Natural access control stands for measures taken to control the main routes of entering or exiting a territory (whether a neighborhood, an open space, or a building) without any extra effort or mechanical aids. This can be done only if the accesses are designed in locations where they can easily be observed by occupants of the area. Natural surveillance, too, stands for control of a territory with the help of occupants' everyday utilitarian activities.

Crowe points out that access control and surveillance of an area can be done with security gaurds and mechanical tools like locks, lighting, and surveillance cameras. But as architects,

planners and environment designers, we need to focus more on natural, designable control of territories rather than simply installing mechanical equipment. This is so because it increases our awareness of the surrounding environment, strengthens positive behavior toward maintaining that environment, and motivates us to consider the environs as a communally shared territory. For this reason, CPTED programs typically emphasize more natural access control and surveillance rather than mechanical control. Therefore, CPTED programs consider natural access control and natural surveillance as a primary design concept.

In order to ensure that a territory is naturally controllable, we need to gather information so that we can develop designs accordingly. CPTED proposes five basic types of information that help designers give facility users a strong sense of territoriality and get them to feel responsible for controlling their surroundings:

(1) Crime analysis information: This information can be found through police departments which have information about where most of the crimes take place in an area; they can also specify the types and time of criminal incidents.

(2) Demographic information: this involves information about the population of the area and is available from city planning departments.

(3) Land use: This information, too, can be found in city planning departments. It is usually presented in map form which illustrates what each part of the city is used for—for instance, where in the city residential, commercial, or mixed-use facilities are located.

(4) Observations: Observation is considered a useful way of finding out when, where, how and what activities are done in the area. Observation can be done formally if an area is restricted or it can simply be done informally in public spaces.

(5) Interviews: This type of information can be useful for making inferences about other data sources; one can learn about people's reactions toward their surrounding and how they feel about events happening in their area.

Considering these five types of information educates designers in regard to people's territorial behavior in a specific environment and enables designers to create or rehabilitate places or buildings in such a way that their users feel responsible for control of their territories, do not violate others' territories, and avoid criminal activities. These types of information work better if they are more visual than written, thus, for example, Crowe explains that a crime map that indicates clusters of burglaries by block is more helpful in the design process than a detailed statistical measure by percentage (Crowe, 2000, p. 41). Crowe also states that"maps and transparent overlays are useful means of comparing the five types of information that are needed in CPTED planning" (Crowe, 2000, p. 43).

Conclusion

To explain territoriality, this chapter first considered what territory is and then presented a brief history of territoriality and discussed whether territoriality is innate or learned. Next discussed was human territoriality, which was considered in terms of four types: personal space (portable territory), primary territory, secondary territory, and tertiary territory (public territory).

Then, three types of territorial infringement—territorial invasion, territorial violation, and territorial contamination—and two type of territorial markers or territorial barriers—real and symbolic—were explained. Next, there was discussion of Oscar Newman's two major works: First, *Defensible space* which explains how to make residential environments naturally controllable by their users; and, second, *Community of interest,* which explains how to make

residential environments more human-friendly in terms of using lifestyle needs to strengthen social relationships through physical design.

Finally, this chapter presented the concept of territoriality in light of CPTED programs so that practical- action plans can be developed for making physical environments naturally controllable. To achieve this goal, four types of information—crime analysis information, demographic information, land use information, observations, and interviews—were overviewed as being crucial while designing physical environments that support features of defensible space and territoriality.

CHAPTER 4 - Cognitive Mapping

Introduction

This chapter overviews cognitive mapping, which refers to how people process information in relation to their environment. To provide this discussion, the term cognition is first defined, followed by a description of cognitive mapping. Next, the chapter discusses cognitive mapping at three levels: (1) the macro-level, focusing on Kevin Lynch's work; (2) the meso-level, focusing on buildings; and (3) the micro-level, focusing on Psychologist Donald Norman's work. Before discussing cognitive mapping, it is important to know what cognition is.

Cognition

The word *cognition* is rooted to the word *cognoscere,* which is a Latin term meaning to know, or to recognize (Sorrentino & Higgins, 1990, p. 568). Cognition is the process of processing information mentally. As Kopec explains, "cognition is the process of thinking, knowing, or mentally processing information" (Kopec, 2006, p. 50). For a clearer picture of cognition, it is important to know how information is managed, because cognition is carried out along with other information processes; the result of cognition is expressed in human behavior. In order to know how information is collected from the environment, processed in the human brain (cognition), and finally affecting behavior, it is useful to focus on Porteous' framework (Porteous, 1977, p. 141) which explains the process through which information from environment is collected, analyzed, and drawn on in terms of human behavior (see figure 4.X).

Porteous' describes four stages through which information from environment consequently affects behavior. These stages are as follows:

1. Stimuli: from the environment, stimuli are received by the individual through his or her senses—sight, hearing, smell, taste and touch. Since the senses are the primary means for connecting humans to their environment, perception of the stimuli begins the cognitive process and refers to a first stage in acquiring information (Kopec, 2006, p. 48).

2. Percept: After information is made available from the environment, it is then interpreted mentally based on past experience, which is called *apperception* (Porteous, 1977, p. 140). In the process of apperception, environmental information is compared and matched with the image already present mentally. This image is partly a formation of cultural, social, and other behavioral dimensions.

3. Cognition: Next, the information is processed mentally to shape a decision which can inform the person as to whether a particular behavior or action is appropriate (Porteous, 1977, p. 140).

4. Behavior: Once the decision is evaluated, the person activates the appropriate behavior—for example, finding his or her way to an urban destination.

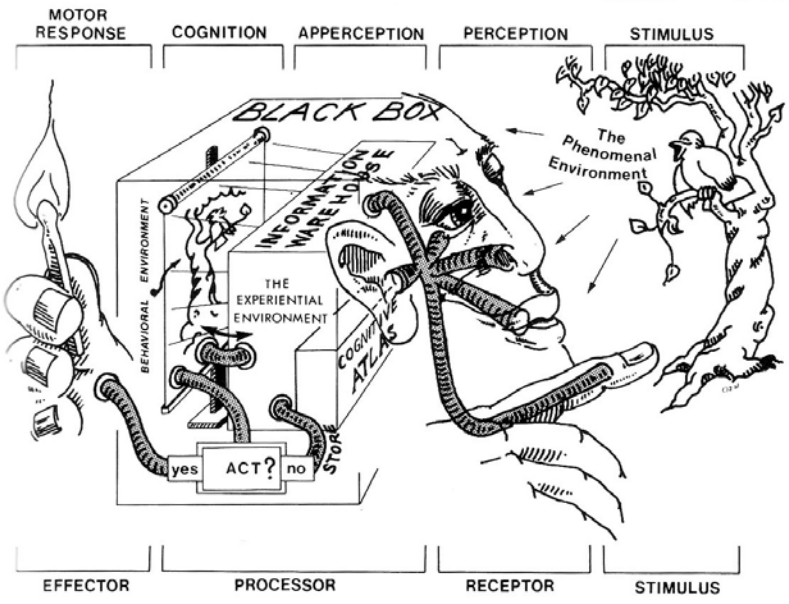

Figure 4.1 (Porteous, 1977, p. 141)

These four stages of the cognitive process demonstrate that "action in the real world takes place on the basis of the cognitive image of the real world held by the individual" (Porteous, 1977, p. 141). Since an individual's image is based on his or her cultural and social background and values, the image of an environment can vary from person to person—a point that will be discussed more fully later when cognitive mapping is discussed.

Cognitive Mapping

Cognitive maps are mental images that an individual creates when he/she interacts with an environment or everyday things. Cognitive-mapping theory was first proposed in 1978 by O'Keefe and Lynn Nadel in their *The Hippacampus as a Cognitive Map:* "The theory proposes that, as an animal travels through its environment, it creates a brain representation of that environment in form of a map, called a cognitive map", which "is then used to guide new trips through the same environment" (Kolb & Whishaw, 2008, p. 602). This provision of guidance with the assistance of cognitive maps is called cognitive mapping, which is a process that assists humans with navigating in their environments without getting lost.

In terms of their developmental aspects, cognitive maps are the product of what we experience in our environs and what we have in our mind from prior experiences. It is important to emphasize that the theory of cognitive mapping can be used practically, specifically in designing, particularly in terms of wayfinding. As Golledge writes, "cognitive maps are important in human wayfinding" (Golledge, 1999, p. 4). Environments that lead to the formation of a clear cognitive map are considered stress-reducing because they rescue people from the risk of getting lost: "Wayfinding has implications for stress in visitors because of being lost or frustrated in finding their destination" (Barling, Kelloway, & R, p. 225).

Research on cognitive mapping has focused on many different environments in terms of scale or size (Garling & Evans, 1991, p. 156). In regard to large-scale environments, Chen points to "a person's cognitive map, or knowledge of large-scale space…built up from observation gathered as he travels through the environment" (Chen, 1990, p. 171). In addition to research on large-scale environments, researchers have focused on small scale environments (Garling & Evans, 1991, p. 157). Since cognitive mapping research incorporates studies of both small-scale and large-scale environments, it is important to focus on different scales while designing so that all environments become cognitively more responsive. Therefore, this chapter focuses on the following two environmental scales: (1) a macro-level, which discusses city-level cognitive mapping; and (2) a meso-level, which focuses on building designs.

Macro-level Cognitive Mapping

This level of cognitive mapping is focused on large-scale environments and, as explained in chapter two, was first studied in a design context by urban designer Kevin Lynch, in his 1960 *The Image of the City*. This book discusses how large-scale environments can be designed and made legible so that users can develop a clear cognitive map and arrange their spatial behavior accordingly to avoid feeling lost. This work has been called "the seminal contribution to the study of cognitive mapping" (Porteous, 1977, p. 101). As explained in chapter two, Lynch came up with five elements that make city environment more imageable—paths, edges, nodes, districts, and landmarks.

Since Lynch's major discoveries have been discussed in chapter two, here I focus on Lynch's research methods. This focus is important because cognitive maps do not have a direct physical appearance and vary from person to person. Two dimensions that are considered

important in Lynch's research methods are: (1) his careful selection of respondents; and (2) a thoughtfully designed questionnaire.

In his research on urban images, Lynch chose people of the same socioeconomic class in order to avoid confusing variations and to have concrete and trustable environmental data. As Porteous explains, "it is likely that individuals belonging to a fairly uniform group in a specific area will not have mental maps which are entirely unrelated" (Porteous, 1977, p. 107). In *The Image of the City,* Lynch studies residents of Boston, Jersey City, and Los Angeles; he interviewed thirty respondents in Boston, fifteen in New Jersey, and fifteen in Los Angeles. These individuals were all from professional and managerial classes (ibid.), thus his respondent sample had a socioeconomic coherence that would not interfere with the environmental dimensions of the three cities' images.

In other words, if respondents had been selected on a random basis—which usually involves individuals that are from different backgrounds— the result might have been a survey with vague and impractical results. This is because respondents would have different environmental representation shaped by different values systems and by what the respondents were mostly exposed to in their everyday life.

In addition to carrying out a careful selection of respondents, Lynch created a well organized questionnaire whereby respondents were able to easily lay out their mental images both in map drawings and in verbal descriptions. Lynch's questionnaire was designed to reveal urban imageability and began with simple questions—for example, what first come to your mind, what symbolizes Boston? Lynch followed these opening questions with more specific tasks that included respondents' drawing their mental maps on which they highlighted

environmental details. The result was that Lynch succeeded in making strong inferences about the respondents' cognitive maps and related design implications.

Meso-Level Cognitive Mapping

At the meso-level, cognitive mapping relates to building scale and studies the legibility of interior spaces of buildings and users' mental maps of buildings. As Dak Kopec explains, "the ability to navigate through [a building] easily influences our overall perception of it" (Kopec, 2006, p. 91). The more we navigate easily in a building, the more easily we can locate and use the facilities provided by it, a situation that leads to more workable and human-friendly environments. To help make interior environments more responsive in terms of legibility and imageability, Kopec highlights four elements: (1) visual access; (2) architectural delineation; (3) signage and numbering systems; and (4) building layout.

1.Visual access

Visual access makes an interior environment visually permeable and easy to read and understand. As Paul A. Bell and colleagues explain, "the ability to learn a new environment may depend upon the degree of visual access" (Bell, Fisher, Greene, & Baum, 2005, p. 91). They explain that Lynch also focused on visual access under the rubric of landmarks (ibid.). Well-organized, visually permeable buildings help even first-time users feel familiar with the environment and not feel lost. Garling (1983) points out that "familiarity with a building has substantial impact on wayfinding performance, as does visual access within a building: if the parts of a building are immediately visible and vistas connect building spaces, users are able to rely less on stored spatial knowledge and can rely instead on information directly available in their field of vision" (1979) (Freksa, 2005, p. 2).

Visual accessibility to enhance wayfinding and stronger cognitive maps can be studied in terms of sub-themes: (1) visual access to outside spaces; and (2) visual access to interior spaces. Provision of visual access to outside spaces enables building users to locate and orient themselves on the basis of cognitive information regarding a building's surroundings. Bringing outside in and taking inside out in complex buildings like hospitals is crucial for providing effective wayfinding within the building. This effort helps not only being linked to the outside while navigating, but also indicates to users outside the building as to how the internal building circulation works. For example, a building with openings that make the major hallways and circulation areas visually accessible outside eases first-time users' experiences and allow for a more effective cognitive map.

In short, major interior spaces for circulation and other activities in buildings need to be designed in such way as to assist users in developing clear mental maps. For instance, visual access to internal atriums is considered important in wayfinding. Arthur and Passini (1992) suggest that "a building organized around an open core has the advantage of providing the users with a visual access to the form of the circulation system" (Baskaya, Wilson, & Özcan, 2004, p. 841). Once users are familiar with a particular circulation system, they can more readily orient themselves within that environment; one can infer that atriums which are visually accessible from interior circulation spaces can help ease wayfinding.

Provision of visual access in a building's interior spaces is considered useful in wayfinding; however, it is sometimes hard to provide. For example, Baskaya and colleagues write that "visual access, which is difficult to achieve in a complex layout, is an important factor in facilitating one's spatial orientation and wayfinding" (Baskaya, Wilson, & Özcan, 2004, p. 842). In order to have strong visual accessibility, clearly connected activity areas in a building's

interior spaces are considered important because they help users absorb large amount of environmental information, thus easing decision making and reducing stress. If visual accessibility is not well provided, neither architectural delineation nor signage may function effectively enough because their relative impact is related to their degree of environmental visibility. In this sense, visual access is considered to be the most powerful tool in wayfinding. If environmental information cannot be visually accessible from key locations like entrances, main circulation areas, major access areas, and so forth, it is of little use for producing legible mental maps.

2. Architectural delineation

Architectural delineation involves making architectural spaces look varied and non-monotonous using various architectural elements and forms. As Kopec explains, "architectural delineation refers to the separation of one area from another via architectural elements or features, e.g., thresholds, walls, or variation in ceiling height and floor dept" (Kopec, 2006, p. 91). One central point regarding architectural delineation is that architectural spaces and architectural elements function best as interior landmarks if they are visually accessible. For this reason, while designing or remodeling architectural spaces, it is important to make sure that key visually influential spaces and elements are located in places that have strong visibility.

Second, it is important to know providing users too much information or providing them with environments that have little or no visual variation will lead to confusion and poor decision making while experiencing these spaces and trying to develop mental maps. The idea that lack of visual variation causes confusion is argued by Baskaya and colleagues (Baskaya, Wilson, & Özcan, 2004) in their comparative study of one symmetrical and one asymmetrical polyclinic. Drawing on user interviews, these researchers found that a symmetrical and monotonous setting

leads users to confusion in navigation; these researchers suggest that asymmetry is a more useful tool than symmetry in terms of facilitating wayfinding. As they explain, “Participants in the asymmetrical setting sketched the layout correctly four times more than those in the symmetrical setting (14.7% and 60.9%, respectively)” (ibid. p. 856).

Asymmetry, too, can help users outside a building to develop a rough mental map as they visually perceive the overall form of a building. This rough mental map can help users orient themselves while inside. Visualizing the overall outer form of a building also helps regular users to confidently locate their destinations before entering a building. It can also help users explain to others potential users what specific parts of building they are pointing to when trying to give directions or information about a building.

Further, proper use of architectural delineation helps generate physical environments responsive in terms of cognitive mapping not only for physically normal, but also for physically impaired users. In order to use this concept to help visually impaired users, for example, it is important to enrich the interior spaces with sensory information—e.g., touch, sound and smell. In regard to tactile information, the architect can help blind people locate themselves through the careful use of wall and floor materials. While walking, blind people sense tactile information with their feet and hands. This information is readable for them only if it is provided in three-dimensional texture form, which makes surfaces haptically responsive to visually impaired individuals. In addition to variation in texture, use of material with different physical properties like wood, plastic or metal handrails can provide visually impaired individuals with different tactile experiences and function as useful tools in developing a cognitive map that visually impaired individuals can depend on while trying to find their way.

Also, the way sounds are shaped by the physical environment can help blind people orient themselves. Creating an acoustically interactive environment through architectural delineation can be of great help to visually impaired individuals. Most often, sounds can indicate the types of activities present in an environment. Therefore, particular activity areas need to be placed within an environment in such a way that their sounds can help blind people recognize the type of activity and the particular location. In a corridor, building users can orient themselves if common spaces incorporate sounds of the functions they house. Sound or voices can help visually impaired individuals create their own hearing-based landmarks, and thus facilitate environmental orientation.

Smell is also considered an important tool for wayfinding because it can give visually impaired individuals a strong sense of where they are and for what purpose the space is used. In designing an airport for example, restaurants and stores should be placed carefully so that they make spaces easy to cognize. Such placement and arrangement of functions enhance the cognitive mapping process.

In short, incorporation of sensory information in addition to visual information can make the physical environment more life-enhancing not just for visually impaired users but for all users. As Juhani Pallasmmaa explains, “every touching experience of architecture is multi-sensory; qualities of space, matter and scale are measured equally by the eye, ear, nose, skin, tongue, skeleton, and muscles” (Pallasmmaa, 2005, p. 41). If users of an environment are stimulated through all their senses, the environment is more supportive in terms of developing a clear mental image that can be effective in wayfinding. Provision of such environments can be ensured by careful and inclusive architectural design.

3.Signage and numbering systems

Sometimes, architects and other designers fail to provide users with environments that enhance wayfinding through environmental design. As a result, these professionals turn to signage because it is a great challenge for designers and architects to design buildings in such a way as not to need signs. In this sense, the use of signs and their design is considered crucial for inserting knowledge into designed environments so they are more legible.

Signage helps environmental users draw on symbols as they try to find their way in an environment. As Kopec explains, "signage and numbering enable us to match displayed codes with the messages or symbolic meanings that we either bring with us (e.g., when we know that a friend occupies a certain hospital room) or obtain from on-site sources (e.g., what we learn from information centers and "you-are-here" maps or by asking directions)" (Kopec, 2006, p. 91). In order to make signage cognitively easy and effective in the wayfinding process, it is important to study it in terms of two factors as Passini does in his *Wayfinding in Architecture* (Passini, 1992)*:* (1) graphic identity; and (2) place identity. These two factors can help the designer to avoid misunderstandings in environments in which people must depend on signs while for moving about.

In order to give signs a specific identity, it is important that signs for different functions are designed differently; for instance, signs for advertisements or signs relating to environmental hazards need to be visually non-identical so that users can easily differentiate them and avoid misinterpretation. Passini writes that "sign perception is further improved if the person is familiar with [a sign's] overall form and design" (Passini, 1992, p. 95). Further, he explains that "Differentiation between wayfinding and commercial signs can be achieved by giving each its graphic identity" (Passini, 1992, p. 94). Graphic identity can be provided if all wayfinding signs have the same design properties (e.g., color, size, and font).

There are other issues like quantity of information and layout of information, distance from observers, and so forth, that all play a major role in helping users easily perceive signage. Passini writes that “in order to assure easy reading, not more than three or four units of information should be used” (Passini, 1992, p. 98). By “unit” he means lines of information as he illustrates in figure 4.2 below. Even though both signs provide the same information, the sign on the left is problematic because it is hard to follow. What makes it hard to read is the improper information layout. If the information on this sign were arranged in three or four lines as laid out on the sign on the right, it would be much more readily perceivable and thus understandable.

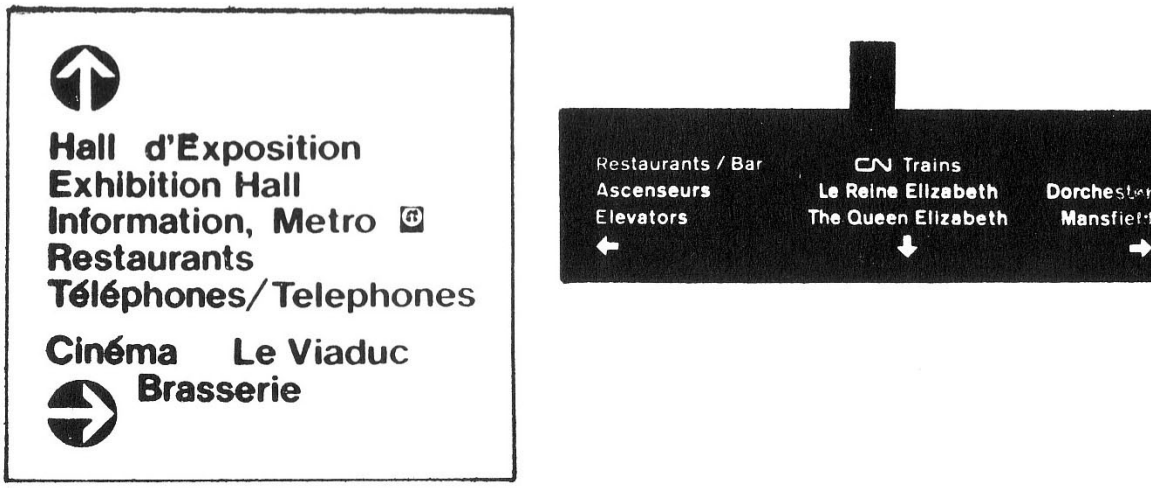

Figure 4.2 Two Signs with Similar Information (from Passini, 1992, p.98). (Courtesy Romedi Passini)

Numbering systems, too, need to be consistent. It is effective to choose one script—e.g., English, Arabic, or Roman—for the number signage of a particular building. Also, it is important to consider the different ways numbers can be written. Lack of consistency in using numbers leads to misinterpretation of the embedded environmental knowledge and leads to a physical environment less responsive because graphic information is not easy for the eye to follow.

Carefully structuring information so that the eye grasps it easily is considered helpful in making the built environment more straightforward. As Passini explains, “information has to be visually structured so that in the setting the message can be picked in glance” (Passini, 1992, p. 100).

And, too, it is important to design signs in such a way that they can be readable from an appropriate distance. Otherwise, they will not be helpful in assisting users of an environment to find their way. This readability can be ensured through examining users’ visual ability. To do this, it is first important to know from how far it is required to read information on a sign. Then, comparing this distance need to users’ abilities, one can design effective board and font size. For clear and visually supportive signs, it is also important to consider color and lighting because they can be used to make signage more prominent and more readable.

In addition to design consideration of particular signs for particular purposes and designing for clear graphic identity, it is important to carefully choose the locations where signs will be installed. Careful location selection helps users easily differentiate what a sign is for, especially in complex settings. For instance, in airport terminals specifying a particular location for signs used for different purposes is of considerable importance because airport terminals have many functions—like directing users to commercial areas (e.g., stores, restaurants, etc), to public services (e.g., restrooms), to luggage claim areas, and so forth.

It is important to consider that, for making environments easily traversable, signs should be installed in places where they are visually accessible for as many as users possible, especially in entrance lobbies. When entry signs are placed in visible locations, users can choose to read the information they need. It is also important that signs have clear visual relationship. If users cannot understand the relationship among signs, then the result is environmental confusion and a much greater possibility that users will become disoriented.

4.Building Layout

Building layout, too, can play an important role in helping users generate a clear image of their surroundings. As Kopec explains, "building layout relates to logical spatial progression and organization (e.g., in the department store, we expect to find women's shoes in near women's apparel, not home appliances)" (Kopec, 2006, p. 91). If functions in an environment are not well located in terms of users' expectations, the environment will probably work poorly in terms of cognitive mapping, since users cannot mentally locate environmental uses.

One example is the design of Kansas State University's Hale Library help desk, whose location is not successfully related to users' cognitive sense of their everyday environment, thus patrons have trouble in cognitively locating the help desk. Instead of being next to the entrance where it can easily be mapped mentally, the help desk is placed on the far side of the entrance. For this reason, users first approach the entrance where they cannot find the help desk so they look around and then locate the helpdesk to check out their books or ask for assistance. This help desk is visually accessible from all parts of the second floor but users often miss it because of its illogical location.

Similarly, this concept of a responsive building layout on the basis of cognitive mapping can make retail complexes more effective for shoppers in terms of their having easy cognitive access to items they want to purchase. As explained above, items that are expected by the users to be close to other items need to be arranged accordingly; for this reason, the layout should be designed in such a way that item placement brings these items together. For instance, if one needs to buy a pen, he or she can intuitively guess that it can be found under stationery. In this sense, carefully designing building layout so that it can easily be understood cognitively will help create environments that are of great advantage functionally, both for users and for owners.

Micro-Level Cognitive Mapping

In regard to micro-level cognitive mapping, a key work is American cognitive scientist Donald Norman's *Psychology of Everyday Things* (Norman, 1988), which focuses on how ordinary objects can be designed to be easily understood cognitively. He tries to make designs interactive and user-friendly by use of the designer/user/system model, illustrated in figure 4.3. This model conceptualizes the designers' vision (design model), the users' needs (users model), and product (system). The key question is whether the visual appearance and perceived functions of the designed object can easily be cognitively interpreted or not. The result is Norman's seven-point program for designing which should: (1) use both knowledge in the world and knowledge in the head; (2) simplify the structure of tasks; (3) make things visible, thus bridge the gap of execution and evaluation; (4) make the relationship between controls and their effects easily comprehensible; (5) exploit the power of constraints, both natural and artificial; (6) design for error; and (7) when all else fails, standardize. The following discussion overviews these seven points.

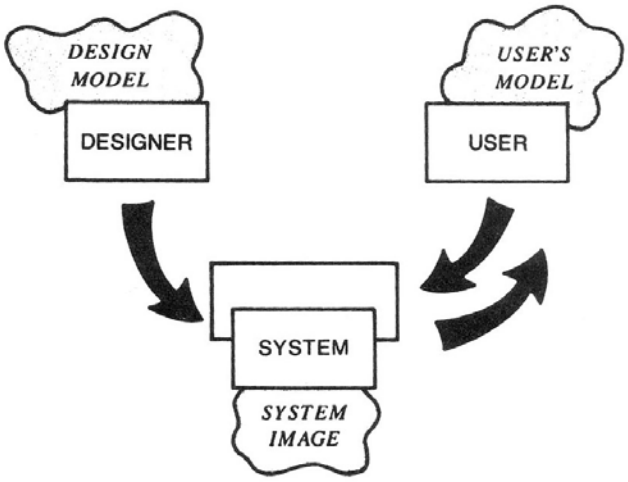

Figure 4.3 Conceptual model of designer, user, and system (from Norman, 1988, p.16). (Courtesy Donald Norman)

1. Knowledge in the world and knowledge in the head

Norman writes that "In everyday situations, behavior is determined by the combination of internal knowledge and external information….." (Norman, 1988, p. 55). By external knowledge, Norman refers to information that humans are exposed to in their everyday lives while interacting with their environments. Exposure to external information helps users of an object regulate their behavior accordingly based on the mental representation they have. This mental representation is called "knowledge in the head" by Norman. If knowledge in the physical environment is different from users' internal knowledge, the design product will neither be responsive and appreciated nor properly used by its intended users. Therefore, careful consideration of what mental information users have and how objects can be shaped to harmonize with that information is considered a crucial design issue that designers should give major attention to as they design.

2. Simplifying the structure of tasks

Norman writes that "tasks should be simple in structure, minimizing the amount of planning or problem solving they require" (Norman, 1988, p. 191). In order to minimize the amount of skill and effort needed to operate or use everyday objects, Norman focuses on: (a) mental aids; (b) use of technology; and (c) changing the nature of the tasks. Mental aids involve labels, vocal and visual signals, and so forth. They should be used to design objects so that they are made responsive to humans' psychological needs. Mental aids function as a reminder and ease mental processes by providing users feedback from the external world.

Also important is the use of new technology that "should be to make tasks simpler" (ibid.). For instance, modern software's interfaces make computer use a simple task that can be performed and understood with minimal or no external instruction. Similarly, if the nature of

tasks is changed so that they can be more easily performed, the design product will be more effective. Norman exemplifies the design of shoes and explains that learning to tie shoelaces can be a difficult task; in addition, tying shoelaces is problematic for some elderly and physically impaired individuals. Therefore, shoe designers shifted to Velcro-hook-and-loop fasteners to make this task of tying shoelaces easy (Norman, 1988, p. 194). In short, simplifying the structure of tasks helps both physically able and impaired individuals to use everyday things effectively without physical and mental struggle.

3. Making things visible

Norman writes that it is important to "make things visible on the execution side of an action so that people know what is possible and how actions should be done; make things visible on the evaluation side so that people can tell the effects of their actions" (Norman, 1988, pp. 197-198). "Making things visible" can result in effective design products, but only if designers pay considerable heed. Norman argues that, too often, everyday objects are not given enough attention because in many designs the parts that are considered important in operating or using an object are not visually prominent (ibid., p. 100). For instance, in the design of some cabinets, handles for opening cupboards are hidden or completely removed; this causes problems as users interact with these products. In order to make products visually responsive in terms of their use, they should be designed in such a way that they can give users enough visual feedback about what certain tasks users can perform and how the object can be used to perform those tasks.

4. Making the relationship between controls and their effects easily comprehensible

Here, Norman tries to enable users to naturally map the relationship between controls and their effects. He explains, "natural mappings are the basis of what has been called "response compatibility" within the field of human factors and ergonomics" (Norman, 1988, p. 199).

“Response compatibility” can be ensured by logical spatial relationship between controls and their effects. Lack of such a relationship will be problematic as users interact with everyday things. To make this point clear, Norman exemplifies the design folly of the standard stove that has four burners arranged in two rows in a rectangle with their controls arranged in one line; this gives its users twenty-four possible combinations (4x3x2x1=24) because the relationship between controls and burners in these stoves cannot be naturally mapped in one-to-one correspondence (Norman, 1988, p. 75). Therefore, users cannot easily remember which control is for which burner, and the device is considered unresponsive.

5. Exploiting the power of constraints, both natural and artificial

Norman suggests that constraints should be used “so that the user feels as if there is only one possible thing to do—the right thing” (Norman, 1988, p. 199). In order to reduce the number of possible actions users can perform to conduct a task as they use a device, Norman focuses on two types of constraints: (a) natural; and (b) artificial. Under natural constraints, he explains physical limitations that prevent users from making wrong moves; for instance, no piece will be misplaced as prefabricated products are assembled if the pieces are designed in such a way that can afford only the appropriate pieces to be attached to them and make it impossible for inappropriate pieces to fit. Similarly, if doors are designed without handles, users have no other option but to push them. This makes the use of written messages like “push” and “pull” unnecessary.

On the other hand, artificial constraints refer to potential limitations that do not affect the physical use of objects, but make objects responsive to a particular group by using culturally accepted codes. Norman explains that these constraints “rely upon accepted cultural convections, even if they do not affect the physical or semantic operation of device” (Norman, 1988, p. 85).

For instance, taxis should have a particular color so that people can recognize them. If taxis are painted yellow in Saudi Arabia where the culturally accepted color for taxis is white, or in Britain where the cultural accepted color is black, its usual positive feedback provided by color will be much weaker and will confuse people. Therefore, both natural and artificial constraints should be considered so that ways for operating or using an object are limited to the appropriate functions only.

6. Designing for error

Users regularly make errors when they first use a device. Normans explains that users should not be blamed for making errors because for every error there is a reason that results in that particular error; therefore, designers should design objects in such a way that minimize reasons or the factors that cause errors (Norman, 1988, p. 131). To make this point clear, Norman explains that, in order to minimize the chances of forgetting personal items placed temporarily on shelves in public restrooms, it is crucial to force users take their items by designing movable shelves that block the doors of cubicles when used and unblock the doors when not used. Designing such devices will minimize probable ways of making errors and help the users perform the best action.

7. Standardization

Norman writes, that “when something can’t be designed without arbitrary mapping and difficulties, there is one last route: standardized” (ibid., p. 200). Standardization is a process that limits or constrains ways of performing tasks or using objects in accordance with global culture or universally accepted codes. Norman explains that “standardization is simply another aspect of cultural constraints” (ibid., p. 202). Therefore, designers should follow once a specific standard

is set for the design of a product—for example, the standardized position of keys on keyboards, colors and signals of traffic lights, and so forth.

If designers do not constrain themselves to standards, specifically in certain cause as exemplified above, they will make products unusable. On one hand, standardization limits designers' creativity; on the other hand, it leads to standardized designs that can easily be cognized and used by users around the world no matter what culture they belong to, what model of that design product they use, where the product is made, or what material it is make of. In short, if there is no other way of making objects user-friendly, standardization is an effective method to make products easily usable for users internationally.

In conclusion, Norman argues that consideration of his seven-point program can help designers make their designs more user-friendly by easing users' cognitive mapping process as they use everyday objects. Norman believes that if these issues are not taken into account as designers design, it will make the designed environments life-suppressing because a designed environment is the compilation of everyday objects used to perform daily activities effectively. If these objects are not easily and comfortably useable, this will affect the whole environment and deter quality of life. Therefore, effort needs to be expended on the design of everyday objects using Norman's model or other innovative design ideas so that the quality of life in everyday environments improves.

Conclusion

To discuss cognitive mapping, this chapter first overviewed what cognition is using Porteous' framework that discusses human-environment information tradeoffs. Then, it briefly defined cognitive mapping. Next, cognitive mapping was discussed in three levels in terms of

environmental scale: a macro-level, which discusses city-level cognitive mapping; a meso-level, which focuses on building designs; and a micro-level that studies the design of everyday objects.

Under “city-level cognitive mapping” Lynch’s work in his *Image of the City* was overviewed and covered two dimensions: (1) Lynch’s selection of respondents; and (2) his questionnaire design. The results of Lynch’s research were not explained in this chapter because they had previously been discussed in chapter two.

At the meso-level of cognitive mapping, mostly interior environments were discussed. A key focus was to design architectural designs that worked well in terms of legibility and imageability, based on Kopec’s four elements: (1) visual access; (2) architectural delineation; (3) signage and numbering systems; and (4) building layout. A major focus of discussion was easing wayfinding in buildings.

Lastly, at the micro-Level of cognitive mapping, Donald Norman’s views in *Psychology of Everyday Things* were explained and emphasized his focus on making everyday objects more easily cognizable. To discusses Norman’s ideas, his designer/user/system model was presented, drawing on his seven-point program of: (1) using both knowledge in the world and knowledge in the head; (2) simplifying the structure of tasks; (3) making things visible, thus bridge the gap of execution and evaluation; (4) making the relationship between controls and their effects easily comprehensible; (5) exploiting the power of constraints, both natural and artificial; (6) designing for error; and (7) standardizing when all else fails.

CHAPTER 5 - Prospect-Refuge Theory

Introduction

This chapter discusses prospect-refuge theory, first developed by geographer Jay Appleton (Appleton, 1975). The chapter begins with an introduction of prospect-refuge theory and then explains the value of this theory for architecture and environmental design. In addition, the chapter interprets Frank Lloyd Wright's Kaufmann House in light of this theory in three ways: (1) experiencing the house while outside; (2) experiencing the outside while being inside the house; and (3) experiencing the inside while being inside the house.

Prospect-refuge Theory

Prospect-refuge theory was developed in 1975 by Jay Appleton, an English geographer (Appleton, 1975). The main focus of prospect-refuge theory is the phenomenon of seeing (prospect) without being seen (refuge). In other words, *prospect* refers to the ability to see over an area or a distance, while *refuge* refers to a sheltered locale where a person can feel safe from potential dangers. Appleton argued that the search for safety and survival has been going on since prehistoric times; however, this survival impulse that evolved is now based on broader conditions like culture and technology. Appleton writes that "Homo Sapiens are motivated to perceive their surroundings in such a way that environmental information is acquired and stored in a form in which it can be efficiently and quickly retrieved when needed to ensure survival" (Appleton, 1984, p. 93). In short, prospect-refuge theory focuses on people's innate search for safety and survival.

In developing prospect-refuge theory, Appleton focuses on human-environment relations by arguing that environmental behavior is partly built into human biological and instinctive nature. This can well be observed as different species fulfill their primary requirements in their

habitat. As Appleton writes, “animals show a general tendency to prefer and…to select an environment which affords opportunities for satisfying requirements…peculiar to their species” (Appleton, 1975, p. 66). Animal species and humans prefer a particular natural habitat because that natural habitat best fulfills a primary need for survival. In contrast, if an environment deprives animals’ or humans’ primary needs, it would be avoided or forsaken for an environment that is supportive to survival.

In examining such supportive environments, Appleton speaks of “habitat theory,” which is the assumption that aesthetic satisfaction of the environment arises from an instinctive sense of the environmental qualities favorable for survival (shapes, colors, spatial arrangement, etc.). Today, these environmental qualities are no longer mostly used to ensure survival, but still they are preferred and are one mean of aesthetic satisfaction. Appleton suggests that this is because environmental preferences are instinctively built into people’s genes, no matter how human society has advanced. Human response, in this case today, is considered mainly aesthetic because humans enjoy the satisfaction of these favorable environmental qualities (e.g., panoramic views or sheltered places) without considering or drawing on their functional significance.

In order to narrow down the wide scope of aesthetic satisfaction discussed under habitat theory and better understand how important the role of aesthetic satisfaction can be for design. I next discuss prospect-refuge theory. As mentioned above, the key idea in this theory is “seeing without being seen.” Creatures exploring and hunting their prey are always also the creatures escaping so as not to be seen; therefore, survival is dependent on both environmental aspects, i.e., prospect and refuge. Environments that possess both a prospect—an opportunity to see—and—refuge an opportunity to hide-are considered supportive to survival. Therefore, prospect-

refuge theory can be defined as the argument that the best landscape for survival is the environment that provides prospects and refuges.

A variety of behavioral and aesthetic experiences can be supported by thinking about design from the perspective of prospect-refuge theory. For instance, the designer can envision such possibilities as: (1) varying objects used to symbolize prospect and refuge; (2) varying the manner and intensity with which these objects symbolize prospect and refuge; (3) varying spatial arrangements of the symbols; (4) varying the equilibrium of prospect and refuge; (5) varying the physical media by which the arrangement is conveyed. By drawing on prospect-refuge theory in this way, one can picture a wide range of how this theory can suggest considerable variation on aesthetic experiences and emotional behaviors.

One important variable that needs discussion in regard to prospect-refuge theory is *hazard* because hazard can be an inseparable part of environmental experience in that it can intensify the emotional value of the refuge by providing vivid evidence of the conditions against which refuge is secured (Appleton, 1996, p. 85). Therefore, assigned environments exposed to environmental threats but secure are often more pleasurable compared to designed environments not exposed to environmental threats (ibid.).

Critiques of Prospect-refuge Theory

Prospect-refuge theory has been criticized by a number of authors (Clamp 1982, Powell 1982, Wookcock 1982, McGlashan1976). Appleton wrote a response to these critics in an article, “Prospect and Refuge Theory Re-visited” (Appleton, 1984). In this article, before discussing criticisms, he reviewed three major aims he had in developing prospect-refuge theory: (1) striving to interpret landscape aesthetics biologically; (2) using a holistic approach to evidence

by turning to art, science, and even everyday experiences; and (3) reducing complex concepts to simpler forms so that the theory's explanation is easier to understand.

Appleton then discusses criticisms of his theory. He claims that "one of the most common kinds of criticisms of prospect-refuge theory clearly arose from a failure to understand its role as an agent of simplification for explanatory purposes" (Appleton, 1984, p. 92). This, he claims, can be seen in McGlashan's criticism (McGlashan1976) which emphasizes Appleton's focus on "primitive" patterns of behavior and perception which are considered the origins of highly complex preferences and behaviors. Appleton quotes McGlashan's statement that "there is more to sophisticated man then primitive man in a three-piece suit" (Appleton, 1984, p. 95). Appleton refutes this criticism (ibid.) by stating that he used basic patterns to generate a simpler theory. Similarly, Appleton refutes McGlashan's criticism (McGlashan1976) that Darwin's habitat theory is dismissed in prospect-refuge theory and claims that in fact the theory is strongly rooted in Darwinism (Appleton, 1984, p. 94).

Appleton also explains that prospect-refuge theory must deal with three problems in terms of dissemination: (1) this theory arises from a multi-disciplinary perspective; (2) reviewers have had restricted understandings; and (3) academic prejudice against his discussing aesthetic values in biological terms. Largely because of these three issues, Appleton argues, some readers have been confused, but this confusion could be reduced if the theory was studied holistically.

Prospect-refuge Theory in Architecture

One aim of this chapter is to discusses how prospect-refuge theory can be used in architecture and environment design. To achieve this aim, I focus on Frank Lloyd Wright's work, which has been studied by architectural historian Grant Hildebrand in regard to prospect-refuge theory. In his 1991 *The Wright Space: Pattern & Meaning in Frank Lloyd Wright's*

Houses, Grant points out that the prospect-refuge concept is linked to human-environment relations from the primitive era to the present. One central human characteristic is to seek refuge from dangers like wild animals and extreme weather. Since ancient times, humans have searched for places and have shaped buildings in such a way as to provide users with protection from environmental dangers. For instance, some ancient peoples used caves because that was the easiest option provided by their environment. Others used trees as places to be safe, or used tree branches to make treetop refuges. Hildebrand writes that

> Appleton considers the refuge concept to be of paramount importance, one of the most fundamental in the symbolism of environmental perception. It finds extreme expression in the search for the nesting place. If safety can't be secured, and if in consequence the individual organism cease to function biologically, then all other desires become, for individuals, biologically irrelevant (Hildebrand, 1999, p. 21).

In his book, Hildebrand works to identify the special qualities that makes Frank Lloyd Wright's houses life-enhancing for both owners and as well as for visitors. In understanding the manner in which this special quality is present in Wright's houses, Hildebrand attempts to connect this quality with some repetitive configuration of architectural elements. Hildebrand argues that this pattern is mainly the product of a spatial configuration between inside and outside and is shaped by certain elements such as entry, fire place, terraces, balconies, windows, and ceilings. In a review of Hildebrand's book, Baneroft (1992) summarizes the architectural elements as follows: "(1) major spaces elevated well above the terrain they overlook; (2) a fireplace at the heart of the house on the internal wall; (3) a low ceiling edge in front of the fireplace with flanking built-in seating or cabinetwork; (4) the ceiling in front of the fireplace sweeping up into roof volume; 5) the distant edge of the ceiling returning to fireplace height; (6)

interior views to contiguous spaces seen through architectural screening devices; (7) extensive glass and glazed doors located on walls distant from the fire; (8) generous, elevated terrace(s); (9) an exterior with deep overhanging eaves; (10) an evident central chimney; (11) broad, horizontal groupings of window bands; (12) conspicuous balconies or terraces; and (13) a long and circuitous path from exterior to interior" (Bancroft, 1992, p. 1).

Hildebrand works to identify the "correspondence between Wright's pattern and the characteristics that we now believe human beings, preconditioned by nature, selected in their habitation" (Hildebrand, 1991, p. 28). Thus in his method of interpretation, he uses prospect-refuge theory, concluding that "the power and magic of Wright's houses are nothing more than an architectural expression of the lingering biological needs in human beings for refuge and prospect" (Seamon, 1992, p. 132).

It is worth mentioning that Wright's house designs involve much more than mere provision of prospect and refuge. As Hildebrand demonstrates, Wright's houses have a strong sense of prospect and refuge, but it cannot be concluded that prospect and refuge are the only qualities that makes Wright's architecture so well-liked. As Seamon argues, "the literal refuge and prospect qualities that Hildebrand identifies may be a genuine part of the uniqueness of Wright's houses, but the error is to claim that these qualities—declared a priori and determined biologically—are the only ones" (Seamon, 1992, p. 133).

A Prospect-refuge Interpretation of Fallingwater

In order to study prospect and refuge in Wright's residential work, Hildebrand discusses Wright's early Chicago houses, Taliesin West and East, several California houses, some Usonian houses, and the Kaufmann house, better known as "Fallingwater." Here, I focus on Wright's

Fallingwater, which Wright designed for department store owner Edgar Kaufmann. The house is built on a stream located in western Pennsylvania (See figure 5.1).

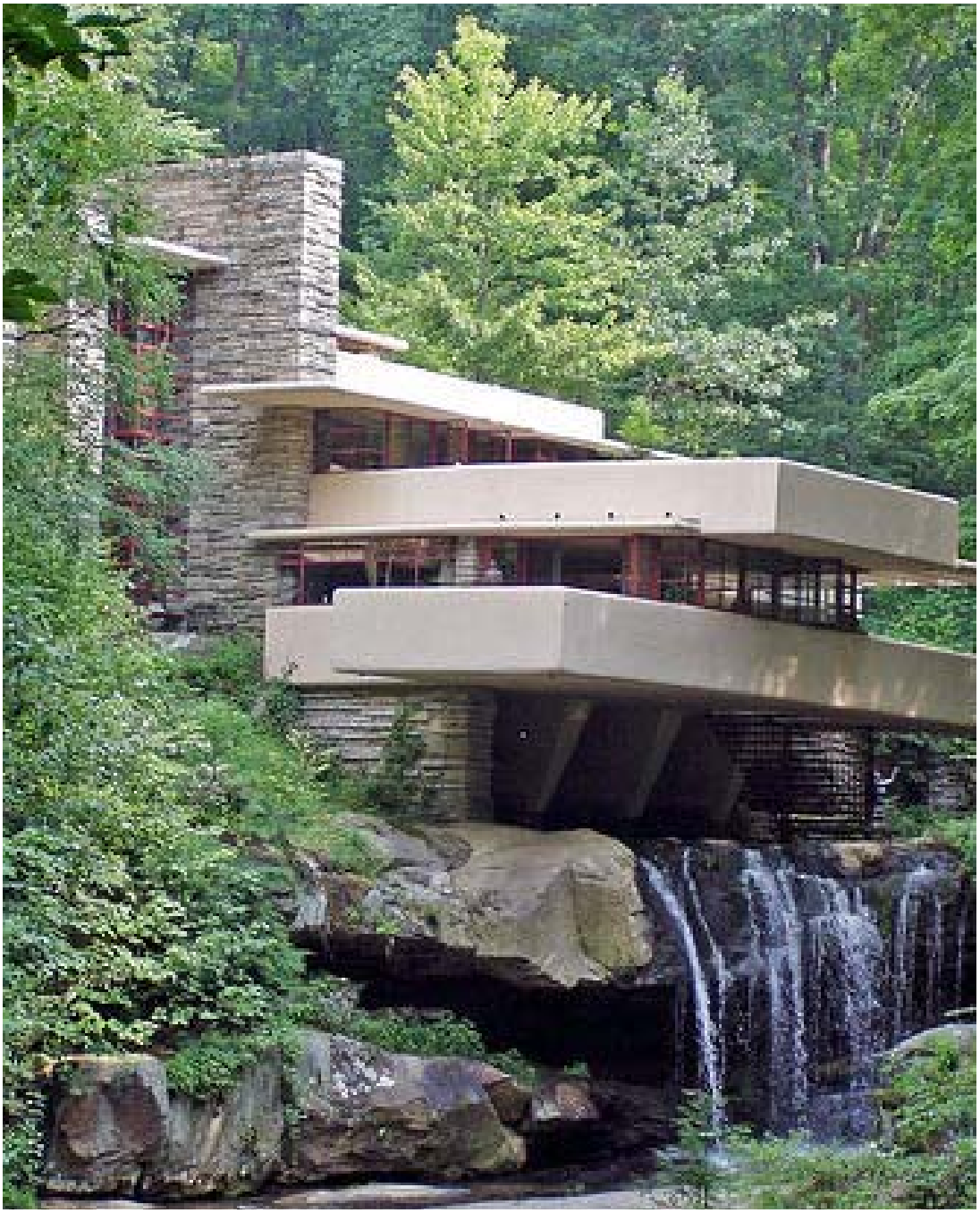

Figure 5.1 Fallingwater. the Kaufmann house, Pennsylvania, 1936 (from Flickr, 2010). (Courtesy Mark Hiser)

Fallingwater was designed to provide its occupants with an environment that helped them recover from the stress caused by the hustle and bustle of urban life. Hildebrand argues that this house plays a major role in enhancing the importance of prospect and refuge because "Fallingwater is a house confronting a natural threat condition with dramatic visible manifestation, and a house that, furthermore, complements this with architecture of calculated hazardous daring" (Hildebrand, 1991, p. 93). The natural threats that this house is exposed to include dense vegetation, ravines, cliffs, and water. Being exposed to these natural threats and at the same time providing strong protection, creates a house that is attractive and life-enhancing for its inhabitants. As Hildebrand explains, "the apparent presence of …hazard conditions intensifies the emotional value of refuge, giving an apparent evidence of the conditions against which refuge is secured" (ibid., p. 94). To study Fallingwater from the perspective of prospect-refuge theory, I focus on three themes highlighted by Hildebrand: (1) experiencing the house while outside; (2) experiencing the outside while being inside the house; and (3) experiencing the inside while being inside the house.

(1) Experiencing Fallingwater while Outside

When people experience a building from outside, it may give them not only a feeling of safety and security but also an ability to see a world that they look out on. As Hildebrand states, "Exterior features of a building can signal a potential prospect and refuge" (Hildebrand, 1999, p. 28). When experiencing Fallingwater from outside, one experiences strong prospect and refuge because of elevated terraces, deep overhanging eaves, central chimney, horizontal window bands, visible balconies and terraces, and a long winding path from exterior to interior.

In regard to Fallingwater's terraces and balconies, these are experienced as prospect-enhancing elements and low-height spaces and obstacles that enhance the sense of refuge. As

Lidwell, Holden, and Butler write, “In human-created environments, prospects include deep terraces and balconies, and generous use of windows and glass doors. Refuges include alcoves with lowered ceilings and external barriers, such as gates and fences” (Lidwell, Holden, & Butler, 2003, p. 156). When viewing Fallingwater from a distance, observers feel a strong sense of prospect and refuge. Since there are many terraces, this makes the house more inviting in terms of potential prospect. But prospect provision is not enough to make the house inviting because, most importantly says Hildebrand, a dwelling should provide refuge from potential hazards. Fallingwater is not only inviting in terms of its prospect provision but is also inviting in terms of refuge by providing deep, overhanging eaves. These eaves cover parts of the balconies and make the interior spaces seem protected. This creates a deep sheltering effect which makes the house seem potentially safe from a distance. As Palassmma explains, “in great architectural spaces, there is a constant, deep breathing of shadow and light; shadow inhales and illumination exhales light” (Pallasmaa, 2005, p. 47).This effect gives this house a deep sense of safety.

In addition, Fallingwater’s broad horizontal windows make both prospect and refuge evident from outside. Some of the windows are exposed to sunlight and some to shade with the result that they offer observers a feeling of warm sunshine, which is a pleasurable sense, especially in cold weather. At the same time, the windows covered by the long overhanging eaves are in dark shade, which projects a sense of both warmth in winter and coolness in summer. For this reason, perceptually, these eaves provide refuge both from hot weather in summer and cold weather in winter. As mentioned above, since these windows are broad and run parallel with the eaves, they have a horizontal character. Thiis Evensen states that “the horizontal wall expresses weight against the ground. Its horizontality gives a compressed and compact first impression” (Thiis-Evensen, 1987, p. 143). This weight against the ground makes the height of

the windows seem lower, and enhances refuge, since the low height provides the innate human need for shelter.

One of the main characteristics of Wright's houses is the chimney, and in Fallingwater, especially, the chimney is readily apparent. Since Fallingwater is located in a region of harsh winters, this chimney make the building appear more homelike. For viewers outside the house, the chimney projects, especially in winter, the possibility of a place to warm oneself. In other words, the chimney helps people interpret this house as a shelter from cold winters while outside. If heat is considered a basic need for a house in a cold region, seeing the chimney from a distance even in summer can be enjoyable and makes the house attractive. The chimney gives observers a strong sense of safety from cold and is, therefore, considered an effective element making this house perceptually inviting in terms of refuge.

When approaching this house, there are ways whereby observers are provided with an environment that gives them the feeling of security from potential dangers, for example, "A circuitous approach serves to enhance the approaching visitor's appreciation of both prospect and refuge" (Manolescu, Voelter, & Noble, 2006, p. 541).

As illustrated in figure 5.2, the white horizontal louvers that observers make the sheltered entry way more inviting and secure. These louvers "force" the rocks to stay back from the passage, and give a sense of safety. Also, this entry route offers a cave-like effect that is inviting in term of refuge.

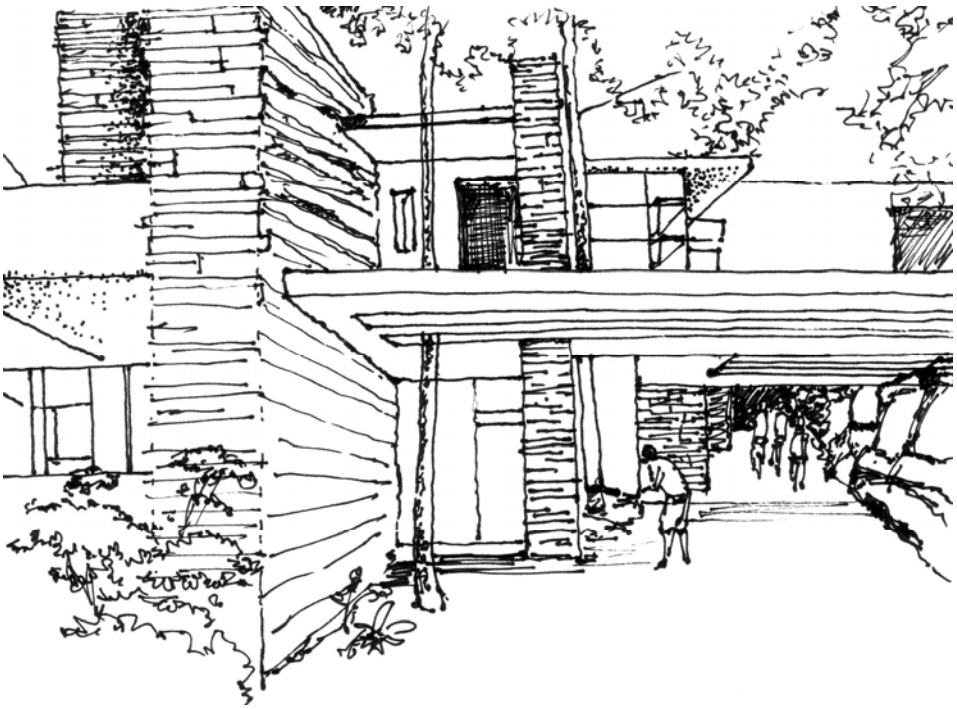

Figure 5.2 Fallingwater. Approach to the entry. (Courtesy Kalyan Chakraborty)

This cave-like effect is enhanced by the darkness of the main entrance. As Fell and Sweden explain, “the driveway crosses the stream by a broad, flat-span bridge, to a forecourt where the main entrance is inconspicuous and almost hidden, like the entrance to a cave,” (Fell & Sweden, 2009, p. 87) which can be considered the ultimate refuge (Palmer, 1988, p. 89). For this reason, Fallingwater’s cave-like entry makes the house a preferred place for refuge. Looking at the house from a distance, one sees symbols of prospect and refuge that make Fallingwater more attractive and pleasing.

(2) Experiencing the Outside while being Inside Fallingwater

The next question is how Fallingwater expresses prospect and refuge as users experience the outside of Fallingwater while being inside. Hilderand points out that Fallingwater has a powerful sense of insideness that is enhanced by refuge symbols and at the same time its inside is opened to outside, which strengthens the concept of prospect. As Assefa writes, “in

Wright's… houses, a powerful sense of insideness is generated, first, by opacity, which, in Fallingwater, is expressed in roughly dressed stone masonry walls... In contrast, the transparency of glass windows in… [the house] opens inside to outside and thereby connects the two" (Assefa, 2003, p. 12). Note that the rough-dressed stone masonry strengthens refuge, while the glass windows strengthen prospect.

In order to study Fallingwater's inside-outside relationship in terms of prospect and refuge and understand how people feel when they experience the outside while being inside, Hildebrand focuses on major spaces elevated above the terrain they overlook, the fireplace at the heart of the house on the internal wall, the extensive glazed doors located on walls away from the fire, the elevated terraces, the horizontal windows, and the terraces.

The major living spaces in Fallingwater are elevated above the natural terrains and provide attractive views of the surrounding landscape. When one is inside, this openness characteristic is reinforced by Fallingwater's continuous windows because they provide the experiencers a wide range of options to enjoy the different views as they look out through the windows, especially in the living-room area. These elevated spaces and broad windows provide a strong sense of prospect; and at the same time, the occupants are protected from natural threats—a situation which enhances the sense of refuge and safety.

Sitting spaces are placed adjacent to windows so that occupants can see and enjoy the views outside, and simultaneously they are given the feeling of being safe from cold weather and other meteorological hazards. These sitting spaces adjacent to the windows are termed "window places" by Christopher Alexander, who writes that "everybody love window seats, bay windows, and big windows with low sills and comfortable chairs drawn up to them" (Alexander, 1977, p. 834). Window places in Fallingwater provide a strong sense of both prospect and refuge.

Elevated spaces and window places both play an important role in prospect and refuge provision, since the window places connect the interior spaces to the surrounding outdoor environment and offer a powerful inside-outside contrast. If occupants were disconnected visually from the outside surroundings, they would take their safety for granted and not enjoy interior spaces so fully. In short, it can be argued that Fallingwater's windows are not merely providing views or lighting interior spaces but also expose occupants to the contrast between interior and exterior environments.

Two other elements that strengthen the inside-outside relationship in term of prospect and refuge are a fireplace at the heart of the house and glazed doors located on walls across from the fire. While sitting near the fireplace, one can feel the inside-outside contrast in terms of safety and comfort. In the cold winters of this region, occupants around the fireplace can view nature outside not only through windows but also through doors. This enhances both prospect and refuge because elements contributing to safety are also valued when their related dangers are visible. In this case the occupants can see the danger of cold weather while experiencing the hearth fire. Fallingwater's broad, horizontal groupings of windows also enhance Fallingwater's inside-outside relationship

Hildebrand also emphasizes the importance of Fallingwater's terraces in facilitating prospect-refuge experience. Terraces are used, on one hand, to draw inside out and draw outside in; in addition, they are used to provide visual privacy. More exactly, these terraces provide the occupants with a direct experience of nature but in such a way that they are also protected. One can also argue that the elevation of the terraces strengthens the sense of refuge and contribute to the occupants' sense of pleasure drawn from the views these terraces overlook. These terrace experiences emphasize the sense of prospect, but refuge is also present because the thick

concrete parapets protect the experiencers from the danger of falling, while the height of the terraces protect experiencers from exposure the surrounding forest (see figure 5.3).

Figure 5.3 Fallingwater. (from Flickr, 2010). (Courtesy Jason Nathan)

(3) Experiencing the Inside while being Inside Fallingwater

Prospect and refuge as expressed through building interiors is discussed by Hildebrand in his 1999 *Origins of Architectural Pleasures* (Hildebrand, 1999). In this book, Hildebrand explains how low ceilings, opaque walls, lower light levels, and spaces of smaller dimensions are some of the characteristics of interior spaces in residential architecture that contribute to a strong sense of prospect and refuge. These characteristics are used here to describe Fallingwater's interior in terms of prospect and refuge.

To begin his discussion of Fallingwater, Hildebrand (1994) focuses on the following elements: the fireplace area, particularly the low ceiling edge in front of the fireplace with

flanking built-in seating and cabinetwork; the ceiling in front of the fireplace; the far edge of the ceiling returning to fireplace height; and interior views to other interior spaces.

Hildebrand considers Fallingwater's fireplace to be the main source of refuge inside the house because it is located in the center of major house activities—living and dining areas—away from major entry ways that lead to outside and balconies. Since the fireplace is visually permeable from all major living-area spaces, it has the strongest sense of not only refuge but also of prospect, as occupants see it from the sitting spaces adjacent to the walls and windows. This is because the fire itself can be considered as an attractive prospect as it blazes and is also a source of powerful refuge from the cold of winter. The fireplace is placed in such a way that, while facing the hearth's fire, occupants are given an opportunity to enjoy two contrasting natural phenomena—the fire and the natural beauty through the windows. This contributes to a cave-like effect because the occupants can experience the light of the fire within and the natural light from outside.

Further, Hildebrand discusses how Wright lowered the living-room ceiling over the fireplace. Marked by three horizontal strips running around the living-room space, this transition in ceiling height was used by Wright to avoid a sudden visual break in elevation. He also used a large stone outcropping (original to the site) in front of the fireplace to reinforce a sense of refuge. This stone element helps to project the fireplace into the larger living-room space and to give occupants a feeling of security (see figure 5.5).

Figure 5.4 Fallingwater. Fire place in the living room. (Courtesy Kalyan Chakraborty)

Hilderband also points out that, overall, Fallingwater's walls are comprised of long horizontal stone blocks, which play an important role in making the ceilings appear lower, since they enhance a sense of horizontality. This provides the occupants with a further sense of refuge because the strong, opaque walls and the fireplace enhance the cave-like effect. In addition, the living-room area provides several small sitting places that offer different views and different light intensities. Since every sitting place overlooks different views, they provide occupants with different levels of prospect and refuge.

Conclusion

This chapter's main aim was to overview prospect-refuge theory, especially as it might have relevance to architecture. In order to achieve this goal, the chapter first introduced

Appleton's prospect-refuge theory—essentially, "to see without being seen." Next the chapter examined what prospect-refuge theory might mean for architecture in general. Lastly, drawing on the work of Hildebrand (1994), the chapter considered how prospect and refuge theory could be used to interpret Frank Lloyd Wright's Fallingwater. Throughout, this chapter emphasized that architectural design can affect our feelings in term of prospect and refuge. As Joye writes, "it is clear that feelings of prospect and refuge can be evoked by specific architectural interventions" (Joye 2007 p.312).

Chapter 6 - Conclusion

A main aim of this thesis has been to encourage readers to think about ways of designing the environment based on users' needs and experiences. The thesis sought to answer two questions: (1) What are environment-behavior studies (EBS)? and (2) how is this research relevant to architecture and environment design?

These two questions were answered in four chapters. Chapter 2 overviewed what EBS are and introduced the work of five influential EBS researchers: psychologist Roger Barker, anthropologist Edward Hall, psychologist Robert Sommer, urban designer Kevin Lynch, and architect Christopher Alexander. These five researchers are considered by Bechtel (1997) as "pioneers" in EBS. Review of these researchers' works was offered to provide readers with a sense of the range of topics examined by EBS.

These five researchers illustrated different aspects of EBS. In different ways, each of these researchers have catalyzed the enrichment of this field of study. Roger Barker recorded children's environmental behaviors and activities in their everyday environment. He eventually developed this research into "ecological psychology" and claimed that only doing behavioral research in laboratories can be misleading due to the lack of a full range of behavioral stimuli. Edward Hall, an anthropologist, introduced the concept of personal space and social distances. He divided everyday social distances into intimate (from touching to 46cm), personal (from 46cm to 1.22m) and social (from 1.22m to 3.67m). Robert Sommer extended Hall's ideas and provided EBS with a crucial and effective contribution in his *Personal Space: the Behavioral Basis of design* (Sommer, 1969). Architect Christopher Alexander focused on environmental design in terms of users' perspectives and sought to empower users to participate in the design and building process so that built environments could become more human-friendly. Urban

designer Kevin Lynch's 1960 *Image of the City* examined the way urbanites perceive and arrange spatial information as they navigate in their physical environment. Lynch's work has played a major role in helping design cities that are more environmentally legible.

Partly because of these five pioneers, EBS was able to become an autonomous field of research. The rest of the thesis provided an overview of three central research themes in EBS to illustrate how conceptual ideas relating to environmental behavior might be used for design considerations. These research themes were: (1) territoriality; (2) cognitive mapping; and (3) prospect and refuge theory.

To explain territoriality, chapter 3 first focused on what territory is and then presented its history. Next, the chapter discussed whether territoriality is inborn or is acquired through environmental interaction. Third, human territoriality was then discussed in terms of personal space, primary territory, secondary territory, and tertiary territory. Fourth, three types of territorial infringement (territorial invasion, territorial violation, and territorial contamination) and two type of territorial markers or territorial barriers (real and symbolic) were discussed. Fifth, Oscar Newman's two major works, *Defensible Space* and *Community of Interest*, were overviewed with an emphasis on how to design residential environments that generate a sense of ownership and attachment. Last, territoriality was discussed in relation to CPTED programs—i.e., Crime Prevention through Environment Design. The focus was on practical- action plans that can be developed for making physical environments more naturally controllable by their users. To achieve this goal, four types of information (crime analysis information, demographic information, land use information, observations, and interviews) were identified as being effective when designing physical environments that support defensible space and territoriality.

To explain cognitive mapping, chapter 4 first defined cognition, using Porteous' framework that discusses human-environment information exchange (Porteous, 1977). Then, cognitive mapping was explained in terms of three levels of environmental scale: a macro-level, which relates to city-level cognitive mapping; a meso-level, which relates to building designs; and a micro-level which relates to the design of everyday objects. To discuss "city-level cognitive mapping" Lynch's work in his *Image of the City* was overviewed and two dimensions were highlighted: (1) his selection of respondents; and (2) his questionnaire design (Lynch, 1960). At the meso-level of cognitive mapping, the chapter examined interior environments. A key focus at this level was designing interiors from a legibility and imageability viewpoint, considering four elements: visual access; architectural delineation; signage and numbering systems; and building layout. A major aim of this discussion was ease of wayfinding in buildings. Finally, at the micro-level of cognitive mapping, Donald Norman's 1988 *Psychology of Everyday Things* was overviewed, a work that focuses on making everyday objects more easily cognizable (Norman, 1988). In order to discusses Norman's ideas, this chapter explained his designer/user/system model that draws on his seven-point program of: (1) using both knowledge in the world and knowledge in the head; (2) simplifying the structure of tasks; (3) making things visible, thus bridge the gap of execution and evaluation; (4) making the relationship between controls and their effects easily comprehensible; (5) exploiting the power of constraints, both natural and artificial; (6) designing for error; and (7) standardizing when all else fails.

In chapter 5, the main goal was to analyze architecture from the vantage point of prospect-refuge theory. The chapter first overviewed Appleton's prospect-refuge theory—"to see without being seen," and then focused on whether this theory might be applied to architecture

(Appleton, 1975). Drawing on Hildebrand's 1991 *The Wright Space*, the chapter considered how prospect-refuge theory could be used to interpret Frank Lloyd Wright's Kaufman House, or "Fallingwater" (Hildebrand, 1991). This interpretation was presented in three parts: experiencing the house while outside; experiencing the outside while being inside the house; and experiencing the inside while being inside the house.

Specifically, this discussion examined those architectural elements that generate a cave-like effect in the house and make the dwelling more attractive when viewed from a distance. Next, discussion examined architectural elements that make the experience of this house life-enhancing, as experiencers are inspired by such a strong inside-outside relationship. Last, discussion considered the role of architectural elements in providing experiencers with a strong sense of prospect and refuge within the interior spaces. Overall, the chapter sought to demonstrate how, in terms of prospect and refuge, architectural design can affect human feelings.

Conclusion

This thesis was originally envisioned to provide the basis for organizing an introductory EBS course for the architecture program at Kabul University in my home country, Afghanistan. Therefore, the structure of the thesis was designed to be simple and comprehensive, and eventually became the introductory review provided here. Eventually, it was realized that the first need was to master an overview of EBS; thus, it was decided not to include a course outline.

Because the aim of this thesis is to be introductory, the topics discussed in detail are limited to three. However, there are other environment-behavior topics of equal importance—for example, Pallassmaa's research on the sensuous dimensions of architectural experience (Pallasmaa, 2005), or studies in the field of neuro-science and its relation to environment-behavior studies. Discussing more topics would have made this thesis more comprehensive, but

it would not have been able to accomplish the main goal of providing a clear and accessible introduction to EBS.

Therefore, these topics explicated in this thesis are simple and focus on the relationship between environmental design and human well-being, from the physical design of cities to the design small objects that are part of people's everyday environments. Such knowledge can inform designers involved in shaping differently- scaled environments about the importance of understanding and designing for environmental behaviors and experiences. In this sense, EBS are an invaluable component of architecture, and my next aim will be to organize the course in EBS and eventually to teach this course at Kabul University.

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