THE ROLE OF THE AUTOBIOGRAPHICAL EXPERIENCES WITH EMOTIONAL SIGNIFICANCE OF AN ARCHITECT IN DESIGN CONJECTURING

A Dissertation

by

IRINA SOLOVYOVA

Submitted to the Office of Graduate Studies of
Texas A&M University
in partial fulfillment of the requirements for the degree of

DOCTOR OF PHILOSPHY

December 2008

Major Subject: Architecture

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Approved by:

Chair of Committee,	Frances L. Downing
Committee Members,	Louis G. Tassinary
	Robert B. Warden
	Victor L. Willson
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ABSTRACT

The Role of Autobiographical Experiences with Emotional Significance of an Architect in Design Conjecturing. (December 2008)
Irina Solovyova, Dipl., Volgograd State Architectural and Engineering University, Russia
Chair of Advisory Committee: Dr. Frances L. Downing

The dissertation investigates the role of autobiographical memories with emotional significance in architectural design conjecturing. The dissertation is structured as a set of individual articles (chapters), each can be read independently. To set the background to the empirical research, an overview of models of the design process, intuition in design, memory, emotion and place are presented. The empirical research consists of comparison of two case studies. Ethnographic methods were used for data collection. Direct analysis, indirect analysis (content analysis of protocols) and analysis of language for affect were used to scrutinize the data. Findings clearly indicate the utilization of autobiographical memories with emotional significance in design conjecturing. The study describes the types of autobiographical memories with emotional significance and purpose of their use in design conjecturing. In general, the dissertation study indicated that half of thought content used by architects during design conjecturing comes from their autobiographical experience. At the same time, personal experiences of students are neglected in architectural education. Overview of the current status of architectural education leads to the argument that academia is due for a paradigm change. The dissertation provides suggestion on the direction of changes in design education.

DEDICATION

To Tatyana and Vladimir Solovyovi, my parents, for all their support.

To Vivian Paul, my American mother, for her faith in me and for all the valuable advice she gave me.

To my husband, Vladimir Borek, the love of my life, and my child, Vladimir Borek, joy of my heart, for always being there for me.

To Upali Nanda, my wise friend and irreplaceable co-author, for intellectual stimulation and help in becoming who I am through this research.

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A special thank you to Upali, my brilliant friend. I could always count on Upali to co-author articles with me, and to always provide her shoulder of support when I needed it. I truly hope that all of the writing we've done together already is only the beginning of our collaboration.

And finally, thank you my Vladimirs, daddy and son, for putting up with me. I love you both, more than I can ever say.

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CHAPTER I

INTRODUCTION

O architecture! A mere reflection in the waters of remembrance?
The memories of your future in the company of my cherished Polya abound!
Albert Pérez-Gómez

Introduction

What role does personal experience play in the architectural design process? A knowledge of aesthetics, technology, the history of architecture, or its theory and composition can't necessarily guarantee the ability to produce meaningful work. The determining factors lie elsewhere - in the idiosyncrasies of a particular designer's train of thought (Rugg, 1963) and in his or her interaction with others. Only through direct experience and emotional connection can we perceive the 'qualitative totality' and meaning of place. Memory registers and stores our meaningful experiences and impressions, our beliefs and emotions, as well as any modifications that may take place under the influence of new experiences (Conway, 1990). The design process, then, can be seen as a symbolic transformation and translation of an architect's experience into new, meaningful content. Architects draw import from the remembered past: they abstract and combine the past through acts of imagination to fuel images of some possible future (Downing, 2000). In other words, designers utilize the knowledge and emotional impact contained in their memorable experiences in order to assist them in the creative design process.

Basic Assumptions

"From the point of view of design methodology and design education, it is important in design research to focus on the role of knowledge in the design process, and on the role of the information processed" (Christiaans and Restrepo, 2001:64). It is well established that a designer's information processing is greatly dependent upon their expertise, their cultural and

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This dissertation follows the style of *Journal of Architectural and Planning Research.*

social background, and if a member of a design group, on their interaction with other members of the team (Christiaans and Restrepo, 2001; Cross, 1999).

'Limited operational definitions of the relevant variables' interact between individual designers, in design teams, and in the overall environment, influence each other, background, current moods, available information, goals, an understanding of the problem and a lot of other factors that affect the outcome and the process of a design. Knowledge of an individual designer is imposed through tacit processes and habits of perception, both acquired through experience. All designers' knowledge and ideas are filtered through those frames (Christiaans and Restrepo, 2001), and used in the design process both intuitively and consciously.

> Given the differences in designer's knowledge frames and experiential backgrounds, which evolutionary and adaptive tool-based strategies can be defined? An assumption is that the interaction with these strategies will result in explorative processes leading to a redefinition of the design environment and, at the end, to creative and innovative design solutions (Christiaans and Restrepo, 2001:64).

Research into the design process shows that tacit knowledge finds its way into design solutions (Downing, 2000; Israel, 2003; Lawson, 1997, 2001; Cross, 1999). The research also shows that this infusion often happens intuitively (Cross, 1999; Hogarth, 2001). This tacit knowledge and understanding of place acquired through bodily connections is critical to designing human-sensitive environments.

Both the worlds of design and of academia have been closely engaged in technological advancements (Nanda and Solovyova, 2005). The latest trend in design is to step back and look at technology in a sober light. There is a new movement toward creating works that have a feel of "warmth and richness lacking from [the] digital world" (Wiles, 2008). Or as Peter Zumthor states: "the strength of a good design lies in ourselves and in our ability to perceive the world with both emotion and reason. A good architectural design is sensuous. A good architectural design is intelligent" (Zumthor, 2006b:65).

My dissertation will focus on tacit knowledge, including autobiographical memory, the emotional significance of memorable experiences, and intuition. I will also review previous research into the design process to identify the steps in that process that are most likely to

involve the recall of emotionally significant memories. The background for my empirical research has already been published in articles, and is also presented in this dissertation. The empirical research itself leads to the discussion of architectural education. Architectural education is in urgent need of change. I hope that the contribution of my research to the echelon of studies stressing the importance of autobiographical experiences for an ability to design will inspire a reform toward a new embodiment of design education.

Research Objectives

As defined by Conway (Conway, 1990), autobiographical memory contains emotional content, and this content can influence an individual's present and future decision-making. Designers all have autobiographical memories to use as a part of their repertoire when they are presented with a design task. The presentation of a task to an architectural designer should spark a process of "what-if" thinking (Lawson, 1997), a realm of conjectures that naturally includes the designer's own experiences found in autobiographical memory. I am specifically interested in the emotional content of memorable experiences as they relate to conjectures produced during the generative part of the design cycle – those that remain thematically significant to guiding the task towards a creative resolution.

Research Hypothesis

Hypothesis 1: Autobiographical memories always include emotional content that could stimulate the development of design conjectures. Hypothesis 2: Autobiographical memories of emotionally significant experiences are used both consciously and intuitively. Hypothesis 3: Autobiographical memories of emotionally significant experiences are mostly used to help the designer achieve certain desired feelings of place.

Significance of the Study

Architecture is a multidimensional, comprehensive discipline; it is as much an art as a science, and the design process is a unique type of problem solving. Architects create significant forms from their unique memories; they transcend their own experiences, transforming and combining them into the design task at hand with knowledge and an interaction with people (Downing, 2000). "Although this is hardly a new idea, its importance has perhaps been neglected by the

design research community for a number of reasons" (Lawson, 2001:133). This investigation of the design process and the role that autobiographical experiences play in architectural decision-making is a modest contribution to previous attempts to fully explore the creative act. Several sciences and the humanities have been exploring this problem for many years, studying it from different positions and with varying methods. Thus, my research could be useful to a wide variety of disciplines, but is specifically oriented towards the field of architecture, and the teaching of prospective architects in particular.

Methods of teaching that enhance the use of inner personal resources and experiences within the design process can and should be developed. Teaching only the technical aspects of design will not produce architects capable of creating human-sensitive environments. It is just as important to fully understand, to teach, and to be able to employ the intangible elements and inner resources embodied by each designer as a person, as a self. If we are to design and teach others to design, we must first understand the essence and content of an experience that makes it memorable, and how to transfer that content to our designs (Downing, 2000). This investigation into memorable experiences and their role in the design process will help in further elaborating upon current methods of teaching architectural design.

Practicing architects should also be interested in this research because it will contribute to a better understanding and use of tacit knowledge. It will help architects build such knowledge and apply it in a conscious way. This research promotes an understanding of meaningful inquiry and design strategies that point "toward fruitful conjectures and comparisons and helps us develop a broad range of conceivable avenues to pursue and evaluate" (Downing, 2000:7).

The challenge of teaching design in the information age is that learning is often confused with collecting a grab-bag of images readily available on the Web. The speed of acquiring visual information, and producing visual artifacts, cannot be compared to immersive design. This speed and the simultaneity of the immediately available abundance of visual elements has been held accountable for a certain imbalance in our design objectives and designed environments, causing a resurgence of sensory and embodied concerns in design thought (Solovyova and Nanda, 2008a).

> In the view of the design results, students would benefit more when these and other methods are taught from the very start of their education… Not only students need to be

> educated, teachers also have to become aware of that, in order to make explicit their individual design methods from their subconsciousness and then carry it through to students (Eekhout, 2001:43).

My research might fit into the field of design-thinking research in general, or "Product Conceptualization" specifically, as it was named by the Sub-Faculty of Industrial Design Engineering at Delft University of Technology. "Product Conceptualization has a specific focus on the designer's thinking and behavior in the conceptualization of product" (Christiaans and Restrepo, 2001:63). It also fits with the latest theory of Prospective Brain (Schacter et al., 2007), explaining how autobiographical memory predicts the future. In the case of architecture we can talk about autobiographical memory predicting future places.

This research should contribute to:

(1) An enlargement of knowledge and insights into the designer's knowledge and behavior in the conceptualization (conjecturing) phase;

(2) A knowledge of the type and extent of information considered by a designer during conjecturing, and a knowledge about information processing during the design process in general;

(3) Methods that will support the designer by offering insight into the designer's own process;

(4) Ultimately suggesting a pedagogy for strengthening architecture students' utilization of autobiographical resources during the design process.

How to Read This Dissertation

The motivation for writing this dissertation was my own architectural education. While architectural education overall undergoes major changes, there is still no general acknowledgment of students' autobiographical experiences by academia, and very little support for students' to reflect on their own personal and professional experiences, to develop their own design processes. I wanted to bring together the topics typically avoided by academia – autobiographical experiences, emotions, intuition, to once again look at the variety of research into the design process to see how tacit processes fit within the existing models, and to review the existing state of architectural education and suggest ways of improving it.

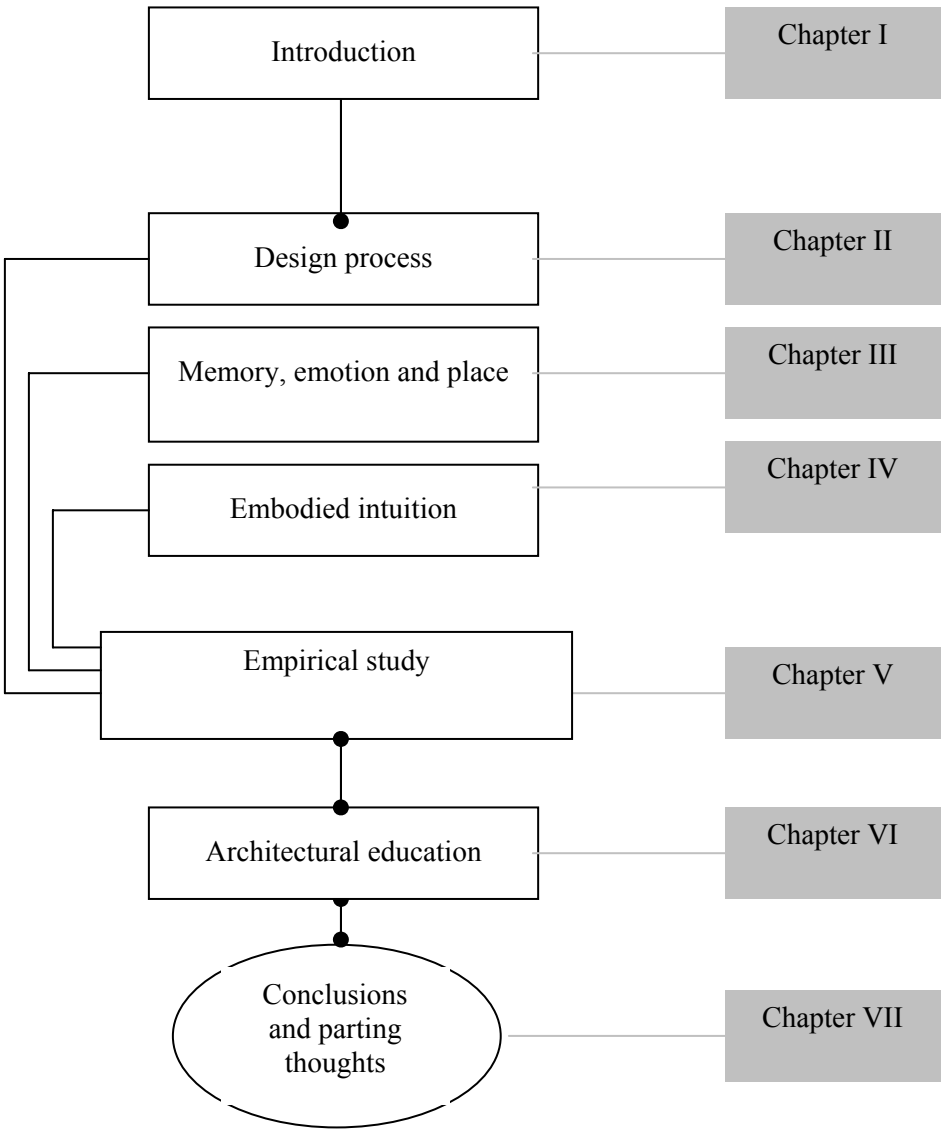

FIGURE 1. Dissertation structure.

Dissertation Structure

Each chapter of this dissertation looks at one aspect of the tacit process and its relationship to architectural design. This dissertation is not written as one continuous narrative, and the reader should not look for transitions from chapter to chapter. Figure 1 presents the dissertation structure which links the chapters. Each chapter can be read independently, as an individual article (and, in fact, several of them are already published articles). Together, the chapters set the

background and construct a more coherent picture of my empirical research, placing it within a global context of research into the design process, memory, emotions, intuition, and pedagogy, leading to a better understanding of the interconnectedness of all those aspects in the real world of design and design education. If there is one message I want to convey in this writing, it is that every moment of the life of the designer matters for the design. Design is a fascinating and rich subject, very complex and reluctant to reveal its secrets to researchers. This dissertation is only the beginning of a life-long investigation into autobiographical memories with emotional significance and their role in the design process. It builds on generations of research in design, psychology, philosophy and education, and only opens a little crack in the doorway to understanding the relationship between an architect's autobiography and his or her design.

Chapter I: Introduction

The Introduction chapter you are reading right now is a typical introduction to a PhD dissertation. I stated the basic assumptions of my study, presented the study hypothesis and research objectives, and explained the importance of my study and the structure of the dissertation. Since the dissertation has a somewhat unusual organizational structure, I also provided suggestions on how to read it. Following the general suggestions, I include a brief summary of each chapter. The summaries are not intended to present the entire content in a single paragraph, but rather to tease the reader. Therefore, I provide an overview of the topic of each chapter but do not offer a comprehensive list of important points. I hope the summary of each chapter will peak the interest of the reader sufficiently to prompt them to read the actual chapter.

Chapter II: The Design Process

Chapter II is dedicated to a discussion of studies into the design process and reviews of the architectural design process, creative problem solving and decision-making. The chapter begins with a definition of the design process. A brief overview of existing research on the design process suggests that there is no single definition or general agreement regarding what the design process is or is not. The chapter provides a comparison of 32 models of problem solving, creative thinking, creative problem solving and the design process, and describes several key models in detail. Analysis-Synthesis, Conjecture-Analysis, and Design as Sequence of Situated Acts are the models reviewed most thoroughly. In addition to the models, theories of design as

puzzle-making, the role of shared knowledge, and experiential knowledge in the design process are all examined. A meta-theoretical structure for classifying abstractions in design theory is presented in order to suggest ways of organizing a design theory that, as my overview of the design process studies showed, is very confused at the moment. Finally, I suggest a combination Situated Conjecture-Analysis model that allows for an account of the designer's personality and autobiography that is better than the other models I reviewed. I adopted the Situated Conjecture-Analysis model for my empirical study, concentrating on the Conjecturing phase.

Chapter III: Memory, Emotion and Place

As the title of the chapter states, the three main issues discussed in Chapter III are memory, emotion and place. I begin with the obvious: architecture is about place, and architects are professionals who design places. We should not forget that architects are not only professionals; they are human beings with emotions, memories, values, beliefs, ambitions and motivations. In Chapter III I describe my attitude towards architects: I see them as social human beings. Shared meanings that the architect possesses are critical for understanding culture and other human beings – peers, clients, users of places they design. It is our emotional connections and our autobiographical memory that allow for us to function as social beings, and for architects to design meaningful places.

In Chapter III I first talk about emotions. I explain what emotions are and how they define our lives. I discuss the properties of emotions, and how emotions indicate the significance of experiences to a person. I also talk about emotions and reason. Folk epistemology considers emotion and reason to be polar opposites, but current research proves emotions to be evaluative judgments themselves, that form the core of reason.

Chapter III also talks about the self, and how it is both implicit and complicit in every emotion. The dynamic structure of the self-concept grows out of our emotions and memory. Like the self, emotions are social, cultural and embodied. It is the ability to evaluate emotions that allows us to establish connections and communication with other human beings, and to understand places.

Memory contributes to a construction of the self and understanding of place. I am especially interested in autobiographical memory, which is a distinct type of memory. I define

autobiographical memory in Chapter III and provide its major characteristics. I also define autobiographical memory with emotional significance, which is the focus of my dissertation.

Then I explain why the emotionally significant experiences of architects are important for them as people and designers. I talk about the 'feel of place,' its perception and its design. I discuss the intricate connection between emotion and memory that is complex and tight. I also talk about noetic judgments (judgments of knowing) and noetic feelings (feelings of knowing). Noetic feeling is nothing less than intuition.

I wrap up this discussion of memory with the latest theory, called Prospective Brain. My hypothesis regarding the importance of autobiographical memories with emotional significance to an architect's ability to design fits perfectly within this theory of memory predicting the future. Architects use autobiographical memories with emotional significance to envision future places. I discuss in depth several studies that led to the theory of Prospective Brain. One of these studies shows the primacy of place and its relationship to our ability to remember.

Memories are always in place and of places. Place is very different from space. I define both in Chapter III. I also illustrate how an embodiment of a space transforms it into a meaningful and significant place. I define concepts of familiarity and atmosphere or 'feeling of place.' The brief discussion of technological advancements brings to our attention the fact that mediated experience cannot convey the full reality of a place. Mediated presentations appeal to reason, but not to the soul. Spatial awareness achieved through immediate experience is essential to the ability to design.

Chapter III ends with a conversation about metaphors as tools that enable architects to transfer meaning between seemingly unrelated domains. Metaphors are closely related to our experiences and memory; they join reason and imagination. Metaphor is a device that assists an architect's memory in predicting future places.

Chapter IV: Embodied Intuition

Chapter IV is devoted to a discussion of embodied intuition. In this chapter I argue that architecture is an intuitive interpretation of our previous spatial experiences. I investigate such concepts as intuition, and sensory and emotional perception of place that result in an

embodiment of place experience, and re-introduce the term 'embodied intuition.' Embodied intuition is defined as the sensitivity that one develops through a perception of space and its embodiment. Sensory and emotional understandings of place and place-related concepts, an emplaced and embodied sensitivity, and our intuitive process are what makes architecture meaningful and distinguishes it from mere building construction. I look at the personality of architects and argue that previous research found architects to be predominantly intuitive (meaning they trust their intuition the most). I also look at explicit and implicit learning, decision making, and intuition. The concept of embodied knowledge is defined and explained. As related to the concept of embodied knowledge, I introduce the terms of 'techné,' 'image schemata' and 'design schemata.' The relationship between embodied intuition and a person's experiences leads to the conclusion that intuition is the result of experience, and that intuition is domain-specific. Intuition and reason, and intuition and abstraction are investigated. Further, I speculate about the possible role of intuition in architectural design. I base my argument on the theory of symbolic transformation of experience. This theory explains how body experience and perception become material for design by considering how we interpret and transform embodied experience into a symbol, and then remake that experience into a different object. Without an emplaced and embodied sensitivity, our intuitive interpretation becomes disembodied and weak, and the creation of architecture becomes mere simulation. At the end of the chapter the role of intuition in design education is reviewed. It is possible to educate intuition, and I suggest that embodied intuition should be seriously addressed by architectural education.

Chapter V: Empirical Study

Chapter V is dedicated to the empirical study. This chapter begins with a discussion of the methodology. I describe and analyze different methods that have previously been used to study the design process. After the general review of methods, I focus on the method I used for my empirical investigation. I describe why I chose case study as a type of study design, why the reliability of such a study is low, and concentrate on the three methods of data analysis I used to process the data from my study. The pros and cons of all the methods – direct analysis, indirect analysis (content analysis of protocols) and analysis of language for affect are – are all evaluated. I explain how the combination of three methods adds rigor to my study, and how the three methods allow me to construct a coherent and complete picture of the utilization of

autobiographical memories with emotional significance during the conjecturing phase of the design process.

After the discussion of methodology, I state six research questions investigated by this dissertation. Then my study's design is explained, following which I present the context of the study, the participants, interview procedures, the design brief used and the types of data collected during the two case studies compared in my dissertation.

Following the description of the study design, I concentrate on the three methods of data analysis, providing a thorough description of each. Indirect data analysis illustrates how the units, categories and themes of content analysis in the talking aloud protocols collected during the interviews with the participants in the study were constructed. I also explain how the validity of the content analysis was established. Then I elaborate on the direct analysis of data and reiterate why direct analysis was important for my empirical study, in addition to indirect analysis. One of the methods of data analysis I used was Whissell's Dictionary of Affect in Language (WDAL). Since to my knowledge I am the first researcher to use the WDAL as a tool for studying the design process, I provide in-depth information about the WDAL itself and how it assisted me in an analysis of the protocols.

The discussion of data analysis leads to the presentation of the results of the study. The explanation of the results is broken down into a description of the outcome of the analysis of the protocols of the two case studies for affect in the language, a discussion of the three major themes that emerge from the content analysis and direct analysis of protocols, a list of the categories that emerge from the content analysis, and finally a thorough description of each category. A summary of the results at the end of the chapter recaps my findings.

The Empirical Research chapter is the longest chapter in this dissertation. A comprehensive description of the methodology allows the user to understand why I chose particular methods of data collection and analysis. A thorough description of the study design should allow anyone willing to repeat the study to come up with the same results that I did (if using the same data). The results of the study present all my findings, and compare them to previously known findings of similar research. I portray all the different kinds of architects' autobiographical memories with emotional significance in design conjecturing, and what those memories are used for. Each finding is explained and supported with examples from the interviews.

Chapter VI: Design Education

The pedagogical implications of this study's findings are presented in Chapter VI. I begin the chapter with explaining my ultimate goal: bringing change to design education. I provide the reader with insights into why I am interested in my dissertation topic, and share my concern over the current situation in architectural academia. The chapter proceeds with two already published papers on architectural education, and additional thoughts.

The first paper offers an overview of the state of architectural education in the US and Europe. It poses an important question regarding the main goal of architectural education. I argue that without having a clear goal, it is impossible to provide quality education and appropriately coach students for their future in the profession. The paper revisits several of many critical issues with architectural education: an architect's relationship with the profession, the studio system and the transformation of universities, and the student body's changing educational needs due to global changes. An extensive review of the existing literature suggests that architectural education is due for a paradigm shift. I believe that a dialog between professionals, educators, and researchers can provide the goal and the ideological conviction required to transform architectural education, and to make it more suitable for the architecture of tomorrow.

The second paper concentrates on pedagogical issues. The main challenge of teaching design in the information age is that learning is often confused with collecting a 'grab-bag' of images that are available at the click of a mouse. We live at a fast pace; we have no time for immersion and reflection. Keeping such a pace leads to an imbalance of design objectives from embodied concerns to visual artifacts.

The second paper places these concerns within the context of design pedagogy. It has become vital to address issues of tacit knowledge (autobiographical experience, memory, intuition) when students develop conceptual, as well as technical, skills.

This second paper is founded upon the design implications of certain perceptual paradigms. The particular emphasis of this chapter is on embodied experience and embodied cognition, illustrating the formative role of the environment on the cognitive processes, and emphasizing a holistic perception and approach to learning. It discusses the potential of an application of

embodied theories for pedagogical initiatives, and suggests a three-step learning strategy based on those theories.

A three-part teaching and learning process that will embody education within the existing format is then proposed. Once interwoven into the existing fabric of architectural education, students' embodied learning will be enriched, allowing for a balance of collateral and collective experience: immersion, connection, reflection, and communication. Immersion will involve "dwelling" in the places of study. Connection will allow students to establish a link between architectural concepts and their autobiographical experiences of dwelling in a place. The last step consists of students' reflections on learning and an expression of that learning via a variety of media and communication techniques best suited to an articulation of their learning.

The thoughts about design education at the end of Chapter VI summarize the content of the chapter and review innovations in pedagogical approaches (for example, design as narrative) and continuous debate about the content and the role of architectural education. I conclude that the shift toward an embodied approach to a designerly way of thinking might be a strategy for bringing positive change to architectural education.

Chapter VII: Conclusions and Parting Thoughts

The conclusions in my dissertation present a summary of all the findings. I restate my hypothesis and research questions, and provide the answers that emerged during my research. An analysis of my findings leads to suggestions for further research, which I also state in the conclusions.

The parting thoughts mainly revolve around possible applications for the findings of my research to architectural education. As an educator myself, I am passionate about helping students find ways of producing meaningful and humane pieces of architecture. I strongly believe that autobiographical experiences, especially memories with emotional significance, are critical to an architect's ability to design, and to students' ability to learn design. The only true conclusion to my dissertation is this one parting though: architectural educators, myself included, have a lot of work to do in order to develop pedagogical approaches that will allow for an holistic, intrinsic, life-long learning process for our students. We must assist them in a development of their own processes of transformation of autobiographical experiences into meaningful future places.

CHAPTER II

THE DESIGN PROCESS

When I read the studies looking into the design process, it seems to me that most have designers with bipolar disorder as their subjects. The studied architects, engineers or artists seem to all have one life as 'professionals' in their field, and another life as normal 'persons.' During the design process studies, these subjects almost always present themselves as 'professionals' exclusively, and researchers have no idea that there is another personality waiting to come out at the end of the working day. Of course, this is a story that I just made up, and it is not true in reality. So why is there such a persistent neglect of designers' autobiographical experiences and knowledge that they share with others, when it comes to design research? Let us look together at the state of research into the design process, review the existing models and see if there are any that allow architects to be both person and professional together, as 'a whole' individual.

Introduction

On the Greater London Council Architects' Department hangs "the six phases of the design project: (1) Enthusiasm; (2) Disillusionment; (3) Panic; (4) Search for the guilty; (5) Punishment of the innocent; (6) Praise for the non-participants" (Lawson, 1997:29). There has been a proliferation of research done into the design process. Design has been looked at as a creative act, as problem-solving, as learning, as a game, as an evolution, and as a social act (Dorst, 2003). The use of logic, structure, and practice enables us to understand the process (Langer, 1980); the efforts to understand the design process have mainly focused on breaking up the process into a sequence of distinct and identifiable activities occurring in a logical order and presenting them in the form of a model. Many models have already been generated, but researchers and architects do not agree on any one model as reflecting the "true" process. There are many approaches to studying the design process; the choice depends upon the objectives. All of those different objectives and different perspectives lead to different models of the design process, or design theory (Van Aken, 2001). "Design activity encompasses some of the highest cognitive abilities of human beings, including creativity, synthesis and problem-solving" (Cross, *et al.*, 1996:1). Models are just one way of understanding design. All of the models tend to emphasize some single aspect of design, and neglect others (Dorst, 2003). I shall review several of the most

influential models of the design process, and mention some creative thinking and problem solving models that have been introduced to architectural design. I shall start with a general discussion of the design process and then proceed to a comparison of creative problem-solving models, creative thinking models, and design process models; then I'll review the key models of the design process in more detail, and at the end I'll discuss which of the described models I believe best reflects the design process and why.

The Design Process – What Is It?

The design process is definitely a unique and distinct way of going about a task. That is why the effort to study the design process has been so persistent. However, there is still no general agreement among researchers of the design process regarding what the design process is and what it entails. Kees Dorst (2003) wrote a book with 150 reflections on design, and even it can't cover all of the aspects of the design process. One universal definition of the design process does not exist. Love attempted to collect a glossary of main terms in design research literature and discovered that "there are almost as many different definitions of 'design' and 'design process' as there are writers about design" (Love, 2000:295). Bryan Lawson, who wrote multiple books on the design process, thinks that "we shall never really find a single satisfactory definition but that the searching is probably much more important than finding" (Lawson, 2006:33). The design process has been considered to be a decision-making process (Asimov, 1962; Bax and Trum, 2001), naturalistic decision making (Ball *et al.*, 2001), a social process of interpretation (Glock, 2001), a creative act (Lawson, 1990; Finke, 1996), learning (Schön, 1983), a conversation (Dong, 2007) and various other forms of activities. Typically, investigations into the design process result in a model, several of which I shall present below. There are two major types of models: prescriptive and descriptive. Prescriptive models attempt to determine a rational process of design and the logical steps it entails. Descriptive models tend to provide an 'objective' description of the design process in a specific setting. Even though neither design practitioners nor researchers of the design process can agree upon what constitutes design activity (Love, 2000), there are several characteristics of the design process that seem to be agreed upon by most researchers. What follows is a list of such characteristics.

(1) The design process is an act of dealing with problematic situations (Dorst, 2003).
(2) The design process is a creative act (Lawson, 1990).

(3) There is a complex and messy relationship between a design problem and the design solution: there is no logical or predictable way of mapping the problem domain and the solution domain (Lawson, 2001).
(4) Novice designers and expert designers have different processes, and different access to and use of knowledge (Konda *et al.*, 1992; Lawson, 2004; Glock, 2001).
(5) Design expertise is domain-specific (Cross, 2003; Lawson, 2004).
(6) Designers have ways of narrowing down requirements and personalizing the design situation. There are numerous speculations regarding how this happens, and different terms have been used to describe the phenomenon, such as 'personal framing' (Cross, 2003), 'first principles' (Cross, 2003), 'primary generator' (Darke, 1978) and 'parti' (Lawson, 2001).
(7) Collective or shared experiences in design are important (Konda *et al.*, 1992; Lawson, 2004; Glock, 2001).
(8) Design is a reflective process (Shön, 1983).

As we can see from the above list, the accepted (even though not universal) truths about design touch on the social nature of the process and the importance of previous experience. Most studies of the previous experiences of designers concentrate on professional experience or design expertise. Very few studies (Downing, 2000; Israel, 2003) look at the experience of a designer beyond their professional experience: that is, at life experience as a whole.

There is a *how* and a *what* of experience in design. The *how* relates to the professional strategies that expert designers utilize while designing, the manner in which they make shortcuts between problem identification and design ideas, and their ways of utilizing knowledge. A majority of the design process research deals with the how. The *what* refers to the kind of actual knowledge and experience that designers use. Expert designers differ from novice designers in handling design problems. Looking at the two studies into designer's biographies by Downing (2000) and Israel (2003), it seems that a study of professional experience alone to identify the expertise of a designer is too narrow and incomplete an approach. Our learning happens implicitly, every given moment of our lives. As the professional experience of an architect grows with time and the projects completed, so does the autobiographical experience that takes place over the same number of years. Glock (2001) and Konda (Konda *et al.*, 1992) talk about the social aspect of

design, and Lawson (2001, 2004) discusses episodic memory as a necessary part of a designer's experience. If we simply follow the practice of starchitects today, or influential architects in history (Le Corbusier is a good example), they have all traveled substantially. With travel comes major a expansion of the image bank of places and an understanding of different cultures. This expansion of the image bank and understanding of different cultures changes the overall understanding of the world by the designer, and is readily available during the design process as a source of imagery. My goal with this research is not to once again criticize the various studies of the design process; there has already been too many of those. My belief is that the autobiographical experience of a designer, through memory, emotional connections, the Self, and shared experiences, plays not a minor but rather an important role in the design process, and eventually contributes to shaping the product of design. Reviewing the various models of the design process allows me to see if any of the models account for the personality of the designer (by personality I mean not just personal traits, but the designer as a Self with the memories, emotions, beliefs and values of an individual) and the shared experience of a designer as a member of the professional team of architects within the architecture community, and within society as a whole.

Comparison of Models

A comparison of thirty-two creative problem-solving models, creative thinking models, and design process models[1] is presented in Table 1. Some of the mentioned models, as well as several models not covered here, can be found in the Cross (1984) and Konda (Konda *et al.*, 1992) publications. No two models[2] agree completely with regards to the number of steps or the "right" sequence of steps, or even with what those steps might involve. As a matter of fact, as noted in Love (2000:296), "there are as many ways of producing block diagrams of the design process as there are of 'tribal lays.'" Even though my comparison doesn't nearly cover all of the existing models, it offers an ample picture of how researchers of the design process see designers go about the design task. I have to note here that because there are no detailed and specific definitions of the terms related to design, the discussion in this chapter is based on my interpretation and understanding of those terms. The most influential models on the design process will be discussed in more detail below. "Design is part of a continuous problem-solving process" (Esherick, 1963:77). There are various creative problem-solving (CPS) models, which

TABLE 1. Comparison of creative problem-solving models, creative thinking models and models of the design process.

Researcher/ stage	1	2	3	4	5	6	7
Models of Creative Thinking and Creative Problem-Solving							
Lawson	First insight	Preparation	Incubation	Illumination	Verification		
Rugg		Preparation	Incubation	Illumination	Verification		
Wallas		Preparation	Incubation	Illumination	Verification		
Breadsley			Inventive phase: Inspiration		Selective phase		
Dewey	Sensing difficulty	Defining difficulty		Suggesting possible solutions	Considering consequences		Accepting the solutions
Rossman	Problem observed Problem formulated	Available information surveyed		Solution formulated	Solution critically examined	New ideas formulated	New ideas accepted and tested
Bransford and Stein	Identify problems	Define problems		Explore approaches	Look at effects		
Vaigui		Preparation Definition Frustration	Incubation	Illumination			
Osborne	Orientation	Preparation Analysis Ideation	Incubation	Synthesis	Evaluation		

TABLE 1 (cont.).

Polya		Understanding the problem		Deciding what to do	Carrying out the plan	Looking back	
Finke		Pre-inventive exploration and interpretation	Incubation	Generation of Pre-inventive structures	Check over product constraints		
Sapp	Initial image inception Associative exploration	Problem parameter exploration Multiple focus exploration		Primary focus exploration	Refinement		Final image
Koberg and Bagnall	Acceptance of the situation	Analysis Definition		Ideation Selection Implementation	Evaluation		
Isaksen, Doval and Treffinger	Mess (objective) finding	Data finding Problem finding		Idea finding	Solution finding		Acceptance finding
Guilford	Input	Filtering		Cognition	Evaluation		Production
MacKinnon	Sensing of a problem	Preparation Concentrated effort to solve the problem	Withdrawal from the problem	Insight	Verification, evaluation, elaboration, application		
Hickling		Definition of the problem		Development of alternative solutions	Comparison and preference of the solutions		Final decisions
Runco and Chand		Problem finding		Ideation	Evaluation		

TABLE 1 (cont.).

Models of the Design Process							
Asimov		Analysis		Synthesis	Evaluation		
Markus and Maver		Analysis		Synthesis	Appraisal		Decision
Jones		Analysis		Synthesis	Evaluation		
RIBA Handbook (1965)		Assimilation		General Study Development			Communication
Norris	Definition	Analysis		Synthesis	Presentation		
Archer		Programming Data collection		Analysis Synthesis	Development		Communication
Strzalecki		Analysis of the problem		Generation of a solution	Verification of the solution		
Hillier, Musgrove and O'Sullivan				Conjecture	Analysis		
Darke	Primary generator			Conjecture	Analysis		
Gero		Formulation		Synthesis Analysis	Evaluation	Reformulation	Documentation
Cross	Clarifying objectives	Establishing functions	Setting requirements	Generating alternatives	Evaluating alternatives	Improving details	

TABLE 1 (cont.).

Boax and Trum		Identification phase (Initiative phase)				
Archea	Making a puzzle		Mediation of problem-solving groups	Synthesizing problems solved by others		Satisfactory fit between parts
Goldschmidt	Definitions/ Design imperatives	Independent input/ Design modifier		Interpretation / Personalized program,	Architectural design/ Physical form	
Voelker		Preparation: Sensing (facts)	Incubation: Intuition (possibilities)	Illumination: Thinking (consequences)	Verification: Feeling (human values)	

Note. Comparison is partially adopted from Dacey (1989) and Plsek (1996).

might reflect the architectural design process. The CPS model (see Figure 2), as presented in Lawson (Lawson, 1997:152), was compiled from the major stages of problem solving in different fields of art and science, as reported by creative professionals (Rugg, 1963; Asimov, 1962; Wallas, 1976; Lawson, 1997).

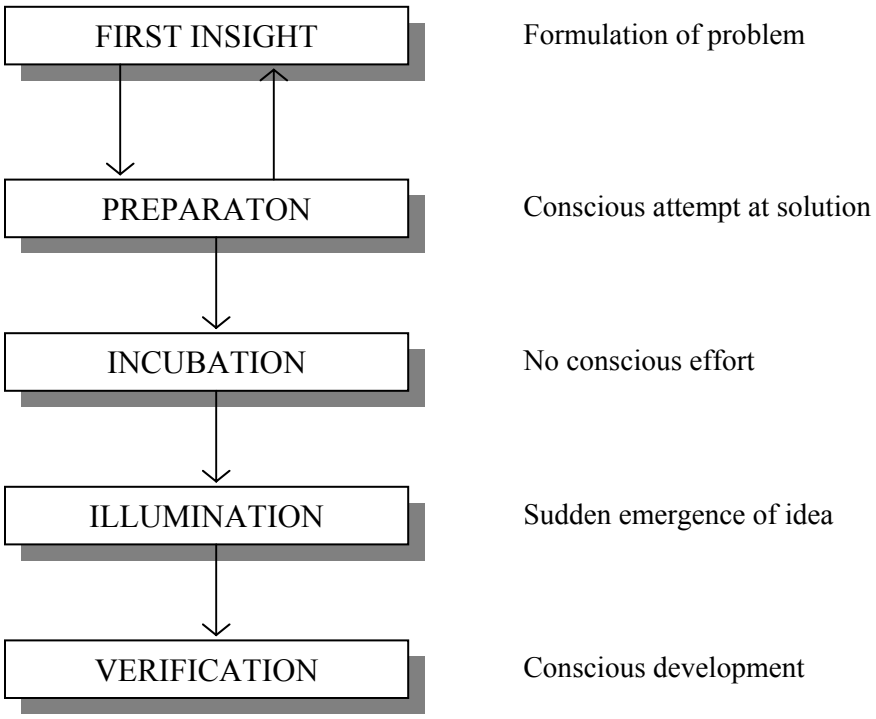

FIGURE 2. The popular model of creative problem-solving.

The first stage is simply the recognition of the problem and the commitment to proceed to a solution. The preparation phase is an effort to identify possible solutions that include critical information to help the designer understand the various possibilities. Included is the reformulation and even the redefinition of the problem itself, as the preliminary solutions are generated and explored. Incubation as a CPS step was clearly distinguished by most creative people who contributed their understanding of the process from various fields of art and science (Lawson, 1997; Wallas, 1976). Incubation is temporarily removing the problem from conscious awareness and is thought to new perspectives. Illumination is the 'magic' moment when the solution 'suddenly' occurs to a person. Finally, the verification step is for testing the solution against the requirements and objectives, its elaboration and development. The model is generally

accepted as best for describing the creative process. Even though the architectural design process is commonly considered creative problem-solving, the model doesn't reflect this very well. It is not uncommon not to have "Aha!" moments during the design process; the model does not reflect feedback loops and many other factors inherent to the architectural design process. The model has no evidence of accountability for shared knowledge, the autobiography of the designer, or the designer as Self with singular and personal values, beliefs, memories, emotions and preferences (even though one can guess that this does take place during Incubation). Let us look closer at some of the most influential models.

Models of the Design Process

One of the many definitions of the design process is a process for solving problems in design that "possesses a rather complete form, a typical sequence of operations" (Asimov, 1962:43). Currently, there are two distinct prevailing models of the design process – the Analysis-Synthesis (AS) model and the Conjecture-Analysis (CA) model. Nearly all other models are either interpretations of, or are similar to the SA model, CA model, or one of the models of creative problem-solving (see Table 1). We shall look at three models – the AS model, as presented by Asimov (1962)[3], the CA model, as proposed by Darke (1978), and a relatively new model known as Designing as a Sequence of Situated Acts (DSSA) by Gero (1998, 1999a, 1999b). We shall also touch upon the theories of John Archea (1985), Bryan Lawson (2001, 2004) and Konda and colleagues (Konda *et al.*, 1992).

Analysis-Synthesis Model

The Analysis-Synthesis model was developed based on the problem-solving process in engineering, but "its process resembles that of problem-solving in general" (Asimov, 1962:42).

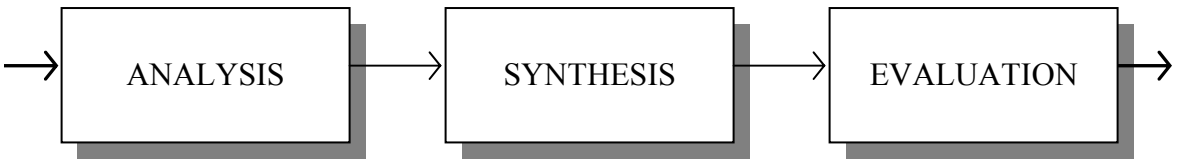

FIGURE 3. Model of the design process as proposed by Morris Asimov (1962).

Early models of the design process in architecture were very similar to models of the design process in engineering (Roozenburg and Cross, 1991). For example, compare the Analysis-

Synthesis model (see Figure 3), elaborated Analysis-Synthesis model (see Figure 4), and the model developed by Markus and Maver (in Lawson, 2006) (see Figure 5). The design process in the AS model is different from more general creative problem-solving in that its uses are more analytical and more specific to a particular field's tools. Most researchers agree that there are three main steps to the design process: (1) understanding the problem, (2) coming up with a number of alternative solutions, and (3) evaluating the validity of those solutions. According to Asimov (1962), this consensus means an Analysis of the situation, a Synthesis of possible solutions, an Evaluation of possible solutions, and possibly subsequent Revisions of those solutions. The first step, Analysis, means understanding the problem situation. Design problems rarely come with a clear statement of the numerous factors involved, or with specific goals. Typically, the designer is presented with a task "which may have many perplexing elements interrelated in complicated and obscure patterns (Asimov, 1962:44), or even with a set of tasks. Thus, in the first stage of the design process, according to the AS model, the problem situation is understood, information is gathered, relevant factors are distinguished, and a set of goals or objectives are established.

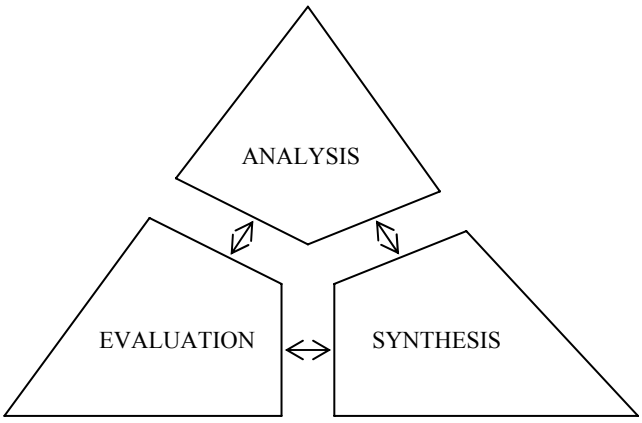

FIGURE 4. An elaborated, 'more honest' Analysis-Syntheses model by Bryan Lawson (1997).

The next step of the design process is synthesis, or a search for the solutions to the identified problem. "A solution is a synthesis of component elements which hurdles the obstructing difficulties and, neither exceeding the available resources nor encroaching on the limits set by the constraints, accomplishes the prescribed goals" (Asimov, 1962:45). Solutions, created in the

synthesis step, are carried out in the next phase of the design process. In the evaluation phase, solutions are checked against goals and constraints. After careful evaluation, decisions regarding which solution to adopt are made. If the solution needs refinement or revision, the forth step – revision - may come into play.

In the 1960's, the movement towards the AS model was thought to be revolutionary in environmental design and other allied disciplines (Downing, 1989). There have been various elaborations on the AS model. Two examples of such are presented in Figures 4 and 5, and other examples can be found in Table 1. The AS model is still alive and well. For example, one of the latest variations (see Figure 6) on the AS model was proposed by Bax and Trum (2001)[4].

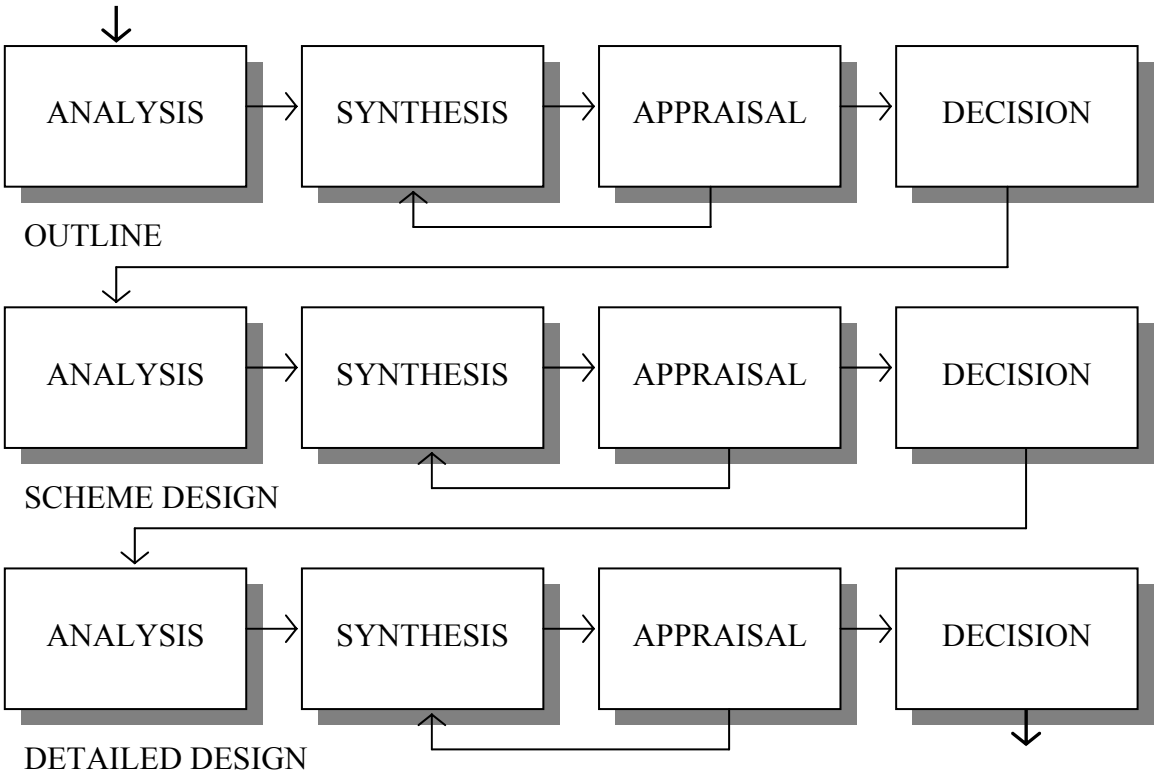

FIGURE 5.Elaborate version of Analysis-Synthesis model
by Tom Marcus and Tom Maver (in Lawson, 1997).

As early as the 1970's. it was noticed that the AS model, which works well for problem-solvers in engineering or mathematics, does not adequately reflect the design process in architecture. A study performed by Bryan Lawson (Lawson, 1997) in 1972 showed that science students utilized

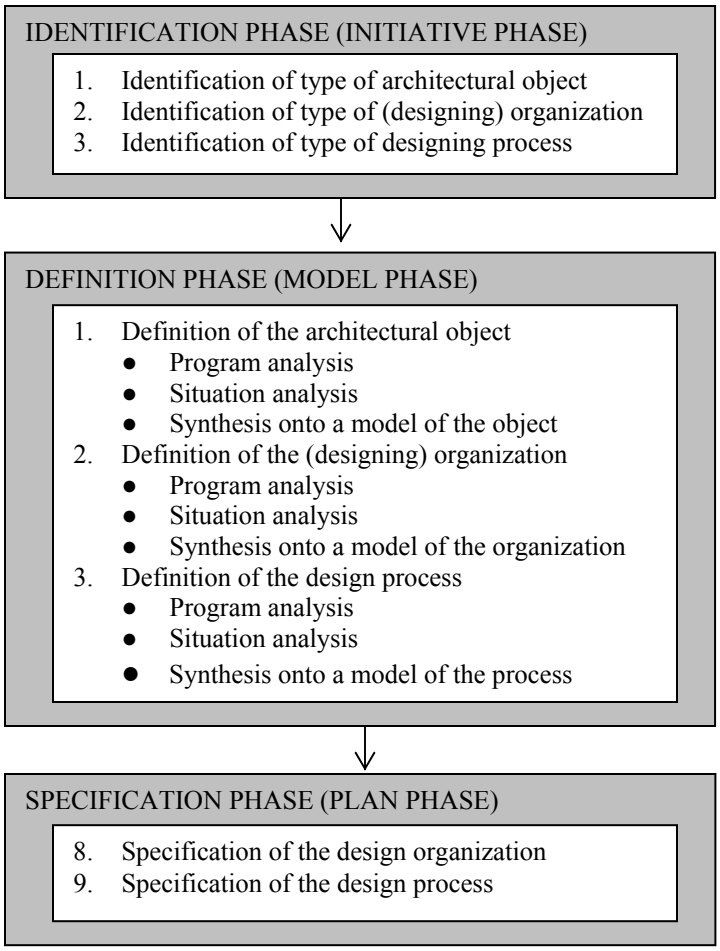

FIGURE 6. Model of the design process by Bax and Trum.

the problem-focused approach to problem solving, while design students favored a solution focus. What that means is that architecture students first identify a solution based upon some identification between the problem statement and an experience of the designer, and then examine the problem against the resulting solution, which is evaluated against the criteria of the design situation. Science students, on the other hand, start out with a thorough analysis of the problem before attempting a solution.

The AS model holds true only for representing the design process of novice designers (Lloyd, 1994). This model assumes the act of designing to be a completely rational activity with little or no freedom to incorporate the designer's personal or shared experiences. The founding fathers

of logical models of the design process, Alexander and Jones, rejected their own models in early 1970's (Cross, 2007).

Primary Generator-Conjecture-Analysis Model

If the AS model of design is referred to as a rational or objective model because, supposedly, it is linked to the idea of avoiding prejudices or stereotypes in the preparation and incubation stages of problem solving (Lawson, 1997; Wallas, 1976), CA is referred to as an intuitive model (Connell, 1996). The CA model was first introduced by Hillier, Musgrove and O'Sullivan (Hillier *et al.*, 1972), and accounts for both the experiences and the subjectivity of a designer. The Paradigm model, similar to Popper's view of science supplied by Hillier, Musgrove and O'Sullivan5 (Hillier *et al.*, 1972), assumed that design is essentially a matter of prestructuring problems by using the knowledge of either solution types or the "latencies of the instrumental set" in relation to the solution type. The design process itself in this model is interpreted as a process of "variety reduction, where a large number of potential solutions of the design problem are reduced by external constraints and by the designer's cognitive structures. Somewhat similar to Hillier's (Hillier *et al.*, 1977) model is the Production-Deduction-Induction (PDI) model proposed by March (March, 1984; Roozenburg and Cross, 1991). This model suggests an understanding of the design process as composed of presuppositions, conjecture, analysis, and evaluation. The PDI model consists of (1) the creation of a novel composition, based on the requirements and on a presupposition, (2) the prediction of performance characteristics, and (3) an evolving typology (March, 1984; Roozenburg and Cross, 1991).

FIGURE 7. Conjecture-Analysis model of design process as proposed by Jane Dark (1978).

Hillier's (Hillier *et al.,* 1977) Conjecture-Analysis model was studied and elaborated upon by Jane Darke (1978, 1979), as shown in Figure 7. The important improvement in Darke's model is the notion of the Primary Generator.

The Primary Generator is a component of the designer's cognitive structure; it is a subjective-objective or a group of objectives, strongly valued and usually self-imposed by the designer, that assists in the generation of a design solution. Primary Generator is a way into the problem for a designer; it is a starting point for the process. "Any Primary Generator may be capable of justification on rational ground, but at the point when it enters the design process it is usually more of an article of faith on the part of the architect, not necessarily explicit" (Darke, 1978:330). In other words, the Primary Generator is a value system of the designer through which he or she orients the project. "Insight is understood to occur in the CA model of the design process as an involuntary and continuous activity that is influenced by the predisposition that experience (pre-understanding) has on the individual designer. The process is primary, private and subjective and is conceived as intuitive; therefore, it doesn't place emphasis on control, but on self-interpretation" (Connell, 1996:20).

The requirements of the project, together with the designer-imposed Primary Generator are used to produce conjectures. Conjecture is the first conceptualization of possible solutions, or initial visual images, not dictated by a prior analysis. To clarify the difference between a Primary Generator and Conjecture, a Primary Generator does not refer to conceptualized images, but rather to the ideas that generate them (Darke, 1979). Conjectures come early in the design process. Then a reduction of the vast variety of design decisions takes place; conjectures are tested against design requirements, refined, and modified as necessary. This is the analysis stage of the CA model. In this model, Conjecture and Problem Specification proceed side-by-side and not in sequence. The design process moves in spiral or iterative patterns as the solution is refined (Hillier, *et al.*, 1972).

The Primary Generator-Conjecture-Analysis model, as presented by Jane Darke, is one of a few models of the design process that allows for subjectivity of the designer and accounts for the designer's personal values, beliefs, preferences, emotions, and professional and autobiographical experiences. The model seems to be one that takes into account both the tacit knowledge and reason of the designer, and thus offers a better representation of the true thinking process that happens during the design process. Complete rationalization of the process, as in SA the model, does not answer for the designer as a Self. The Creativity model tends to put too much emphasis on the 'magic.' Darke's model treats the designer's knowledge holistically, and least discriminatorially. It is not, however, clear if shared knowledge has a place in this model.

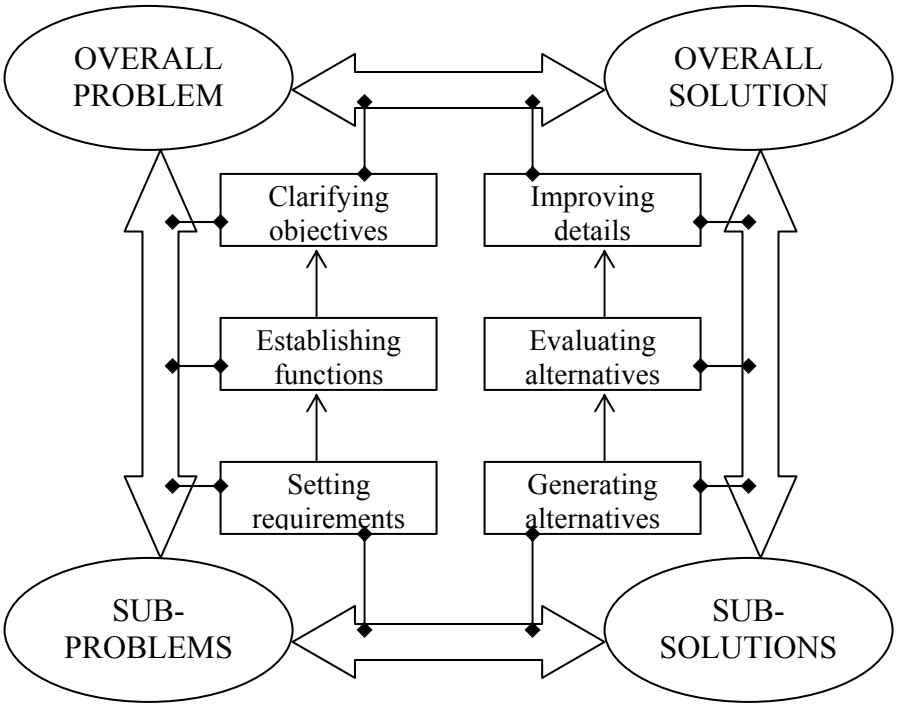

FIGURE 8. Hybrid model by Nigel Cross.

Hybrid Model

Nigel Cross proposed what he called a hybrid model (Roozenburg and Cross, 1991). In this model (see Figure 8), Cross attempted to capture the complicated relationship between problem and solution in design, and the hierarchal relationship between problems and sub-problems.

The Hybrid model attempts to account for complexity and loses clarity. The idea of a model is not to realistically encounter and describe every move of the designer, but rather to break it down to the simplified, meaningful actions, in order to help us understand their relationship. Cross's model still does not capture the complexity of the design process. It becomes too prescriptive and still lacks a holistic understanding of the process.

Model of Designing as a Sequence of Situated Acts

Model of Designing as a Sequence of Situated Acts (DSSA), developed by John Gero (1998, 1999a, 1999b), is a combination of the traditional AS model of designing and the Function–Behavior–Structure (FBS) model of Artificial Intelligence[6]. The DSSA model design process can be seen as consistent across the three major blocks of Function, Behavior and Structure,

"where the behavior is bifurcated into expected behavior, B_e, and behavior derived from structure or actual behavior, B_s" (Gero, 1999b:30). In diagram form, the FBS model is presented in Figure 9.

The description of the process is given as follows: the FBS model accounts for the following eight processes: Formulation, Synthesis, Analysis, Evaluation, Documentation, and three different possible ways of Reformulation of the problem and its solution. Basically, the FBS model is an elaboration of the AS model with an account of the feedback loops, and a reinterpretation of solutions. However, a discussion of Gero's model would be incomplete without mentioning two important concepts that he accounts for in his model: Situatedness and Constructive memory.

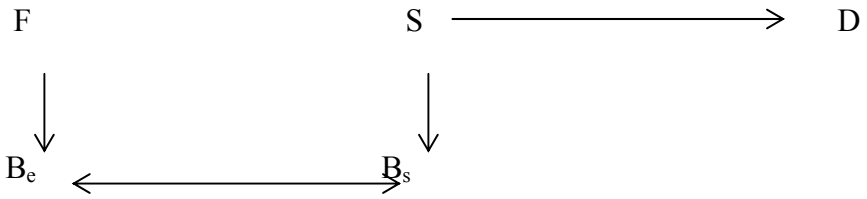

FIGURE 9. The Function-Behavior-Structure model by John S. Gero. In this model, F is the formulation, B_e is the expected behavior; B_s is the actual behavior, S is the synthesis; D is the formal output of designing; → is transformation; and ↔ is the comparison.

Situatedness refers to locating everything in context so that the decisions made are "a function of both the situation and the way the situation is constructed or interpreted" (Gero, 1998:168). When designing, a designer works with his or her experience, with knowledge, with other people and with situation. "What the designer has done previously, both prior to this design and during the current process of designing affects how the designer views the situation and what memories he [or she] constructs and brings to bear on the current situation" (Gero, 1998:169). In other words, Situatedness is a means by which a designer changes the track of the developing design. This notion of Situatedness gives some insight into why conceptual design sometimes leads in unexpected directions, and may account for unpredictability in the design process (Gero, 1998, 1999a).

The interpretation of a design situation depends upon the design task at hand, and of what a designer knows, i.e., his or her experience (Gero, 1998). Memory, as a medium of the experience, can be seen as a function of the design situation; memories effect the designer's perception of the situation and understanding of the problem at hand, and give meaning to the

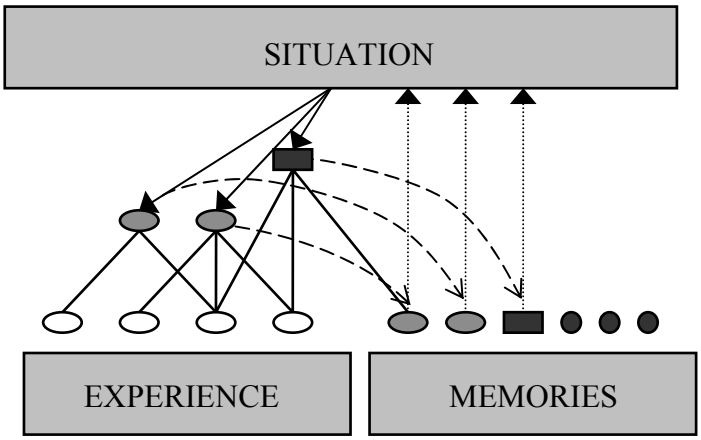

FIGURE 10. In this model, the design process as described by Gero is interpreted as a transformation of experiences. Sensate experience is stored as an experience. The construction of the memory includes the situation pertaining at the time of the demand of the memory (the design task). Memories are constructed initially from the experience in response to the demands of this experience. The experiences, ⬭, and the situation, are used to construct memories of the experience, ⬬; then these memories are added as experiences and may be used later to produce further memories, ▬, in conjunction with a later situation, and so on. (Gero, 1999a).

situation and the design itself. Constructive memory connotes that memory is not a static storage of experience that is available for later recall. "Rather the sensory experience is stored and the memory of it is constructed in response to any demand on that experience" (Gero, 1998:168). In the context of the design process, conceptual memory can be interpreted as such: knowledge and autobiographical memory of a designer actively participate in the design process in conjunction with a design situation. Figure 10 graphically demonstrates this conception. Gero's model is the only model that gives full respect to the designer's entire prior experience, but also for shared knowledge. Like Darke's CA model, it interprets the design process holistically and does not try to break it down into a set of prescriptive steps.

Puzzle-Making and Shared Knowledge

This discussion of the research into the design process will be incomplete without mentioning theories of Puzzle-Making and Shared Memory. Puzzle-Making theory was proposed by John

Archea (1985). He makes a strong distinction between how architects go about the design task and how other designers in allied disciplines do so. One major difference, as Archea sees it, is that architects do not separate knowing from acting. "Architects…are not problem-solvers and they are not seeking explicit information when they design a place. Explicit design criteria cannot be stated at the onset of the design process and it would not be desirable to do so" (Archea, 1985). Architects learn through the process; and the initial starting point of the design process is not collecting and analyzing the objective criteria and requirements. The program for design serves only as a catalyst for design activity. At the beginning of the design process, neither goals nor elements used later for reaching those goals and objectives are clearly stated by the architect. The architect engages with the elements and attributes to achieve a satisfactory result. In other words, from the perspective of Archea, the design process in architecture is puzzle-making through which a designer learns the unique combination of elements that will produce a satisfying whole. Some of those elements are other people. Architecture has become a more and more specialized discipline. If historically an architect was a master builder, now architects manage the process as much as serve active creators themselves. Archea proposes not to consider the design process as problem-solving, but rather to look at it as non-generalizable (i.e., a model is not possible), reflective process of achieving certain architectural results.

Architecture is a service profession, and "design processes are conceived as social processes of interpretation" (Glock, 2001:199). Konda, Monarch, Sargent and Subrahmanian (1992) wrote a convincing article on the importance of context and shared meaning in design. Konda and colleagues (1992) talk about the shared meaning and shared experiences conceived in shared memory that they define as a 'codified corpus of knowledge, techniques and models' and a 'mutual translation of terms and concepts across groups.' They see shared meaning and shared memory as nearly interchangeable, and argue for shared memory being a starting point in design. I make a case for shared experience and shared cognition in the Chapter entitled Memory, Emotion and Place. The bottom line is that an architect must share an understanding of the culture and the surrounding world with the client, users and collaborators, in order to design meaningful and appropriate architecture. Such shared understanding can only be achieved through experience.

Lawson (2004) and Cross (2006) made a case that a 'designerly way of knowing' (a term coined by Cross in 1982) is "heavily dependant on experiential rather than theoretic memory" (Lawson,

2004:451). In this statement, theoretical memory stands for 'textbook knowledge,' or memorized concepts and theories. Experiential knowledge is often explicit, and accumulated through life experience and professional practices that allow an architect to build a 'reservoir of knowledge.' Only when a reservoir is filled with "precedents based on episodic memories" (Lawson, 2004:457) does a designer become and expert. There are other important factors in becoming an expert, and Lawson (2001, 2004) does a beautiful job explaining those. What is important for my argument is that when an architect designs, they rely on entire, or as Lawson calls it, the collective experience they have, both professional and autobiographical, a part of which is shared experience. Only by drawing on the pool of entire experience, including "old and buried memories" (Hofstadter, 1985:208) and shared experiences, can a designer be creative[7], otherwise he or she can only produce imitations (Hofstadter, 1985).

Meta-Theoretical Structure for Classifying Abstractions of Design Theory

One issue becomes clear from the review of theories and models of the design process: design

TABLE 2. Classification of abstractions of design theory buy Love (2000).

<table>
<tr><td></td><td colspan="3">(1) Direct perception of realities</td></tr>
<tr><td rowspan="4">Object</td><td>(2) Description of objects</td><td rowspan="4">Design process</td><td>(4) Mechanisms of choice</td></tr>
<tr><td>(3) Behavior of elements</td><td>(5) Design methods</td></tr>
<tr><td></td><td>(6) Design process structure</td></tr>
<tr><td></td><td>(7) Theories about the internal processes of designers and collaboration</td></tr>
<tr><td rowspan="3">Philosophy</td><td colspan="3">(8) General design theories</td></tr>
<tr><td colspan="3">(9) Epistemology of design theory and the theories of objects</td></tr>
<tr><td colspan="3">(10) Ontology of design</td></tr>
</table>

process research is confused. Love (2000) lists multiple problems with design process research. To brings some clarity to it, he proposed a classification of the abstractions in design theory (Table 2). Abstraction, here, is tied to human assumptions, and the premise for classification is that the "theory of concept is dependent upon a variety of other abstractions at different levels of

abstraction itself, and for its validity if [it] must be seen to be coherent with them" (Love, 2000:303).

What is most important in this table is that at the very basis of any assumption or abstraction is direct experience. The rest of the structure is a way of describing experience with different levels of complexity. However, in most theories and models, direct experience is overlooked and modeling or theorizing begins with some level of abstraction.

Summary

The process of design is rather complex and difficult to understand, and especially to break down into distinct, observable, or measurable steps. As discussed above, some researchers consider the design process in architecture as nothing like the problem-solving process in any other field (Archea, 1985), and others strive to find a universal model. For any design researcher, it is important to understand how designers proceed from receiving a task, to accomplishing a project. It is also important to understand how the autobiography and personality of a designer, the knowledge that he or she shares with others, influence the design process of the designer as a professional expert, and is inseparable from the designer as an individual.

From the reviewed models, only two (CA and DSSA) seem to give credit to the personality of the designer and shared knowledge. The CA model accounts for the use of personal, past experience as well as a wide range of abstracted principles of space, form, and order (Downing, 1989). In some ways the design process can be seen as a symbolic transformation and a translation of an architect's experience, knowledge and interaction with others into new and meaningful content, a solution to the design problem at hand (Downing, 2000). That particular aspect of the CA model seems important. If a Primary Generator, as augmenter of the conjecture, and conjecture itself is developed partially on the basis of personal or autobiographical experience, then it is in this stage of the design process that architects possibly rely on their entire experience. Such assumption is confirmed by the theory of constructive memory discussed within the DSSA model and studies by Frances Downing (2000) and Toby Israel (2003). I do not want to create yet another model to contribute to a vast pool of existing theories and models of the design process. However, it appears that a combination of the CA and DSSA models can come closer to a true description of the real life design process that combines an understanding of the process of design as it is spelled out by the CA model with notions of situatedness and a

constructive memory of Design as Sequence of the Situated Acts model. Let's call it a Situated CA model (see Figure 11).

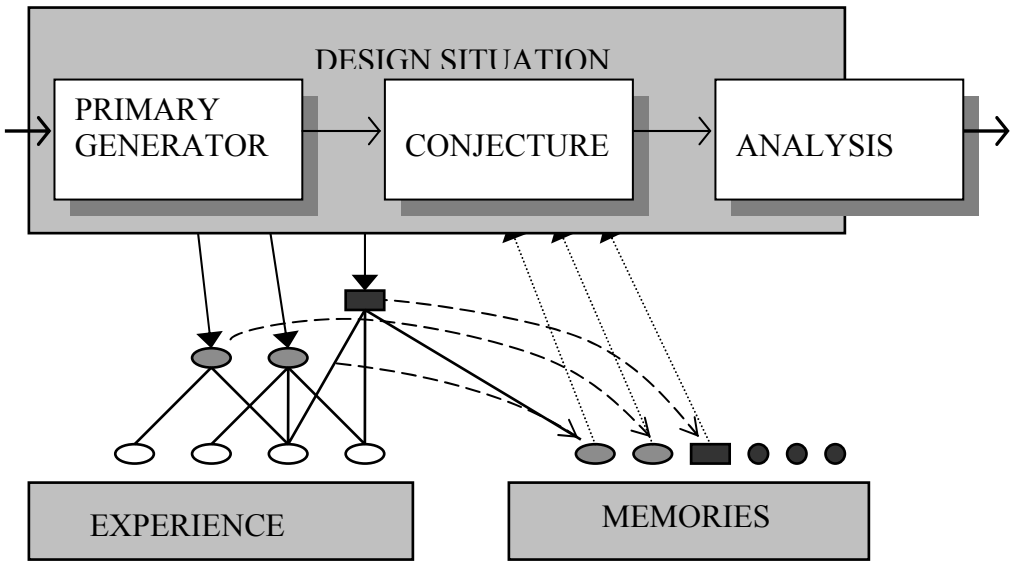

FIGURE 11. Situated Primary Generator-Conjecture-Analysis model.

Already in 1896, Dewey (1981)[8] wrote that subsequent experiences give meaning to what was experienced before. Memories require processing the experience, as opposed to actual recall (Shön, 1983; Gero, 1999a, 199b). "The ability to reinterpret what…already has a given meaning appears to be one of the distinguishing features of designing" (Gero, 1999a:97). Research by Frances Downing clearly showed that architects use autobiographical memories, including emotional memories, during the process of design, and mostly during the step of generating solutions to the design problem (Downing 1989, 2000) or conjecturing, to use Darke's language. Konda emphasises the concept of "shared memory as the embodiment both of context and of shared meaning" (Konda *et al.*, 1992:23) in architectural design. Neither one of the models or theories of the design process really talks about how a designer takes shared experience and meaning, their own experiences, knowledge and values and transforms those into a new place exp erience. This question is completely opened for investigation.

Notes

1 Models of the design process considered here are only those models where the act of design was attempted to be modeled at various levels of abstraction. Models that describe the steps of completion of the design project, mathematical models, as well as models of computer-aided design, and models describing the design process from the point of view of the creative personality are not covered.

2 The Analysis-Synthesis model is perhaps one of the earliest widely accepted models of the design process (Gero, 1999b).

3 The models in the table, which seem to agree completely on the number and sequence of steps, differ in the details. For more information, refer directly to the authors' publications.

4 There will be no discussion of this model. For more information, see "A Building Design Process Model" by Bax and Trum (2001).

5 This model, proposed by Hillier (Hiller et al, 1972) is based on Popper's "conjectures and refutation" model in science.

6 The Function-Behavior-Structure framework was also developed by John Gero, and is rather complex. For more information on that framework refer to Gero, J.S.: "Design prototypes: a knowledge representation schema for design," 1990, published in AI Magazine 11(4), pp. 26-36.

7 Creativity is understood in a general sense of concepts or ideas being original and useful (Mayer, 1999).

8 The sited work, written in 1896, was reprinted in 1981.

CHAPTER III

MEMORY, EMOTION AND PLACE

Introduction

I would like to start with the very obvious. Architecture is about place, and architects are the trained professionals who design places. They are professionals equipped with the necessary knowledge of construction technology, fire regulations, and historical styles, as well as the skill it takes to carry an architectural idea through from its conception, to its birth on paper, and finally to its growth into a real building that leaves the home of the architectural studio and begins a life of its own. But what allows the architect to 'conceive,' to create this image and idea of a future *place* that makes us relate to it, love it, or hate it? I believe it is the architect's biography that makes them who they are, developing into Selves through their lived experiences, their relationships with people and places, and the emotional connections and memories that stem from those relationships. Memory, emotion and place are connected in a complex and indivisible way. I will try to show this connection, and to explain how I see it as the very basis of the architect's ability to design.

Architects as Human Beings

> I like absorbing moods, moving in spatial situations, and I am satisfied when I am able to retain a feeling, a strong general impression from which I can later extract details as from a painting, and when I can wonder what it was that triggered the sense of protection, warmth, lightness, or spaciousness that has stayed in my memory. When I look back like this it seems impossible to distinguish between architecture and life, between spatial situations and the way I experience them. Even when I concentrate exclusively on the architecture and try to understand what I have seen, my perception of it resonates in what I have experienced and thus colors what I have observed. Memories of similar experiences thrust their way in, too, and thus images of related architectural situations overlap (Zumthor, 2006b: 51).

Humans are social beings, and our cognition is shared (Resnick, 1991). This statement about shared cognition is a critical, and explains the cognition of a designer and the way an architect

operates within the profession, and the vital role the architect's personality, autobiographical experience, memories, emotions, beliefs and culture all play. The design processes, as well as the product of design, are reflections of the social nature of design and the designer. The design process has been seen by some researchers (Gero, 199b) as a Sequence of Situated Acts[1]. We can think of it in the broader sense of Situated Cognition. This theory of Situated Cognition is similar to what in Russia is known as Activity Theory, developed in the 1920s by Vygotsky (1925), and expanded upon in the 1970s by Leontyev (2003). The essence of both theories is that people share common knowledge and conceptions about the world. Through that shared knowledge and those concepts we share meaning and our beliefs, and simply understand one another. During the design phase, architects operate mainly through shared meaning and, mostly through universal graphic representation. Architects like to say that they 'educate their clients.' They interact with their clients to create shared meanings in architectural and aesthetic concepts, in order for people to understand one another. When an architect does not understand the culture and does not share the meaning of that culture, major design failures result (like Le Corbusier's Pruitt-Igoe). Less infamous but no less disliked examples could at one time be viewed on The Architecture Hate page[2], and several examples are described by Rose (2007) in the Guardian. Architectural work is never purely for the individual. Besides working with clients and users of the places for which architects design, architects work in teams with other designers, consultants, government agencies, contractors, engineers, the press, and many other groups of people on an everyday, routine basis. Even starchitects[3] collaborate with others in the social process of shared decision making. In other words, by no means can we understand an architect as 'a solo creator' out of his or her context and culture. Everything we do, think, and feel, and how we act, feel, and think is all dependent upon our previous experiences and culture. It is our emotional connections and our autobiographical memory that allow for us to function as social beings, and for architects to design. I see architects as social and culturally-immersed beings with a high level of social cognition, and I strive to show in this chapter how architects become who they are (as Selves and expressions of themselves in their designs) through their autobiographical memory and emotional connections.

It is obvious that memory and understanding of place are both critical for design. Emotion plays its role in perception, understanding of place, and the construction of memory. In this chapter I will discuss emotion, memory, place and the various relationships among the three. When I

began writing, this first draft seemed recursive – the beginning was the end and the end was the beginning. Memory, emotion and place are so interconnected that it is impossible to write about one and not mention the other; one always leads to the other.

To introduce what the reader can expect to find in this chapter, I would like to first provide a brief summary of my argument. One important speculation upon which I rely is that the design process may be seen as a symbolic transformation and translation of an architect's experience into new, meaningful content (Downing, 2000). This meaningful experience is stored in the memory and is readily available, either consciously or unconsciously (through intuition, metaphor, and implicit learning), to architects when they design. Memorable experience usually has a component of emotion (Conway, 1990; Robinson, 1996; Christianson, 1992). Emotions are central to the meaning of experience because they are the expression of the way a person understands an experience (Robinson, 1996). Emotions and memory make us who we are; they are at the very basis of a person's Self, his or her value systems, beliefs and judgments. Place is central to remembering. Our memories are of places and in places. Autobiographical experiences with emotional significance through the construction of an architect as Self, through understanding of place, and through shared meaning allow architects to design places for the future.

Emotion

Architects do not design buildings as objects. "The effect of architecture stems from more or less common images and basic feelings connected with the building" (Pallasmaa, 1996:450), and thus it is the common images and basic 'feeling of place' that architects design. To be able to design a 'feel of place,' one needs first to experience such feelings themselves. Let us first take a look at emotions - what emotions are, how they relate to architecture - and begin building connections to memory and place experience.

Tuan said that "the given cannot be known in itself. What can be known is a reality that is a construct of experience, a creation of feeling and thought" (1999:9). Respected by researchers of emotion, the philosopher Robert Solomon restated the same idea more simply: "we live our lives through emotions, and it is our emotions that give our lives meaning" (1987:1). Emotions make us human; they define our lives. "We are our emotions as much as we are our thoughts and actions" (Solomon, 1987:3). If we pause and think, it will be very hard to recall one lived

situation that does not involve emotion. Emotions give us insight into and the meaning of situations not only when those situations are special (such as times of love, death, faith, or hatred), but also the mundane (like buying milk at the grocery store).

Definition of Emotion

Often in common language, we identify and describe our emotions as feelings. 'Feeling' in English is one of the vaguest terms. We feel air on the face, feel happy, feel ill, and sometimes feel like doing nothing. Averill (994:379) provides a good metaphor for understanding what it means to feel by comparing feeling to emotion: "'feeling' an emotion can be compared to "hearing" voices. No matter how vivid and realistic a voice might seem, the experience will not be considered real unless there is some adequate stimulus to account for its occurrence." Feelings are not necessary or sufficient conditions for emotional states. I am not interested in feelings and will refer to them insofar as architects or referenced authors used the term 'feeling' to describe emotional states.

For researchers of emotion, emotion and feeling are very distinct. In general, emotion refers to a homogeneous collection of psychological states and processes, and feeling is a "generous" term that refers to all sorts of experiences from simple and sensuous to extremely complex and sophisticated (intuitions) (Solomon, 2007).

What is emotion? Emotions are hard to pin down in a simple and single description because they really are streams of consciousness, often very complex and involve physiological reactions, theorizing, sensations and moods. There are many definitions for emotion, most of which are limiting. In reality, as noticed Robert Solomon (2007), we still don't know exactly what emotion is. In this research I take the same stance as Solomon, looking at emotions and the memory of emotionally significant events from the perspective of emotional integrity, rather than a more narrow, physiological viewpoint. Emotions are "internal mental states that are primarily focused on affect (where affect simply refers to the perceived goodness or badness of something)" (Clore, 1994:184). "What an emotion is about includes a description of the emotional experience of the world engaged in the ways peculiar to this or that emotion" (Solomon, 2007:140).

It is generally agreed upon by philosophers and neuroscientists alike (LeDoux, 1986; Luptop, 1998; Solomon, 2007), that emotions are pre-existing. How we express such emotions depends upon our culture and other factors, but the basic set of emotions is 'built-in' and universally

shared by all human beings. In other words, emotions are social structures that are hard-wired. Some famous researchers, like Damasio (1994), consider emotions primary to cognition and feeling, but also to be triggers rather than complex processes. I believe that this standpoint is too narrow. This belief of mine is based upon experiencing emotions myself, reading literature covering a rather wide range of viewpoints and, of course, conversations with the most respected current researchers of emotion such like Nico Frijda, Louis Sundararajan, Gerrod Parrott, Robert Solomon and Neal Ashkanasy, who I was lucky to meet at International Society for Research on Emotion (http://isre.org/) conference in Bari, Italy, in 2005. Therefore, I stand by the above definitions, and generally look at emotions as elements in a complex processes that can last from a moment to a lifetime. Emotions can transform themselves, are not necessarily conscious, and incorporate many different aspects of a person's life, such as feelings, actions, thoughts, relationships with others and physical well-being (Solomon, 1987). Now that we have defined emotion, let us look at properties of emotions and emotional experiences.

Properties of Emotions and Emotional Experiences

Many aspects of emotions make them critical to our lives. Below is a summary of what I found during my research on emotions that will be relevant to my overall argument.

(1) "Emotions represent complex psychological and physiological states that, to a greater or lesser degree, index occurrences of value" (Dolan, 2002:1191).

(2) "Consciousness is firmly tied to emotional drive and goal-directed behavior" (Cytowic, 1993:194).

(3) Emotions capture attention (Dolan, 2002).

(4) Emotions have logic of their own (Christianson and Engelberg, 2006).

(5) Without emotions mentation would be predictable and unimaginative (Cytowic, 1993).

(6) Emotions are evaluative judgments (Solomon, 1987).

(7) Emotions are more central to rationality than reason as it provides focus for reasoning (Solomon, 1987).

(8) Emotions are central to construction of Self (Robinson, 1996).

(9) Emotions influence construction of memory, how and what we remember (Conway, 1990; Reisberg, 2006).

(10) Emotions help us become efficient and give us an intuitive sense of what is right, what goes together, what is beautiful (Cytowic, 1993).

When we think about the meaningful experiences in our lives, we usually confront emotions. Emotions indicate the personal significance of experiences. When recalled, experiences that continue to be meaningful evoke even stronger emotions. Emotions are intelligent and purposive. They are "strategies for getting along with the world;" they are a means of influencing, guiding and manipulating (Solomon, 1987). Emotions provide guidance through close their relationships with the issues that inspire them, our goals, and people about whom we care deeply care; through this guidance they shape our sense of who we are and our broader perception of the world. That sense of self and perception of the world, in turn, influences our actions, outlook and beliefs (Resiberg and Heuer, 2004). When emotions facilitate thought and direct thinking for an individual, they are said to have Emotional Intelligence (EI). What first was deduced by philosophers is now proven by clinical and neurological studies (Solomon, 1987; Cytowic, 1993) - emotions are part of our judgment system.

Emotion and Reason

Traditionally, emotions and reasoning have been considered to be polar opposites, with reason being central to good judgment and emotion thought to weaken any judgment. However, this wide-spread belief is faulty. Both philosophy and neuroscience (Solomon, 1987; Cytowic, 1993) prove that emotions are evaluative judgments themselves; they are also central to rationality and reasoning. This fact is proven by simple evidence: people acting from an emotional deficit can't make rational decisions (Solomon, 1987).

Emotional judgments are not propositional – they are bodily judgments, ethical judgments, and intuition (Solomon, 1987), and it is emotional evaluation that informs our behavior (Cytowic, 1993). If we look at rationality as maximizing our well-being, emotions are rational. "Emotions are strategies. They are instrumental in getting us what we want (and helping us avoid what we do not want), and sometimes they themselves may be (or seem to be) what we want: true love, for example…Our emotions are rational insofar as they further our collective as well as personal well-being, irrational insofar as they diminish or degrade it" (Solomon, 1987:182).

Emotion and Self

Beyond the scope of whether emotions are 'reasonable' or not, emotions make us who we are. The Self is implicit or complicit in every emotion. "We experience our emotions as profoundly indicative of the kind of person we are. Our emotions make us *self-conscious*" (Solomon, 1987:219, original emphasis). If we look at neurological paths, processes related to the Self use mostly the same networks as emotion and memory (Hassabis *et al.*, 2007). Emotions and memory actively participate in constructing the concept of Self (Robinson, 1996). At any one time, the Self is a dynamic structure comprised of specific possible (both past and future) selves that help define and structure the current self-concept. Autobiographical memories may represent knowledge critical to the functioning of these processes, and in this sense autobiographical memories may facilitate the maintenance of a dynamic self-concept (Conway, 1990).

Emotions are central to the meaning of experience because they are expressions of the way a person understands an experience. People need explanations of important events in their lives. Good explanations help people sustain their belief system in an orderly manner and reinforce a coherent sense of personal identity, as well as feelings of personal efficacy. Acceptable explanations always satisfy personal and social criteria, even though these explanations may change with time. "Social norms are not just constraints, they can also be heuristic models for self-exploration" (Robinson, 1996:212).

Emotions, Culture and Embodiment

Emotions are social, cultural and embodied. Luptop (1998) wrote that the emotional Self is *always embodied*, because it is through the body that we construct and make sense of our emotions. There are several views on emotions in the humanities and social sciences. Constructionalists see emotions as experienced and understood through social and cultural processes. In phenomenology, the experience of emotion is integral to our Selfhood and is the way in which we assess and deal with others. According to embodied ontology, "emotions can be conceptualized as the felt and sensed reactions that arise in the midst of the (inter)corporeal exchange between self and world" (Hubbard, 2005:121). While emotions are both a state of mind and a physical experience, the particular encounters between Self and the world elicit strong emotional reactions which are not pre-given, but rather are emergent. "Conversely, managing these emotions is part of the process by which we construct our sense of self, with

socio-cultural circumstances dictating that particular forms of emotional management are appropriate for different social groups" (Hubbard, 2005:121).

Humans' ability to understand and articulate emotions allows for establishing social connections, and at a basic level, to evaluate the intentions of others. As social beings we need to understand and communicate with other people. We theorize about emotions in order to understand and explain our own and others' behavior (Solomon, 1987). We have emotional relationships with things and places. Human social relationships are influenced by objects and spatial environments, "just as the meanings of objects or environments and people's interactions with them are constituted through social processes and always exist in specific sociocultural contexts" (Luptop, 1998:137). Architecture is a social service, and when designing, an architect relies on the same structures of emotion and collective memory to understand a client's needs and wants, to understand an existing place (the site) and a future place (the new design). The process is similar to any other case of social interaction or interactions with place.

Autobiographical Memory with Emotional Significance

> When I design a building, I frequently find myself sinking into old, half-forgotten memories, and then I try to recollect what the remembered architectural situation was really like, what it had meant to me at the time, and I try to think how it could help me to revive that vibrant atmosphere pervaded by the simple presence of things, in which everything had its own specific place and form. And although I cannot trace any special forms, there is a hint of fullness and of richness that makes me think: this I have seen before. Yet, at the same time, I know that it is all new and different, and that there is not direct reference to a former work of architecture which might divulge the secret of the memory-laden mood (Zumthor, 2006b:8).

Before we move on to a discussion of memory, I would like to note that my research is focused on an investigation into the emotional influences on the phenomenology of remembering, rather than on the accuracy of memory, the memory of distinct emotions, or distinct types of memories. I consider memory in a broader sense, as the collective experience of an individual.

<u>Definitions</u>

Martin A. Conway defines autobiographical memory as "memory for events of one's life… It constitutes a major crossroads in human cognition where considerations relating to self, emotion,

goals, and personal meanings, all intersect." (Conway and Rubin, 1993:103). Autobiographical memory is a separate and distinct type of memory (Conway, 1990). Autobiographical knowledge is event-specific knowledge, which takes the form of images, emotions, "and highly specific details indicating the retention of sensory details of objects and actions in a general event" (Conway and Rubin, 1993:107). Imagery and self-reference are two major characteristics of autobiographical memory.

I should also define other types of memory that will be mentioned further. The following definitions are not adopted from a particular source, but present a general understanding of the terms. What we refer to in everyday life as memory is episodic memory. Episodic memory is called such because it stands for the memory of the episodes of one's life. The distinction between autobiographical memory and episodic memory is still unclear. Episodic memory is always connected to time and place. A memory of a family vacation is a good example of episodic memory. Explicit and implicit memory represent subdivisions of long-term memory. Long-term memory refers to anything we remember that happened more than a few minutes in the past. Explicit memory is the deliberate and conscious recall of events and information: for example, who came for dinner last night. Implicit memory includes learned behaviors and responses that are expressed at an unconscious level through behaviors and actions. Natural tasks like walking and tasks that became automated, like tying one's shoes or driving a car, are examples of implicit memory. Semantic memory refers to knowledge unrelated to specific experiences, such as the memory of meanings and concepts. In common language we can say that semantic memory stands for 'textbook learning.' Semantic memory allows us to know that Paris is the capital of France, and three times three is nine.

Emotional memory and affective memory (usually used interchangeably) are shorter terms for the memory of emotionally significant events; this term can also mean the memory of emotions themselves. To avoid confusion, I adopt the longer, more descriptive term, 'autobiographical memory for emotionally significant experience.'

Memory for Emotionally Significant Events and Architecture

"Emotional events are emotional precisely because they are related to the issues we care about and have thought about in other contexts; this will foster the sort of memory connections that we know promote retention and recall" (Reisberg and Heuer, 2004:4). For an architect, experiencing

the environment and visiting places are often emotional events. Architects take pilgrimages to visit the buildings that intrigue them, images of which they might have seen in periodicals or on the Web, places of which they dreamt and thought. I remember when I first visited Red Square in Moscow; it made such a tremendous impact on me I couldn't sleep for several days. By default, due to architects' sensitivity to place, architects establish stronger emotional connections to the places they experience. Architects think about emotional experience after they happen, and thus promote the retention of memories and build strong image-banks of places easily available for later recall during the design process. The 'feeling of place' that we grasp during such experiences is retained, and it is that feeling we attempt to recall during the design process in order to be able to generate the 'feeling of place' we attempt to design. The sketches architects make when visiting places help them evoke the experienced feeling of place while providing informative details of place recorded during the experience.

> The inner architecture of the mind emerging out of feelings and memory images is built on different principles from the architecture developed out of professional approaches. I personally, for instance, cannot bring to mind from my own childhood a single window or door as such but can sit down at the window of my many memories and look out at a garden that has long disappeared or a clearing now filled with trees. I can also step through the innumerable doors of my memory and recognize the dark warmth and special smell of the rooms that are there on the other side (Pallasmaa, 1996:451).

Emotion and Memory

Pillemer's study of autobiographical memory recall (as reported in Conway, 1990:84) showed that "84 percent of memories contain reference to the remember's feelings and 47 percent also included mention of the emotional reactions of the people associated with remembered event." There are different viewpoints on the relationship between emotion and memory. For example, the turn-of-the-century psychologist Ribot claimed that emotional memories had unique affective logic and were different from cognitive memories. Zajonc also makes a claim for the independence and primacy of affective memory over event memory, because affective memory is essential for speedy judgments (Christianson and Engelberg, 2006).

However, multiple empirical studies clearly show that emotional events are remembered differently from neutral or ordinary events. For example, one can vividly remember a romantic

dinner, but might still have trouble recalling what they for breakfast. There is no simple relationship between emotion and memory (Christianson and Safer, 1996; Christianson, 1992). "Emotions are retained in some cognitive representation, rather than as distinct entities. When asked to recall emotions, one recalls the cognitive circumstances and then experiences a similar, but new emotion" (Christianson and Safer, 1996:230). Emotional memories usually center on the thoughts, feelings, and reactions of the subject, or in other words, around the source of the emotion. This causes an individual to personalize the account of the emotional experience (Christianson, 1992), as in the memory below:

> One thing I didn't mention is about my father's sister, Elizabeth Wren, whose house is in the old town on School Street. I can remember my first experience at about two there. Almost the first thing I remember is being on a cot in a room with a four-poster bed. I remember looking out and seeing the sewing machine and I didn't know if it was an animal coming to get me or what. So I got really uptight (Charles Jenks, in Israel, 2003:88).

The organization may be different for emotional information versus purely cognitive information (Christianson and Safer, 1996). In the case of strong emotional memories, the emotional component of memory can be dissociated and accessed implicitly by unconscious retrieval. For example, Vivian, a friend of mine, is afraid of heights. She didn't know why until her mother told her what happened in her childhood when Vivian was about four years old. Her dad, a war veteran, had a dream of Japanese coming into their house. He wanted to save his children, and while still asleep picked up Vivian and tried to throw her out of the second floor window. My friend had no recollection of this event, but it had a major impact on her. At 65 years old, Vivian is still afraid of heights. Every time Vivian is high up, her implicit memory of hanging outside the window is unconsciously retrieved, causing fear.

Christianson (1992) claims that the organization of emotional information may be automatic, non-conscious, and mediated by sub-cortical structures, and that retention of emotional event information is one of the earliest characteristics developed by human memory function. The latter is supported by the fact that the brain structures involved in emotional behavior and memory function are closely located to the oldest area of the human brain. Different neural circuits are responsible for memories of the emotional significance of an event, as opposed to the memory of the event itself (Christianson and Safer, 1996).

Even though it might be possible to distinguish between the neurological pathways for emotional memory and for the memory of the event itself, each of us will agree that we don't just remember an emotional event by itself. Inseparable parts of the memory of such an event are always our reflections, assessments and reactions. "For many people, introspection suggests that recall of prior feelings is immediate, long-lasting, and quite compelling. One may not remember much about a particular speaker's lecture, but one remembers that the talk was boring" (Reisberg and Heuer, 2004:31). Emotions are central to the meaning of experience because they are expressions of the way a person understands an experience. Remembering, like perceiving, is guided by current ways of understanding. Memory processes such as retrieval and reconstruction are either controlled by the aforementioned states and structures, or they interact with them to determine recollective experience and memory judgments (Robinson, 1996). So-called metacognitive[4] judgments link emotion and memory.

"Metacognitive judgments may be based either on information retrieved from memory, or may rely directly on sheer subjective feeling" (Koriat, 2006:89). Metacognition distinguishes information-based (or theory-based) judgments and experience-based (or affect-based) judgments. Information-based judgments are based on a purposive and explicit inferential process when analytical deductions are made from information deliberately retrieved from the long-term memory. Experience-based judgments are grounded in subjective feelings. Koriat and Levy-Sadot used the term "*noetic judgments* (or judgments of knowing) to designate information-based judgments, and *noetic feelings* (or feeing of knowing) to designate the subjective experience that underlies experience-based judgments" (Koriat, 2006:89, original emphasis). The example that Koriat (2006) provides is the act of monitoring knowledge during one's study. When a person judges themselves to be ready for an exam based on the knowledge that he or she has read a chapter so many times that they *must* be ready for an exam, this is a case of noetic judgment. When a person thinks he or she is ready for an exam based on a sense of competence, it is a case of noetic feeling. In the case of architectural design, when a designer evaluates their decision against a set of constraints (typically after the initial brainstorming session), it is a noetic judgment. When (most of the time during the brainstorming process) a designer accepts the decision because it 'feels right,' it is a case of noetic feeling. The designer relies upon his or her experiences and unconscious processing of such to make a shortcut to an acceptance of the decision that will be later be evaluated against the project requirements.

Noetic feelings rely "on internal, mnemonic cues that derive from the online processes involved in learning and remembering rather than on the content of beliefs and information retrieved from long-term memory" (Koriat, 2006:90). In everyday life, we call noetic feelings intuition. Intuitions, or noetic feelings, allow us to make judgments via quick assessments of partial bodies of information, and by using cues of familiarity; they are the short-cuts to judgment that our mind takes.

Emotions mediate the encoding of detailed memories and give rise to the highest level of spontaneous, autobiographical memory retrieval (Conway, 1989). Reisberg (2006:20, original emphasis) concludes that emotional events are remembered better than other kinds of events; "emotional events are usually important to us, virtually guaranteeing that we will pay close attention as the event unfolds, and close attention contributes to more accurate and more complete remembering." Emotionally significant events are emotional exactly because they are related to issues about which we care; we may have thought about them numerous times, and this type of repetitive act fosters memory connections that promote retention and recall. We tend to ponder emotionally significant events after the actual event, and this is "tantamount to *memory rehearsal*, which, again, has a positive effect on memory" (Reisberg, 2006:21).

The recollection of emotionally significant events is always vivid, regardless of the event's personal or public nature (Reisberg and Heuer, 2004). For architects, this can mean that the recollection of being robbed on the street can be just as emotionally vivid as an exciting trip abroad to visit architectural landmarks. A scary experience can be just as powerful as an enjoyable one. It is the strength of the experienced emotion, rather the pleasantness of it, that makes the memories of emotional events more vivid (Reisberg and Heuer, 2004; Conway, 1990).

To summarize, it is the emotional intensity of a particular event and its impact on person's life that gives rise to autobiographical memory, which is both detailed and easily available for recall, as well as relatively resistant to forgetting. Memories of emotional events provide a basis for social interactions, for maintaining a dynamic self-concept, and for personal meaning (Conway, 1990). A high level of emotion signals that an even has to be encoded in terms of complex and personally significant knowledge structures. Concepts and knowledge about emotions (for example, the experience of love) are structured in the mind around autobiographical memory. Also autobiographical memory, and especially memories of emotionally significant events,

represents *personal* meanings. Other types of knowledge also represent meaning, but not necessarily that which is personal. "Remembering [emotionally significant] events is heavily dependent upon reconstruction and beliefs, theories about the mind, and the self, all of which may be drawn upon in the reconstructive process and lead to 'memories' which are consistent with the current state of the cognitive system at the expense of accurately representing the past" (Conway, 1990:104). For architects, an accurate representation of a memory is not important. Rather, it is the 'feeling of place' that an architect strives to create, and it is subjective experience and shared meaning that allows for that.

Memory Predicts the Future

The new theory of the Prospective Brain has only been recently revealed. My hypothesis regarding the importance of autobiographical memories with emotional significance to an architect's ability to design perfectly fits within this theory of memory predicting the future. Architects use autobiographical memory with emotional significance to envision future places.

It has been previously suggested (Robinson, 1996) that the emotional dimensions of memory are related to potential futures. Robinson's proposition was based on the fact that emotions are central to the construction of the meaning of experience, and the life perspective of an individual. This also accounts for changes that meaning undergoes over time, and for new experiences and emotions. Robinson suggested that emotions and autobiographical memory mold a person's future by shaping a person's understanding of events. The Prospective Brain theory takes Robinson's hypothesis one step further.

The theory sprung from several of the latest studies that strove to prove that the same neural mechanisms are used in imagining the future and in remembering the past (Schacter et al., 2007; Hassabis et al., 2007; Gaidos, 2008). The discoveries of these ground-breaking studies led to the Prospective Brain theory of memory: the purpose of memory is not to "[sit] around reminiscing about the peanuts we ate yesterday" (Kathleen McDermott, as quoted in Gaidos, 2008:28) but rather "an ability to envision and so better negotiate an unknown future" (Gaidos, 2008:28). Even though there are countless studies of memory articulated from a variety of points of view, scientists still have trouble explaining why human memory is designed the way it is. More studies need to be done to prove that this new theory holds true. However, the finding is critical and definitely makes sense: memory focus is not the past, it is the *future* (Schacter et al., 2007).

In the Constructive Episodic Simulation Function of Episodic Memory hypothesis, proposed by Schacter et al. (2008), the "simulation of future episodes is thought to require a system that can flexibly recombine details from past events… A crucial function of memory is to make information available for the simulation of future events. According to this idea, thoughts of past and future events are proposed to draw on similar information stored in episodic memory and rely on similar underlying processes, and episodic memory is proposed to support the construction of future events by extracting and recombining stored information into a simulation of a novel event" (Schacter et al., 2008:659-660). The basis for generating and maintaining a complex and coherent scene of both real and imagined events is provided by the same group of brain regions (Gaidos, 2008:29). This important finding tells us that when architects experience places, they utilize the same brain regions as they do while generating designs for new places. The very ability to envision future places is based in the real, embodied experience of places.

> We comfort ourselves by reliving memories of protection. Something closed must retain our memories, while living them their same tonality as those of home, and by recalling these memories, we add to our store of dreams; we are never real historians, but always near poets, and our emotion is perhaps nothing but an expression of a poetry that was lost (Bachelard, 1997:87).

Hassabis and colleagues' (Hassabis et al., 2007) experiment with amnesiac patients showed us the critical role of *place memory* in remembering events and imagining the future. The amnesic patients could neither remember and autobiographic event nor imagine one, and the main reason was a lack of spatial context, or simply not having the ability to remember the place of the event. It is common sense that designing requires mental simulation in order to produce alternative solutions for a current use of space. No neural studies have been performed yet to provide empirical evidence of this, though it has been suggested that the "core brain system allows one to shift from perceiving the immediate environment to an alternative, imagined perspective that is based largely on memories of the past. Future thinking, by this view, is just one of several forms of such ability" (Schacter et al., 2008:660).

Hassabis and Maguire's (Hassabis and Maguire, 2007) study of memory recall and imagination led them to the following conclusion: "We think scene construction underpins not just autobiographical and spatial memory and imagination, but a whole host of other critical cognitive functions" (in Gaidos, 2008:29). Other studies reported by Schacter (Schacter et al.,

2008) echo Hassabis and Maguire: the fewer the autobiographical experiences one remembers, the less vivid those memories are, and the poorer the capacity to imagine the future. In addition, it seems to be the place, rather than temporal factors, that allows us to remember or imagine the future (Hassabis and Maguire, 2007; Schacter et al., 2008). Neuroscience has now proved what orators and philosophers have known for centuries (Yates, 1966; Casey, 1987), what is now called *mnemotechniques,* or *memory of loci*.

Memory and Place

Place (or as called by Conway, "the structure of the encoding environment") plays a prominent role in recall. "The findings clearly illustrate that aspects of the original encoding environment are utilized by the retrieval process in accessing memories" (Conway, 1990:142). In other words, the remembrance of a place is critical for the recall of an event, and place is *always* present in memory. Empirical studies have finally explained what people have used intuitively for ages, mnemotechnique, or memory of loci5. Mnemotechnique was invented by the ancient Greeks, and is a powerful example of the intimate and profound relationship between memory and place (Casey, 1987; Yates, 1966). All our memories are either *in* place or *of* place. As Rachel McCann (2005) wisely noticed, "place is an empty container for experience." "One of the most eloquent testimonies to place's extraordinary memorability is found in nostalgia. We are nostalgic primarily about particular places that have been emotionally significant to us and which we now miss" (Casey, 1987:201). Researchers Frances Downing (2000) and Toby Israel (2003) clearly showed the dependency of architectural design on the previous place experiences of the designers. The latest theory of Prospective Brain places this finding in a broader context; as we imagine the future based on what we have experienced, architects design future places from embodied spaces.

I keep talking about *place*. But what is place? How is it different from *space*? Tuan provides a good definition of space and place, establishing the difference between the two. "Place is security, space is freedom" (Tuan, 1977:3). "Space is transformed into place as it acquires definition and meaning" (Tuan, 1977:136). All human capacities are involved in the understanding place; we grasp it through intellect, the senses, emotion and imagination. For the same space, each person has a unique construction of place. An example can be taken from an interview with Charles Jenks (in Israel, 2003:89) regarding how two people – Jenks himself and

his wife - can cherish their oceanside house, yet exhibit very different understandings and values of that place.

> Every summer I came here with the children…Maggie and I always came here. It was this incredible flexibility. So, in a kind of subliminal way, it's a Modernist's "machine à habiter," but one which my wife Maggie loved for its modesty. She was much more of my great-uncle, Charles Platt's persuasion. She liked very modest things; her values from her father were against ostentation. She didn't like pretentious architecture and we used to have little arguments over symbolism.

The 'stabilizing persistence' of places housing experience contributes powerfully to their intrinsic memorability. "We might even say that memory is naturally place-oriented or at least place-supported. Moreover, it is itself a place wherein the past can revive and survive…" (Casey, 1987:187). The emotional bond between people and place is called "topophilia" (Tuan, 1994:152). Topophilia is defined as a study of environmental perception, attitudes and values. Perception of place, gathered from the senses, as well as accumulated personal experience, are important parts of emotions inspired by place.

Finish architect Peter Zumthor once asked himself: "So what moved me [in the experience of square across the street]?" To this he answered: "Everything. The things themselves, the people, the air, the noises, sound, colors, material presences, textures, forms too – forms I can appreciate… What else moved me? My mood, my feelings, the sense of expectation that filled me while I was sitting there [in the sun]" (Zumthor, 2006a:17). The power of place is most fully manifested at the very moment when place and body fuse and lose their identities (Casey, 1987:200). When this happens, the expressiveness of place cannot be contained by simple parameters; the emotion literally becomes the moving force. The place reaches significance[6], and with that significance, memorability.

One major distinction between *place* and *space* is that place is *embodied*. Our remembering and remembered bodies are place-bound (Casey, 1987). "To be embodied is *ipso facto*[7] to assume a particular perspective and position; it is to have not just a point of view but a place in which we are situated. It is to occupy a portion of space from out of which we both undergo given experiences and remember them" (Casey, 1987:182, original emphasis). Our every experience

and memory depends on that basic stance, the place and its embodiment. Embodied experience *always* takes place in *a* place, and our memory of any experience is *always* place-specific.

It is the lived body that allows us to be *familiar* with a particular place. "For familiarity to begin to set in, we must project a state of *already having inhabited it*" (Casey, 1987:190, original emphasis). Familiar places are 'attuned places,' to which we are "sympathetic at some very basic level" (Casey, 1987:192). "Body memory establishes familiarity that is requisite to the full realization of place memory" (Casey, 1987:193). This familiarity is critical to architectural designers: familiarity allows the embodied understanding of place that can be projected into the designs of new places by an imaginary inhabitation of them. Emotion is a strong part of this familiarity: we feel at home, we feel oriented in place, and we feel habitual. We are never indifferent to a familiar place; our emotional response to it is intrinsic to place experience and place memory. It is often a certain 'feel of place,' or *atmosphere* as Zumthor (2006a, 2006b) calls it, that architects attempt to design.

With the latest developments in technology, more and more do architectural and interior experiences become mediated. The internet is irresistible: tidy summaries, an abundance of images, and an answer to any question with one click on Wikipedia. My design students prefer to spend hours on the internet instead of going to visit actual places, simply because of the ease and convenience of the access. Tutors of architecture require walk-throughs for project presentations instead of physical models, and show 360 degree panoramas on Youtube instead of taking students on the field trips. The virtual world has become our second identity, and for some people it is on Myspace where they are their true selves. We accept, however, that through images, electronic simulations and models, we see cannot convey the entire reality of a place. Sensory and kinesthetic experience cannot be substituted by even the best fly-through. Only by being in a place, moving through it, connecting to it emotionally, habituating it in time we can experience and understand it fully. We understand mediated places by an imaginative reconstruction of similar places that we've experienced personally. Architects use the same kind of imagery for creating new places.

Mediated presentations of space appeal to our reason, but not to our body and emotions. In 2005, Upali Nanda and I argued that embodied experience is essential to architects, for their very ability to design. To be able to abstract, one has to abstract from something. The abstractions

(such as proportion and metaphor) have to initially be understood through direct and embodied experience. Basic spatial dimensions like mass and volume, vertical and horizontal planes - the operating elements of an architectural designer - are learned and known intimately through the body (Tuan, 1977). Spatial awareness is achieved through immediate experience, emotional engagement, and embodiment. Architects, by both personal preference and training, are more attuned and sensitive to our environment. When intimately experienced, especially in the case of emotionally significant events, a place gains significance and becomes easily available in the image bank of an architect.

The fact that memory of emotionally significant events is thematic and not visual (Reisberg and Heuer, 2004) is very interesting. As much as we talk about 'images' and 'imagery' in architecture, and insomuch as trained architects can, in fact, sometimes envision an image, our knowledge of place and our memories of places are nothing like photographs. Memory (that encases an image, sensory qualities, emotions and everything that has to do with an event in the past) is what predicts future of architecture through the architect's design. Even when we browse through images on the internet or in publications they are devoid of most of those qualities, but still inseparable from our thoughts and feelings, our overall experience and their physical context of us searching the Net or flipping through a book. To reiterate, experience and memory are very complex.

"The atmosphere pervading the mnemonic presentation and ourselves as rememberers is characterized by a particular emotion or group of emotions, lending to the atmosphere its dominant tonality" (Casey, 1987:78). We describe memories as "sad" or "joyful," and when we do, we refer more to the *atmosphere* of the experience and the memory of that experience than to the specific content. Fascinating how the atmosphere of memory, as described by phenomenologist and philosopher Edward Casey, is almost identical to the description of the 'feel of place' that architect Peter Zumthor calls atmosphere. "The character of such atmosphere is emotional, and it is experienced in undisguisedly emotional terms" (Casey, 1987:78).

In my subjective opinion, Peter Zumthor is the greatest architect of our time. It is amazing that he is staying in business, because he takes up to 15 years to complete a building. But when his place is constructed, it is not a building, but rather an incredible experience that immediately makes itself intimate with its users and every visitor. Out of curiosity, I calculated how many

times Peter Zumthor used the words 'feel,' 'feeling' and 'emotion' in his short (31 page) book *Atmoshperes*. It was a total of 21 times. His writing is full of other emotional words, such as melodic, grace, passion, caring, loving, unbelievable, spiritual, beautiful, intimate. Zumthor's architecture is like that; it is about the 'feel of place' and atmosphere, and that is why it is so beautiful, engaging and unforgettable. His architecture is not cold, 'frozen music;' it is not a sculpture. It is "part of people's lives, a place where children can grow up" (Zumthor, 2006a:65). I believe that Architecture is that quality of place Zumthor talks about, and the rest are just buildings. Another architect, Luis Barragan, wrote: "I believe in an 'emotional architecture'. It is very important for humankind that architecture should move by its beauty; if there are many equally valid technical solutions to a problem, the one which offers the user a message of beauty and emotion, that one is architecture."

As rightly noticed by Juhani Pallasmaa (1996), a functional building is not yet architecture. To become architecture, that functional building needs to have both atmosphere and meaning. Both experiencing and the memory of past experiences are essential for the construction of meaning in general (Langer, 1980; Gendlin, 1962), and of meaning of a place as a "qualitative totality of complex nature" (Norberg-Schultz, 1980). Naturally, the meaning and understanding of 'place' is essential for architectural design (Downing, 2000; Lawson, 1997). "Design is an act of understanding and the pragmatic use of past experience to identify, peruse, and imagine possible futures" (Downing, 200:83).The past autobiographical experiences of an architect contribute to the construction of self as both person and designer (Conway, 1990; Downing, 2000; Lawson, 1997; Robinson, 1996), establishing for that individual a value system (Rugg, 1963). These experiences also determine evaluation factors and the development of basic ideas at the initial steps of the design process (Rugg, 1963; Darke, 1978). Through autobiographical experiences that predict the future, emotional judgment, Self with memories, beliefs, attitudes and values, we construct the meaning of life and place, and design new meaningful places through this process known as Architecture.

Metaphor

To wrap up, I would like briefly to talk about metaphor as a design tool. Architects often use metaphors to assist them in designing places (Downing, 2000; Antoniades, 1992). Metaphor is a fundamental form of cognition, and can be defined as a tool that enables the transfer of meaning between dissimilar domains (Lakoff and Johnson, 1999). Metaphors are closely related to our

experience and memory. “Metaphor is experiential and visceral, and irrational transfer of connotation from one thing to another. The emotional, irrational self is wise beyond knowledge, and we can see this wisdom in the way metaphor physically encapsulates our relations with the world. While metaphor is a means of seeing the similar in the dissimilar, it is emphatically not rational analysis” (Cytowic, 1993:206). Cytowic (1993) and Lakoff and Johnson (1980) agree that metaphors are not based on logic or rationality; they are “rooted in concrete experience, which is what gives metaphors their meaning” (Cytowic, 1993:206). Like intuition, metaphors can be rationalized, but at the time of emergence, it is concrete experience and meaning that

FIGURE 12. Jardín Botánico de Medellín in Colombia.
Photograph courtesy of Iwan Baan.

allow metaphoric leaps to happen (often unconsciously). Of course, there are more concrete metaphors, like the one Plan B used for The Jardín Botánico de Medellín in Colombia. The architecture of the pavilion is organic, similar to the flowers and other vegetation within the botanical garden (Figure 12). However, metaphor is never a direct copy of reality; it is always an understanding of lived experience in projection. I see metaphor as a device that assists memory in predicting the future. This conceptual system known a metaphor provides manifold assistance to architects. Metaphor joins reason and imagination (Cytowic, 1993). It gives architects an

understanding of meaning, of spatial and material qualities of place, connection with the social and cultural aspects of place, recognition of the typology of the buildings being experienced, and the ability to form their personal aesthetic preferences and beliefs.

> The idea of things that have nothing to do with me as an architect taking their place in a building, their rightful place – it's a thought that gives me an insight into the future of my buildings: a future that happens without me. That does me a lot of good. It's a great help to me to imagine the future rooms in a house I'm building, to imagine them actually in use. In English you could probably describe it as a <sense of home>. (Zumthor, 2006a:39).

Notes

1 The Sequence of Situated Acts model places the design process within the context of both the situation and the way the situation is constructed or interpreted by the designer.

2 The Architecture Hate Page (http://www.bbvh.nl/hate/) allowed for submission of and voting on the most hated architecture. The site was very active in 1999 and prompted substantial discussion in the architectural community, as well as heavy participation from the general public. This site is currently inactive.

3 Starchitect is a neologism used to refer to celebrity architects.

4 Metacognition is the awareness of one's cognitive processes, or knowing about knowing.

5 Mnemotechnique, also called memory of loci, is a method of memorizing long lists or narratives based on places. A sequence of familiar places is linked to sections of narrative or items on a list. Then these sections or items can be recalled in order by imagining walking through those places.

6 The following definition is based on Susan Langer's definition of 'significance of form' (Langer, 1953). Significance is a felt quality of place that occurs when it acquires personal meaning and importance for an individual experiencing that place.

7 *Ipso facto* (Latin) – by deed itself, direct effect of action.

CHAPTER IV

EMBODIED INTUITION*

It's by logic we prove, it's by intuition we invent.
Henry Poincare.

Introduction

Good architecture is based not only on formal visual composition, but always also on an understanding of experiential reality and meaning of form. Such experiential reality is emotion-based and embodied. If we see the goal of architecture as to strengthen our existential experience, then uncomfortable notions of intuition, feelings, self, and culture that form human experience within place need to become equal players in design, together with formal knowledge (Solovyova, 2008).

Very little research has been done on intuition in architectural design. At the same time, we know that designers have predominantly intuitive personalities (MacKinnon, 1962; Durling *et al.*, 1996; Woolhouse and Bayne, 2000). We also know that intuition, pared up with logic, is essential to learning (Hogarth, 2001; Epstein *et al.*, 1996). The concept of intuition is difficult to define or test, but most people recognize it as an important factor in both judgment and thought (Officer, 2005). Specifically because intuition is so difficult to study and explain empirically, the discipline of architecture and architectural education prefers to shun the subject. However, avoiding acknowledging the role of intuition in architectural design does not prevent it playing a role in the design process.

Intuition is a difficult subject. We have intuition, but we don't always trust it if we are aware of it. Architects make intuitive decisions when designing places, but they almost always have to

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rationalize them later, because it 'feels right' is not usually considered an acceptable justification. I shall investigate such concepts as intuition and embodiment, and re-introduce the term of 'embodied intuition' (Pallasmaa, 2001; Solovyova and Nanda, 2003). I shall look at intuition in everyday life, as well as theories of embodiment from neurological studies, anthropology and architecture, and build an argument that without an emplaced and embodied sensitivity, our intuitive interpretation becomes disembodied and weak, and the creation of architecture becomes imitation (Solovyova, 2008).

Embodied Intuition

The Merriam–Webster Dictionary (http://www3.merriam-webster.com/opendictionary/) sums up intuition as the "immediate knowing or learning of something without the conscious use of reasoning; instantaneous apperception." In reality, intuition is very similar to an insight, and is nothing but "the ability to make elliptic shortcuts from a situation to a response" (Damasio, 2000:327). Myers (2004:17) describes intuition as "some things we know we know, but we don't know *how* we know them." Most people will agree that intuition can be described as ideas or feelings that guide our thoughts and behavior.

Intuition is embodied, *ipso facto.* Intuition is intrinsically intertwined with our collateral experiences, memories, and implicit thought. Implicit thoughts may consist of ideas, beliefs, images or any other cognitive components. They influence our thoughts and experiences while we are completely unaware of them (Etch *et al.*, 2004). Our minds constantly process tremendous amounts of information outside of our consciousness. "Inside our ever-active brain, many streams of activity flow in parallel, function automatically, are remembered implicitly, and only occasionally surface as conscious words" (Myers, 2004:29).

Our learning can be both implicit and explicit. When we put effort into understanding concepts or acquiring a skill, it is called explicit learning. We also learn implicitly, every moment of our life, without exerting any effort or conscious attempt to learn (Volz and Von Cramon, 2008). Both explicitly and implicitly, we collect a great repository of experiences. To understand a new situation, we capitalize on "stored mental representations, which reflect [an]entire stream of previous experience," says researchers from the field of neuroscience (Volz and Von Cramon, 2008:82). The essential point is that in the design process, embodied intuition draws on our *entire* experience, and not solely on what we consciously isolate as relevant information.

Intuition is part of the tacit human system[1], and thus a part of the subconscious. Hogarth (2001) identifies intuition as automatic information-processing that occurs outside our consciousness and attention. When we learn implicitly, we learn to respond to complex situations and relationships without being aware of the rules underlying the task (Policastro, 1995). This happens because tacit perception of coherence automatically activates mnemonic networks and allows for 'connecting the dots' without consciously using deductive processes (Policastro, 1995). Fricker (1995) suggests the possibility of a retrospective retracing of subjective associations or idea triggers that happened during the intuitive process. This sounds almost identical to what Darke (1987) had to say about the design process: solutions to the design task are often reached intuitively, even though the process of formulating those solutions can be argued rationally (and retrospectively, as well). It is probably because of such similarities that Nigel Cross (1999:29) called intuition a "convenient shorthand word for what really happens in design thinking."

Let us look closer at intuitive decision-making in everyday life, and in architectural design. Research into management suggests (see Dane and Pratt, 2007 for an overview) that embodied intuition may be integral to successfully completing tasks that involve both a high level of complexity and short time horizons, such as corporate planning, stock analysis, and performance appraisals. Architectural design faces the same types of constraints. Dane and Pratt (2007:45) claim that "intuition, as a holistically associative process, may actually help to integrate the disparate elements of an ill-defined problem into a coherent perception of how to proceed." In architecture all of the problems are ill-defined, in the sense that there are various parameters and complex issues that need to be addressed and prioritized. Architectural tasks have even been called 'puzzles' (Archea, 1985) and 'wicked problems' (Cross, 2006). If we define intuition as Bowers does (in Woolhouse and Bayne, 2000:158), as "a preliminary perception of coherence (pattern, meaning, structure) that is at first not consciously present, but which nevertheless guides thought and inquiry toward a hunch of hypothesis about the nature of coherence in question," then embodied intuition is what gives an architect a recognition and comprehension of a given design task and allows for that architect's understanding of how to proceed.

Officer claims, "when a scenario is ambiguous or multifarious, human intuition is as good as it gets" (2005:4). Hogarth (2001) and Gigerenzer (2007) echo Officer: the analytical way of going about a problem is not necessarily always the most effective or the most favored. Glöckner's

(2007) study of intuitive and heuristic methods of decision-making demonstrates that intuition beats 'fast and frugal heuristics,' and consistently, very few individuals apply linear complex-rational thinking in assessing problems. This study was performed on participants determining a city size based on given cues. Compared to even the simplest architectural design task, the charge in Glöckner's study was very straightforward, and we can speculate that in a more complex task one would need to rely on intuitive judgment even more. And of course, if you have an intuitive personality you will often let intuition guide your decisions.

Architects Have Intuitive Personalities

The personality of a designer seems to be an important factor in the level of intuition used. Durling, Cross and Johnson wrote that "designers' strategies for problem-solving are different from many other professionals, and an intuitive way of working is preferred strongly" (Durling *et al.*, 1996:1). Durling's team proved what MacKinnon discovered in 1962: designers are intuitive. Psychological studies of American architects and designers described in *Royal Designers for Industry* showed that all designers preferred using their intuition, and relied upon intuition when the right idea presented itself (Durling *et al.*, 1996). Over three quarters of the tested architects preferred using intuition in their designs. Seventy nine percent of students participating in Durling's study preferred to use their intuition, and a majority also preferred to use their personal perceptions. Woolhouse and Bayne's study, published in 2000, is consistent with Durling and colleagues' findings.

"Designers' creativity seems inextricably bound up with their particular personality types. Embodied intuition seems to be at the core of the designer's special brand of creativity" (Durling, *et al.*,1996:6). Architects naturally give intuition the right of way and subordinate rational thinking to it. They enjoy, use, and trust their intuition the most. Wooldhouse and Bayne's investigation also shows that intuition is more profitable when using unconscious information, and that for intuitive personalities (which architects, in great majority, are), this strategy is more successful.

Embodied Intuition and Embodied Knowledge

Mark Johnson, in his article on Embodied Knowledge (1989), illustrates the blurred line between personal and practical knowledge. Knowledge, in general, is not static; it is "affecting and transforming our ongoing experience" (Johnson, 1989:364).

> The relevant knowledge… is thus knowledge that grows out of one's personal experience and is the very means of transformation of that experience. It both emerges from and restructures our world, and it has meaning and value only within the context of that experiential process of growth and change (Johnson, 1989:364).

Johnson brings in a concept of *techné,* defined as a deliberate application of intelligence. The personal practical *techné* is a process; it is a knowledge process emergent in the course of activity. This process is context-sensitive, and is directed toward the end of imaginative activities dealing with problem situations. What is most important about Johnson's concept of knowledge is that knowledge embodies human interaction with ever-changing reality, and makes up for our fluid cognition and understanding of the world. The embodiment happens through living life without creating distinctions between the personal and 'practical,' with all of the emotions, projections, patterns and imagination that accompanies such embodiment. Embodied intuition grows out of embodied personal and practical knowledge. The knowledge of an architect is a fluid, embodied understanding of place, culture, and the world at large, which is constructed through living a private life and working professionally as a designer.

Embodied intuition is based on each person's unique experiences and life history (Hogarth, 2001; Johnson, 1989). The role of our embodied interactions with the world is essential to exploring intuition, and is evidenced by the following second-generation claims of the cognitive science of the embodied mind (Lackoff and Johnson, 1999): our mental structures are intrinsically meaningful by virtue of their connection to the body, and all conceptual structures arise from body-based forms of inference. Lackoff and Johnson write that "cyclic patternings out of meaningful experience are *known rhythmically through our bodies"* (Johnson, 1989:369, author's emphasis). *Image schemata* structures our experience. This *image schemata* is flexible and is defined as a mode of imagination: "a recurring pattern in the imaginative process by which we experience recognizable order in our understanding, cognition and knowledge" (Johnson, 1989:370). Imagination includes both sensory modalities and abstract representations. *Image schemata* also means the embodiment of imagination, which shapes the feel and quality of human spatial and temporal experience. Compare the *image schemata* of the organization of knowledge hypothesized by Lackoff and Johnson (Johnson, 1989), and the domain schemata of experienced architects, as described by Lawson (2004). By domain schemata, Lawson refers to an 'extraordinary efficient' organization of 'enormously complex and sophisticated' ideas.

Through personal and professional experience, architects learn to recognize and communicate very complex sets of ideas in simple and clear ways.

Embodied Intuition and Architectural Design

In order to immediately see the connection between intuition and architectural design, it is helpful to list the skills identified by Hogarth (2001) as demonstrated by the intuitively gifted:

(1) The capacity for visualization (two- and three-dimensional temporal visualization is a skill inherent to architects);

(2) The ability to acknowledge emotions and learn from them (even though the level to which each designer acknowledges emotions is idiosyncratic, all designers develop sensitivity to place experience);

(3) The willingness to speculate and consider alternatives (to state the obvious, architects approach design tasks by creating a range of alternative solutions, often in more than one iteration).

(4) Continuous testing of perceptions, emotions and speculation (again, a part of what architects routinely do in order to achieve a desired impact with a place).

To elaborate on item 3, management studies (Dane and Pratt, 2007) show that when a situation is uncertain, it is likely to result in a multitude of plausible alternative solutions, rather than in a single objective criterion for success. This is exactly what happens with architectural design: architects explore the design problem through a series of attempts to create solutions (Lawson, 1990). In other words, in architecture it is typical to produce a range of possible solutions to the task, and then choose a best-fitting or most plausible one. Design ideas can be generated both logically and intuitively. There seems to be a correlation between intuitive decision-making in both design and the designer's experience.

Embodied Intuition and Experience

Hogarth (2008) summarizes various different roles of intuition in human life. Intuition can look both backwards and forwards into a life. In the first case, it provides context for justification; in the second, it provides context for discovery. Intuition can also stem from the expression of

preferences. Finally, examples of embodied intuition are expressions of 'cultural capital' or the unique and shared life experiences of a particular person. Most importantly, Hogarth (2001, 2008) states that intuition is domain specific. Moreover, since intuition is inherently embodied, it may become 'confused' if the embodied concepts are borrowed from a different, artificial paradigm.

Studies in a variety of disciplines (literature, sports, chess, medicine, and physics) prove the domain-specificity of an embodied intuition. A good example from everyday life would be driving. In architecture, much like in driving, certain processes become so automatic that professionals can design, drawing upon their personal experiences and professional knowledge, but in an automated and subconscious way (Lawson, 2004). In this case, 'feels right' designs can later be justified and explained in a logical fashion, though at the time it happens, it might happen intuitively. Before a designer can develop this 'sense of rightness,' he or she has to work through many cycles of responding to design tasks, accumulating design expertise, and acquiring substantial personal experiences. Through experiences, successes, failures, and reflection, architects gain intuition, or *recognition* as Lawson (2004) calls it. Without conscious analysis, expert architects can quickly recognize a plausible way to respond to a design task, or to find a correct solution to a design problem when they see it. This recognition is closely related to the 'guiding principles' that all expert designers use (as claimed by Lawson, 2004). Those 'guiding principles' are the result of experience, and they reflect the values and priorities of the designer that guide his or her projects, and which are progressively informed and refined by whatever task is currently at hand. Guiding principles allow a designer to orient the project and narrow the scope to a manageable set of requirements, and experience allows an architect to recognize and make an intuitive connection to some memorable precedents or previous solutions. The "thorny concept 'intuition' appears as the result of a great deal of experience" (Miller, 2007:48).

Intuition and Reason

It is obvious that when solving a design problem, architects rely on both reason and embodied intuition (Jones, 1992). Nodding and Shore (in Thayer-Bacon, 2000) make a distinction between reason and intuition as two different modes, with intuition allowing for subjective certainty, and reason for objective uncertainty. Intuition allows us "to sense the answer and feel with certainty that we know something" (Thayer-Bacon, 2000:154), and reason allows us to remain skeptical. Embodied intuition, as direct responsiveness, allows a designer to *recognize* the right match

between a task and a solution (Lawson, 2004). Reason provides the designer with a logical analysis of found solutions against all project requirements. Intuition can take the form of automatic thoughts, and in this case thoughts that cannot be ignored (Pedigo, 2005). It's like our spine – we can't see it, we don't constantly think about it, but it is always there and it performs well (most of the time) to keep us standing straight. We use intuition to make decisions when conscious analysis of vast amounts of information and a variety of possibilities seem overwhelming. Coupled with reason, intuition gives us a "fuller understanding of the character of[?] human reasoning, achieving what we might call a 'rich' conception of reason," as writes Miranda Fricker2 (1995:181).

Embodied Intuition and Abstraction

Twenty years ago, Walker (1987) wrote that architecture became mute. Architecture became mute because of its over-fascination and sudden dedication to everything scientific, analytic, objective and rational. Architects began reducing design requirements to facts, reinterpreting them into architectural jargon, and using them as abstract elements and principles for design. As a result, we have spaces that are doubly objectified and doubly removed from everyday care and concern (Walker, 1987). Academia might be to blame for this trend. In architectural school, students are always taught and encouraged to think analytically, and to have a strong, evidence-based reason for every decision they make. Whether reasoning prevails because it is easier to teach logical methods and demand rationalizations, or for some other cause, architectural graduates come out 'cold heads,' well equipped with abstraction. Amateur professionals tend to approach design problem the same way, and only after years of practice do they become confident in trusting their embodied intuitions.

Architecture uses a lot of abstract concepts (proportional systems, design principles, and typology, to name a few). While we accept that the ability to abstract is precious and essential to creative thought, abstraction devoid of initial embodiment risks reducing such abstraction to mere appearance. To be able to abstract, first we must gain the ability to be aware of and reflect on our own embodied experiences. Hideki Yukawa makes a very good point (Yukawa, 1964:119):

> Abstraction cannot work by itself, by its very nature. One must abstract from something else which is more concrete and rich in content. In other words, man has to begin with

> intuition or imagination, and then he can proceed with the help of his power of abstraction.

A designer's prior experience—not only professional expertise, but overall autobiographic experience—plays a significant role in his or her ability to design. According to Frances Downing (Downing, 2000:83), "design is an act of understanding and the pragmatic use of past experience to identify, peruse, and imagine possible futures." The design process, in other words, can be seen as a translation of an architect's embodied experience into an imagery of new places. Architects draw knowledge and import from the remembered past: they consciously (through metaphor) or unconsciously (through intuition) combine, abstract, and transform the embodied experience through acts of imagination, in order to fuel images of possible places.

Place

The complex understanding of place that we owe to our sensual experiences and emotional connections can never be taught or developed through cognitive processes (Langer, 1942). Place cannot be understood in any way other than through a direct experience of it. Place enables experience, but afterwards we remember not the place itself, but our experience of it, our emotions about it (McCann, 2005; Conway, 1990). According to Tuan (2003), there are three levels of understanding place: (1) sensation, (2) perception, and (3) conception–emotion–thought. In other words, our modes of connection to reality range from basic sensations to an indirect mode of symbolization, and emotion tints all human experience. In architectural education and architectural publications there is significant emphasis on abstract space, but not on dwelled place, which is connected intrinsically to our embodied and emotional fabric. Tuan (2003) understands place as an "object" you can dwell in, whereas space is that which gives you freedom to move. For example, concepts such as comfort, security, and "sense of home" cannot be taught or explained; they have to involve sensory and emotional engagement, which entails both memory and a conceptualization of these sensations and emotions. They refer not just to physical space, but also to located place. One common example would be 'grandma's kitchen' (Downing, 2000), a space that symbolizes notions such as a sense of home and comfort. The overall experience of happy times during childhood—in grandma's kitchen, with the smell of cookies baking and family around the table—form that notion. Whether happy or miserable, it is experience that forms our understanding of the world, and architects use experience to form their conception of place. The embodied understanding of place is essential for architectural design.

> In daily life we make interpretations about the stuff around us all the time – how it might work and what we can do with it. We develop an exquisite awareness of the possibilities and sensory qualities of different materials, dorms and textures. This awareness is evident from out actions, even when we are not conscious of them – these are our "thoughtless acts." Understanding intuitive interpretations might be a significant source of insight for designers (Suri, 2005:164).

Embodied Intuition and Design Education

Miles Richardson's anthropological theory (Low, 2003) shows how bodily experiences and perception become material—in the case of architecture, for design—by considering how we transform embodied experiences to symbols and then remake those experiences into different objects.

> [Richardson] suggested that we use objects to evoke experience, thus molding experience into symbols and then melting symbols back into experience. Embodied space is being-in-the-world, that is, the existential and phenomenological reality of place: its smell, feel, color, and other sensory dimensions (Low, 2003:29).

Learning, for architects, has traditionally involved travel, visiting places, and 'learning by doing.' Such learning is rich in direct experience, emotional engagement, and can easily be drawn upon during the process of designing for imagery. When directly experienced, perception and actual experience of a place contracts and expands in "relationship to a person's emotions and state of mind, sense of self, social relations, and cultural predispositions" (Low, 2003:12). Without the sensory and emotional understanding of place and place-related concepts, and an emplaced and embodied sensitivity, our intuitive processes become disembodied and weak, and the creation of architecture becomes mere simulation.

As noted by Purcell and Sodersten (2001), design problems are not only ill-defined, but are identified and stated in abstract terms involving laws and principles. The designer has to bring the conceptual and the physical together, and create a solution that embodies a physical expression of relevant concepts. It is absolutely correct that the architectural professional is currently, for the most part, a managerial one whose main tasks are to coordinate teams of contractors and consultants with whom the architect works, and to complete any necessary

paperwork. At the same time, it is that small portion of creative design that differentiates architects from managers and engineers. When we simply follow codes and laws, we get what in the US is called "builder houses" or cookie-cutters — functional but characterless, identical, and not always particularly comfortable structures. What we call "architecture[3]" is a different level of building design: it is the design that offers a personal, rich living environment, well-suited for all its required functions. Embodied intuition helps expert designers convey meaning and the 'feel of place' through their designs. Embodied intuition can help design students learn how to take their designs beyond imitation (merely rearranging building elements according to the rules of composition and the laws governing building construction regulations).

Negative Influence of Academia

As Frances Downing (2000) notices, it is design education that defines the boundary between the autobiographical and professional experiences of a designer. She discovered that mature professionals often drew from informal imagery from their autobiographical memories during the design process. Architecture students, on the other hand, displayed lesser fluidity across domains and experiences, resorting to more formal imagery. Lawson (2004) echoes Downing: expert designers rely mostly on experiential knowledge, while novice designers follow primarily theoretical and analytical principles. At the same time, research shows that intuitive expert decisions are not necessarily better than novice decisions, when made intuitively (Hogarth, 2001; Klein, 2002) even though strategies of processing information vary. More than that, conscious analysis and attempts to solve a problem can be fruitless in cases where complex factors underlie the problems (Woolhouse and Bayne, 2000). Linking this fact back to architecture, we can hypothesize that there is a chance of improvement in the quality of designs if novice designers are allowed to trust their embodied intuition. Attempts exclusively to respond to the design task with pure logic and reason desert many important factors and leave out valuable lifelong repositories of experience. It is only a hypothesis that needs to be tested, but potentially, a novice designer's mind can intuitively make a leap that the same designer might not be capable of making through a process of reasoning not yet fully equipped with the necessary tools and concepts.

Educating Intuition

Having said that, I have to mention the various studies showing that embodied intuition can be a function of experience that positively correlates to competency or to an extent and range of

experience (Miller, 2007; Woolhouse and Bayne, 2000; Lawson, 2004). The underlying idea is that before an intuition can become prolific, one has to provide a fertile soil of experiences upon which it can grow. The broader the range of the experiences one has, and the more cycles of similar experiences one has enjoyed, the higher the chances for intuition to be fruitful. There are theories on how one can educate intuition (Hogarth, 2001). In order to educate intuition, we can provide a "kind environment" (Hogarth, 2001), engaging our students in activities like the "design psychology toolbox" (Israel, 2003), which facilitates an exploration of the student's intimate connections with place. Such exercises help to consciously uncover intuitive decisions through explorations of the individual's past.

In academia, we address only conscious learning. But learning is not time or place specific, and it is constant – every minute of our lives we learn, even when we don't mean to. Educators generally prefer to concentrate on formal learning, and disregard the incredible repository of autobiographical experiences available to both teacher and student. It is these experiences that often present themselves through embodied intuition.

Deliberate thought is most valid when a well-defined and accepted model exists – but this is not the case with architectural design. In complex decisions, analytic models cannot always capture all of the nuances of a situation. Reinterpreting Khatri's and Ng's definition (in Volz and Von Cramon, 2008), I can say that embodied intuition as a synthetic psychological function allows an architect to apprehend the totality of a given design task and to synthesize a great number of isolated bits of information involved with each project, all to create a coherent design. When we make choices or decisions, we base them first on preferences shaped by prior experiences and embodied intuition (Hogarth, 2001; Pedigo, 2005); "one goal of education should be to teach when people should use specific forms of deliberate thought" (Pedigo, 2005:16) and another should be to educate students on the proper use of their intuition.

Professional architects spend years acquiring domain schemata, developing guiding principles and collecting a pool of precedents (Lawson, 2004). They learn by trial, error and reflection to recognize design situations and to make shortcuts in the design process. Upon coming to academia, students do not yet possess sufficient professional knowledge, experience, and understanding regarding how and when to use deliberate thought, or when to have domain schemata or make shortcuts. They have nothing else to fall back on but intuition and personal

preferences. As educators, by not dealing with students' intuitions, we simply ignore our students' reality. One way of approaching the issue is by comparing the intuitive performance of expert and novice designers, alike. It is known that expert designers approach design tasks and use knowledge differently than novice designers (Lawson, 2001, 2004; Newstetter and McCracken, 2001; Cross, 2006). Understanding the differences might lead to improved methods of teaching architectural design in academia.

There seems to be volumes of evidence hinting at the idea that intuition is important in design. Whether we call intuition what it is, think of it as part of a 'designerly way of knowing,' or call it insight, intuition does have a place in the design process. Embodied experiences, shared meanings and emotional understanding all find their way into a design of new places, via embodied intuition. There is an urgent need to study intuitive decisions in architecture, and to address students' embodied intuitions in architectural education.

Notes

1 Tacit knowledge is unconscious, and people are not necessarily aware of possessing it. Tacit knowledge provides context for places, people, ideas and experiences.

2 According to Miranda Fricker, any rational enquiry (whether theoretical or practical) "relies heavily upon the intuitive mode. Viewed in this light, our standard conception of reason, in its negligence of intuition, looks excessively rationalistic, excessively 'thin'" (1995:185).

3 Of course, there is another view of what architecture is. Lawrence Garvin published a 1964 summary of an AIA-ACSA Teacher Seminar at Cranbrook ("Creativity and Design Process," Journal of Architectural Education 19(1):3-4. The general agreement amongst the seminar participants was the equation of creative architecture to great architecture. Great architecture was decided to poses a quality of uniqueness in some aspect, but it didn't have to demonstrate an overall superior performance. Garvin herself mentions that great buildings can be uninhabitable. I do not subscribe to this view of great architecture. I also hope that such a view can now be retired and the greatness of architecture can be measured in comfort, wellness, safety and the happiness of its users, as well as its regenerative impact on the environment.

CHAPTER V

EMPIRICAL STUDY

The goal of my empirical study is to investigate the architect's use of autobiographical memories with emotional significance during the brainstorming phase of the design process. This chapter is entirely devoted to a discussion of methods used to collect and analyze data, a statement of the research questions and hypothesis investigated below, a description of the participants in this study, and the results of the investigation.

Methodology

On Methods

There have been numerous studies investigating the design process with different focuses, and a variety of methods have been employed for such inquiries. Peter Lloyd (1994) provides a good overview of the various methods that have been previously employed to study the design process: thinking aloud (concurrent verbalization) protocols, retrospective reports, introspective reports[1] (when the designer is the investigator), analysis of graphic representation (sketches) of the thought process, structured[2] and unstructured[3] interviews with designers, longitudinal studies[4], clinical studies[5], and more. Both statistical (quantitative) analysis and qualitative analysis were used here. Examples of quantitative analyses in design proved not to be useful. Though statistical evaluations allow a researcher to identify differences in trends within the design process, interpreting such trends is difficult and does not offer much insight into the design process (Lloyd, 1994).

Almost all existing methods of psychological studies have been tested for use in examining the design process. The two methods found most useful are (1) thinking aloud, followed by a further analysis of the protocols for the themes, patterns of sequence, and content of the designer's thoughts; and (2) the so-called direct method, which is used when an observation of the design activity is analyzed from raw data, with description being the main analytical tool. Both methods have pros and cons, which will be discussed in greater detail below. To summarize the most important points, the main criticism of protocol analysis is that design thinking is not open to verbalization (an accurate articulation of the thought process) (Lloyd, *et al.*, 1996) and thus may

not be sufficient for a study of the design process. Direct analysis is often called unscientific and subjective, data being used only selectively for the construction of an argument (Lloyd, 1994). However the direct method, like no other method, allows for the construction of a broad picture of the design process. This method is most applicable when discussing general theories of design, and the indirect method (or protocol analysis) is best suited for analyzing specific issues. In my investigations both methods were used, with protocol analysis being the core method of investigation and direct analysis assisting in a global understanding of the utilization of autobiographical memories with emotional significance during the design process. In addition to traditional methods, all of the various protocols were analyzed for their affects in language using Wissell's *Dictionary of Affect in Language* (WDAL). This method will be discussed in more detail in WDAL section of this chapter. An analysis of affect in language is typically used in studies of literary texts. I do not know of any investigation of the design process or other architectural research that has previously used this method.

Method

The study design used in this research is the case study. The reasons for choosing this particular study design are as follows: "As a methodology, it [the case study] is especially responsive to research questions of *why* and *how*, and it offers scholars a flexible yet integrated framework for holistic examination of a phenomenon in its natural state" (Winegardner, 2002). Case studies allow for in-depth investigations and the compilation of a complete, well-organized picture of the use of memory of emotional experiences in the creation of architectural design conjectures. Case studies are preferable to surveys because of the significant number of variables and conditions that affect this type of research (Isaac and Michael, 1995). In addition, case studies are better adapted to describing multiple realities (Lincoln and Guba, 1985). Another benefit of choosing the case study method is that it allows the researcher to gain an emic perspective into an analysis of this flexible and sensitive human instrument. The context of the design process is important. In my experiment, obesrvations of that context permit the construction of a more detailed picture of the issue under study. This study will provide conclusions as to the nature of the relationship between autobiographical memories of emotional experiences and design conjectures – both their direction and their magnitude.

Like all studies of the tacit[6] processes, my study has a rather low reliability due to confounding factors such as motivational and temperamental traits (Guilford, 1950), learning, administrative

and time biases, lack of uniformity in the test conditions, individual moods, cultural peculiarities, and the project specificity. Actual findings are applicable only to the population, time period and conditions studied. However, the generalizability of these case studies is "naturalistic," that is, context-specific and in harmony with a reader's experience; hence, these case study findings will resonate experientially or phenomenologically with a broad cross section of readers and thus facilitate a greater understanding of the phenomenon in question (Winegardner, 2002).

In a broader sense, my study uses the method of naturalistic inquiry (Lincoln and Guba, 1985) or qualitative analysis. The paradigm is grounded in cultural anthropology, and its primary aim is understanding from an insider's perspective that forms a basis for comparison and self reflecting criticism (Marcus, Fisher, 1986). The research engaged the participants - architectural designers - in acquiring the data in an open and honest negotiation of knowledge construction (Denzin and Lincoln, 1994). In Case Study 1, the inquiry took place in the context natural of architectural design - in a studio, design office, or at home – a location where the particular designer typically works. The means of gathering the data in both case studies was ethnographic interviews. Descriptions and verbal protocols were created on the basis of these interviews. This method is expected to offer insight into how the participants utilize their autobiographical memories with emotional significance, for the development of architectural conjectures that would otherwise be inaccessible.

The employment of autobiographical memory in architectural design is a tacit, intuitive, and often unconscious process not easily revealed by designers. Understanding of such employment requires a method of inquiry that enables the researcher to enter into the unobservable and internalized process of architectural design (Lawson, 1997). It cannot be acquired by studying the mere products of design without supplemental inquiries into how the designer makes sense of what he or she designs, and when and how autobiographical memories with emotional content come into the process of design. Active participation of designers through their engagement with the task and verbalization and reflection on their emotions, memories, thoughts, ideas, and reasons during the design process is necessary for a full understanding of the process. This methodology offers entry into those parts of the process in which the knower (the researcher) and the known (the participating architects) interact in a process of mutual shaping of the data of the inquiry (Lincoln and Guba, 1985).

Detailed models of the memory process and problem solving (design activity in particular) have demonstrated a sensitivity of behavior to task instructions, types of stimuli, and other crucial factors in experimental design (Cross *et al.*, 1996; Lloyd *et al.*, 1996; Ericsson and Simon, 1980). There are two major types of verbal reports: concurrent and retrospective. Concurrent verbalization describes the procedure that occurs when the subject (the participant in the study) verbalizes the information at the time that he or she attends to it. The situation in which the subject verbalizes about processes that occurred earlier in time is called retrospective verbalization. In my study, retrospective reports were not suitable. According to an investigation of the knowledge of elicitation methods, "concurrent protocols yield a greater overall quantity of data than do retrospective protocols" (Bradburn and Stauffer, 1991:305). A retrospective explanation of the process, as well as answers to the predetermined set of direct questions, could not provide conclusive evidence that the participants, in fact, utilized their autobiographical memories with emotional significance for the development of architectural conjectures. It is easy to propose models of cognitive processes that would permit interviewed architects to generate a particular answer without consulting actual memory traces of the design process (Ericsson and Simon, 1980). Also, the amount and truthfulness of the information that can be obtained with the help of retrospective protocols decreases with time (Ericsson and Simon, 1980; Bradburn and Stauffer, 1991).

In the instance of talking aloud, the heeded information may be verbalized either through direct articulation or by a verbal encoding of information that was originally stored in a nonverbal code (for example, imagery). With the instruction to verbalize, a direct track is acquired for the heeded information, and an indirect track is obtained for the internal stages of the cognitive process (Ericsson and Simon, 1980). When information is being processed in order to perform a task that is not verbal or propositional, verbalization may be incomplete, but the course and structure of the task performance process remains largely unchanged. Studies show that talking aloud, in general, does not affect behavior or the structure and course of the thought process (Ericsson and Simon, 1980). It is doubtful that, at least in the case of such a complex cognitive activity as designing, there might be a side effect of verbalization such as a change in behavior or cognitive process (Cross *et al.*, 1996). Hogarth (2001) suggests that when requested to verbalize their thoughts, people typically shift to a deliberate mode of processing information and shut off tacit processes. Though verbalization can distort the typical design process to capitalize on

logical processes, verbalization is the only way to actually know what a designer thinks. Besides, it is typical for a designer to communicate with peers (designing is often a team effort) and to explain design ideas to clients. In other words, the verbalization of thoughts is conventional for designers.

Concurrent verbalization provides detailed and informative accounts of conscious thought processes and important insights into the subconscious processes. Thinking that is not closely related to the external environment can be retrieved with clues (but seldom otherwise), except when it is verbalized concurrently with the thought process. The individuals know the focus of their attention, their current sensations, and their emotions, evaluations, memories, plans and thoughts. These are exactly the kinds of information that are stored in short-term memory and available for reports (Ericsson and Simon, 1980, 1993). And these are exactly the kinds of information that I looked for, that would allow a researcher to trace out the relationship between designers' autobiographical memories with emotional significance and the development of architectural conjectures. I suspected that certain intuitive processes or tacit use of autobiographical memories with emotional content would not to be easily revealed during concurrent verbalization. Tacit information is stored in the long-term memory and is usually unconscious. However, paying attention to the task at hand, and a habit of discussing design projects with peers and clients could and did force some tacit thoughts to become accessible via conscious thought.

Studying the design process and analyzing design activity is an intellectual challenge (Cross *et al.*, 1996). As discussed above, different kinds of research methods have been adopted for analyzing design activity. Yet a larger variety of methods has been used for studying human memory and emotion. Those methods range from philosophical reflections to split-brain research. The most commonly used method of empirical research on memory and design activity is protocol analysis (Cross, *et al.*, 1996). The Delft protocol workshop on analyzing design activity (Cross *et al.*, 1996) is the only unique scrutiny of the suitability of existing research methods for the study of design activity. The workshop had multiple sessions analyzing specific methods in relation to studying various aspects of the design process. In general, "protocol analysis as a research technique for design has been 'validated' with some qualifications" (Cross *et al.*, 1996:13). 'Major qualification' means that the protocol analysis was determined to have severe limitations in capturing the non-verbal thought processes going on during the process of

designing (Cross *et al.*, 1996; Lloyd *et al.*, 1996). It is common sense that the design activity consists of many 'interlocking and overlapping processes' (Lloyd *et al.*, 1996). Lloyd, Lawson and Scott (1996) raise various questions about the different aspects of the design process and how or if they can be captured with the protocol analysis technique. Dorst, in his thesis study (1997:84), mentions that "designers do not necessarily always know what is going on inside their own heads, let alone have the ability to verbalize it. They might report what they believe they are thinking, what they want to communicate to the researcher, what they think the researcher wants to hear, or what they were thinking recently."Lloyd, *et al.* (1995:258) warns: "protocol analysis, and constraint it brings both theoretically and methodologically, interferes with designing." This statement echoes Hogarth's claim, as mentioned above, that verbalization can interfere with tacit processes. In the case of the design process, this will prevent the researcher from accessing the emotional content of architects' memories. Lloyd *et al.* (1994) also admits that all of the current methods of investigating the deign process have salient features, but also major failures. I will adhere to an analysis of the protocols of concurrent verbalization as a study of design. Currently, this method is still the best available process for studying the design process, and has to some degree been validated (Cross *et al.*, 1996).

The protocol data, as well as the design activity itself, is heavily influenced by its experimental setup. I attempt to provide a coherent and ample picture of the experimental technique and the context of the study that should provide a road map for fellow researchers to reach similar conclusions.

Research Questions

My empirical study posed the following questions:

(1) Do autobiographical memories with emotional significance always contribute to the development of conjectures?

(2) If possible to discern, what is the proportion of autobiographical memories verses the amount of knowledge used during the brainstorming process?

(3) In what case do autobiographical memories with emotional significance verses the use of knowledge contribute to brainstorming?

(4) How (if at all) does the choice of primary generator depend upon autobiographical

memories with emotional significance?

(5) What kinds of autobiographical memories with emotional significance do designers utilize during conjecturing?

(6) What is the correlation between task complexity and utilization of autobiographical memories with emotional significance, thematic form generation and autobiographical memories with emotional significance, and professional experience and autobiographical memories with emotional significance?

Study Design

Because of the nature of my study, I was interested in individual designers rather than design teams. It is true that architectural design is mostly collaborative; even starchitects[7] have to work

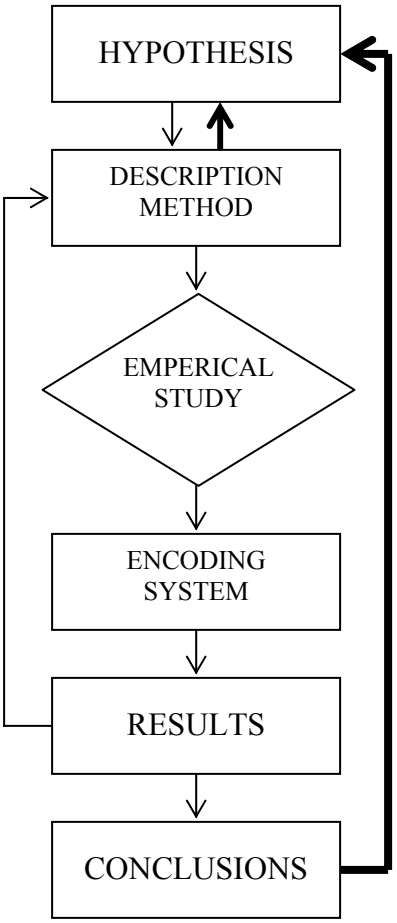

FIGURE 13. The structure of the study.

with teams (Lawson 2001, 1997). Sharing ideas, group brainstorming, and collective experiences are invaluable in the design practice, and all significantly influence the traces of thought and the design process of individual designers. The aspect that I am particularly interested in – autobiographical memory and its emotional content – is inherent to a designer as an individual, only. If and when autobiographical memory enters the design process as the source of design ideas, it can be elicited by many triggers – everything from accidental smells, to interactions with peers, to conscious attempts to recall an idea that might facilitate design conjecturing. Researching the physical triggers of autobiographical memories with emotional significance during the design process is beyond the scope of this study. This research concentrates on the relationship between the autobiographical memory of the designer and its emotional content, and the development of the design conjectures. That is why interviews were conducted with individual designers – it was much easier for this researcher to trace a designer's train of thought during the act of brainstorming, and individual interviews were just as relevant to this research as interviews with teams.

My investigation compared two case studies. I conducted one case study in the US, and another researcher conducted the second case study in the UK. Both studies were carried out completely independently, with dissimilar design briefs[8], at different times and with diverse participant populations. Such a study design was chosen to help eliminate the biases possible due to any predispositions of the researcher or particularities of the studied designers. A comparison of the case studies should provide answers to the following questions:

(1) Does the use of autobiographical memories with emotional significance depend upon the task at hand?

(2) Did the design of the study influence the use of autobiographical memories with emotional significance?

(3) Is the use of autobiographical memories with emotional significance universal and natural to designers, or is it dependent upon environmental factors like design education and professional practice?

Context of the Study

Case Study 1

Case study 1 was conducted in the offices or studios of the participant architects, or other settings natural to a particular designer's design activity. A design studio is an environment where the culture of the architect both originates and is maintained (Pressman, 1993). Artifacts of the typical design process environment will provide material that will allow additional queries into the design process and the personality of the participant.

This research, as with any research that utilizes ethnographic interviews, considers the human mind as the major instrument of acquiring data. Information collected from such sources will be interpreted and constructed by this researcher from data obtained via interviews. Participants in this study were selected from a convenient group (Texas A&M University alumni) at random, based only on their engagement in the architectural design practice. Another criterion for choosing the participants was a balance of male and female architects. Men and women have different approaches and working styles with regards to the competitive atmosphere of architectural practice (Groat and Ahrentzen, 1996). Consequently, men and women may have contrasting approaches in the design process and utilize autobiographical memories with emotional significance differently. Once they were chosen as a potential subject for the research, each participant received a letter of request for participation with a brief introduction and explanation of the purpose of the study (Appendix A).

The participants in my research included fourteen architectural designers who practiced in architectural firms or had independent practices. One criterion for choosing the participants was their active engagement in designing buildings for at least five years (which qualified them as expert designers). I was looking for representatives of varied levels of architectural practice (intern, chief designer, independent practice, working within a firm, designers practicing for twenty five years, architecture only designers, and designers who changed their career after working in architecture for five or more years). The participants in this research were a balance of men (ten) and women (four), somewhat reflecting the proportion of men to women in the professional practice. Participants in this study were from a variety of locations in the United States, but primarily from Texas and the West coast, who have been engaged in designing projects ranging from the very simple to the highly complex in scope. Some of the participants

had independent practices, some worked in the large firms within teams, and three had recently changed their career.

Case Study 2*

The second case study was designed to deduce from the findings whether the use of autobiographical memories with emotional significance is dependent on the type of architectural task preformed and the level of design expertise. All ten interviews included in the second case study were independently collected and transcribed by an another researcher with different goals in mind. However, the procedure of collecting ethnographic interviews was very similar, and the data was collected during the conceptual phase of the design process.

The second case study was received from Peter Lloyd, a Senior Lecturer in Design and the head of the Design Group (who at the time was conducting interviews a PhD student at the University of Sheffield). The results were in hard copy in the form of transcribed notes. The case study was originally conducted for Peter Lloyd's dissertation entitled "Psychological Investigations of the Conceptual Design Process," which has since been published by the University of Sheffield in 1994.

The studied population for Case Study 2 consisted of ten architectural students from the University of Sheffield, UK. Peter Lloyd divided all participants into two groups: experts and novice designers. Three male and two female students represented the expert designers. Three of the students were sixth year architectural students, one was a fifth year student, and one participant has been in professional practice for over twelve years. All students had previously practiced professionally. Five male second-year students in the architectural program with very little professional experience represented the novice group of designers. For the sake of my study, such differentiation between the level of professional experience of the students was not important. However, since the participants in Case Study 1 were all professional architects, and participants in Case Study 2 were all students from the same university, the educational impact and level of professional expertise may have had an impact on the study results.

Interviews

Research using ethnographic interviews considers people to be major subjects for acquiring data. The researcher interprets information and constructs meaning around the perspectives and constructions revealed by participants in the study. The researcher treats participants as actors within the culture, and seeks insight through shared meaning. Accounts of ethnographic researchers are authorized, but restricted in unique ways. Interviews in Case Studies 1 and 2 are were restricted to time, setting, the characteristics of the participants, and other factors. By describing the study design, the interview process and the analytical procedure in detail, I hope to provide the reader with a 'thick' description that will allow for an understanding of the conditions of the interviews and allow other researchers to come up with similar results if their analysis is performed on the same type of data.

Case Study 1

All participants were approached by mail or email prior to their interviews, except for one individual who was approached in person. Before this study, I was acquainted with only two of the participants. Therefore, the majority of the design sessions began with an introduction. At the beginning of the interview, I presented an overview of my research to re-establish the purpose of the study. All of the architects were asked to read the informed consent form and sign it if they were willing to participate in the interview. The form stated the purpose of the research, the volunteer basis of participation, and the procedure of the interview (Appendix B). Participants were assured their confidentiality, privacy, and the preservation of anonymity with regards to all of the information they provided, and that this information was to be used for research purposes only. All interview notes were coded and kept in a safe place, the procedures for which were spelled out in the informed consent. Also, participants were asked for their special written permission to record their interviews and to publish any drawings produced during the design session (Appendices C and D).

A brief explanation was given to each participant about the premises of the methodology. Each participant was informed about the member check, which was a review of the documented interview used to assure accuracy in the gathering and interpretation of data. After this initial informational session, the introductory conjecturing session took place. This was the first time that the designers saw the design task. The designers did not have access to a computer, but were allowed to use reference material if they desired.

After the design session, an unstructured interview took place. I asked the designers to talk about themselves. By posing open-ended questions, I hoped that each designer would focus on the aspects of his or her life and self that they considered most important. When the designers were unable to answer certain questions, I suggested broad categories such as family, education, travel, and work. A majority of the designers chose to talk about their life experiences, including experiences with their family (either family they grew up with or family through marriage), places they had visited, their academic education, and their professional history. Design sessions and interviews both varied drastically in length. Some interviews were very brief, with architects finishing literally in minutes, while several others took more than two hours.

The design sessions and interviews were tape recorded. Verbalizations were transcribed after all the interviews were conducted. Transcribed notes were sent to the participants for verification. Only three participants reviewed their transcribed interviews.

Case Study 2

In the second Case Study, the administration of the task was intended to mimic a real world design situation, with the investigator assuming the role of the client. The task was handed to the designers at least a week before the interviews, with an option of visiting the design site. All designers were allowed to conduct research and to begin thinking about the brief. The designers were allowed to use CAD systems, but all preferred pencil and paper. Designers were not required to continuously verbalize their thought processes, but all designers did, at least to some extent. All design sessions took about an hour, or until the participant chose to stop.

Interviews after the design session were used to clarify the position of the designers prior to the session. This final interview included questions regarding their professional design experience, formal architectural education, and approaches to architectural problems and theories.

All sessions included in Case Study 2 were video recorded and timed. Peter Lloyd transcribed the interviews of this case study. In order to be able to break the interviews to meaningful units, I retyped all the protocols. Retyped protocols were double-checked for possible errors via a careful comparison to the original document. Privacy of the participants was carefully protected. Peter Lloyd did not release any information about the participants or their original video tapes to me.

Brief

Case Study 1

The design brief for Case Study 1 was not a typical form of architectural task, and was intentionally very open for interpretation. Such a brief, with minimal requirements and information that was provided, was presumed to make the choice of primary generators more obvious, and to solicit a more active use of autobiographical memories with emotional significance.

All of the participants in the study were asked to design a working environment for the author of the piece of poetry that was presented to them. The piece chosen was a haiku by Masaoka Shiki, which reads as follows:

> Twilight cicadas -
>
> The shadow of the pasania tree
>
> Press on my desk.

There were no other specifications to the task except for this haiku. The participants were asked to produce concept sketches for such a working environment. Also, the participants were asked to talk aloud while designing and to verbalize any thoughts, ideas, and emotions experienced during the process of the design. A full task description can be founds in APPENDIX E.

Case Study 2

In contrast to the brief of Case Study 1, the task for Case Study 2 was a typical architectural design brief with an actual site which participants had the chance to visit (none of the participants chose to visit the site, but some were already familiar with it). The full brief is presented in APPENDIX F. Overall, the task was to design a nursery school for 3 to 5 year old children. The design site was a vacant 1000 m^2 lot in Sheffield, UK. The design had to include three main areas – the school building, a covered outdoor extension and a protected garden of a minimum of 400 m^2. A description of activities anticipated to take place in the building and breakdown of the interior area by square footage was provided.

Types of Collected Data

Various types of data were collected for this research, and are listed as follows:

(1) Sketches of design conjectures produced during the completion of a given task in Case Study 1 (APPENDIX G).

(2) Sketches of design conjectures produced during the completion of the task given in Case Study 2 (APPENDIX H).

(3) Protocols of concurrent verbalizations produced during Case Study 1. Talking aloud during the completion of the design task was tape-recorded and later transcribed. Member checks were obtained from most of the participants.

(4) Protocols of concurrent verbalizations during Case Study 2. Talking aloud during the completion of the design task was video-taped and later transcribed by Peter Lloyd.

(5) Protocols of the unstructured interviews collecting personal information on the subjects of the Case Study 1. The researcher rarely asked questions and engaged only to minimal degree to facilitate the participants in their monologues.

(6) Protocols of the reviews conducted immediately after the completion of the design task in Case Study 2. Typical review questions are included in APPENDIX I.

(7) Notes about the participants' moods and artifacts that had special meaning for the design process during the interview.

(8) Protocols of the interviews were used for content analysis and an analysis of language for affect. Reviews were used together with concurrent verbalization protocols because they provided immediate reflections of the designer on his or her own process. Unstructured interviews were content-analyzed as well, though personal data was mainly used to help me understand the values of each designer and to give me insights into their design process, rather than to show me how their that data directly applies to the design process. Sketches were used to help understand what the designer was talking about while conjecturing, and for direct analysis in order to comprehend the overall picture of the design process.

Indirect Data Analysis (Content Analysis of Protocols)

After the member check, interview protocols were analyzed for content. To protect confidentiality and eliminate bias, all participants were assigned a number that was used instead of their name throughout the entire analysis (for example, Participant 1). For Case Study 2, I

adopted an identification system established by Peter Lloyd (for example, Participant A1 or NA1, where A stands for an expert architect and NA stands for a novice architect).

All protocols were broken down into meaningful units of text. Each unit of data held a unique and single chunk of meaning, or a singular idea as it emerged from the account of the participant. Such data chunks or units varied from a fragment of a sentence to a full sentence or a paragraph. All data units were coded to the interview transcripts, indicating a code for the participant and a location in the transcript by line number. Once the data was unitized, data clusters were established from related units. All unit clusters and categories emerged from the data; I did not impose any pre-established categories. Even though the purpose of this research shaped the categories that emerged, content analysis allowed for flexibility and for unexpected findings to come forward.

When unitized, first categories and then larger themes were established from the units that were related to each other in certain meaningful ways. The analysis continued through several iterations of categorization until a saliency of categories and themes was achieved, and the question posed could be explained in a consistent way. The data was analyzed beginning with issues of the development of architectural conjectures and where a participant's autobiographical memories with emotional significance fit in to this development. This procedure was intended to generate data that helped discover underlying meanings constructed by the participants. In the naturalistic paradigm, the data are not analyzed with a strict set of rules establishing a priory, but rather the paradigm allows for the emergence of themes that are judged relevant to the research and can be arguably justified or explained (Lincoln and Guba, 1985). To understand the culture, it is best to include the voices of those who are studied. An ethnography provides an insider's interpretation of the subjects' worlds and reflects the way in which meaning is constructed (Cuff, 1991).

The data were analyzed in two steps. First, it was analyzed for themes and if there was evidence of the utilization of memorable emotions by architectural designers during the process of development of design conjectures. Second, the data were analyzed for the patterns of employment of memorable emotions. Results of analysis of the two data sets were then compared to answer the overall research questions.

Validity (Rater Consistency)

Transferability of the study was established by providing a "thick" description, which would be necessary for anyone interested in this research to be able to transfer to conclusion (Lincoln and Guba, 1985). Current qualitative research does not consider the reliability necessary to establish such conclusions (Denzin and Lincoln, 1994; Morse, 1994). Armstrong and colleagues (1997), in their empirical study, proved that even with researchers' biases and subjective interpretation of the data, a qualitative research proves "concordance at a level of situating themes within a wider framework" (Armstrong et al., 1997:605). I believe that a qualitative assessment of reliability is essential for establishing the rigor of the research. Reliability of judgments must be assessed "in order to know the extent that measurements are measuring anything" (Shrout and Fleiss, 1979:427).

The trustworthiness of this inquiry was established through an intra-rater reliability. To ascertain the validity of the study, ten percent of Case Study 2's set of units established was sorted by an external rater. To eliminate possible biases, the external rater chosen was a volunteer 'lay' person of the opposite gender (male). He was not familiar with my research, has never done sorting before and was not a trained architect. Such choice of the external rater was assumed to prove (in the case of sufficient agreement) that categories were established in a way where anyone analyzing protocols according to the provided categories descriptions would come up to the same conclusions that I did.

The second rater sorted meaningful units into categories that emerged during my sorting, which I defined in a narrative form. The coefficient of the inter-rater reliability (Cohen's kappa) was obtained to estimate the consistency and homogeneity of the sorting. For 45 categories, Cohen's kappa was 0.61, which demonstrates a good agreement for many categories. For the themes (16 total), the kappa was 0.758 (and 0.78 for the weighted kappa), which shows substantial agreement. The qualitative analysis for the categories was proved to be reliable, and it endorsed the theoretical framework I suggested.

Even thought Cohen's kappa for the themes was sufficient and good for chosen categories, I was interested in locating the mismatches in the sorting. After comparing the two sortings, unit by unit, it became clear that the majority of mismatches were in identifying the different stages of

the design process. The unfamiliarity of the second rater with the architectural discipline explains this finding.

Direct Data Analysis

In addition to indirect content analysis, a direct analysis of data was performed. During the direct analysis, the data were treated in a phenomenological sense rather than a cognitive sense (Lloyd, 1994). Direct analysis allowed for this researcher to account for graphic information (sketches

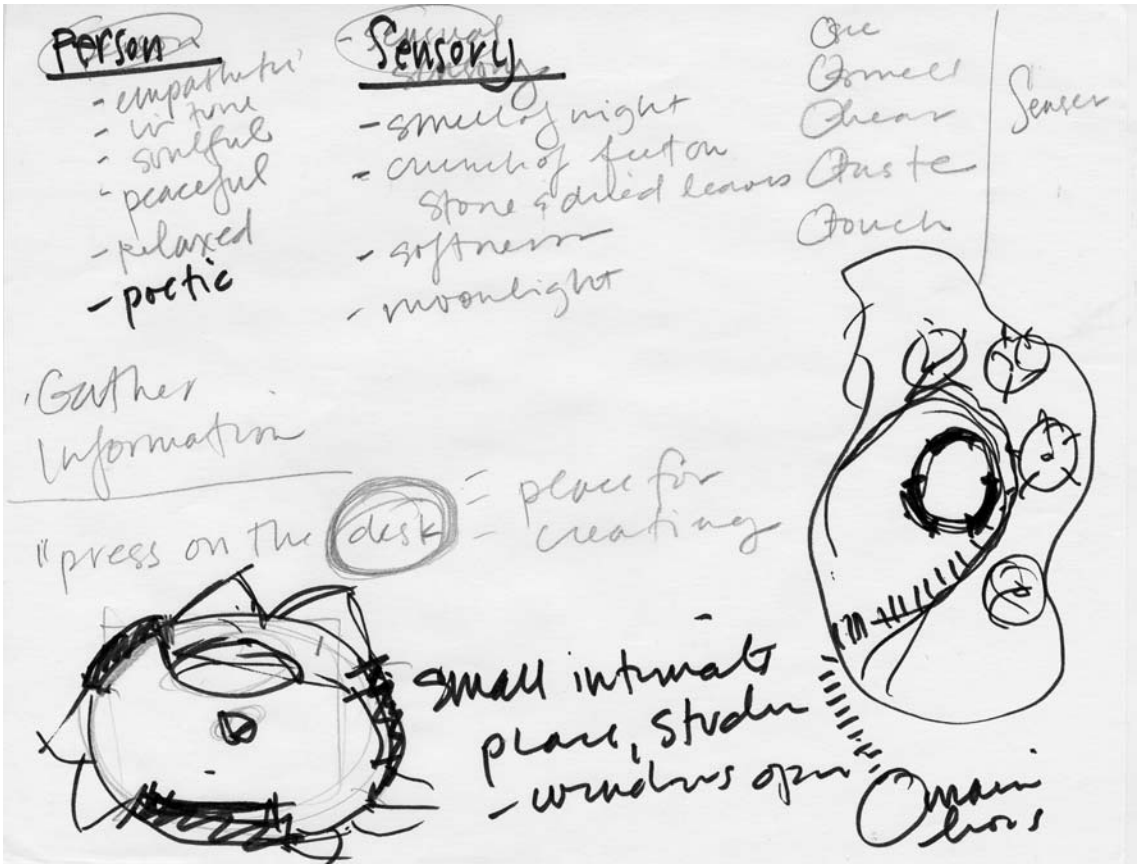

Figure14. One of the sketches produced by Participant 1.

produced by the participants during the design session), to preserve the complexity of the design situation, and to focus on the larger themes that could have been lost when the data were unitized during the content analysis of the protocols. A direct analysis of data offered new insights. For example, at times during design process, the use of personal preferences of the designers or autobiographical memories with emotional significance were difficult to discern until the records of any talking aloud during the design session were compared with post-task interviews, where

designers were asked to speak about their values and personal histories. Sketches and notes on those sketches helped to clarify the verbalized thought content. One of these sketches is shown in Figure 14. Direct analysis, in combination with indirect analysis, imparted the establishment of these groups.

Affect in Language

Whissell's *Dictionary of Affect*[9] *in Language* was used to measure the emotional meaning of the interviews with the architects. An evaluation of affect in language was expected to help me identify any emotional content of autobiographical memories that was not clearly evident from a verbalization of the conceptual design process, either due to its intuitive use or to other factors. Since the language of the was of special importance, it is presented in this dissertation verbatum.

The "*Dictionary of Affect in Language* is an instrument designed to measure the emotional meaning of words in text. It does this by comparing individual words to a word list of 8742 words which have been rated by people for their action, evaluation and imagery" (Whissell, 2001:1). The WDAL has been statistically validated. Descriprtive statistics can be found in its manual (Whissell, 2001). The WDAL has a hit rate of 90%. In other words, nine out of ten words in the English language can be mached by the WDAL. The *Dictionary of Affect in Language* is suggested for and has been utilized to select words for memory and cognitive experiments, texts of many kinds "including descriptions of subjective feelings" (Whissell, 2001), free-association tasks, emotional memory, and other purposes. As claimed by the creator of the dictionary, Cynthia Whissell (2001), "*any* sample of language gathered in *any* manner can be scored for its emotionality and imagery using the *Dictionary of Affect in Language*" (author's emphasis). As evident from its suggested use, the WDAL is a useful tool to aid in a concent analysis of the protocols with the goal of discerning autobiographical memories with emotional significance and emotions experienced during the design process. The dictionary categorizes emotionally-laiden words into the following groups: nice, pleasant, fun, active, nasty, unpleasant, sad, passive, high imagery and low imagery. Overall, the three major dimentions along which the WDAL addresses emotional connotations are pleasantness, imagery, and activation. The manual for the WDAL does not provide a specific definition for each of the emotional words categories; however, one can see the list of words attributed to such categories. All words in the dictionary are assigned a certain score regarding their emotionality.

One of the expected limitations of the WDAL is the inclusion of only common words. Archtiectural terminology, thus, could not be rated. The hit rate of the WDAL should allow me to identify how much of the architectural jargon used by designers was not accounted for by the WDAL. However, typically professional jargon does not have much emotional coloring.

Each of the talking aloud protocols was evaluated separately using the WDAL. Reviews and post-task interviews were evaluated seperately as well. The statistical results of these evaluations are presented in APPENDIX J.

Results

Introduction

Before interpreting the results of the content analysis of this study, I would like to reiterate that the results are not generalizable to an entire population of architects, but are specific to this study. The results of the sorting of meaningful units are presented in APPENDIX K. The direct analysis and the content analysis clearly demonstrated a use of autobiographical memories with emotional significance in design conjecturing. The magnitude of this utilization was more difficult to establish, though it is evident that such a magnitude and the types of memories are dependent upon the design task at hand.

Analysis of Affect in Language

As described in the Methods section, Whissell's *Dictionary of Affect in Language* was used as a supplemental tool to help me identify the emotional content of the interviews. The use of autobiographical memories with emotional significance is sometimes unconscious, and thus not obvious from the verbalization of the participants. The *Dictionary of Affect in Language* scores emotional words used in any text or speech, and can capture emotional content not clearly evident from the protocols. An analysis of the protocols of concurrent verbalization used during the design tasks, as well as post-task reviews and interviews, did prove a substantial use of emotional language and, consequently, a use of substantial emotional matter during the design process.

For the analysis of affect in language, I was most interested in an analysis of the protocols of concurrent verbalization used during the design session, rather than the post-task interviews, as the goal of the study was to discern the types and magnitude of recall of autobiographical

memories with emotional significance in design conjecturing. However, post-interview reviews (Case Study 2) and unstructured interviews (Case Study 1) about the lives and values of designers were evaluated by Whissell's *Dictionary of Affect in Language*, as well, in order to determine if there is a correlation resulting from any characteristics of verbalization peculiar to

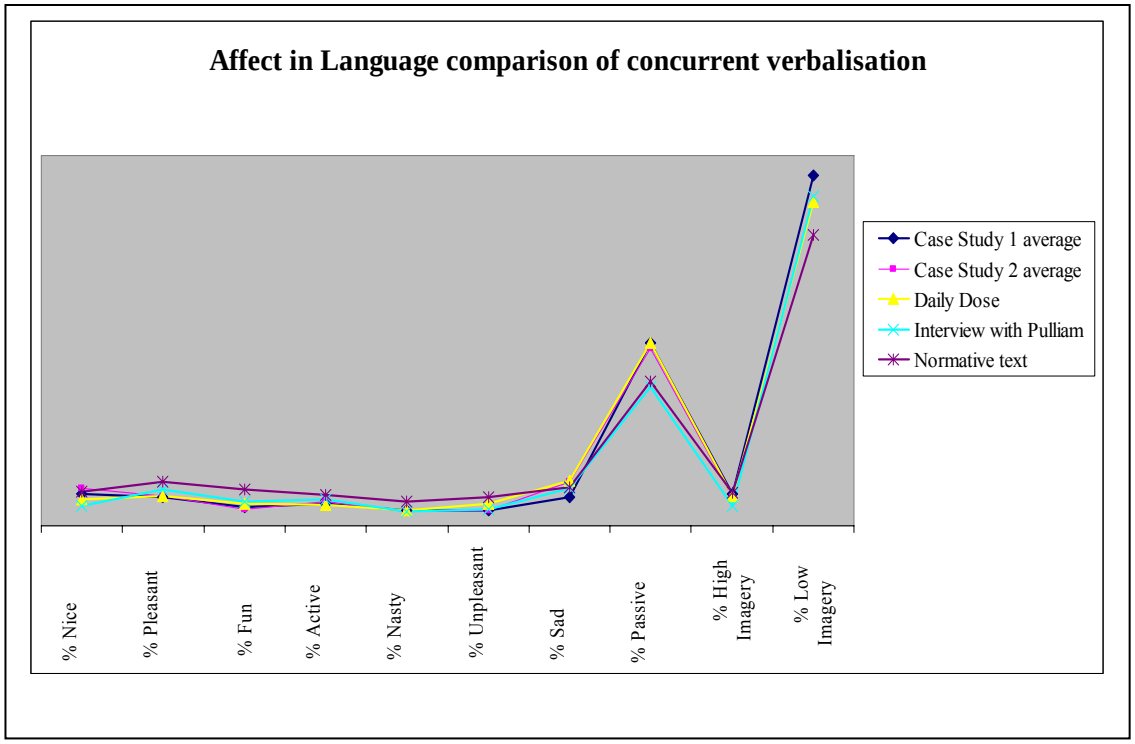

FIGURE 15. Comparison of affect in language of concurrent verbalization.

individual designers. The results of the analysis of affect in language are presented in APPENDIX J, Figures 15, 16 and 17, and discussed below.

The hit rate for words evaluated by Whissell's *Dictionary of Affect in Language* varied from 90% to 98%, which means that 90% to 98% percent (with an average of 96% for the concurrent verbalization and 95% for the post-task interview) of words from the protocols were matched and scored by the WDAL. In other words, over nine out of ten (or in some cases, all) words used in the interviews were assessed by the WDAL; this is a statistically significant rate.

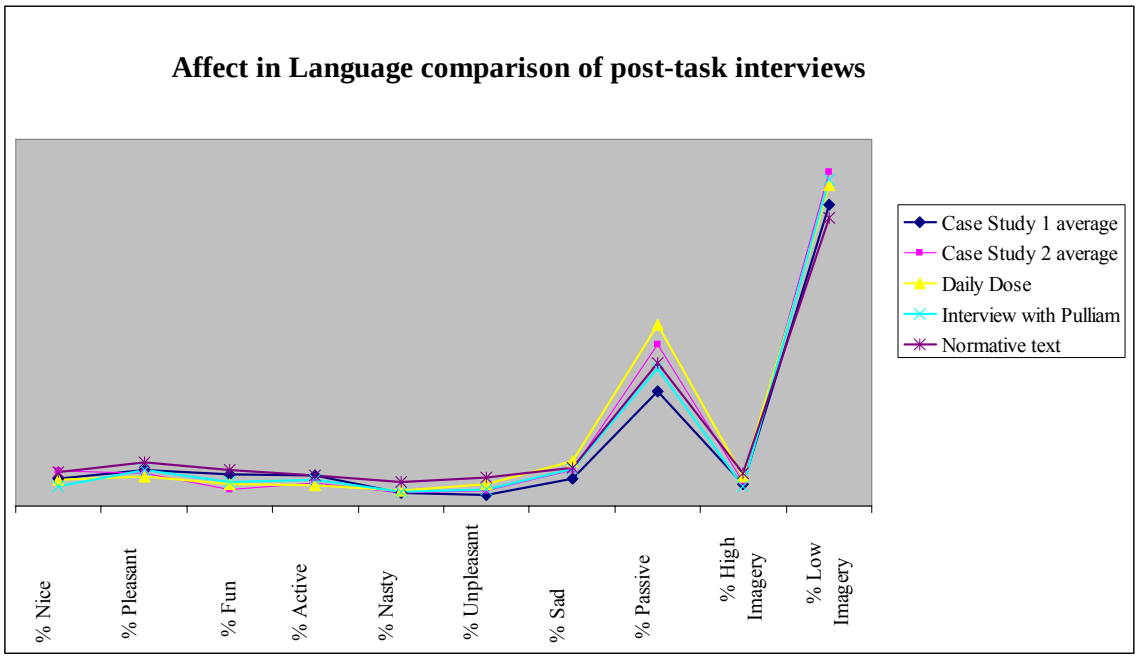

FIGURE 16. Comparison of affect in language of post-task interviews.

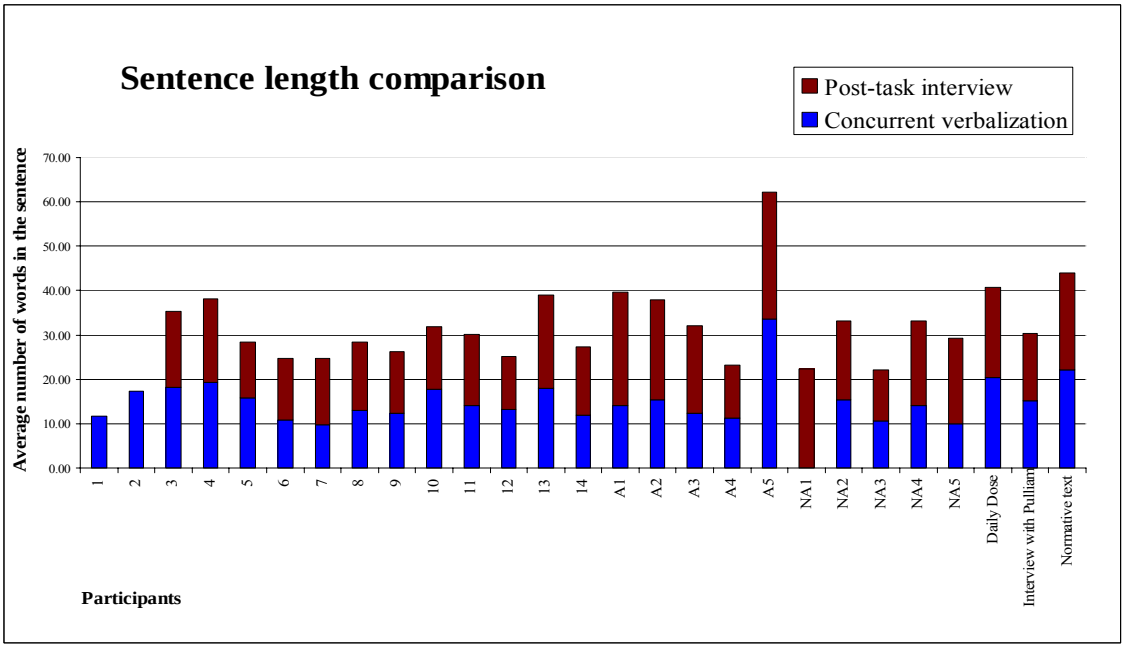

FIGURE 17. Comparison of average sentence length.

Looking at the overall results of the analysis of the entire interviews (including talking aloud protocols, reviews and unstructured interviews) sentence length was generally fairly short (11 to

17 words in a majority of the interviews, and 16 words as an average). This finding is consistent across all of the participants. Only participants A1, A5 and NA1 had an average sentence length over 22 words during the concurrent verbalization. The average sentence length for an adult conversation is 20 words (Whissell, 2001). Since all of the participants were adults, only NA2-NA5s' verbalizations in such short sentences could potentially be attributed to juvenile talk. One interpretation of the sentence length of the concurrent verbalization being substantially shorter than the normal adult sentence length is that the architects did not verbalize all of their thoughts. Referring back to Hogarth's statement (2001) that intuition is hindered by verbalization, I can speculate that designing was, to a certain extent, intuitive or tacit, and when requested to talk aloud, architects were not able to express each and every though or feeling they had. The result was shorter or incomplete sentences. At the same time, the sentence length of the post-task interview and review was about the same – about 17 words on average. Only one participant, A5, had a substantial change in the length of sentences during the interview (29 words).

I analyzed one page of postings from the Daily Dose of Architecture blog (http://archidose.blogspot.com/) to compare the verbalization of the participants in Case Studies 1 and 2 to more general 'architectural talk.' Below are the scores from the Daily Dose of Architecture page:

Hit rate 90%
Mean Pleasantness 1.80
Mean Activation 1.61
Mean Imagery 1.50
Known Adult Words 1219
Child Pleasantness 4.42
Child Activation 3.95
Known Child Words 239
Total words 1470
Mean Frequency 2441.82
Sentence Length 20.42
Sentences 72
Periods 66
Exclamation Marks 0
Question Marks 6
% Nice 3.61
% Pleasant 4.02
% Fun 3.04
% Active 2.79
% Nasty 2.13

% Unpleasant 3.04
% Sad 6.07
% Passive 24.69
% High Imagery 4.02
% Low Imagery 43.72

I also analyzed an interview with an architect, James Pulliam, which was randomly selected from a list of interviews with contemporary architects published by Volume 5 (1997). An analysis of the interview (with the actual questions removed) by Whissell's *Dictionary of Affect in Language* follows:

Hit rate 92%
Mean Pleasantness 1.84
Mean Activation 1.66
Mean Imagery 1.45
Known Adult Words 2527
Child Pleasantness 4.53
Child Activation 4.30
Known Child Words 653
Total words 2754
Mean Frequency 2618.86
Sentence Length 15.22
Sentences 181
Periods 172
Exclamation Marks 6
Question Marks 3
% Nice 2.73
% Pleasant 4.95
% Fun 3.32
% Active 3.60
% Nasty 1.90
% Unpleasant 2.18
% Sad 5.10
% Passive 18.68
% High Imagery 2.69
% Low Imagery 44.52

As we can see, the sentence length in the Daily Dose of Architecture blog interview is basically the average sentence length for an adult conversation, but the sentence length of an interview with Pulliam is consistent with those of doctoral dissertations. Of course, I this comparison I am weighing a written text against the spoken word. Written text is usually composed of complete expressions, while verbalizations have to keep up with the rapidity of human thought. From my fairly small sample of architects who participated in the study, I can say that architects are more

expressive in graphic language (see, for example, the sketches in APPENDICES G and H) rather than verbal language. During the concurrent verbalization of their design processes the participants used frequent incomplete sentences or short statements. The quote: “which usually does not work, but since we are just playing… So there is bathroom here… Simple…” (Participant 7) is typical of the types of concurrent verbalization demonstrated by the interviewed architects. The following is a quote from the same participant describing her life: “So I ended up finishing up, staying there, finishing up in interiors. Got an internship at Gensler, which is a very large architectural firm. And then just kind of started here.” This is, again, a typical language formation seen in most of the interviewed architects. It is very clear from this excerpt that sentences in post-task interviews are short statements, rather than descriptive sentences. However, unlike in concurrent verbalization, in the post-task interview, most of the sentences appeared as complete thoughts.

On the activation, imagery and pleasantness scales, all of the verbalization used passive language. The only time when the language of the participants became active was during the unstructured interviews, when participants could talk about anything important to them and their lives. Half of such unstructured interviews used active language, and half used passive language. I hypothesize that the language was mostly passive due to participants explaining what they were doing rather than actually verbalizing their current thought processes. This is unfortunate, because it shows that I was not be able to analyze all of the thoughts and feelings of the participants in the study, and tacit processes still remain inaccessible. The passivity of the language is characteristic of the written architectural language, as well (see Daily Dose of Architecture scores), and of the retrospective verbalizations (see the Pulliam interview scores). I can conclude from this data that passive language is archetypal for describing architecture and architectural processes, in general.

In reviewing any extremely emotional words used in architects’ interviews and written texts, only the use of sad words is both consistent and predominant. The written text in the Daily Dose of Architecture blog is not very emotional, and neither is the interview with James Pulliam. However, most of the participants in my research used extreme emotional words. About 22%, on average, of concurrent verbalizations, and an average of 24% of post-task interviews were emotionally laden (varying from 17% to 30%, depending upon the participant). The distinction is small but valuable, especially when independently comparing the case studies. In Case study 1,

21% of the language was emotional during the concurrent verbalization, as weighted against 24% in the post-task interview. In Case Study 2, it was 22% verses 23% of emotional words, on average. Evaluating each participant independently, it became clear that when discussing their lives, architects use emotional words more often (for example, 24.5% versus 18% for participant 5). For participants in Case Study 2, such distinctions were less dramatic and sometimes in reverse order: for example, 28% verses 24% for the participant A3, and 25% verses 28% for participant NA2. This is not surprising, as memories of life events are always more emotional than other activities, such as designing. For Case Study 2, the reviews of the findings were also not surprising : since the review and the task referred to the same design brief, the emotionality of language was about the same. The most important fact here is that over 20% of the language the architects used was emotional, which clearly identifies a use of emotions and autobiographical memories with emotional significance during the design task.

Interestingly, in Case Study 1, most of the extremely emotional words were either nice or pleasant, but in Case Study 2 they were sad (in 9 out of 10 participants). I interpret this finding as follows: the participants found the Case Study 1 brief more interesting and personally engaging than the participants in Case Study 2 found their brief. The Case Study 2 brief was a standard architectural brief, and therefore not as enticing for the designers as an open-ended task, and the language reflects that. Many of the participants in Case Study 1 personalized their architectural task, as is evident from the quotes below. This contributed to the pleasantness of the design experience, as is reflected in the language.

> I was recently in a little place south of Paris a couple of weeks ago. And it was a building that has a kind of an intimate courtyard that has a diagram like this (Participant 8).
>
> But the way that I see this is that the shadow of the tree is on my desk while I am outside and kind of been into this kind of whole environment (Participant 3).
>
> Right now I am obsessed with our new house. It is solid and square with the big tree near it. We want to make an addition to it with a long walkway connecting it to the house. And now I though that it may be something like that (Participant 6).

In Case Study 2, the brief allowed for much less personalization, and the extreme feelings expressed mostly related to frustration with the struggle that comes with designing a space, or to some extent a lack of excitement about the task:

> So this is your outdoor extension to the garden which is probably going to be - it's going to be a mixture of light and shade because it's just going to be too dark if it's just completely covered, I'm not sure how it might work. I don't like that at all, I've completely gone off it (Participant A3).
>
> Twenty for lunch. That isn't a great deal of children… which isn't a great deal of children but... that's four children into twenty which is fine. Probably get them in that space, so we could have that corner as the play one (Participant NA4).

All of the protocols for the concurrent verbalization scored high on low imagery. These scores don't necessarily reflect the actual imaginative abilities of the participants, but instead show that the wording architects used during concurrent verbalizations was easy to imagine. In addition, 8 of the 24 participants used high imagery language, with two of the mature architects ranking substantially higher (6.23 and 6.79, as compared to 4.5 in adult language). The interview with Pulliam (1997) scored very low on high imagery (2.69, as compared to 4.5 in adult language) with a 200% high in low imagery. The Daily Dose of Architecture scores are consistent with all of the interviews; however, the distinction from the general adult conversation is not so drastic (4.02, as compared to 4.5, and 43.72, as compared to 39.3). Taken as a whole, architectural language generally uses low imagery words, and is more technical rather than poetic.

Comparing the concurrent verbalization protocols to the protocols of reviews and unstructured interviews showed little correlation between the language used in verbalization and the language used in everyday language. Three of the Case Study 2 participants showed correlations, but this is to be expected because the review of Case Study 2 was closely and directly related to the design task. I can deduce from this data that the language used by the participants during the concurrent verbalization was not as heavily dependent upon the verbalization styles of each of the participants, but rather relates more to the task or to the question.

Overall, I construe that the level of engagement of the participants in the design task clearly showed through their language. The most important finding is that verbalization is not complete or completely revealing with respect to the architect's thought process and feelings. There is

evidently a tacit part of the design process that does surface during the verbalization process. Another critical finding is that up to 20% of the thought processes of the architects during the act of designing relates to emotions and autobiographical memories with emotional significance, as is reflected by the language they use.

Use of Emotive, Embodied and Intellectual Content in Design Thinking

The three major groups of thought content that emerged from the content analysis were Intellectual, Embodied and Emotive. The groups are defined as follows. The Intellectual Group is characterized as 'pure thought,' or involving faculties of logic and reasoning. This group includes the manipulation of abstract concepts, a logical evaluation of design options, and a similar content of thought. The Embodied Group consists of the thought content, as identified by Csordas (1995), perceptual experience, and the mode of presence and engagement in the world. More specifically, this category can be described in Downing's terms (2000:97), which "involve[s] active body-memory construction, event experiences, and significance in conjunction with a sensate experience." This group includes described autobiographical experiences, an understanding of space, a perception of scale, and other concepts that can only be comprehended by a person through some engagement with the world. The term Emotive was adopted from Reddy (1997). In Reddy's work 'emotive' means 'emotional expression,' and stands for an effort by the speaker to offer an interpretation of something that is observable to no other actor (Reddy, 1997); emotives are the expressions of emotions through the use of language, specifically through constructions that explicitly describe emotional states or attitudes. In my study, the term Emotive is understood in a broader sense and stands not only for linguistic constructs, but any constructs that express or pertain to emotions and emotionally significant experiences. The Emotive category includes a perception of self, intra-personal relationships, autobiographical experiences with emotional significance, emotions expressed during the interview, and other emotionally-laden content. The defined categories are fluid; for example, embodied knowledge may have emotional content as well. The groups were established by inferring the prevailing dimensions of the thought content. For example, most categories in the Personality theme were surmised to be Emotive, because emotions prevail against other embodied experiences as we as the logic in a person's perception of self. Figures 15 and 16 present a breakdown of groups of thought content as they emerged from an analysis of the protocols of concurrent verbalization. As we can see from the graphs, half of the content of

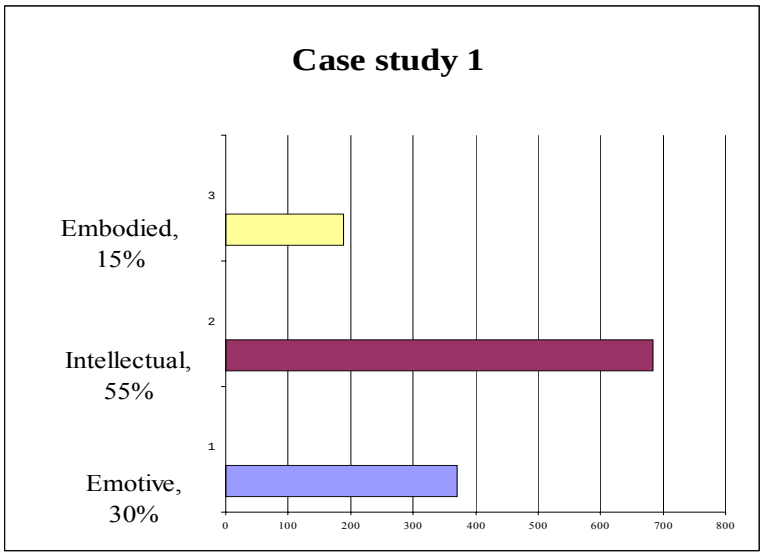

FIGURE 18. Use of Emotive, Embodied and Intellectual content of thought in concurrent verbalization during completion of the task, Case study 1.

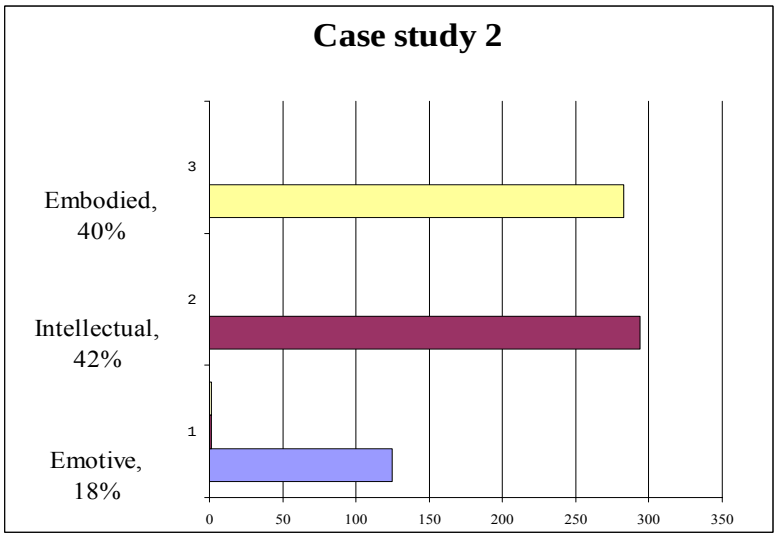

FIGURE 19. Use of Emotive, Embodied and Intellectual content of thought in concurrent verbalization during completion of the task, Case study 2.

thought is Emotive and Embodied, and only half can be attributed to pure logic. This is a very interesting finding illustrating that embodied experiences through emotion, an understanding of space, and a perception of self contribute as much to the design process during the conjecturing phase as professional knowledge, skills, and logic. Looking at Figure 18, we see that in Case

Study 2, a portion of the Intellectual component of thoughts remains somewhat the same and stays within 50%, but the Embodied and Emotional components vary depending upon the task. In Case Study 1 the design task was open ended, poetic, and with limited requirements (in other words, open for interpretation), and therefore the Emotive component played a greater role. In Case Study 2, the Embodied component prevails over the Emotive. Though my study does not allow for making any generalizations, I can hypothesize that a structure of the design tasks

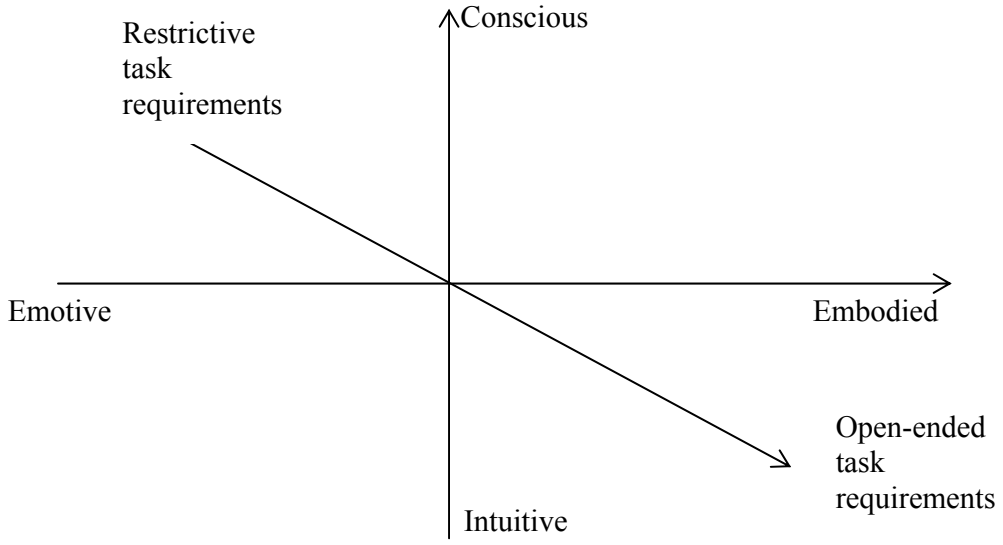

FIGURE 20. Dimensions of consciousness and intuitive use of embodied and emotional content of thought during design conjecturing in relation to task specificity.

determines how much of the embodied or intuitive components that a designer utilizes during the conjecturing process vary fluidly along the scales of embodiment, emotion, intuition, a conscious utilization of experience and the strictness of the task requirements (Figure 19).

Comparing post-task interviews in Case Studies 1 and 2, we see major differences between the use of Emotive and Embodied content (Figure 20). Even though a utilization of 'pure thought' diminished in the review of Case Study 2, it still accounts for a quarter of all thoughts. In the post-task interviews in Case Study 1, however, a majority of the content becomes Embodied or Emotive. Recalling the nature of the post-task interviews in Case Study 1 and the post-task review of Case Study 2, this finding is predictable.

Overall, we see a substantial use of current emotions and autobiographical memories with emotional significance utilized during the design conjecturing process. Further, I shall discuss what kinds of autobiographical memories with emotional significance the architects used, and the purpose of the utilization of those memories and concurrent emotions.

Frances Downing, in her doctoral dissertation (1989), conducted two studies of memorable places used for design conjecturing. Interestingly, though my study and her study took place a decade apart and had somewhat different focuses, the results are similar. The three major themes that emerged in Downing's study were an Emotive framework, an Experiential framework and a Quasi-objective framework. Her definitions of Emotive and Experiential are similar to mine, and Quasi-objective is "defined [as]those constructs where the experience of place was described by participants [in]as objective or intellectual a manner as possible" (Downing, 1989:98). In other words, the Quasi-objective framework, as defined by Downing, is similar as my definition of the Intellectual content of thought. The proportions of the frameworks utilized in Downing's studies were different: for the first study, 25% of the constructs were identified as experiential, 51% as emotive, and less than a quarter, or 70%, as quasi-objective; for the second study, 39% were identified as experiential, 21% as emotive, and 40% as part of a quasi-objective framework. Qualitative studies are very sensitive to setting and time of study, as well as the nature of the participants. Therefore, it is not surprising that the proportion of emotive, experiential and intellectual constructs in my study and in Downing's study do not closely correlate. However, the general outcome is very similar, and this is a critical finding. Both studies empirically support the hypothesis, also suggested by Lawson (2004) and Cross (2006), of a predominance

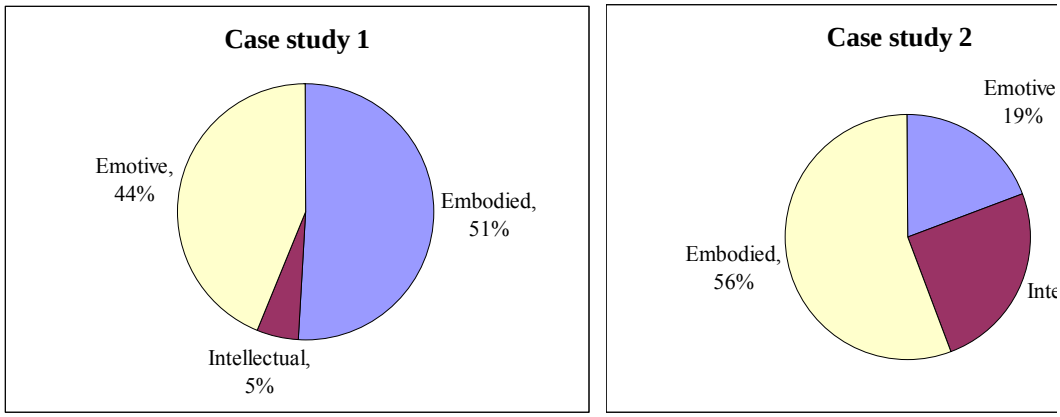

FIGURE 21. Use of Emotive, Experiential and Intellectual contents of thoughts during the post-task review and interview.

of experiential knowledge in design, rather than 'textbook knowledge.' Emotions are central to both memorability and shared meaning, and thus contribute to the overall experiential knowledge of architects.

Types of Autobiographical Memories with Emotional Significance Used for the Design Conjecturing and the Purpose of Such Memories

Before engaging in a discussion of the types of autobiographical memories with emotional significance utilized during design conjecturing and the purpose of those memories, as well as concurrent emotions experienced by the designers, I would like to briefly mention the categories that emerged from the content analysis of the data. A description of the categories with a definition of the content of those categories will help the reader understand how I came to my conclusions. After a brief conversation regarding the outcome of the content analysis, we can proceed to making inferences on how, when, why and what kind of autobiographical memories with emotional significance are utilized during design conjecturing.

Categories Emerging from the Content Analysis

During the content analysis of the protocols, over 2,700 units were established. Those numerable units were classified into about a hundred categories, and sixteen larger themes. Some themes have sub-themes (for example, the design process is broken down to the steps of the process, the values of the designer, various assumptions made, etc.). As described in the Methods section, the protocols of Case Study 1 and Case Study 2 were analyzed separately. Only a few categories that emerged during the sorting varied between Case Studies 1 and 2. To name a few such categories, 'instant idea' and 'possible scenarios' emerged in Case 2, and 'meaning,' 'metaphors based on autobiographical experience,' and 'imagery based on autobiographical experience' emerged from Case Study 1. Certain categories that emerged during sorting of the units from the post-task interview protocol of Case Study 1 were case study specific, due to the different matter tackled during that unstructured interview (the Case Study 1 interview was about the autobiography of a participant, and in Case Study 2 it was a review of the task completed). Family relationships, travel and academic education were themes specific to Case Study 1. Table 3 summarizes the themes that emerged during the sorting, with a general description of the categories content. All of the categories that emerged can be viewed in APPENDIX K.

The quote below is an example of the use of autobiographical experiences with emotional significance that might not be obvious from the quote as explicitly verbalized, but becomes evident due to assumptions made on the basis of personal experiences.

> Press on the desk - desk is important here - makes me think about peace for creating.
>
> So, this is probably a small intimate place (Participant 1).

TABLE 3. General description of themes emerged during data analysis.

Theme	General description
Experience	Travel, learning (including academic education), experience of space, professional experience
Feelings	Feelings experienced in life and during the task
Senses	Sensory experiences remembered, sensory experiences as design considerations, senses named
Form generator	Different types of form generators: imagery, metaphor, abstract associations, memory, meaning of forms, aesthetic preferences, as well as instant idea and intuitive creation of form, as claimed by the participant
Memory	Affective memory and memory of experiences
Collaboration	Collaboration with others and talking to him(her)self
Explanation	Description of what a participant has drawn, naming (this is…), and story or walking the listener through the space
Client	Relationship with client and assumptions about the client
Program	Defining the scope of the project, generation of the program and personal interpretation of the program
Process	Steps of the design process, feelings about the design process, issues specific to a particular process of an individual designer
Inspiration	Inspirations named, and charms
Precedence	Precedents and reference materials
Personality	Personal values and beliefs, perception of self as a person and a professional
Research-related	Questions and opinions about my research
Graphics	Perception of size, graphics as means to learn about the project, presentation
Opinions	Any expressed opinions except for opinions about the study
Personal history	Family, places the participant lived, childhood experiences, hobbies

Taking into consideration similar secondary evidence of the presence of autobiographical memories with emotional significance, my study demonstrates a utilization of the autobiographical memories with emotional significance for conjecturing on any type of the design brief, with an average of 20% of the thought content contributing to the conjecturing. That being said, only 1% of the autobiographical memories with emotional significance was openly expressed (memories recalled and emotions named) during the concurrent verbalization.

This evidence could be explained in two ways: that the use of autobiographical memories with emotional significance is mostly intuitive (Hogarth, 2001), or that autobiographical memories with emotional significance are simply not explicitly explained during the design process. Nevertheless, the use of autobiographical memories with emotional significance appears to be natural to architectural design conjecturing, whether such embodied memories are utilized intuitively or via conscious recall.

Several categories of autobiographical memories with emotional significance emerged during the content analysis: precedent directly experienced, a feeling of space, elements of space evoking a certain feeling, assumptions made based on personal experiences, values and beliefs, sensory experiences, the meaning of place or experience, the perception of the size and space of metaphors, the perception of self as a person, and the perception of self as a professional. Broadly, we can classify those different uses into two groups: place-related and personality-related. In other words, my study confirms that place experience is embodied and learned through direct experience, and the personality of an architect is an important factor in the design process. Now let us examine the different kinds of autobiographical memories with emotional significance utilized, and the purpose of the utilization of such memories in greater detail.

Types of Autobiographical Memories With Emotional Significance Utilized During the Design Conjecturing Process

My study distinguished between several kinds of autobiographical memories with emotional significance utilized by architects during the design conjecturing process. Such memories include memories of specific embodied places (places visited by the participant) or precedents; the elements of embodied places; sensory experiences; and the meaning of place.

Precedent

> I was recently in a little place south of Paris a couple of weeks ago. And it was a building that has a kind of an intimate courtyard that has a diagram like this. And there is some different things in the courtyard. And what happens is the site kind of comes down the road a little bit, then it comes down the hill and drops off. And the building sits like this, so it gets protection from the surroundings. And then this is the road that comes right here, and then I think it comes down like this. And the site is pretty wooded, kind of like that. And so there is a lot of privacy, maybe, perhaps, from the sound of the cicadas. And maybe you can capture them inside the courtyard here. And the whole building floats, and the site goes through. And so what you might have then – pasania tree is a fill-in inside the courtyard. Anyway, that was a very beautiful place that you can imagine. This is open landscape, and the town was way down here some place. You can imagine sounds of animals and insects and trees. I was actually here during the evening; the light quality was quite beautifully coming into the space (Participant 8).

The long quote above presents an example of a direct application of the autobiographical experience with emotional significance as a precedent for the design conjecture. The participant remembered a place he recently visited and experienced that gave him a feeling he wanted to convey with his design for the brief; he literally utilized the elements and typology of the embodied place for the design conjecture. This is one of the most explicit examples of the conscious use of autobiographical memories with emotional significance during the design conjecturing process observed during my study.

At times the precedent was not one particular place, but rather a combination of places experienced, or as Participant 6 called it, an amalgam of places:

> Originally since it said “twilight” I was thinking ocean side kind of, but as I got into it, a tree got more sense, a tree sort of suggested a mountains dry place where cicadas would be met. I don’t know. And now it is kind of turning into an amalgam of places I’ve been, places where I take my dog hiking. Mountains are over there. I don’t go hiking every day, usually about once a week. If I get up early enough before it gets really hot, because my dog will not drink water unless she is at home (Participant 6).

The excerpt above summarizes this participant's use of autobiographical memories with emotional significance: an 'amalgam of places' that are special for the participant. The post-task interview allows for some insight into the meaning of those places, such as where this participant took his dog hiking. The person, at the time, was single and had a very strong bond with his dog. The period in the morning when they went hiking, and the quiet places they walked, allowed for contemplation, reconnection with nature, and a sense of peace within his soul. This participant consciously recalled autobiographical memories with emotional significance to re-establish those types of feelings (like the one in the previous example), but also to remember the actual experiences of those places in order to use elements of those embodied places for the design task at hand.

Elements of Places

As we saw in the previous examples, the architects recalled specific places to capture the feelings associated with and the meaning of places. Some of the designers first recalled autobiographical memories with emotional significance, analyzed them, and then use their characteristics and elements in design conjecturing.

> Okay, "twilight cicadas"- that reminds me of the south, that is a sunset kind of thing, hearing lots of noise. So that is audio, a constant kind of beat, it reminds me of the south and of the sunset, primarily of the nighttime. So for me that's kind of a romantic notion. Whoever wrote this or this is my client to have a flair for drama (Participant 4).

In this quote, the participant was consciously recalling autobiographical experiences with emotional significance that he associated with certain notions from the brief. He goes beyond simply remembering places or feelings to analyze such embodied experiences, and deduces the characteristics of the client based on his analysis of his own experiences. This is a longer deductive sequence of thoughts, all based on his memory of autobiographical memories with emotional significance.

Sensory Experiences

> When I do design I make references to the experiences that I've experienced – whether this be the sound of the frogs or the cicadas, and light. Light is a major influence on my thought, the play of light and the play of time (Participant 12).

In this excerpt from a talking aloud protocol, the senses are clearly named. The architect refers to the sensory memories of sounds and light. Sensory experiences and memories of such experiences appeared to be rather important during the design conjecturing process. Recollection of the sensory qualities of embodied places helps architects grasp the 'feel of place.'

Meaning

Of course, autobiographical memories with emotional experience were often recalled to comprehend the meaning of place or experience:

> "Press on my desk". It is harder for me to approach it, it seems more mundane, a lot more mundane, less poetical. And that caught me off guard after working with the other parts. This part is kind of spanned me around in a different direction. Now I am seeing something more rigid, something more true (Participant 12).

The bodily memory of pressing on the desk changed the entire direction of Participant's 12 design, due to its meaning to the participant. Every memory recalled by the various participants had a meaning, and this meaning was projected onto the design at hand.

> It seems like I am more interested in light and the actual noise, possibly actually capturing issues of time, which implies issues of life and death, which means then you can see the actual physical transformation of a cicada as it goes through it. It's life and death (Participant 4).

<u>Emotions Experienced During the Design Conjecturing Process</u>

Not only autobiographical memories with emotional significance were utilized during the design conjecturing process, but emotions experienced were used as well. Participants experienced emotions om reference to the client, about the project, and about certain elements of the project. When designing, often it was the 'feeling of place' that a designer tried to capture and express. I will refer to the emotions in this subsection as 'feelings' because this is what the participants called their emotions during their interviews.

Feeling of Place

The quote below presents an example of a designer talking about a place they are trying to design:

> To me this is an a place of inspiration, a work inspiration connecting with whatever forces – if you want to be religious about it or you want to be just spiritual about it – that kind of connect us to whatever consciousness is out there that we tap into or where artists get their inspiration (Participant 3).

It is very clear from the excerpts that it is not an abstract architectural form or style that the designers endeavor to create, but rather it is the 'feel of place' or 'atmosphere' (Zumthor, 2006a, 2006b) that they want to capture. Though with this quote we don't directly observe a recall of autobiographical memories with emotional significance of similar spaces, such memories must be used intuitively to make a designer feel in certain way. Only through direct experience can we gain an understanding and embodiment of space (Langer, 1980; Israel, 2003; Bloomer and Moore, 1977). Therefore, in order to be able to utilize such knowledge and understanding of space, an architect must consciously or intuitively refer to the embodied experience of it, recall the emotion, and only then transform that powerful autobiographical memory with emotional significance into the new place.

Feelings about the Client

Humans are social beings, and we always experience feelings when we interact with other people, even imaginary ones (like the client in the design brief). The designers were not indifferent to whom they designed for:

> Like this person is really stuck, whoever wrote it, for some reason they are held in space of what they've written for whatever reason. That's why I am drawing these tall weeds all around everything (Participant 6).

It is common sense that the client's needs would need to be analyzed by the architect. But architects also try to understand the client as a person, through shared feelings and meaning. Experiencing the shared feelings and establishing shared meanings help the designer to capture the 'feel of place.'

Feelings about the Project

We are never indifferent to an activity in which we are engaged. Designing for an architect is an emotional experience in itself. Almost all designers talk to themselves during design, and everyone interviewed expressed feelings about the project assigned. Let us look at a couple of examples:

> Kitchen is a bit of a pain, should be up here somewhere… (Participant A4).
>
> And you'd think oh gosh this doesn't work that doesn't work, and the best way I think to cope with it is to stop thinking about it, because if you carry on you can spend hours (Participant A1).

Sometime the feelings about the project and the act of designing were positive, mainly focused on satisfaction with the results or with the process of designing; other feelings experienced most often were frustration when an architect struggled with designing a form or place that should capture the feeling and meaning of place he or she is trying to project.

Now that we've described the types of autobiographical memories with emotional significance the designers recalled during the conjecturing process and their concurrent emotions, we shall now review the purpose of the recall of those memories. Some of those purposes I have already mentioned (for example, capturing the 'feeling of place' or the meaning of place), but I would also like to provide the reader with a more detailed discussion of the purpose of such recall of autobiographical memories with emotional significance.

Purpose of Utilization of Autobiographical Memories with Emotional Significance

Capturing 'Feeling of Place'

When architects design, it is not only a form and a function of place, it is a 'feeling of place' or 'atmosphere,' and a meaning of place that they try to convey with the new places they create.

> At twilight sound is hollow, at night it is mysterious. From when I was a kid I remember cicadas' noise as very nice that I was falling asleep and waking up under. This is a little muggy, peaceful, mysterious Oregon memory (Participant 1).

In the quote above, the recall of the emotionally significant memory is clear. This memory from childhood allowed the participant to re-evoke a feeling she wanted to capture in her design for that brief. There are multiple similar examples in almost every interview, which allowed us vividly to see how an architect recalls a feeling of place in order to create a similar feeling of place for that place they design.

We saw previously that architects also look at the characteristics of places that can help them create a certain 'feeling of place.' An example below demonstrates this:

> The reason for the curve design, if you actually have a glazed curve then if you stand there, it feels like you're almost outside - it sort of blurs the distinction between inside and outside and it sort of just, [inaudible] and it's quite a welcoming shape, so when you come back in, it's very pleasant to walk into (Participant NA2).

In the quote above, the participant does not refer to a specific memory, but rather to an embodied experience of curved, transparent shapes. I will speculate that this is an autobiographical experience, this inviting feeling and connection with nature previously experienced in a transparent building that allowed the Participant NA2 to project those emotions and embodied experiences onto design.

Metaphor

> So there is some kind of dynamics there just in the first phrase – "The twilight cicadas." So I do not know what that defines, but I want to set up some kind of datum that expresses a dynamic movement across a certain rhythm (Participant 12).

As expected, we found that architects use metaphors for design conjecturing. The metaphor joins reason and imagination (Cytowic, 1993). I can speculate that this architect recalled an autobiographical experience with emotional significance that he used as a metaphor, even though 'dynamic' is an embodied concept. Further in the interview, we see the proof of my assumption:

> This dynamic rhythm of a place of contemplation, thought study. I guess, when I do design I make references to the experiences that I've experienced – whether this be the sound of the frogs or the cicadas, and light. Light is a major influence on my thought, the play of light and the play of time.

Lakoff and Johnson (1980) wrote that we live by metaphors. Architects live and create by metaphors. This finding is not new, but my research did support this previously known fact.

Use of Precedent

I would like to repeat the quote from the interview with Participant 8:

> I was recently in a little place south of Paris a couple of weeks ago. And it was a building that has a kind of an intimate courtyard that has a diagram like this.

The reason I wanted to repeat that quote is because it is the most obvious example of direct utilization of a precedent to the brief at hand. The participant recalled a place he visited recently and used the typology of that place as a diagram for his design, in order to capture the same atmosphere of that place.

Understanding of the Notions of the Brief through Recall of Place-Experience

To understand the client and the kind of place to be designed, participants broke down their brief into distinct notions, or parts. Then they tried to understand each notion or part in order to be able to grasp the desirable qualities and the atmosphere of the design as a whole.

> The pleasant images that came to my mind had mostly to do with a desk against the wall that had a window in it with light coming through. Also, I have a recollection of the painting I did when I was in graduate school and I wanted to do painting. I drew the window of the room and shadow coming in. It had a distinct sort of recollection for me (Participant 2).

The two notions from the design brief – twilight and desk – are apprehended by the designer through the recollection of an autobiographical memory with emotional significance, in this case a memory of a similar scenario involving an experience of light in an environment with a desk. This example is one of many where the memory of experiences assisted the designer in understanding the task.

Understanding of the Notions of the Brief through Recall of Intra-Personal Relationships

There are two parts to each architectural task (1) the physical, which involves the building itself and the program for that building, and (2) the human, which is the client and the experience of future users of the building. To understand the client and the client's needs and wants, architects rely on shared experiences through their autobiographical experiences with emotional significance:

> At a studio, at a movie studio there are people that have different production deals or something. We just hired a producer, and when they are coming to the studio we have to create a space. And they are going to develop a movie based on that or whatever. So what kind of deal does this person have – is it like Steven Spielberg who is going to come work on the lot. Or is that people out of college, who wrote one hot script and who

> are going to come and we have to design space for them. So depending on what kind of deal they have - this is where politics come involved – because there is always reality to design process (Participant 9).

The example above is different from the ones I quoted before. The use of the participant's previous experiences is evident, but the emotional content of this experience is not clear. Working with people always involves emotions. Going into the field of politics in this case brings us to emotional intelligence, a definite characteristic of Participant 9. Discussion of emotional intelligence is beyond the scope of my study, but I would like to mention that one aspect of emotional intelligence is emotional awareness (Business Summaries, 2001). The next example is almost an exact opposite. It is a clear reference to autobiographical experience:

> Here is a lot of association with both images and words. Now I think that should be like a concrete shelter that is fully padded inside so you cannot hear the cicadas. Maybe the guy is absolutely insane because the cicadas were driving him absolutely crazy. All the childhood memories… They are all kind of jumbled, they are not distinct (Participant 1).

This excerpt from an interview with Participant 1 brings us to a discussion of another finding of my study: the personalization of the program. All participants made a good number of assumptions about the project itself and the client. Those assumptions made on the basis of the architects' experience, prioritizing the elements of the design task and certain decisions made during the act of designing were reflections of the architects beliefs, values and experiences.

Personalization of the Design Task

One of the results of this story that I found fascinating regards the personalization of the design task. Jane Darke (1979), many years ago, was one of the first researchers to write about this fact. She expressed her discovery through her Primary Generator – Conjecture – Analysis model. Other researchers later proved the discovery (Downing, 2000; Israel, 2003). Peter Lloyd (1994:145) noticed that with experience, designers begin "to interpret the problem situation fitting it within their own procedural experiences of designing." Designers first impose their own structure on the problem, which helps them control the situation. "The generally experienced designer has then made a transition in encapsulating his own personal preferences, judgment, and problem experience into procedural knowledge that can pre-structure novel design situations" (Lloyd, 1994:145). My study supports the finding that designers personalize their

design situation. I will now follow with examples of how autobiographical memories with emotional significance are used by architects to personalize their design situations.

Primary Generator

The Primary generator is defined as is a component of designers' cognitive structure, a subjective objective or a group of objectives, strongly valued and usually self-imposed by the designer, that generates a design solution. By the use of a Primary generator, the designer limits an overwhelming number of project requirements to a handful that can offer him or her a way into the problem.

> What if I was asked to design this desk. So the first thing, I suppose, I would do just as a base – I would use the numbers of five, seven, five [haiku structure] (Participant 5).
>
> The first thing to ask you was about the site. I mean are there any trees on the site because it's quite a leafy area (Participant A4).

The Primary generator can either be given elements (like the site or the desk from the quotes above) or be of personal choice (like the example below).

> It's quite important I think to hear, seeing the children are so small, that there's nowhere where they can't sort of see outside you know where, for example here, they're too short to look out the window… (Participant NA2).
>
> And that is not an urban setting. It cannot be an urban setting to me (Participant 11).

The Primary generator can be an overall approach to design (called First Principles by Cross, 2003):

> I like to think of myself as a very analytical person, so I am going to approach cicadas in biological, anatomical approach (Participant 13).

Personal choice or assumptions made about the project and the client that serve as a Primary generator and a program depend upon the structure of the design brief. A comparison of the protocols of concurrent verbalization in Case Studies 1 and 2 supports this statement. While in Case Study 2 the architects began creating a solution for the design task from working with elements of the site or a given program, designers in Case Study 1 treated the brief more freely, to the point of almost negating given requirements and creating their own:

> When I am given a design task similar to this, really all I can do is take what little I have here and really create my own design problem, something that I am familiar with, instead of trying to piece together something that seems fairly nonsensical (Participant 13).

Assumptions about the Project

Another way designers personalized their design situation was through assumptions made about the space, client and the project in general, based on personal experiences and preferences. The types of assumptions made about the project in general, the space and the client were task-specific and task-dependent. In Case Study 2, most assumptions were made about the space and possible needs of the clients, while in Case Study 1 most of the requirements, an understanding of the client and the task were interpreted to reflect personal values and experiences.

> Right now I am obsessed with our new house. It [my house] is solid and square with the big tree near it. We want to make an addition to it with a long walkway connecting it to the house. And now I though that it may be something like that (Participant 7).

As we see from the excerpt, this designer personalized the design situation by literally make it their own – by calling upon the designing of her own house.

Assumptions about the Place

The majority of interviewed architects made assumptions about the place they were working with. We saw from previous examples how architects tried to understand and capture the 'feeling of place,' but they also made assumptions about where and what the place could be, based on autobiographical experiences. In the example below, the designer called upon a memory of travel:

> I say that [that place of design is not in the US] because I found from traveling… (Participant 10).

Assumption about the Client

> And it is twilight, the shine is just breaking through, and there is still the last of the shadow, last of the shadow of the pasania tree. And the cicadas are singing because the light is coming. And then I am here and I am working on my desk, and I am pressing

> hard on my desk, I am pressing hard on it. A thought or a vision, whatever that might be. (Participant 12).

In the quote above, we see how the architect tried to understand their client by assuming his role, imagining himself as a person who wrote a haiku and is working late at night with cicadas singing. For this participant, working late is a common situation, a vivid autobiographical memory with emotional significance of working at a desk late at night with the shadow of a tree falling onto his space through a window, the door to the outside open, and the sounds of the bugs in the distance. The intimate memory allowed the architect to make an assumption regarding how the client would feel and proceed to design a place that would capture that feeling.

The more the design task leaves for interpretation, the more autobiographical experiences and personal values and beliefs the designers bring to the design. The above architect brought not only autobiographical memories with emotional significance to the process of design conjecturing, but their personal preferences, values and beliefs, as well. Self and Designer are inseparable, and the self of the designer influences his or her design decisions.

Personal Values and Beliefs

> This is kind of part of the environment, it is very much a part of the environment. So, I think also that the client not always is a part of the environment. This space is elevated up in the air to see even farther than just where they are currently stationed what they currently see. They can get up high and actually look around and be inspired by things beyond their immediate environment, kind of take it all in. And I think, this place is also very airy, without any walls. It's just an area of platforms up high in the environment.

The conjecturing by Participant 5 quoted above does not seem to be related to autobiographical memories with emotional significance until one learns more about the participant. Other quotes from the post-task interview with this participant explain a lot:

> Growing up traveling was probably the biggest impact on me. We had a motorhome growing up. And so by age twelve I traveled forty eight out of fifty States, several times. We would take these summer vacations that are four-five weeks long just travel through States. It was great experience just to see everything, it was fantastic. That includes like Canada, we went to Canada, saw a lot of outdoors, saw a lot, had a great life.

> e you going to go to Death Valley? Go see Death Valley. You got to. As far as anything, that's so different from anything else around. It's going to be hot this time of the year, but it's an amazing, it's shocking. I mean you'll never see such a wide-open landscape, and you feel so little in this big huge place. It's amazing.

From the above, it is clear that not only autobiographical experiences with emotional significance but also the personal values of the designer are projected onto the design conjecturing process. It is not possible to tell from the concurrent verbalization whether the utilization of autobiographical memories with emotional significance in the case of Participant 10 was conscious or intuitive. Since no evident recall of embodied experiences happened during the conjecturing, I presume that autobiographical memories with emotional significance were used intuitively. Later during the interview, those memories that floated into the short term memory during the design exercise became conscious and were verbalized by the participant as he described his life.

Another way the designers expressed their personal preferences, values and beliefs was by paying more attention to certain parts of the design, or simply by imposing personal opinions on the project:

> I think the building should be a bit more fun than just a like… (Participant A3).

Phrases such as 'I like it' and 'it feels right' for an experienced architect seem to be just as valid for judgments or reasons as a logical and systematic rationale for a decision.

Intuitive Use of Autobiographical Memories with Emotional Significance

I have provided numerous examples of conscious recall of autobiographical memories with emotional significance utilized for design conjecturing by the participants in my study. In addition to conscious recall, participants used such memories intuitively. An example from Participant A1's concurrent verbalization is a good case in point:

> because at that age they have a lot of energy and if it's raining and they can't go outside, they go absolutely frantic and run round and round the room, and if there's somewhere where they can let off steam it.

First, some familiarity with children's behavior, experienced personally, is evident from the quote above. If irritation with such behavior can be sensed from reading the excerpt, the analysis

of this quote by Whissell's *Dictionary of Affect in Language* openly scores it as highly unpleasant. We can speculate about the autobiographical memories with emotional significance that Participant A1 relied on, though it is not apparent from the verbalization. Because intuitive use of autobiographical memories with emotional significance is unconscious and not verbalized during the design session, and possibly not even realized by the designer, detecting those memories is nearly impossible.

We can only guess what initiated a certain thought or design decision when it was made intuitively.

> Immediately I sort of look at it as almost like a pavilion as opposed to… I mean I suppose it could be attached to that as a building, in a built form but… (Participant A3).

Instant ideas don't come from nowhere; they either spark from our memory without conscious recall or as intuition based on subconscious evaluations of a situation. We know that Participant A3's decision to make the structure pavilion-like was intuitive, but we have no information on what prompted this intuitive judgment. My dissertation study has demonstrated that autobiographical memories with emotional significance are used both consciously and intuitively; however, the magnitude and type of intuitive utilization of such memories was impossible to distinguish.

Task-Specificity of Use of Autobiographical Memories with Emotional Significance in Design Conjecturing

One aspect that became apparent while comparing the protocols from Case Studies 1 and 2 was task-specificity and task-dependency of the use of autobiographical memories with emotional significance during conjecturing. The common sense hypothesis of the conscious or subconscious recall relevant to the task of design conjecturing proved to hold true. The magnitude of such use of memories with emotional significance and types of memories recalled depend upon the task and personal involvement of the designer with that task.

> It's almost quite difficult to know what to do with the outdoor area as well, instead of just boxing it in with a fence. They like to hide don't they, and run around. Probably best to give them little to hide in. Probably be quite nice to have the hard surfaces, sort of give them little paths so they can, so that they can... hide them away behind the bushes

> so they have to follow the path to see where it goes - because I remember doing that when I was about two.

Participant NA2 (the author of the quote above) used his memories of childhood and playing outside for design conjecturing. The emotional content of the memory is not clearly evident from the quote. Overall, Case Study 2 had fewer clear examples of the use of autobiographical memories with emotional significance.

In Case Study 1, with an open-ended brief, the recall of autobiographical memories with emotional significance was abundant and each participant utilized such memories for design conjecturing. Verbalizations from Participant 14 (below) provide an ideal example:

> So, this is a client, who likes this haiku, I guess, since that refers to that. So, it should be something, I guess, that has indoor-outdoor space, I would say, or space where you could hear the outside, or see the outside. So, maybe that is something very simple like a porch. So that's it – just a porch. So, I guess, this has to do with experiences. And I think about my experiences of indoor-outdoor space, and cicadas, and sounds of them, and time I spent on the porch thinking, watching the stars. And protected by the cover of the porch, and also being outside and inside at the same time. That's all I am going to do. Just draw a porch, a very simple porch.

There seems to be a correlation between the type of brief and the unconscious use of autobiographical memories with emotional significance. The less freedom the brief provides, the more unconscious the use of such memories becomes.

I cannot, however, claim the task-dependency of recall of autobiographical experiences with emotional significance. Other factors could play into the situation to produce the same results. For example, the participants in Case Study 1 were expert designers, and participants in Case Study 2 were novice designers. Therefore, not only the task but the expertise of the designers could be the determining factor regarding the utilization of autobiographical experiences with emotional significance in design.

Summary

To summarize the findings of my study, I first have to remind the reader that the conclusions I can draw are specific to time, place and participants, which cannot be generalized to the entire architectural population. I also need to mention that it became clear from an analysis of the language that the designers did not verbalize all their thoughts and emotions during the interviews, which undoubtedly affected the findings.

The study proved the utilization of autobiographical memories with emotional significance during design conjecturing. I used three means of data analysis (direct analysis, indirect analysis of interviews, and analysis of affects of language with Whissell's Dictionary), all of which led me to conclusions I made. First of all, the overall emotive content of thought during the design conjecturing process is significant. Emotions experienced during the design process, memories with emotional significance, personal values, beliefs and attitudes expressed all constitute at least 20% of that thought content. Embodied experiences through emotion, an understanding of space, and a perception of self contribute even more to the design process during the conjecturing phase, at least as much as professional knowledge and skills, and logic.

The use of autobiographical experiences with emotional significance is task-dependent and task specific. The types of memories used reflect the brief. A comparison between Case Study 1 and Case Study 2 allows us to make the conclusion that the more open-ended and open for interpretation the design task is, the more autobiographical memories with emotional significance architects use to assist them in design conjecturing.

The types of autobiographical memories with emotional significance used during the design conjecturing process include memories of specific places, elements or combinations of previously experienced places, memories of sensory experiences, and the recall of places or events that bear certain meaning. The recall of autobiographical memories with emotional significance assists architects in re-creating the 'feeling of place' or the meaning of place, understanding the client, and understanding the design task. They also use places and events from memory as metaphors or as precedents for design.

All architects personalize the design situation. Autobiographical memories with emotional significance play a major role in such a personalization of the design situation. They can serve as

a Primary generator, and help the designer to narrow the number of requirements of the given program. They allow an architect to make assumptions about the client, the place and the project in general, that makes a given project 'theirs.' Designers also bring the entire Self to the drafting board, and express personal values and beliefs in their designs. There is still more to uncover with regards to autobiographical memories with emotional significance that are used both consciously and unconsciously (intuitively). A further study similar to Israel's psychological investigation (1993) is need in order to uncover the intuitive use of memories in design.

Notes

1 When the subject of the study is the investigator himself or herself, such study is called introspective.

2 A structured interview, also called a survey, is a method where each subject responds to exactly the same questions and in the same order.

3 During the unstructured interview, questions are changed or adapted according to the flow of the conversation, situation and previous answers provided by the subject. There was no pre-set list of questions.

4 Longitudinal studies involve repeated observations of the same items over a long period of time.

5 Clinical studies are conducted in laboratory conditions and involve fMRI or similar devices that allow the recording of physical changes in the subject while the subject is undertaking a certain activity.

6 Tacit knowledge is unconscious, and people are not necessarily aware of possessing it. Tacit knowledge provides a context for places, people, ideas and experiences.

7 Starchitect is a neologism used to refer to celebrity architects.

8 An architectural brief, or simply a brief, is another term for the design task or, in a broad sense, the requirements for the space/building that an architect's design is to meet. The term is used mostly in Great Britain, and is adopted for my dissertation in order to eliminate confusion in differentiating a full set of design requirements from smaller tasks within the design process.

9 Interestingly, the WDAL manual does not provide a definition for 'affect.' Since the goal of the Dictionary is assess emotional words within a text, I can hypothesize that affect in language as used by Whissell stands for the proportion of words with emotional connotations to neutral words used in a text.

CHAPTER VI

ARCHITECTURAL EDUCATION

The ultimate goal of my research is ambitious: to introduce substantial changes into architectural education. I began my study with a belief that what we teach architecture students in academia is not enough, or at least that the focus of education is not where it should be. The insight regarding what could fill the gap came to me when I was returning from my first trip to the United States. I had a rare chance to attend Texas A&M University for a year, after completion of four years in the architecture program in Russia. After the end of that academic year, I went to France as a participant in a research project. I then traveled in Europe on my own. Upon my return, I still had two years of my degree in architecture to complete. Even though I took a range of courses and had a good time in the US and in Europe, I didn't believe that the experience fundamentally changed me. However, my architecture tutors immediately noticed that my understanding of place changed drastically. I was a little startled by this observation and began thinking about why some designers become good architects, and others never do. For example, in my graduating class, every one of us took the same classes and with the same professors, so our respective educations were fundamentally the same. Of course, there is talent and dedication that play into professional development, though those couldn't account for the only deciding factors. This led me to ask: is autobiographical experience important? I wanted to find out. After reading Downing (2000), Israel (2003), Pallasmaa (1996, 2005, 2007), and Perez-Gomez (1987), it seemed very clear that autobiographical embodied experiences are not only important to the ability to design, but absolutely critical. This conclusion led me to another question: does architectural education stress this connection?

In this chapter I present two papers on architectural education. The first paper presents an overview of the current state of architectural education. The second paper talks more in depth about the importance of embodied experience to the ability to design, and provides some suggestions regarding architectural education reform that might help students become better designers. At the end of this chapter, I will provide a summary of this review of architectural education, and supplement it with further thoughts on what can be done to facilitate positive changes.

General Overview of Architectural Education*

"Architecture is a distinct epistemological category, a Practical Art, occupying its own cultural territory" (Cunningham, 2005). Architecture has always been a very complex discipline; it becomes more and more so with new, rapidly developing technologies, and the changing demographics of the world's population. As educators of architecture, we get so caught up in trying to keep up with this fast-changing world and profession and staying current with the latest gadgets that we lose sight of the big picture. I believe that we need to ask ourselves the important question once again: what is the goal of architectural education today? Is this goal going to be the same tomorrow? Is this goal focused on mere vocational training, or is it rather on the advancement of the profession? Questions regarding the refocusing of key objectives in the university education of an architect have been raised before (Fran, 2005; Bermudez, 1999), but they continue to be unresolved.

The discussion of education first raises an obvious question – who do we ultimately want to graduate? Who is this person, what kind of job can they assume, and what professional responsibilities they are ready to accept? Currently, many students graduating with a professional degree in Architecture begin their career as draftsmen or provide other types of rudimentary assistance to the design office. Is it worthwhile to prepare skillful trainees, or should education aim to coach designers who can pick up technical skills after entering practice? Over thirty years ago, Leslie Martin (1970) wrote in "Education around Architecture" (as quoted in Nicole and Pilling, 2005:439), "the important aspect of [architectural education] is not the known professional habit but the discovery of process or thought and [its] relevance to the social tasks in a changing world." In addition, I would add: to instill values related to the public domain and the common good (Glasser, 2000). Education is not about education, but rather about approach.

<u>The Changing World</u>

With a changing population (Martin and Cassault, 2005), increasing migration, and technological

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progress, boundaries of time and space are blurred, and the practice of architecture becomes increasingly international. How can we deal with 'glocalisms'[1] (Teymur, 1992), in architectural education? European schools have been hit first with the necessity of responding to those factors. In 2001, the European Association for Architectural Education set building blocks towards a "mobility of students, modularity, flexibility in the curricula – necessary for the cultural, regional and pedagogical diversity it considers to be of large value for education in architecture in Europe" (Speridonidis and Voyatzaki, 2005:51). Because of the changes in current lifestyles, technology and architectural practice remain the main factors that give definition to the universities and students' experiences within the universities. Most were almost nonexistent before the 21st century[?]. Identity of place, identity of time, identity of the student community and identity of the scholarly community in Europe are mostly not relevant anymore (Speridonidis and Voyatzaki, 2005). It becomes critically important to give contemporary architecture students a sense of meaning in an 'unlimited, decentralized, globalized world' (Havel, as quoted in Speridonidis and Voyatzaki, 2005:64) A META-University has been created (http://www.meta-university.eu), and is currently breaking ground in advancing both a curriculum and structure for university education in architect in a global world.

The complexity of today's world is tremendous, and this reflects on the profession of architecture. As estimated by Joseph Hudnut (in Wesley, 1984), it will take 22 years to give graduates competence in each and every discipline they need to know to become successful practitioners. Since 1940, the date of the Hudnut findings, the time required for thorough preparation of graduates has probably at least doubled as the knowledge and demands of the modern world grow in geometric progression.

> The request for 'relevant' forms of new knowledge is… distracting, because what is new now is going to be out of date, irrelevant even, by the time our students face the world. Societal, and the spatial constructs are emerging with such rapidity that we are can no longer educate for a fixity; instead we must educate for moving targets (Till, 2003:173).

He adds (*ibid.*): "the radical contingency of architectural practice demands new forms of education, not new forms of knowledge." Attempts to respond to cultural, technological and economic changes by adding more courses to an already overwhelming curriculum are pointless, because such attempts don't prepare students any better for practice (Moore, 2001). It seems to be more important for architects to develop a sense of critical judgment, rather than to possess an

in-depth knowledge in a variety of disciplines that most architects deal with on a daily basis. Acquiring multiple modes of thinking, rather than learning particular ways of doing, might be the key. This leads us to a discussion of the system established for teaching a 'designerly way of knowing' (Cross, 2006), the Studio.

The Studio Culture

In the past 60 years, our world has been changing with incredible speed. The profession of architecture has changed drastically, as well – from the design and communication processes we now utilize to the shapes of spaces we can create, to construction methods applied, to materials used, safety requirements in place, and the emergence of new professional relations. Architectural education, however, continues to utilize models established almost 400 years ago. Norman Blogster (2008) believes that design is simply a myth. Dr. Garry's opinion that

> the studio system of education is… a fantasy world in which incompetent professors who are the centre of petty personality cults encourage bizarrely unrealistic expectations in students, while avoiding the teaching of anything actually to do with the hard realities of life (Garry, 2001).

Robert Campbell, architecture critic for The Boston Globe (as quoted in The Chronicle for Higher Education, October 22, 2004) echoes Garry:

> Most people dislike the buildings that architects love most, and part of the problem is that architecture is taught within the culture of academe. University professors tend to believe, falsely, that architecture is primarily an intellectual activity, just like, say, philosophy. They dream up totally unreadable theories

that can lead architects to "build for their peer group, and the hell with the rest of the world." Blogsters' Garry and Campbell's points of view might be a little extreme, but they are not too far from reality. Jean-Paul Scalabre (2005:28) is somewhat more objective:

> the profession has the temptation to criticize a lack of realism in the school's curricula and a non-suitability of education to what is supposed to be the needs of the profession. On the other hand Schools seem to be destabilized by the frenetic movement of society; they loose their references and do not know what kind of future has to be proposed to the students.

The studio system has been criticized over and over again for the a of intellectual rigor (Cunningham, 2005; Glasser, 2000), for an authoritarian nature, for teacher-centered organization (Porter and Sotelo, 2004), for its culture (Nicole and Pilling, 2005; Glasser, 2000; Harder, 2003; Teymur, 1992; Austerlitz *et al.*, 2002; AIAS, 2002), and for the very value of the studio for architectural education (Rappaport, 1984; Fisher, 1991; Salama *et al.*, 2002; Archvoices, 2005; Salama and Wilkinson, 2007).

One issue that is hardly ever addressed in a discussion of studio teaching, or even of architectural education discourse, is that a great majority of educators in architecture schools did not receive any formal teacher training (Nicole and Pilling, 2005; Glasser, 2000; Moore, 2001; Ochsner, 2000). Some educators have been exposed to the theories of the educational processes, many coming from either direct practice or research that was never fully performed. Teaching studios and the entire studio culture relies on educators' personal experiences as former students in architecture and their subjective understanding of how studio teaching should happen. This is a prime example of the blind leading the blind. The Interior Design Educators Council has been nurturing the idea of professional training for interior design educators. Maybe soon, design academia will have a first echelon of professional educators to step in.

Regardless, the education of an architect still places the heaviest weight on the studio. However imperfect the studio can be, it is still the best existing system for educating architects. Proper preparation of design educators and new methods of teaching design based on 'hard core' research rather than on personal preferences and attitudes can produce revolutionary results and bring substantial change to architectural education.

<u>Education vs. Profession</u>

Should education mold and continuously adjust in response to the needs of the student, the professional, or financial institutions' opinions and demands? Or should education have its own objective and path? The discussion during the European Association for Architectural Education 2005 meeting (Spiridonidis, 2005) stated once again the historically uneasy relationship between the architectural profession and education that continues to be unresolved. There is no question that the task of academia is to prepare graduates to enter the profession. But is that all? Should education also take a lead and advancing the profession, or are we comfortable in the role of little brother? The architectural profession in its current state is in turmoil, due to contradictions

within the profession. These contradictions result from difficulties arising from a specialized and fragmented production system, constantly increasing demands from society, an escalating complexity in the profession itself, and a toughening competition with the non-architectural professions that share the same market (Nicole and Pilling, 2005; Spiridonidis and Voyatzaki, 2005; Seidel, 1992). Gutman states that it is simply that "professionals are increasingly confused about their task" (in Nicole and Piling, 2005:232). In its current condition, the profession can provide little if any guidance with regards to architectural education (Moore, 2001). Architectural education trying to look up to the profession and struggle to fulfill its immediate needs is senseless in terms of strategy. Unlike the profession, architectural education can maintain a critical position between the profession and society (Spiridonidis and Voyatzaki, 2005); it has the luxury of being imaginative and realistic without becoming mundane and subservient (Teymur, 1992). It has the ability to experiment and theorize freely. Education should take charge and lead the architectural profession, rather than be continuously led, examined and validated by it. This has been done before (Bauhaus and Vhutemas set such precedents), and it can be done again.

Closing

With major world changes due to many factors – climatic change, population change and mainly technological advances – and the profession of architecture transforming to respond to those changes, the education of an architect is due for a new paradigm shift (Bermudez, 1999; Nicole and Pilling, 2005; Spiridonidis and Voyatzaki, 2005; Malecha, 2006). It is up to us, the educators, to make it happen. I raised several important questions, the most important of which is: "What is the goal of architectural education?" Now is the time for the global community of architectural educators, professionals and researchers to open a dialog and to form the goal and ideological conviction required to transform architectural education, and to make it more suitable for what Architecture will be in the world of tomorrow.

An Embodied Approach to Learning*

I would like to address the issue of disembodiment in design education. I shall argue that for the ability to design, students' personal experiences are of as much importance as the training that formal education imparts. The embodiment of formal concepts through personal experience yields true education. I shall also address the issue of the inherent disconnect in architectural education. Each subject and discipline taught within the curriculum is usually approached independently, making it difficult for students to establish a connection between the various fields of knowledge. Again, the separation of the self from the profession can be held accountable for this disconnect. Students do not mediate between the specialized knowledge that they acquire through their own personal experience, thus building chasms rather than bridges between the various pillars of knowledge.

Teaching does not necessarily result in learning. Understanding the many design concepts inherent to architecture can be achieved only through direct experience. Notions like comfort, privacy, and sense of home cannot be taught or understood by cognitive thinking alone. Reflections on experiences allow for a holistic approach to learning via a continuous process of giving meaning, and of categorizing new experiences and information. Learning is always a product of previous experience, context of culture and the role of others in the present. To assist students in learning, we must assist them in finding connections between those experiences they had and information yet to be learned. It is especially important at the introductory design level because incoming students have nothing to refer to but their previous experiences. Such a learning-to-learn approach can help students become lifelong learners who can go beyond memorizing isolated pieces of information and mastering limited skills to establishing a fluidity between domains and engaging in reflective practices. I shall suggest that hands-on exercises, continuous inter-disciplinary projects, and self-reflecting practices may allow students to gain insights and link their past, present, and future experiences into embodied designs.

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Knowledge in the Technological Culture

"The existentially most important knowledge of our everyday life–even in the technological culture of today–does not reside in detached theories and explanations, but it is a silent knowledge beyond the threshold of consciousness that is fused with the daily environment and behavioral situations" (Pallasmaa, 2007:771). We learn every moment of our lives, even if we don't realize it. Everything new that we learn, we interpret in terms of our prior experiences, beliefs and values, and our current goals. "In architecture, a realization of this personal dimension of knowledge is paramount" (Perez-Gomez, 1987:58). In design education, the realization of this personal dimension is vital. Personal grounding allows the embodied making of an architect, and it is this personal grounding that must become the basis of the education of the architect.

Professional education emphasizing technical knowledge and skills poorly prepares students for practice (Yinger, 1987). We only scratch the surface when we teach students the discrete disciplines of history, technology, and various techniques. It is not through usage of recognizable and marketable architectural forms, nor through a refining of one or two techniques learned in school, nor fitting the current dogma or detached experimentation with new materials and technology, that one becomes a good architect. It is through a deep understanding of the human being as they exist in a dwelled place, and a personal reinterpretation of this understanding through an architect's own techniques. This is what comes together to make a good architect. Architectural education lays the foundation for such understanding, and for a development of the skills to be manifested in material form.

Currently, the curriculum in architectural education is derived primarily from the Ecole des Beaus Art's tradition (Garvin, 1964). Over the years, the architectural curriculum has endured a myriad of transformations, leading to more amorphous pedagogical initiatives and the continuous addition of new courses to meet the demands of practice. Obviously, the onus of education cannot be on the curriculum; it must be on the pedagogical approach to learning. Unfortunately, the emphasis on performance and evaluation targeted towards sustained accreditation and improved ranking among schools, based on performance and evaluation, is a deterrent to nurturing this emphasis. As a result, rather than inculcate mediation between modalities, architectural education defines boundaries between domains (Downing, 2000), and as a result, students struggle to juggle among them.

Landrum (2004) stated that the overwhelming problem in education today is students' neglect in recognizing their own relationship to the very reality in which they dwell. Understanding of place cannot be taught; it can only be learned through one's sensory and emotional engagement with it. Often, design exercises in academia are meant to teach students to abstract. We give students exercises–a set of rules guiding them through generalizations and a reduction of information content to a concept, an image somehow distilled from a real world to a pure form. Students learn the steps of getting from point A to point B, but do they really learn to extrapolate and abstract genuine learned experiences into future places? Instead, maybe we need to allow students to investigate their own processes of embodiment and develop their own processes of transforming those embodied experiences into new architecture, whether through abstraction or reflection.

Embodied Realities

When professional education discarded the apprenticeship model, knowledge through analytical thinking superseded learning through practice. The emphasis shifted from learning by doing, contemplation of an activity and a consequence, to "pure" thought, to learning theory and techniques, and to abstract analyses of lectures by knowledgeable researchers (Hoberman and Mailick, 1994). Perhaps there is a lesson to be learned from the fact that vernacular buildings are commonly considered both humane and sustainable; they are built from embodied experience. In an age of information overload and technological sophistication, by the time the student graduates, his or her tools are already obsolete, and therefore the internship model in practice is firmly in place, where the student must re-learn in context, and unlearn what is no longer relevant to the industry. Students in architecture schools cannot win the race with technology. Education must equip them for challenges in a swiftly changing world by relying on their inner resources. As we become more connected to a shrinking world, connections with our own embodied cores become weaker, transient, and heavily mediated. In this context, architectural education must accept the challenge to triangulate the *what*, *why*, and *how* of architecture with the critical *who* of each of our own embodied realities.

Information vs. Knowledge

> This field [of architectural practice] becomes increasingly oriented to the pursuit of symbolic capital and disconnected from the life-world of everyday experience… The

> values of the field also permeate architectural education with an increasing specialization in the production of symbolic capital (Dovey, 2005:293).

We are all familiar with Internet's neat summaries, infinite links to information, and images (Beckett, 2007). It is comfortable to open a laptop and peruse through endless imagery on any subject readily available through Google or any number of other aptly-named browsers.

Since students now have much more plentiful and easier access to information, it seems like they should, consequently, have more knowledge. However, it is a mistake to classify knowledge, "the normative frame for our praxis" (Perez-Gomez, 1987:57), as identical to information. Today, people have an overwhelming abundance of information, but very little knowledge. The internet allows for a seductive ease of information access, but our profession puts pressure on informed design. It is not the collection of facts and figures that allows one to gain knowledge or to create good architecture.

> Architecture is not the embodiment of information; it is the embodiment of meaning… Knowledge must be understood as a possession of embodied consciousness qualitatively different from superfluous information (Perez-Gomez, 1987:57).

Even now, in the digital age of fictitious realities, we live in our bodies and create meaning through our bodies and their interaction with reality.

Starr-Glass (2002) has a very useful analogy for territory (actual experience) and the map (representation of this experience) that is figurative, but cannot be substituted for the actual territory. We should explore the territory, and not the map. In design education, we need to rely on embodied, and not on mediated, experience. Many curricula of architectural education now introduce computers very early. However, with an emphasis on abstraction and media we can only map the map, but not the territory. "Thinking and feeling ourselves as they make sense is more than merely the sensation of knowledge in making. It is a sensing of ourselves in the making, and is that not the root of what we call learning" (Ellsworth, 2004:1)?

Experiential Learning

There is a significant body of literature today, making the case for the crucial and inevitable role of embodied relationships (Csordas, 1994; Downing, 2000; Israel, 2003; Johnson, 1989, 1990; O'Loughlin, 1998; Pallasmaa, 2005, 2007; Perez-Gomez, 1987). Unfortunately, this argument is

still under-represented, and architectural design education remains too abstract, too theoretical, and too mediated. "The prevailing educational principles fail to grasp the indeterminate, dynamic and fundamentally sensuous and holistic essence of human existence, thought, and action" (Pallasmaa, 2007:769). Experiential learning of real world problems is what allows for embodied learning.

Webster (2001) provides a useful summary of influential theories and variations of experiential learning adopted by different professional programs. Learning by doing, problem based learning, and project-based learning all exemplify the superiority of experiential learning over traditional models. Even though architectural education was the first among other professions to use project-based learning as the core of education, the role of reflection in the learning process and the role of subjective embodied experience in understanding a conception of place have often been overlooked.

Experiential learning is the type of learning that naturally occurs when the learner is an active participant in a real life event. By default, this experience is embodied. Even though Dewey (1933), the father of experiential learning, did not believe that experience without reflection produces real learning, I believe that embodiment that occurs during experience is the only way to achieve an understanding of place and a meaning of an event. Reflection takes this understanding to a different level; it helps this understanding to float up onto the level of consciousness. Kolb's cycle of experiential learning (1984) summarizes what seems to be obvious: understanding cannot be imposed or transmitted by direct action. Knowledge must be constructed by the learner though a transformation of personal experience. Towards this objective of constructed knowledge based upon an embodiment of experience, Upali Nanda and I (2008a) propose a three-part teaching and learning process that can address design education within the current format. Once inter-woven with the existing fabric of architectural education, students' embodied intuitions will be enriched, allowing for a balance of collateral and collective experience, including (1) immersion, (2) connection, and (3) reflection and communication.

Immersion

Students must dwell in the places they study. To make design decisions, they must immerse themselves completely within a built environment, or draw from the environment in which they are immersed. Such immersion would mean an elimination of abstract exercises, reducing studio

time and increasing travel, field trips, or sessions in natural/inhabited surroundings. Learning for architects has traditionally involved exploring actual places, as well as learning through interaction with clients, patrons and contractors, and through processes of designing and construction. Such learning is real, rich, and personal; it can easily be drawn upon in more abstract exercises such as the creation of a two dimensional representation of buildings, or a drawing. When directly lived through, perception and actual experience of a place "contracts and expands in relationship to a person's emotions and state of mind, sense of self, social relations, and cultural predispositions" (Low, 2003:12).

Immersion must not be just at a physical, or merely a cognitive level, but rather at an emotional level as well, because human experience is grounded in emotion.

> It is the embodied self which expresses feelings and disposition, and which thus communicatively inhabits its places in the world. The body as action and communication can only be so through emotion. Major educational policy and curriculum discourses still tend to assume that there exists an independent reason or cognition which operates independently to effect the acquisition of knowledge within the minds of learners (O'Loghlin, 1998:280).

In my view, architectural education should be pre-K style: learning about one's immediate environment through sensory and emotional experiences, playing with building blocks, and reading books that describe those experiences in a simple way, but in architectural terms.

Immersion should also include exercises similar to Israel's (2003) 'design psychology toolbox,' facilitating an exploration of a person's intimate connection with place. Such exercises help to uncover the experiences of past places, to draw upon those remembered places and their qualities, and to translate their elements and meaning into a new design. Using such a toolbox can teach students how to transform embodied experiences into conscious design tools. Once students are introduced to the process of immersing in the environment, and within their own consciousness, they can create their own processes for translating those experiences into designs.

Connection

Bourdieu (2002) said that space frames social practice; McCann (2005) called space "the empty container of experience," and Dovey (2005:291) wrote "architecture is the practice of 'framing'

the habitat of everyday life, both literally and discursively." Students must be exposed to architecture in the context of real life—not as an object of art, but as dwelled places—to facilitate the connection of architectural experiences to their autobiographical experiences. Immersive experience must be connected to the creative endeavor that is at the foundation of architectural education.

In order to forge these connections and to properly understand them, students must be encouraged to take electives in the social sciences, such that they are better able to connect the human experience of dwelling with the making of place. Hands-on, design-build exercises that help students connect autobiographical experiences to learned formal and technical concepts must build upon the theoretical foundation studied in classrooms.

Architectural designs should also offer connection-hubs, a range of places and cultural settings for students to connect with people of different cultures, different fields of education, and different points of view. A connection hub, by definition, must be outside the studio environment. It must take students out of their studio-world, into the big world where ideas are exchanged and experiences are lived. Through an experience of other cultures, both geographic and academic, students gain great insight into their own cultures and the self that exists within it. Universities allow students the opportunity to amass a repository of embodied experiences to draw from when designing an individual, unique "pattern in language" in their minds (Alexander *et al.*, 1977; Yinger, 1987). This pattern in language constantly changes, together with experience, while allowing for a recognition of the framework and providing for a basis of communication.

> It is, rather, a structure of an imaginative process that we bring to experience by way of anticipating recognizable forms, but which is then re-formed by its imaginative instantiation in a particular situation (Johnson, 1989:370).

In other words, once we have a library of embodied (in this case, architectural) forms, imagination can transform those forms into new imaginary or real places.

Relying on a student's embodied experience is crucial for teaching architectural language. The terminology that students learn in academia contains a significant amount of "jargon shaped by assumptions, prior conceptualizations, and academic traditions" (Starr-Glass, 2002:228). In order

to translate this jargon into a usable language, there needs to be shared meaning (Starr-Glass, 2002), and the only way to have that is through shared experience. When we teach new concepts and terms, references to students' autobiographical experiences are much more productive than academic readings of Kahn and Le Corbusier alone.

Reflection and Communication

Most educators in the field of architecture are familiar with Schön's (1983) "reflection in action." Stump and McDonnell (2001) introduced the notion of "reflection on action." Reflection *in* action refers to reflecting attempts in order to solve the problem at hand. Conversely, reflection *on* action draws on the experience of an action as a whole. Reflection *on* action can be called experiential if we define such learning in Kolb's terms (2001) as "the process whereby knowledge is created through the transformation of experience." Experiential learning is more powerful than traditional modes of learning, as it is continuous; it involves intrinsic motivation[2], emotional connection, bodily participation, and interaction with others. Reflection *on* action should become a regular practice in the design studio.

Students must take time to reflect on their experiences, both in school and outside its confines. In this fast-paced world, without the time and effort to reflect, both immersion and connection can become fleeting phases with no lasting effect on the design process or on the student's learning. It is important that pressures from presentation be lifted periodically in order to emphasize the depth of a particular thought and the ability to communicate it meaningfully. Experimentation with media and communication techniques (oral, written, and visual) must be encouraged to allow students to express their subjective experiences better.

"Experience is not an orderly sequence of events but the narrated reflection of being" (Starr-Glass, 2002:228). When we relate to prior experience, that experience is explored, reinterpreted, and redefined, depending upon the current situation. It is a process of "investigating multiple and everchanging metaphors" (Starr-Glass, 2002:229). Research on reflection in design typically addresses studying the design process (Dewey, 1933; Pereira, 1999; Shön, 1983; Webster, 2001). I would argue that as part of an understanding one's own design process, it is critical to understand the sources of design imagery. Design decisions are often reached intuitively, even though the process of formulating the various solutions may be argued rationally. Israel (2003) and Downing (2000) investigated how the embodied experiences of designers are used as

imagery during the design process. Tracing back those embodied experiences and reflecting on their transformation into new places is necessary for quality designers to reach their full potential.

There are various ways to introduce reflection into the architectural curriculum; currently, video and blogging are probably the most enjoyable for students. Video recording of students working and interacting with each other can be both revealing and powerful (GTC, 2007), as it allows students to see themselves with someone else's eyes. Almost everyone now has a blog, a Facebook or Myspace page. Many of our students are very disciplined about writing in their Facebook or Myspace blogs every day, describing what happened, reflecting on the day's events, and networking with peers and strangers. Design education can build on the popularity of such online communication utilities, in order to help students reflect on their experiences as they relate to architecture and learning. Experience, embodiment, and reflection can all allow students to create their own architectural language–a framework specific to a unique person marking how they understand the world and how they translate this understanding into the creation of truly meaningful places—or in other words, architecture with an embodied soul.

Devoy (2005:283) posed a critical question for our times:

> We experience architecture primarily in states of distraction; we live in it first and look at it second. Our contemplative gaze falls upon 'architecture' within a spatial world we have already silently imbibed and embodied. How do we reconcile this unreflexive embodiment with the production of architectural imagery, everyday life with architecture as discourse?

The answer is through immersion, connection, reflection and communication.

Some Thoughts on Architectural Education

In one of my previous papers (Solovyova, 2008), I made an argument for using embodied intuition in design as a tactic. Designers do use intuition (though they don't always call it so or admit to it). As it is embodied, it relies on our *entire* experiences, and memory allows for a construction of the future. Of course, the discussion of education is much broader than looking at individual aspects like intuition or a design-build. A lesson is to be learned from the fact that what was considered good design a thousand years ago is still appreciated as good design. There

must be universal qualities of design beyond flabbergasting technological and material innovations. Unfortunately, the discussion of what good design means is outside the scope of this dissertation. However, it is a critical issue for design education. If the purpose of design education is not helping students learn how to produce good design, then what is it? Vocational school is sufficient for acquiring the basic skills in drafting and putting together construction documents. Designing in architectural practice can be as little as 10% of the total time spent on a project, and in large practices only about 1/3 of architects design (Part IV, 2008). Every graduate gets to do his or her share of drafting, laying out drainage or specifying tubs and toilets. There is no question that basic skills and knowledge are essential to enter the profession. But if it is not that 10% of design than distinguishes architecture from the builder world, what is it?

Design studios emphasize and overemphasize design. Balance between technical disciplines and the design is a never-ending battle in architectural education. Over this battle, over attempts to keep up with the profession's demands, over our own academic polemics about importance of design or research, we begin to miss the big picture. We can't teach design; we can only help future designers find their own processes and make connections to their embodied experiences in order to facilitate an understanding of how to design Architecture. As educators, we heavily underestimate the critical contribution of students' autobiographical experience and shared knowledge. Newstetter and McCracken (2001) published a fascinating paper on design knowing and learning. They once again confirmed that learning is filtered and interpreted through the learner's previous experiences. "Our hunch is that students of design have well-developed prior conceptions and theories about the nature of design that conflict with understandings held by expert designers" (2001:63). They acknowledge that even though theories that students bring into the classroom are usually naïve (as compared to those of expert designers), they often possess robustness. Downing (1989, 2000), Israel (2003), and my own study (see the Empirical Study chapter below) confirm that it is embodied personal experience that serves as a source for design solutions. And it is autobiographical experience that allows a person to develop shared meaning. Negating or ignoring each student's vast autobiographical experiences that will, regardless of our will, predict all of our architectural futures does a great disservice to architectural education.

Teaching methodologies and strategies, goals and current critical issues of architectural education are the main emphasis of all conferences and other activities in the Association of

Collegiate Schools of Architecture (https://www.acsa-arch.org/home.aspx), most academic professional organizations and individual faculty members. New teaching methodologies and approaches are constantly being developed and tested. Different issues are brought to the table by the profession (not only of architecture, but other disciplines as well). The community has its opinion as well. So do students (AIAS, 2002). There even exist societies of researchers, teachers and professionals dedicated to particular theories; one example is the Design and Emotion Society. The Design and Emotion Society is committed to an integration of "salient themes of emotional experience into the design profession" (http://designandemotion.com/). Another society that is worthy of mention is the Design Research Society, a multi-disciplinary international community dedicated to all aspects of research in design, including research informing design education. It is near impossible to mention all of the organizations, associations, societies, and especially individuals suggesting reforms and changes in architectural education. The two I mentioned above, I respect personally for both their focus and their professionalism.

I would like to mention two theories of design pedagogy, not necessarily new but far from being mainstream. One relates to the mission of the Design and Emotion Society, and to a large extent relates to my own beliefs. Emotions are important, embodied experience is important, and both need to be brought back legitimately into design education. Design build studios and study abroad programs are now common to most architectural programs. This is an exciting step in the right direction, but it is only one step. A majority of coursework is still independent and lecture-based, and very few design build and study abroad programs incorporate the levels of reflection so critical to learning.

Another approach I would like to mention is designing by narrative. Narrative in design has been investigated theoretically (Danko *et al.*, 2006), professionally (mostly in interactive design and visualization, for example Broden *et al.*, 2004, but also in art and architecture, for example the Telling Places conference, http://www.tellingplaces.co.uk/), pedagogically (Porter and Sotelo, 2004; Danko *et al.*, 2006) and empirically (Danko *et al.*, 2006)[3]. The importance of narrative in design is not a question. As Porter and Sotelo (2004:1) state, "there is no design in silence." Preliminary qualitative studies, observations and reflection all show the usefulness of narrative incorporation into the design process as a pedagogical tool (Porter and Sotelo, 2004; Danko *et al.*, 2006). The cases using narrative in design all used both professional and creative writing in

all steps of the design process. Some of the advantages include a reflection on students and teachers' culture, visions of the world, assumptions of cause and effect; stimulations of the mind to explore the unexpected and innovative; understanding intuitions; envisioning places from the user's perspective, understanding human-centered design issues, multi-sensory and psychological design considerations; improvement of interpersonal skills; facilitation of holistic thinking; and a greater use of the imagination. This incomplete list of benefits of incorporation of narrative into design seems to show great potential for the overall method. Design as a narrative is also one method that promotes reflection, and shifts the focus of design from visual language and pure form to an understanding of human conditions and place.

I proposed a few ideas Upali Nanda and I developed in "An Embodied Approach to Learning," a paper discussing what can be done to help students learn design. Our suggestions are only a few in the vast pool of pedagogical developments in architecture, but implementation of strategies allowing students to build an understanding of design from their embodied experiences is a step in the right direction. Before analyzing, abstracting and transforming, one must experience. The actual experiencing, sensing, perceiving, and establishing of emotional connections to a place is required for learning design.

Notes

1 Glocal is a neologism uniting 'global' and 'local.'

2 Engagement in an activity voluntarily, without obvious external inducement, is called intrinsic motivation.

3 Narrative in design is not the main focus of this dissertation; therefore, a full overview or literature review is not provided. Four references were chosen to represent the different approaches to studying and testing narrative in design.

CHAPTER VII

CONCLUSIONS AND PARTING THOUGHTS

Conclusions

As is the case with much research, I have only begun to tap into design behavior. While providing a few answers, my dissertation leads to more questions on the nature of designers' image banks[1] and the design process. In this chapter, I will outline how I see the research presented in this dissertation, discuss possible applications to architectural education, and pose future research questions. The summary of this research is a typical synopsis of study results, similar in format to almost any dissertation. The parting thoughts, however, are more stream of consciousness. It is an effort to represent a dialog I've been having with myself over the years; I invite the reader to participate in this dialog and hope that together we can find the answers to these very important questions.

Summary of Research

In the Introduction I stated the three hypotheses upon which this study is based. My empirical research proved all three hypotheses correct, at least to some extent. Let me first remind the reader of these hypotheses:

(1) Hypothesis 1: Autobiographical memories always include emotional content that could stimulate the development of design conjectures.

(2) Hypothesis 2: Autobiographical memories of emotionally significant experiences are used both consciously and intuitively.

(3) Hypothesis 3: Autobiographical memories of emotionally significant experiences are mostly used to help the designer achieve a certain desired 'feel of place.'

Below is a summary of the findings related to each of these hypotheses. A detailed discussion of the findings can be found in the Empirical Study chapter.

(1) Autobiographical memories do not always include emotional content that can stimulate the development of design conjectures. However, at least 1/5 of all thought content during design conjecturing is emotive. A majority of autobiographical memories recalled during design conjecturing is related to the architect's attempt to create a desired 'feel of place' and does have emotional content capturing that feel.

(2) Autobiographical memories with emotional significance are in fact used both consciously and intuitively during design conjecturing. The intuitive use of such memories came across very clearly, but the extent and their content was difficult to identify. A further investigation focusing exclusively on the intuitive aspect of the design process is necessary.

(3) Expert architects don't approach the design of places from the standpoint of functionality and pure form alone. They strive to create places that convey a certain feel, an atmosphere. To be able to generate an atmosphere in the new places an architect designs, he or she has to rely on autobiographical experiences of places that evoked such feelings for them, on the emotional sensibility of a perception of place, and give physical form to the remembered experience.

In my research I attempted to answer several questions. To some extent, I was able to answer all of them (as outlined below). The list below presents a brief summary of the findings that are described in greater detail in the Empirical Research chapter. Due to the study design, no conclusions can be made beyond the population, time and cases studied.

(1) *Do autobiographical memories with emotional significance always contribute to the development of conjectures?* Autobiographical memories with emotional significance definitely contribute to the development of archtiectural design conjectures. Every participant in the study utilized autobiographical memories with emotional significance to generating conjectures, to varying degrees. The extent to which autobiographical memories with emotional siginificance contribute to conjecture generation depends upon the brief at hand and the expertise of the designer.

(2) *If possible to discern, what is the proportion of autobiographical memories with emotional significance to knowledge used in brainstorming?* Often autobiographical memories with emotional significance are used subconsciously. Subconscious thoughts are always difficult to investigate. Even neurological studies using fMRI machines can't always provide definitive conclusions. The qualitative research in this dissertation attempted to interpret the observed scenarios, and as a result I was led to the following deductions. At least 1/5 of all thought content during the design conjecturing process is related to autobiograpohical memories with emotional significance, and their concurrent emotions. Both direct and indirect analysis, as well as an analysis of affect in language, led me to the same inference. This finding is consistent with the findings of Frances Downing (1989, 2000) and Toby Israel (2003). Even though the proportion of emotive content versus intellectual content is about 20% to 25%, versus 50%, it is still significunt.

(3) *When do autobiographical memories with emotional significance, as opposed to knowledge, contribute to brainstorming?* One interesting discovery was the consistency of use of the intellectual content of thought during the design conjecturing process. If the proportion of emotive and embodied content varies according to the design task and expertise of the designer, knowledge or intellectual content remains approximately the same (at around 50%). Emotive content seems to contribute to brainstorming mostly in the recall of personally experienced precedents, feelings of place and the qualities of places evoking the feelings the designer wanted to capture in the new place. From my research, I concluded that the ability of a designer to create a certain feeling of place is heavily dependent upon his or her autobiographical experience. As I argued in the Empirical Study chapter, the boundaries between the established categories of thought content are fluid. However, in general, the emotive and embodied content is as important as knowledge and logic. The emotive and embodied content of thought allows the designer achieve the qualities and the feel of place they design, while knowledge and logic are necessary to test the generated solutions against set criteria.

(4) *How (if at all) does the choice of primary generator depend on autobiographical memories with emotional significance?* The choice of primary generator is based on the designer's beliefs and value system, and obviously on the design brief. Autobiographical memories with emotional significance contribute to the construction of the self, the designer's beliefs and value system, and through that to the choice of primary generator. Such a choice of primary generator is always subjective and depends on many factors. One of the factors is autobiographical experiences with emotional significance. This clearly shows through in the pesonalization of the design task and the way assumptions about the project at hand are made.

(5) *What kind of autobiographical memories with emotional significance are used during brainstorming?* There is a range of autobiographical memories with emotional significance utilized during brainstorming. As can be concluded from my research, those memories typically relate to the place, the sensory qualities of the place, the feeling of the place and the meaning of the place.

(6) *What is the correlation between task complexity and autobiographical memories with emotional significance; thematic/accounting form generation and autobiographical memories with emotional significance; professional experience and autobiographical memories with emotional significance?* The dependence on utilization of autobiographical memories with emotinal significance for a design task became very clear from my study. If the complexity of the design task can be interpreted as related to the open-endedness of the design task (when the designer has not only to respond to the requirements but to structure those requirements), then there is a positive correlation between the complexity of the task and the use of autobiographical memories with emotional significance. The more open-ended and complex the design task, the more the designer relied on their autobiographical expereinces. I have not investigated the link between the autobiographical memories with emotional significance of the designers and their expertise. However, previous studies (Downing, 1989, 2000) suggest that maturer designers exhibit greater fluidity between domains and rely more on autobiographical experience. One of

my findings indirectly suggests the same. The participants in Case Study 2 utlilized autobiographical memories with emotional significance less than participants in Case Study 1. In the Empirical Study chapter I suggested that this finding could be explained by the task-specificity and task-dependence on utilization of autobiographical memories with emoitonal significance. However, the expertize of the participants also could be a contributing factor, as all participants in Case Study 2 were amature designers, and all participants in Case Study 1 were designers with at least five years of experience.

In an attempt to answer my research questions, I made several additional discoveries. I would like to discuss them in the following subsection, as those discoveries pose questions for further research.

Parting Thoughts

Further Research

The study undertook in this dissertation is only a beginning to what will probably be a life-long research interest. It opend up many questions that need to be addressed. Design is a very complex process and presents a challenge to anyone investigating it. Understanding human memory and emotion has been a struggle for researchers in a variety of disciplines from neuroscience to philosophy, for hundreds of years, and there are still many questions to be answered and new theories emerging every day. What follows are several findings from my study that lead to questions for further inquiry.

(1) The use of autobiographical memories with emotional significance during the design process is often intuitive. In the Embodied Intuition chapter I made a claim based on previous research, that intuition is embodied and often plays a role in decision making. Research into the unconscious processes of architectural design is needed to be able to assess the full extent and types of memories used in design conjecturing.

(2) I did not investigate the relationship between designers' expertise and utilization of memories with emotional significance. It is a known fact (Downing, 1989; Lloyd, 1994; Newstetter and McCracken, 2001; Cross and Edmonds, 2003; Cross *et al.*, 1996) that novice designers' behavior differs from the behavior of

expert designers during the design process, especially with respect to autobiographical experiences and the way knowledge is handled. A further study of the relationship between the expertise of architects and the utilization of their autobiographical memories with emotional significance is needed.

(3) Autobiographical memoreis with emotional significance contribute to the construction of self as both a person and a designer, the values and beliefs of the person, and his or her current understanding of any situation. Prior experience plays into the personalization of the design task. More investigation is needed regarding what beliefs and values of the designer help to structure the primary generator and shape the understanding of the design problem.

(4) The biggest question that has not yet been adressed is the overall relationship of autobiographical experience and the quality of architectural design. It is clear that autobiographical expereince is important for the ability to design (Downing, 1989, 2000; Israel, 2003; Brawne, 2003; Zumthor, 2006a, 2006b), but to what extent? Is it the formal education and professional experience or the autobiographical embodied experience that makes an architect a designer? What types of autobiographical experiences are most important to the ability to design?

The last question is of great importance and leads us to a discussion of architectural education. If autobiographical embodied experience is essential to the ability to design, the entire system of architectural education needs to be reassesed.

More Thoughts on Architectural Education

I am sure that the following story is familiar to most architecture faculty.

> A student from an undergraduate studio presents a project that has a façade with randomly placed windows of varying sizes and proportions. The façade, the student says, is "like Ronchamps." The critics stretch their imaginations to Le Corbusier's powerful and poetic treatment of the thick south wall of Notre Dame du Haut. The student's version is weak and pathetic (Findley, 1990:36).

The lack of student understanding is clear. But before making a quick judgment, we should pause and think of what kinds of understanding this student lacks. Does she simply not comprehend the basic principles of architectural composition, or does the problem lie deeper?

Lack of talent is an eminent excuse, but I don't believe that there is a student who comes to an architecture program who can't learn to design. I believe that it is us, the educators, who fail to help students establish a connection between the known and the unknown, students' autobiographical environmental experiences and 'high architecture,' students' understanding of place and an ability to translate this understanding into an imagination of new places.

"Place experiences which young designers bring with them to schools of architecture are often ignored and sometimes openly challenged as having no relevance to design education" (Downing, 1989:133). I can compare the attempt of teaching architecture by ignoring prior experiences of the students to the endeavor of writing the next book in a series without reading the previous volumes. Like in a sentence game[2], occasionally there might be a nice surprise, but most of time the result is nonsensical.

The source of architectural imagery affects the nature of design inquiry and the meaning that is transferred to future places (Downing, 1989). Frances Downing calls this source of architectural imagery an 'image bank.' An image bank stores "experiences, emotions, and ideas in memory as visual, kinesthetic, olfactory, auditory, and soporific phenomena… The memory of powerful place experiences affords the designer a set of 'tools' through which a new place can emerge" (Downing, 1989:131-132). Only by assisting students in establishing a link between places experienced and future places, in all their complexity, we can help students learn to design. No mediated experiences can compare to the truth of lived experiences, and emotional connection is at the essence of it.

> Postmodern life can be described as a state in which everything beyond your own personal biography seems vague, blurred, and somehow unreal. The world is full of signs and information, which stand for things that no one fully understands because they, too, turn out to be mere signs of other things (Zumthor, 2006b:16).

Only lived experience through autobiographical memory can predict the future and serve as imagery for future places (Hassabis and Maguire, 2007; Hassabis *et al.*, 2007).

The very existence of such associations as the Design and Emotion Society (http://www.designandemotion.org) indicates how important emotions are for design. Frances Downing's (1989) dissertation study proved that over a third of the images utilized by professional architects in design are emotionally significant. My own research described in this

dissertation demonstrated that a quarter of the knowledge content applied by architects during the conjecturing phase of the design process is emotive. Downing suggests that it might be "impossible to work in design without utilizing some form of past place imagery as preconceived knowledge for how future places could be examined during the act of design" (Downing, 1989:142).

What all of this really means is that in architectural education we need to get out from inside the studio and live and design in the world. Students need to have interactive and emotional experiences in places in order to be able to add the experiences of such places to their image bank. Tutors need to help students understand how autobiographical experiences relate to designing places, assist in testing their idiosyncratic experiences against successful architectural precedents to construct shared meanings, and facilitate the development of students' own strategies of transforming their embodied experiences into new meaningful places.

Currently, architectural education constructs and reinforces the boundaries between autobiographical experiences and formal knowledge and imagery. In Downing (1989:138): "It may take the student years of study and practice before these connections [between direct and vicarious experiences] are made or to overcome the rationality of objective analytical techniques, and reintroduce poetic, emotive criteria." Zumthor echoes Downing (Zumthor, 2006b:23):

> On the search of architecture that envisage, I frequently experience stifling moments of emptiness. Nothing I can think of seems to tally with what I want and cannot yet envisage. At these moments, I try to shake off the academic knowledge of architecture I have acquired because it has suddenly started to hold me back. This helps. I can breathe more freely.

If architectural education fails to establish connections between the experienced past and the future, and disengages existing connections, architectural education fails its very root purpose. I provided one possible scenario for helping students establish connections between embodied experiences and 'high architecture' in the Education chapter. The change will not be easy, but it is necessary.

> The strength of a good design lies in ourselves and in our ability to perceive the world with both emotion and reason. A good architectural design is sensuous. A good

> architectural design is intelligent… The roots of understanding of architecture lie in our childhood, our youth; they lie in our biography. Students have to learn to work consciously with their personal biographical experiences of architecture" (Zumthor, 2006b:65).

Design schools are always under the pressure of insufficient financial support, accreditation requirements, and the demands of the profession, among many other stresses. The performances of faculty, students, and academic units are all evaluated in numbers. It's incredibly difficult to concentrate on holistic and implicit learning when you have to keep up the numbers. The goal of architectural academia has shifted from actual educational goals to a simple fulfillment these overwhelming requirements – accreditation, grant money, student placement, you name it. It is easy to miss the big picture under the pressure of completing a never-ending list of everyday, mundane (but important at the moment) tasks. We even lost track of what 'specific species of designer' (Dorst, 2003) we want to train. We find this out, again and again, from alumni surveys. The curriculum structure is often based on models of existing curricula at other universities, the expertise of the faculty, and accreditation requirements. Kees Dorst (2003:80) made a sharp observation:

> There is an element of intellectual laziness in a curriculum founded on the idea of 'give them design projects, and they will learn to be a designer.' We cannot afford this any more, we need to professionalize our design schools by making the design curriculum better aimed and more explicit.

Dorst's book of 150 reflections on being a designer contains a section on design education. Twelve short chapters contain more than twelve critical thoughts. One has to do with reflections on the student's own design process and learning. No learning can happen without reflection. Do we leave time for students to reflect? Can we lift the anxiety of good performance and high grades for the sake of learning[3]? Even expert designers sometimes struggle with explicit reflection (Dorst, 2003). How can we expect it from eighteen year olds barely learning how to be college students? What can we sponge from design as narrative pedagogy to promote explicit reflection? And is education only about pedagogy?

Do we really have realistic expectations for design education? Being honest with ourselves, we have to accept the fact that in the complexity of today's world it is not possible to prepare a student well for design practice - not in four years, and not in six. Dorst (2003:87) suggests

transferring the responsibility of preparing for practice onto the students shoulders: "students need to find out who they are, what kind of design area suits them, and devise their own training. The quality of a design school is therefore, to a large extent, determined by its ability to feed and assist this development."

This is a very simple (and beautiful in its simplicity) thought: admit your limits, and use your resources the best way possible. Following this notion will not only set sensible expectations for design schools, but will also allow to use the expertise of each design educator to the fullest potential, and allow talented students to receive the special attention they deserve. I've always been startled by the reality that tutors end up spending most of their time with 'strugglers' and leave talented students to swim on their own. Yet those are the students who have the greatest capability of understanding design, learning to design, and bridging the gap between the knowledge domains.

Lawson brings to our attention the knowledge system issue. He thinks that educators fail to recognize this issue and to "provide cognitive tools for crossing the knowledge boundaries" (Lawson, 2001:145). Lawson articulates what most educators already know:

> A common experience is that while students can learn to pass their examinations in these subjects [of history, building science and such] this learning may have little impact on their design work (Lawson, 2001:145).

My personal insight about this knowledge system issue is that the discriminatory teaching of each subject in the curriculum is only one problem. There are many other factors that contribute to creating gaps between knowledge domains. Language is one important to mention. As with many other professions, architects have their own jargon. Students are introduced to it very early. One has to speak the language of the sect to belong to it. Educators refer to 'high architecture;' that is just as mysterious to the students as the Secret Chamber at Hogwart's. Why, then, are we surprised when students don't get it?

Why can't we rely on shared meaning and students' experiences to help them build an understanding of architectural concepts? Individual researchers and educators (Lawson, Cross, Downing, Dorst, Stumpf, and Konda, to name a few) have been emphasizing the role of experiential learning and shared experience in design. In this case, by 'experiential learning' I mean any learning through direct experience, and not only hands-on exercises in academia.

Theoretical knowledge without experiential embodied understanding is meaningless. We see vivid examples of this in student work when design elements and principles are applied exclusively logically. I have witnessed many student projects that are beautiful artifacts but that show no understanding of place. It is impossible to overemphasize the importance of shared meaning. Shared meaning is at the heart of communication between people. It takes shared meaning to comprehend new concepts, because we learn by extrapolating from what we already know. It takes shared meaning to communicate with peers in a design team and with clients. It takes shared meaning and living life and to understand human nature. Every time I have a new group of students, I ask them what architecture is about? And every time I hear "about buildings" or "about space." For some strange reason, it always comes as a revelation when I tell them that architecture is *not* about buildings, but rather about *people*, their health, safety and quality of life. Maybe this is where we should start. If we want to see human-centric architecture, we need to provide human-centric education to the architects.

Notes

1 Image bank, as defined by Downing (1989), is a repository of memorable environmental imagery.

2 In the sentence game, participants take turns writing a story. After writing a sentence or several sentences, a participant folds the paper to reveal only the last several words. The next participant continues the story based on those last words.

3 While visiting The Royal Danish Academy of Fine Arts in Copenhagen in 2003 for the EAAE workshop held in the School of Architecture, I discovered that until that year the School was on a pass/fail system. There were no grades. Student work was rather sophisticated and showed an advanced understanding of place. As much as we like to assign everything a numbered value, education of designers is clearly possible without the pressure of grading.

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APPENDIX A

Letter of Request

Date:

Mr./Mrs./Ms.

Dear Mr./Mrs./Ms.

This letter is to kindly request your time for the purposes of an interview. I am working on a Ph. D. dissertation in Architecture about how architects utilize memory with emotional significance during the development of conjectures (the first conceptual image) in architectural design.

The research will take place in the form of an ethnographic interview, based on multiple sources of information including observations, interviews, and documentation. It should take place in the natural context of the office or studio of the architect or designer. I will be interviewing ten to twelve architects and I would like you to accomplish a design task, to tell me your thoughts and emotions experienced during the process of design, and then to summarize them. I will be primarily recording, observing and writing notes on my observation. At the end of the interview I will go over the note with you to make sure the notes are accurate.

After I interview all the participants I will favorably ask you to evaluate on a checklist the designs obtained all the architects participating in the study. The evaluation will be anonymous. You will neither not know whose works you will be evaluating nor you will sign your name on the evaluation sheet unless upon your wish. This research has been approved by the university for the purpose of the dissertation and will take approximately one hour for interview and half an hour for evaluation.

Research of this kind is most valuable in that it goes directly to the source and offers the most salient information and detail possible. But it also requires the willingness and time of participants like yourself to which I will always be indebted and grateful for the opportunity. I hope you will give me this opportunity as I value what you will have to say and do and would like to have that as a part of my research. Thank you for consideration.

Sincerely,

Irina Solovyova,
Ph. D. Candidate
Department of Architecture
College of Architecture
Texas A&M University
College Station, Texas 77843-3137
(979) 845-1221

APPENDIX B

Informed Consent

I understand that the research is the research study which objective is to investigate the impact that memory with emotional significance as a component of autobiographical memory has on the development of conjectures (the first conceptual image) in architectural design. I understand that it is important for the study to be conducted in the design studios of participating architects as their natural working environment. I agree to participate in the study and to be interviewed in my office (design studio).

I am informed that there are going to be total 10 to 20 participants in the study. I was also informed that all the participants including me are selected from the Yellow Pages phone books and from World Wide Web. I am selected on the random basis from the list of practicing professional architects.

I understand that I will be asked general autobiographical questions. I understand that I will be asked to complete a given design task, to talk aloud about my thoughts and emotions during the design process, and to summarize my experience of solving the given task. After the completion of the task I will be asked to summarize my experience of design.

I agree to evaluate on a checklist the works of other architects participating in the study. I understand that the works I will have to evaluate will be anonymous and I will not sign the evaluation sheets to keep my own anonymity.

I realize that there are no discomforts or any physical or emotional, psychological risks for me. I understand that it is on voluntary basis and I may at any time or for any reason withdraw from the process without penalty or recourse.

I understand that there are no benefits and no compensation for me as a participant in the research study.

I understand that all the information that will be provided by my will remain confidential unless I give a special written permission to the researcher. I understand that I will not be identified by name or otherwise allowing me to be identified. I was informed that notes will be made from the interview and will be coded for privacy and kept secured in the office of the associate dean for International Programs in the College of Architecture, Texas A&M University. I was also informed that the researcher will keep the recorded tapes for a following year and will erase them at the end.

"I understand that this research study has been reviewed and approved by the Institutional Review Board –Human Subjects in Research, Texas A&M University. For research-related problems or questions regarding subjects' rights, I can contact the Institutional Review Board through Dr. Richard E. Miller, IRB Coordinator, Office of Vice President for Research at (979) 845-8585 (e-mail: rich-miller@tamu.edu)."

I have read and understand the explanation provided to me. I have had all my questions answered to my satisfaction, and I voluntarily agree to participate in this study.

I have been given a copy of this consent form.

Signature of Subject _____ Date_____

Signature of Principal Investigator _____ Date_____

For information concerning the study or event of any problem please contact:

Irina Solovyova, the principal researcher
Department of Architecture
College of Architecture
Texas A&M University
College Station, Texas 77843-3137
(979) 845-1221

or

Frances Downing, Chair of Committee
Department of Architecture
College of Architecture
Texas A&M University
College Station, Texas 77843-3137
(979) 845-7852
fdowning@archone.tamu.edu

APPENDIX C

Audio Tape Release Form

I voluntarily agree to be recorded while talking aloud my thoughts and emotions during the accomplishing the design task given by Irina Solovyova. I understand that the tapes will be used only for the content purposes and will not be reproduced as an interview. These tapes will be identified by the code assigned to me by the researcher and known to the researcher only. The tapes will be kept for a year in the office of the associate dean for International Programs in the College of Architecture, Texas A&M University. After data is collected and processed the tapes will be erased.

_____ _____

Signature of the Subject Date

_____ _____

Signature of Investigator Date

APPENDIX D

Permission to Use Drawings

By signing this I give my permission to Irina Solovyova to publish the drawings with design conjecture on the task of the study and to publish explanation of this drawing. I understand that all other information will remain confidential and the drawing and its explanation will be published without mentioning my name or any other identifying me information.

_____	_____
Signature of the Subject	Date
_____	_____
Signature of Investigator	Date

APPENDIX E

Task Description: Case Study 1

The task is to design a working space for the author of the following haiku:

Twilight cicadas –
The shadow of the pasania tree
Press on my desk

Masaoka Shiki

The subjects did not receive any other information about the client (author of the haiku) except for this haiku. Subjects were be asked to complete the task on the basis of their own experience of working space and imagination of the client.

The subjects were asked to talk aloud everything coming up on their minds and feelings during the completion of the design task.

APPENDIX F

Design Brief: Case Study 2

Organization of the Nursery School

The following are points to consider in the design of the nursery school: -

The design should include three main areas: the building itself, a covered outdoor extension to the building, and a protected garden.

For nursery education both the indoors and the outdoors are for much of the time the working area and both are equally important as parts of the total design.

The school is for 40, 3-5 year old children, three staff, and five part time employees (A gardener, maintenance, and three kitchen staff).

20 children attend full-time, 20 attend part-time in the mornings, 20 part-time in the afternoons.

A mid-day meal is provided for the 20 full-time children.

All children are brought and collected by parents, about one third arrive and depart in cars, the rest collect their children on foot.

Small van deliveries are expected about once or twice daily.

Parents may be coming at all times of the day and tend to congregate while waiting for their offspring.

Coat-hanging and lavatories are needed both when a child arrives and departs, and when they are darting in and out of the school. The children also need to be within easy sight of a teacher in the play area.

The inside play area comprises defined activity settings these are listed as follows:-

(1) Tablework:- eg. Using materials and objects - not making much mess - small scale.
(2) Acting:- eg. Home play, camping, shops, hospitals.
(3) Music:- eg. Exploring sounds individually, singing or dancing.
(4) Messy work:- eg. Using clay, water, sand, dough.
(5) Quiet work:- Looking at books, writing, resting, story telling.
(6) Moving:- eg. Climbing, swinging, jumping, rolling.
(7) Construction:- eg. Building with blocks, small and large scale, undertakings such as engines, buses, boats, houses, etc.

Although such settings are usually defined by furniture arrangement, some do have architectural implications, e.g. finishes and availability of water.

Floors, walls and ceilings are all potential work and display surfaces.

The garden must be controlled and protected space, and should be securely bounded. It should offer a wide range of outdoor play and experience.

The Schedule of Accommodation

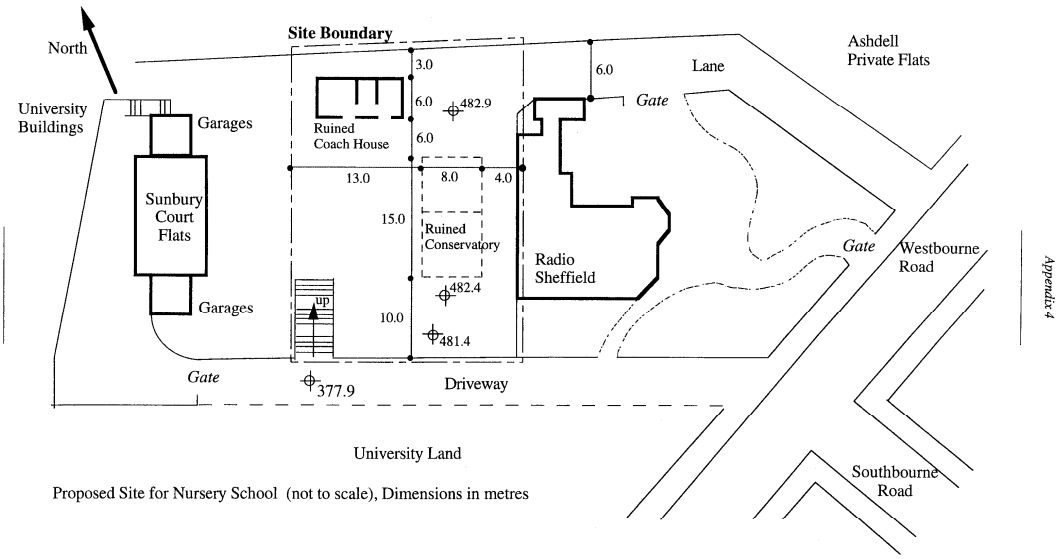
The area of the site is 1000m2.

This should include a garden playing space of minimum area 400m2 of which not less than 150m2 should be paved. The total interior area should be around 250m2. This excludes verandas and any other outdoor shelter or stores.

The interior area is broken down as follows:

Home play and acting	$20m^2$	
Wet play and messy	$20m^2$	
Quiet room	$20m^2$	
Other play areas (i.e. activities 1, 3, 6, and *7* in previous section)	$70\ m^2$	
Total	**$130m^2$**	**Educational Space**
2 staff rooms and toilet	$30\ m^2$	
Kitchen	$10m^2$	
4 children lavatories	$15m^2$	
Children coat-hanging and lockers	$15m^2$	
Total	**$70m^2$**	**Ancillary space**
2 toy stores	$15m^2$	
Furniture store	$15m^2$	
Total	**$30m^2$**	**Storage space**
Entrance lobby and circulation space	$20\ m^2$	
Total	**$20m^2$**	**Circulation space**

The site is an existen plot of land in Sheffield.

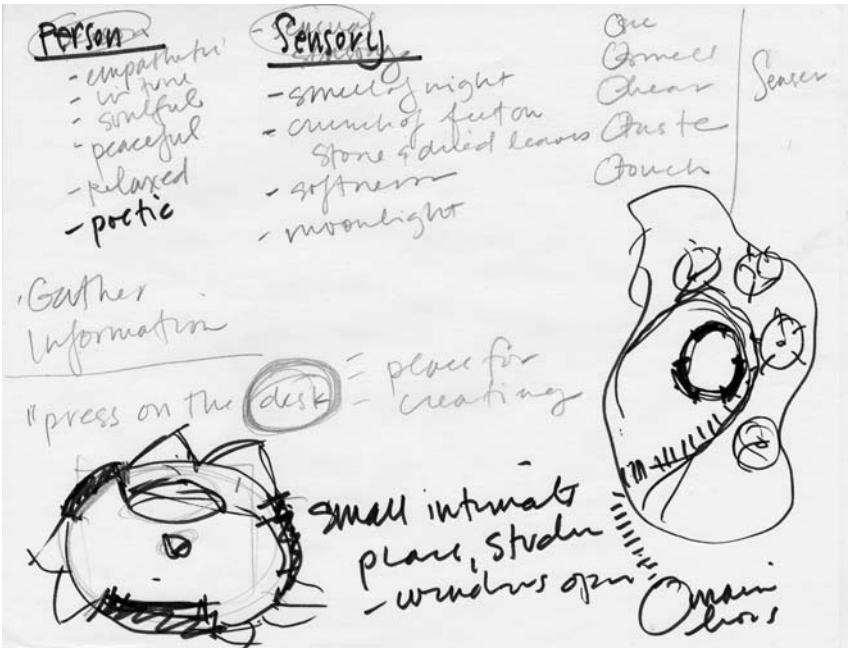


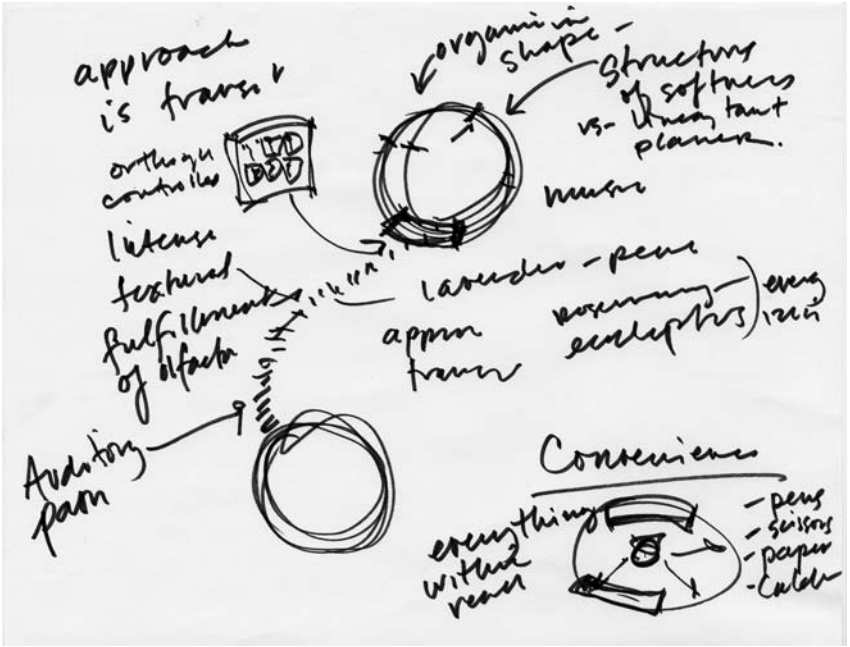
Appendix 4

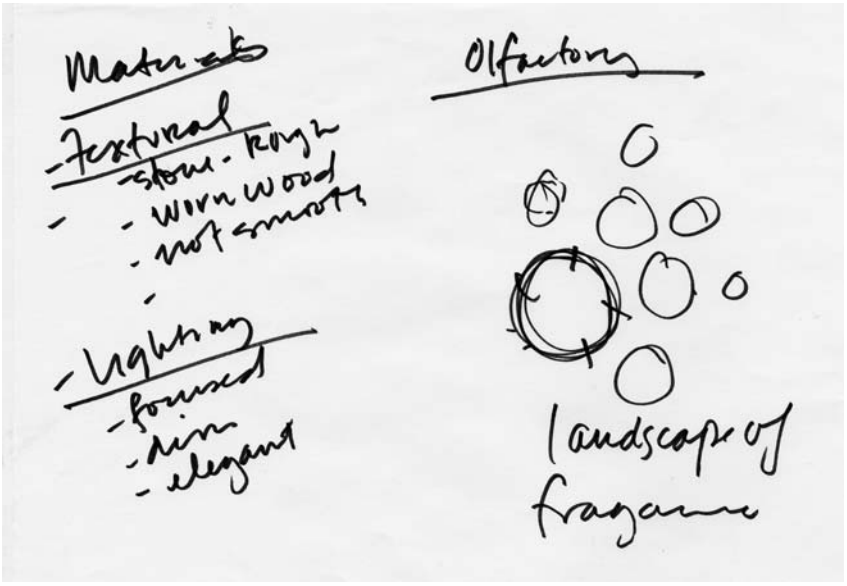
APPENDIX G

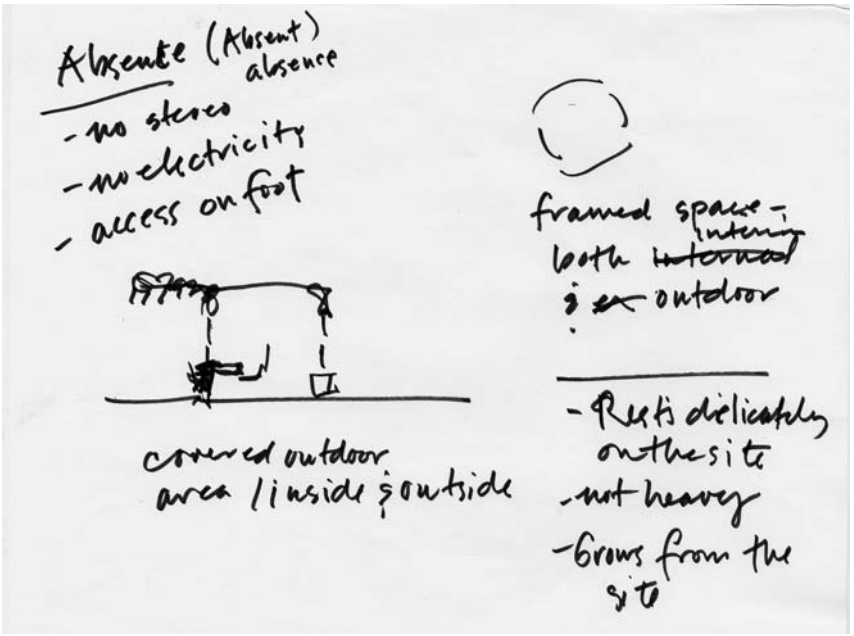
Sketches Produced During the Design Conjecturing: Case Study 1

Participant 1

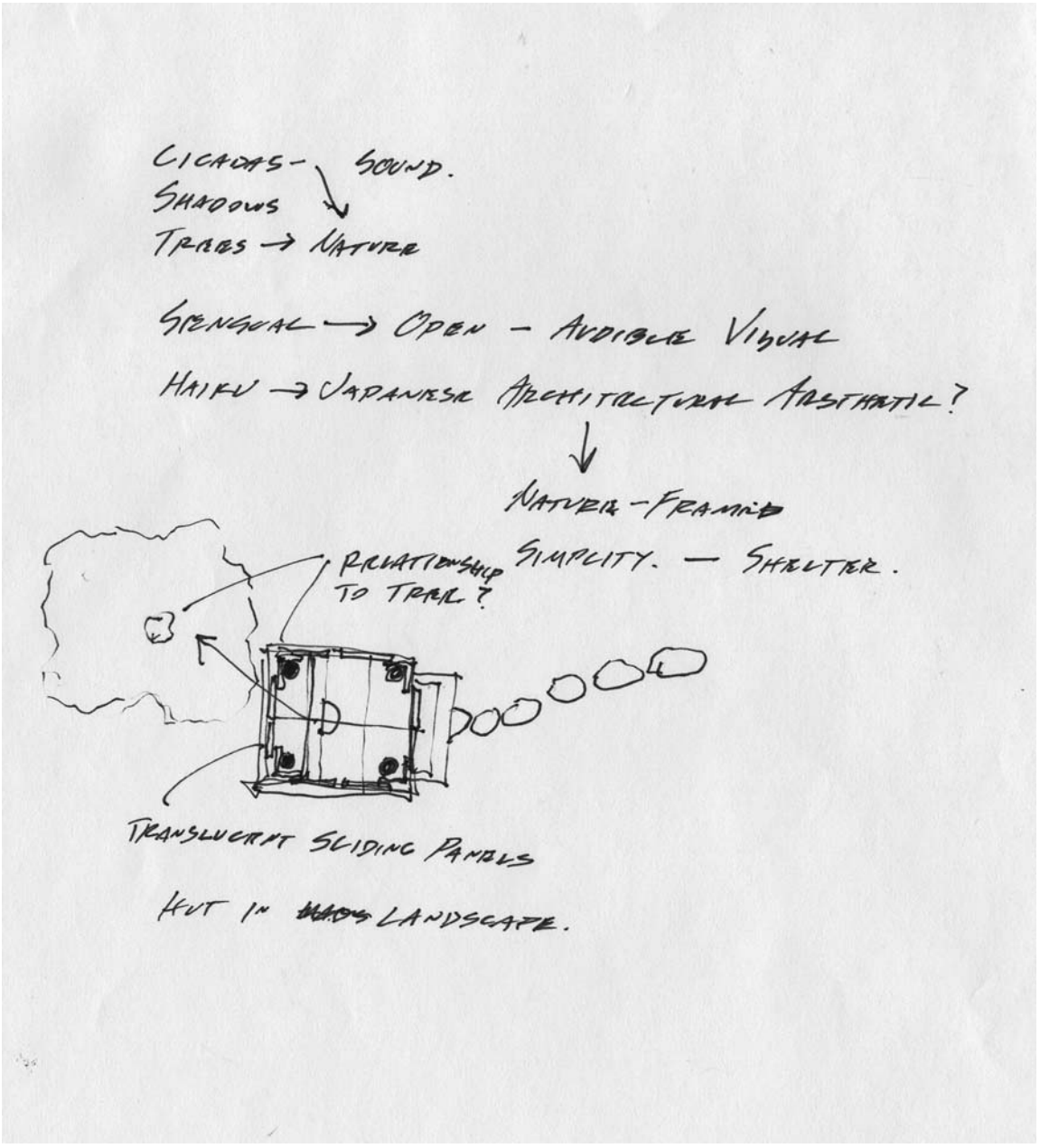




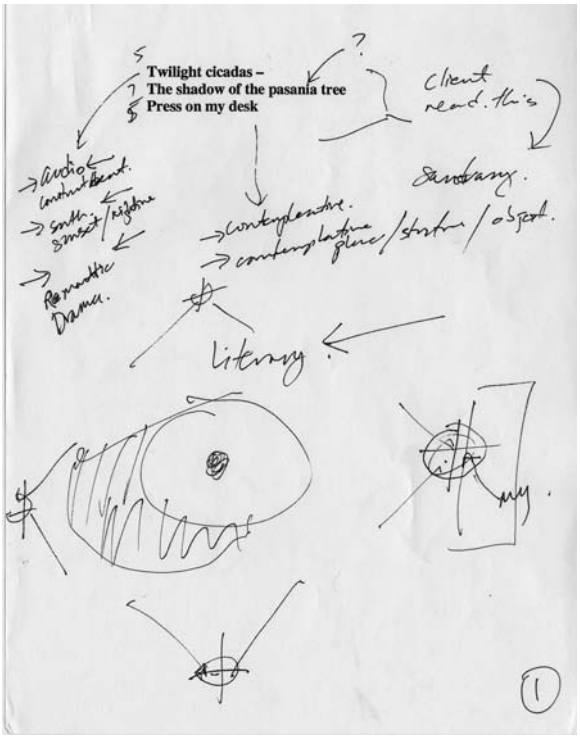

Materials
-Textural
-stone - rough
- worn wood
- soft smooth
-
-Lighting
-focused
-dim
-elegant
Olfactory
landscape of
fragrance

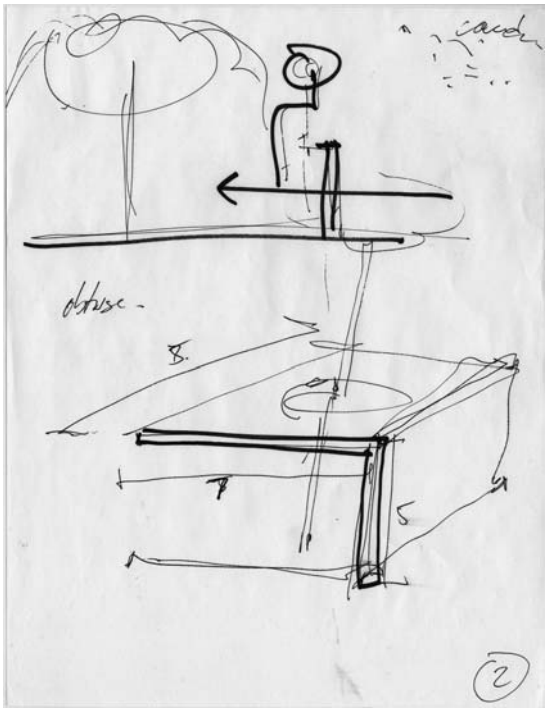

Absente (Absent)
absence
- no stereo
- no electricity
- access on foot
covered outdoor
area / inside & outside
framed space -
both interior
& outdoor
- Rests delicately
on the site
- not heavy
- Grows from the
site

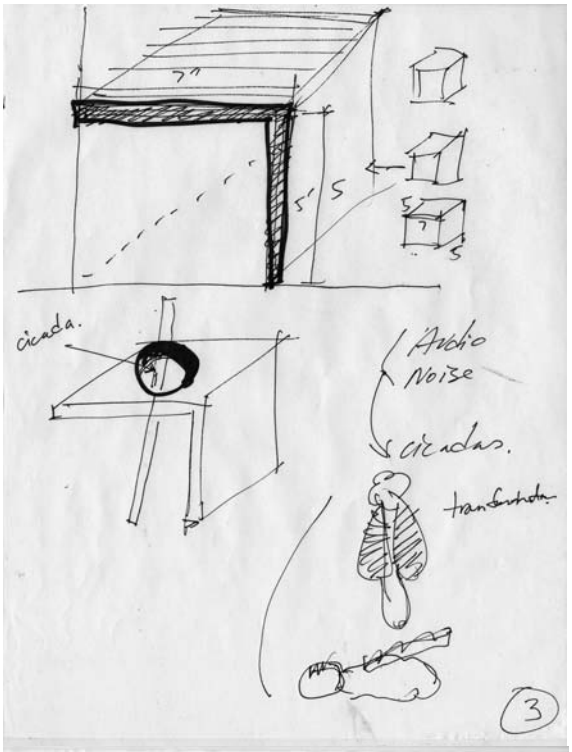
Participant 2

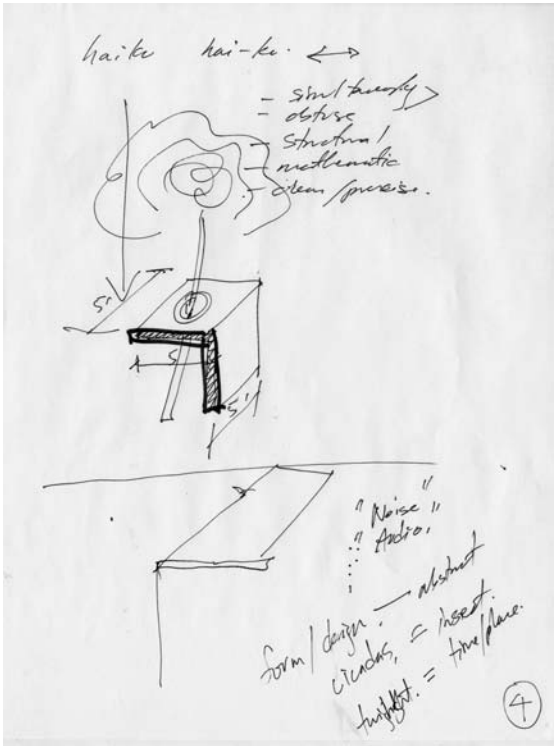


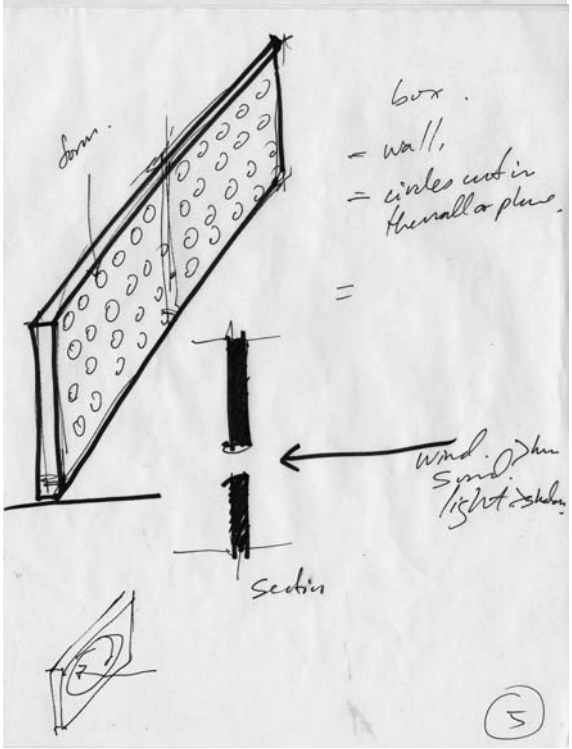
Participant 3

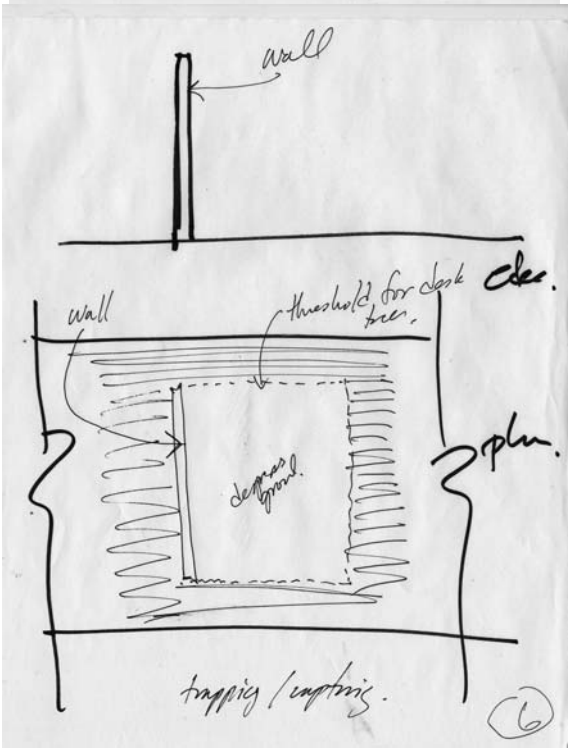


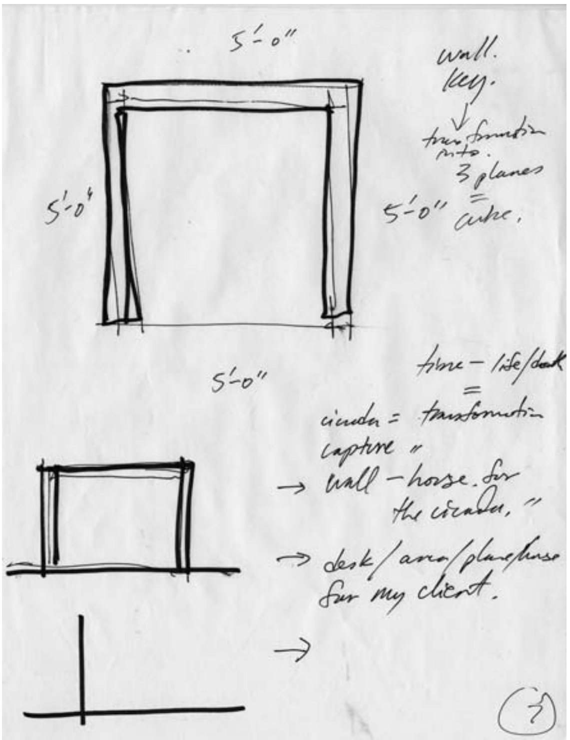


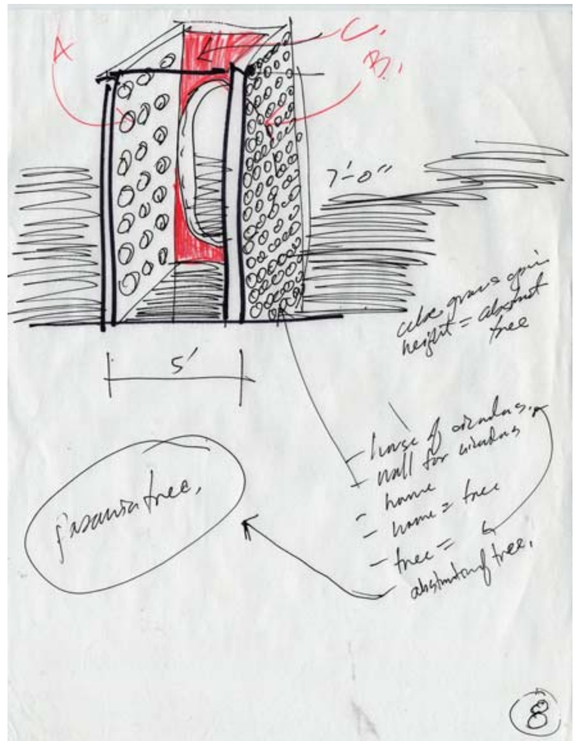

cicada.
Audio
Noise
circadas.
3

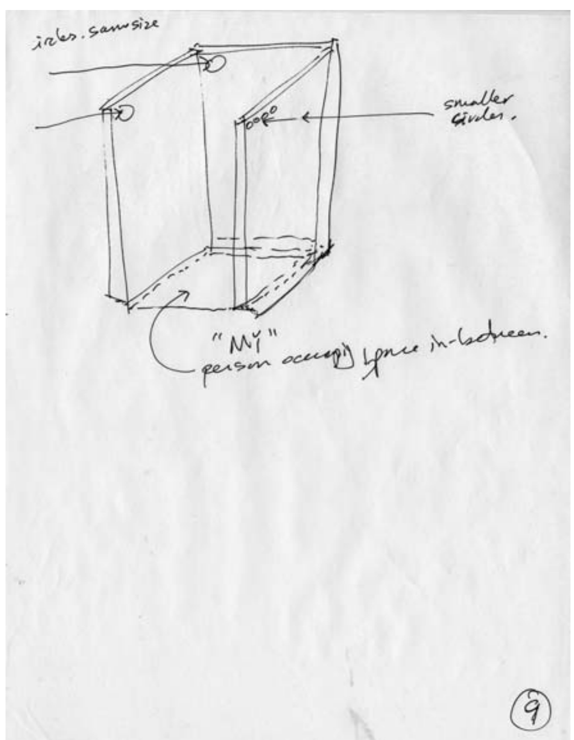

haiku hai-ku
"Noise"
Audio
circadas, = insect
twilight. = time/place.
4


box.
- wall,
= circles cut in the wall a plane.
=
Section
5

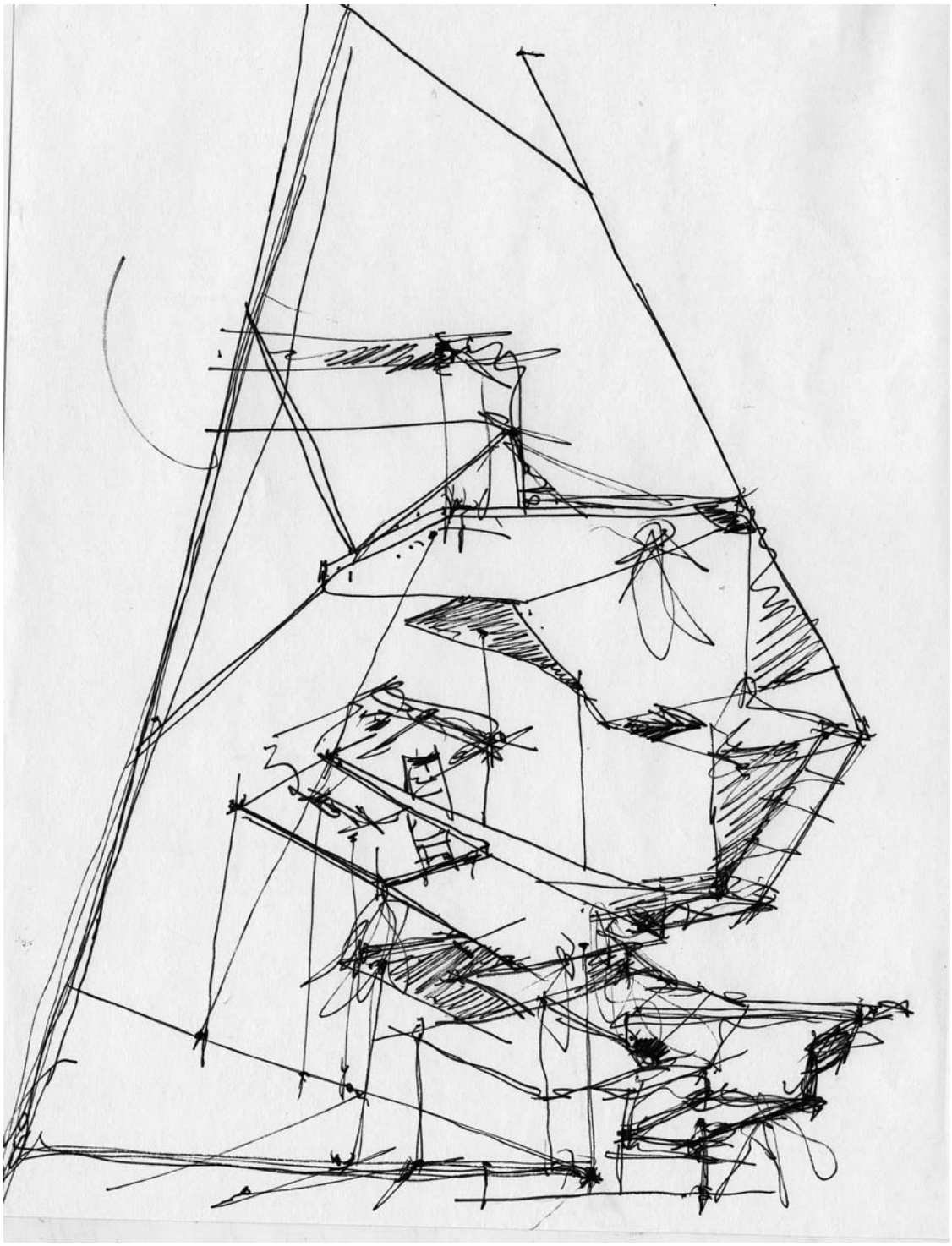

wall
wall
threshold for dark deer.
plan
trapping / capturing.
6


5'-0"
wall.
key.
3 planes
=
cube.
5'-0"
5'-0"
5'-0"
time - life/death
=
cicada = transformation
capture "
→ wall - house. for
the cicadas. "
→ desk / area / place/house
for my client.
→
7

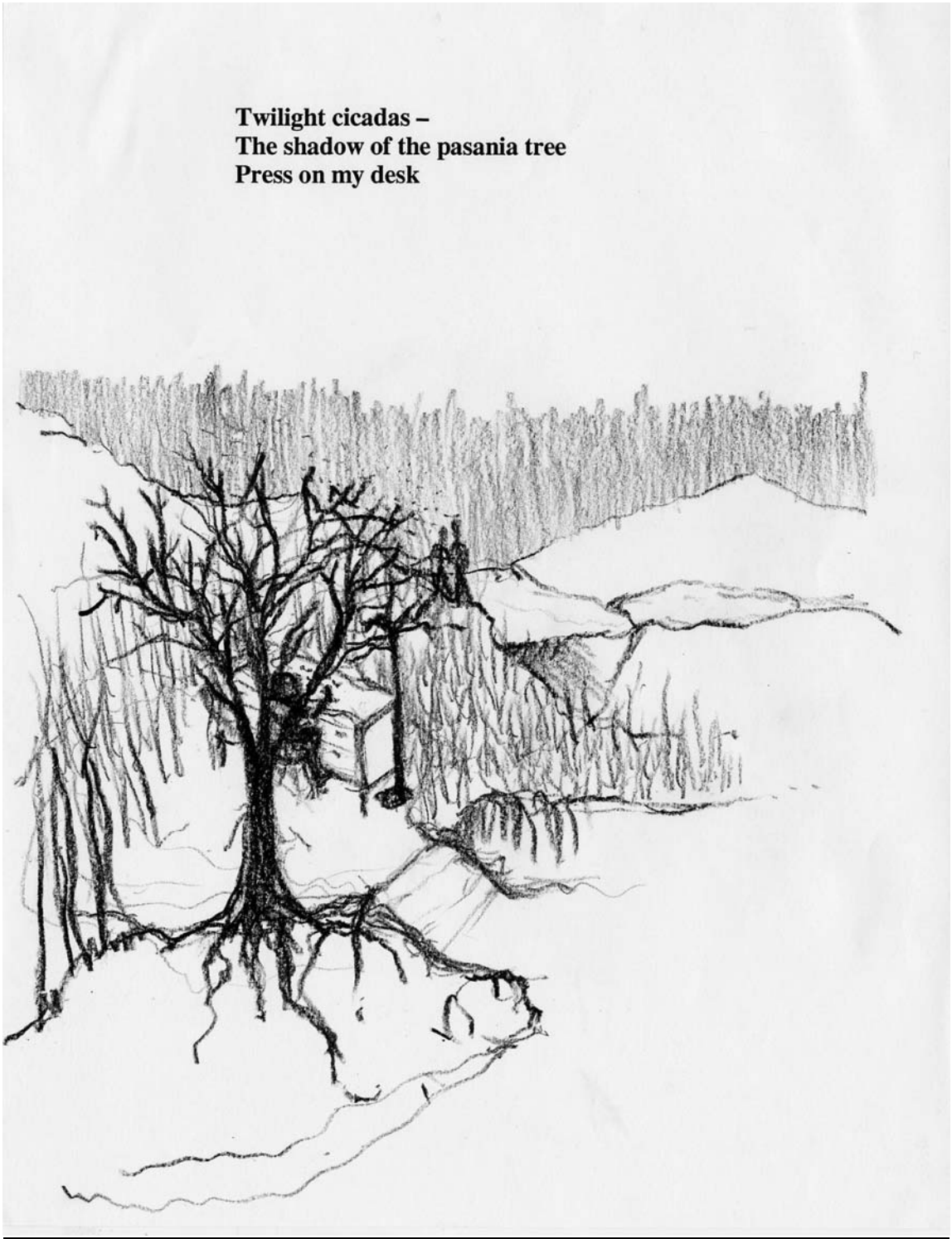

A
C.
B.
7'-0"
5'
house of cicadas.
wall for cicadas
- home
- home = tree
- tree =
abstracting tree.
8


smaller
circles.
"MY"
person occupy space in-between.
9

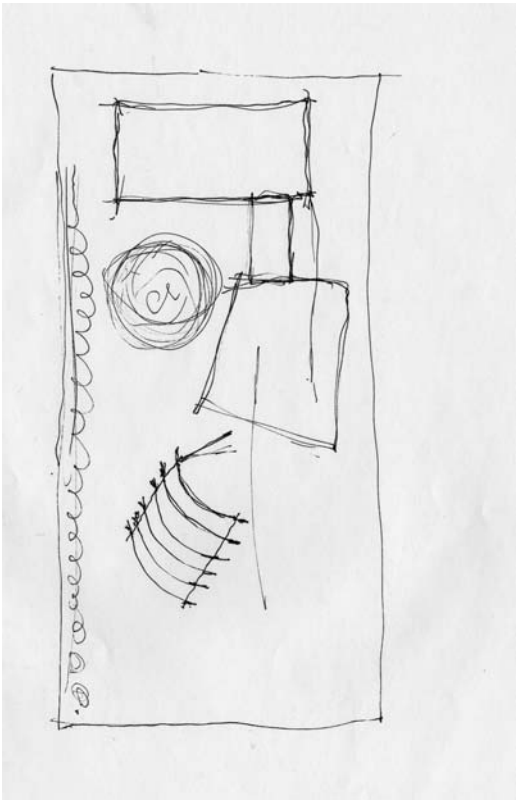
Participant 4

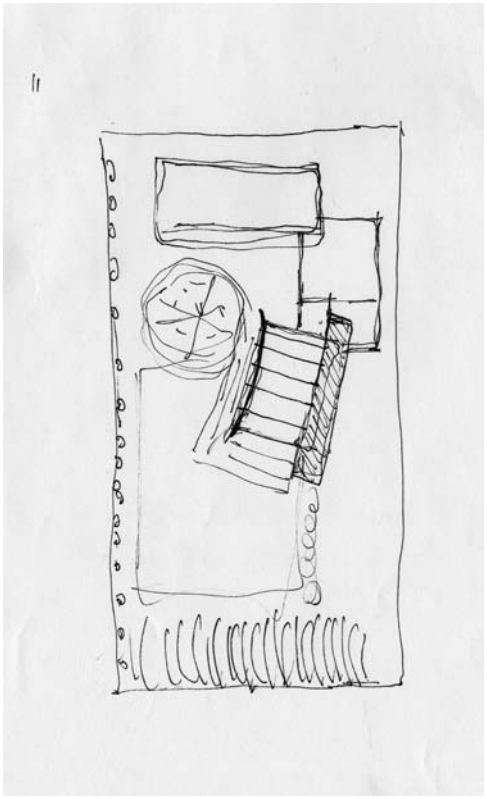


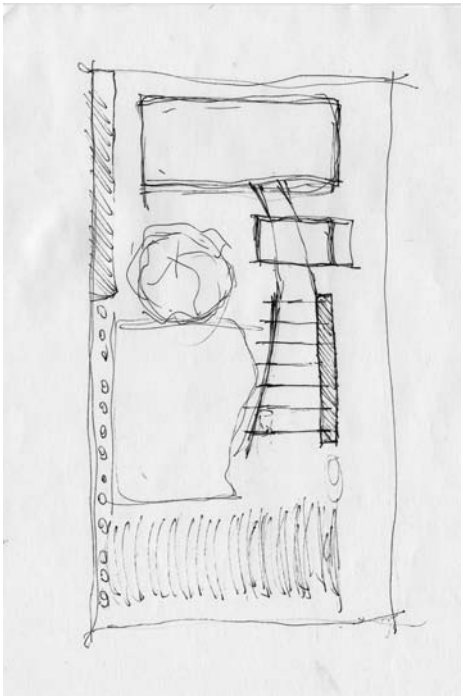
Participant 5

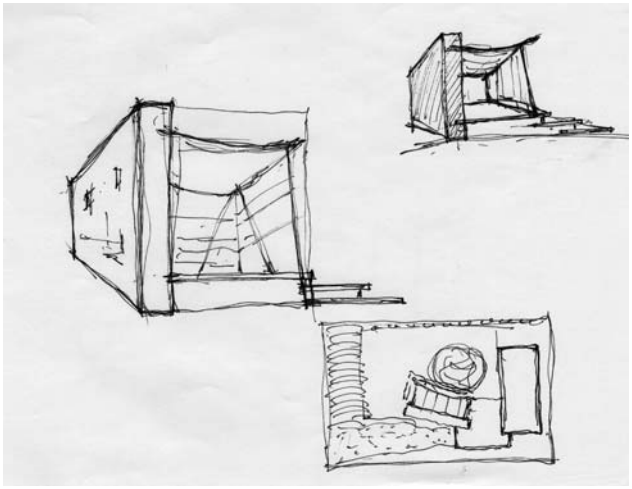


Participant 6

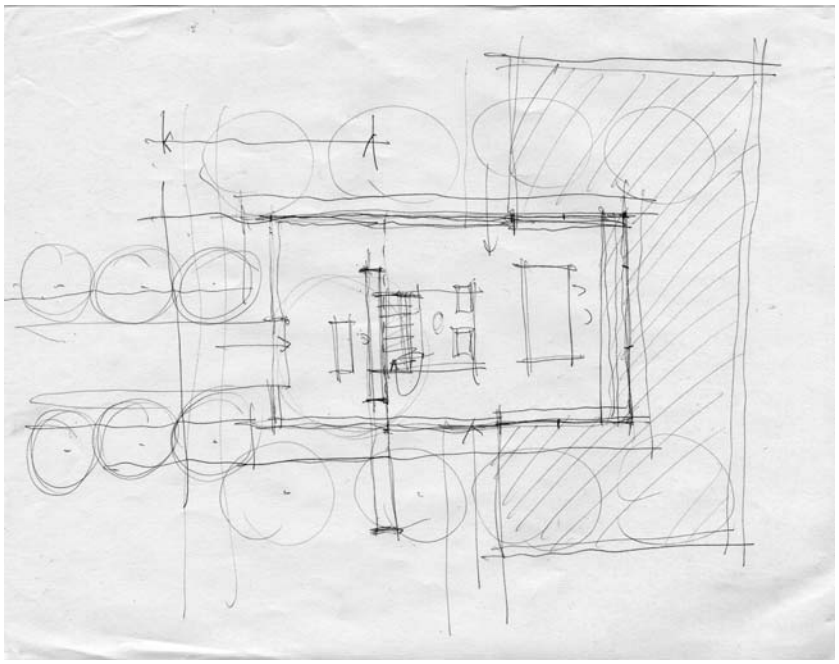


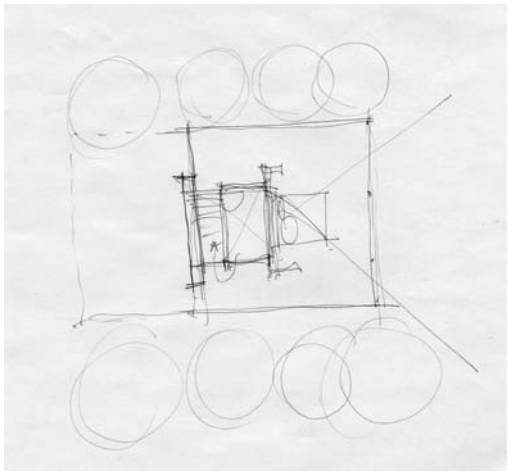


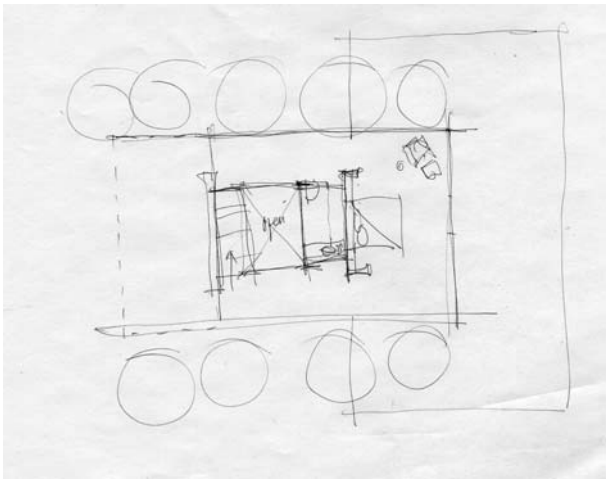




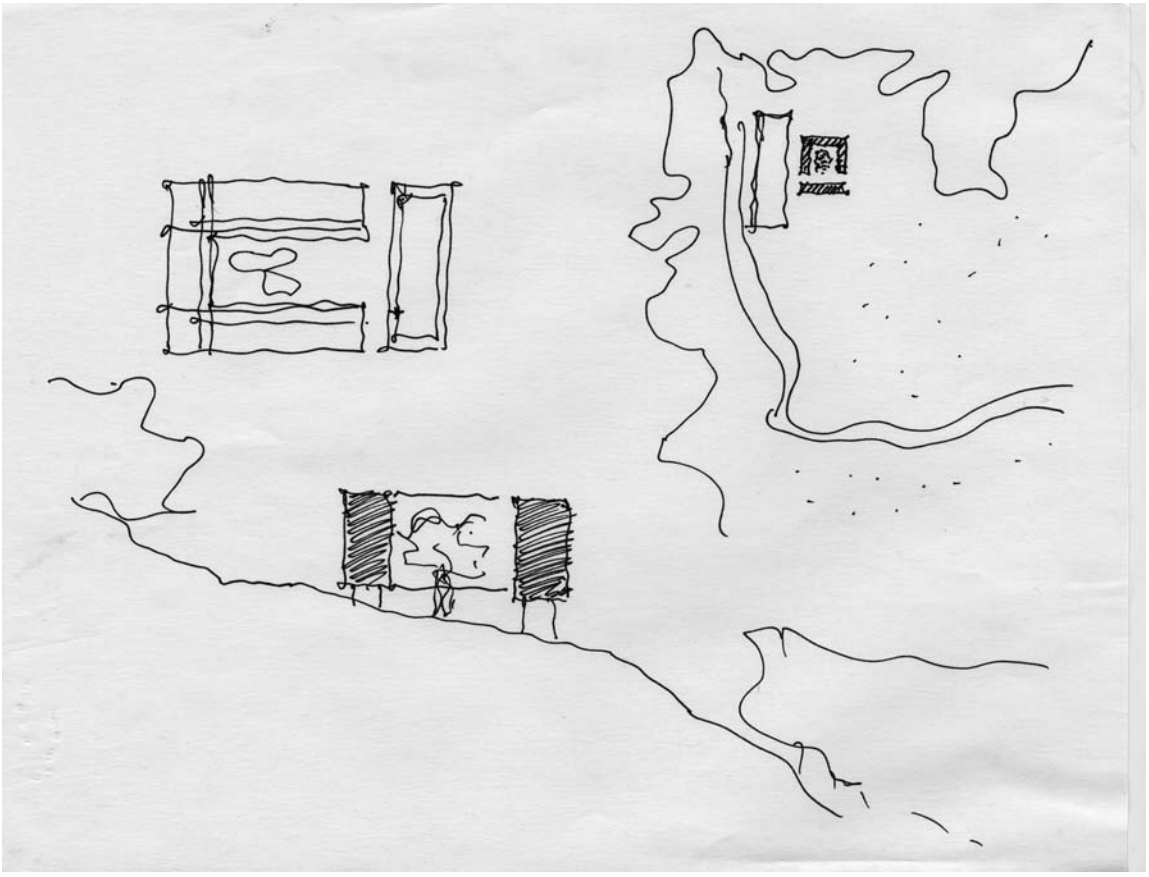
Participant 7







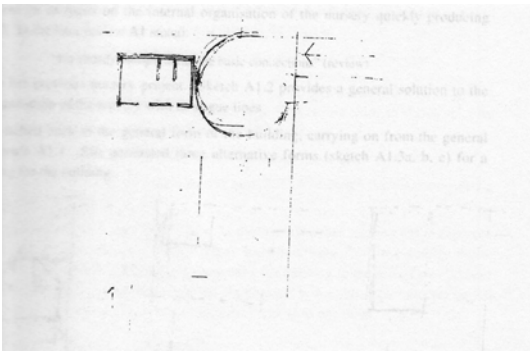
Participant 8

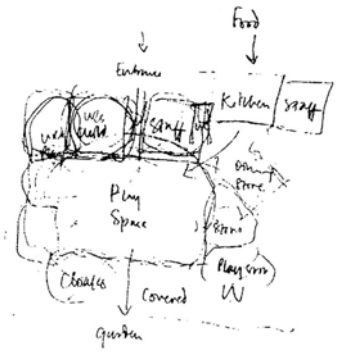


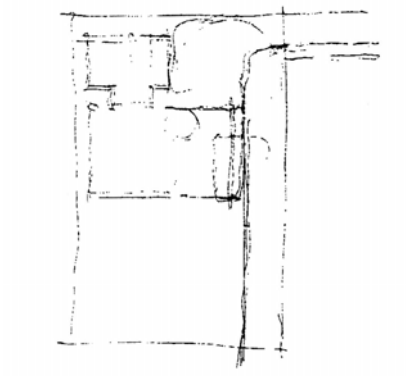
APPENDIX H*

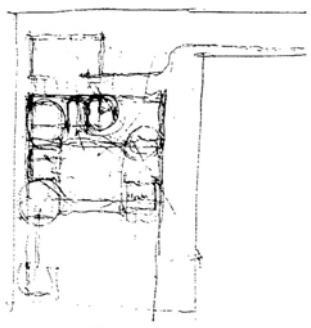
Sketches by Participants: Case Study 2

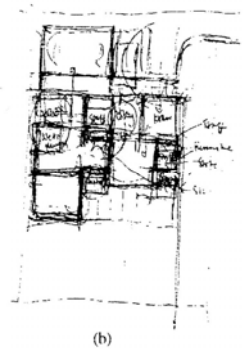
Participant A1

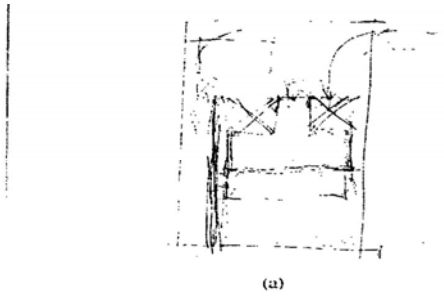


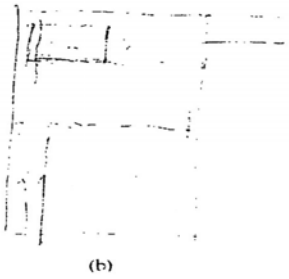












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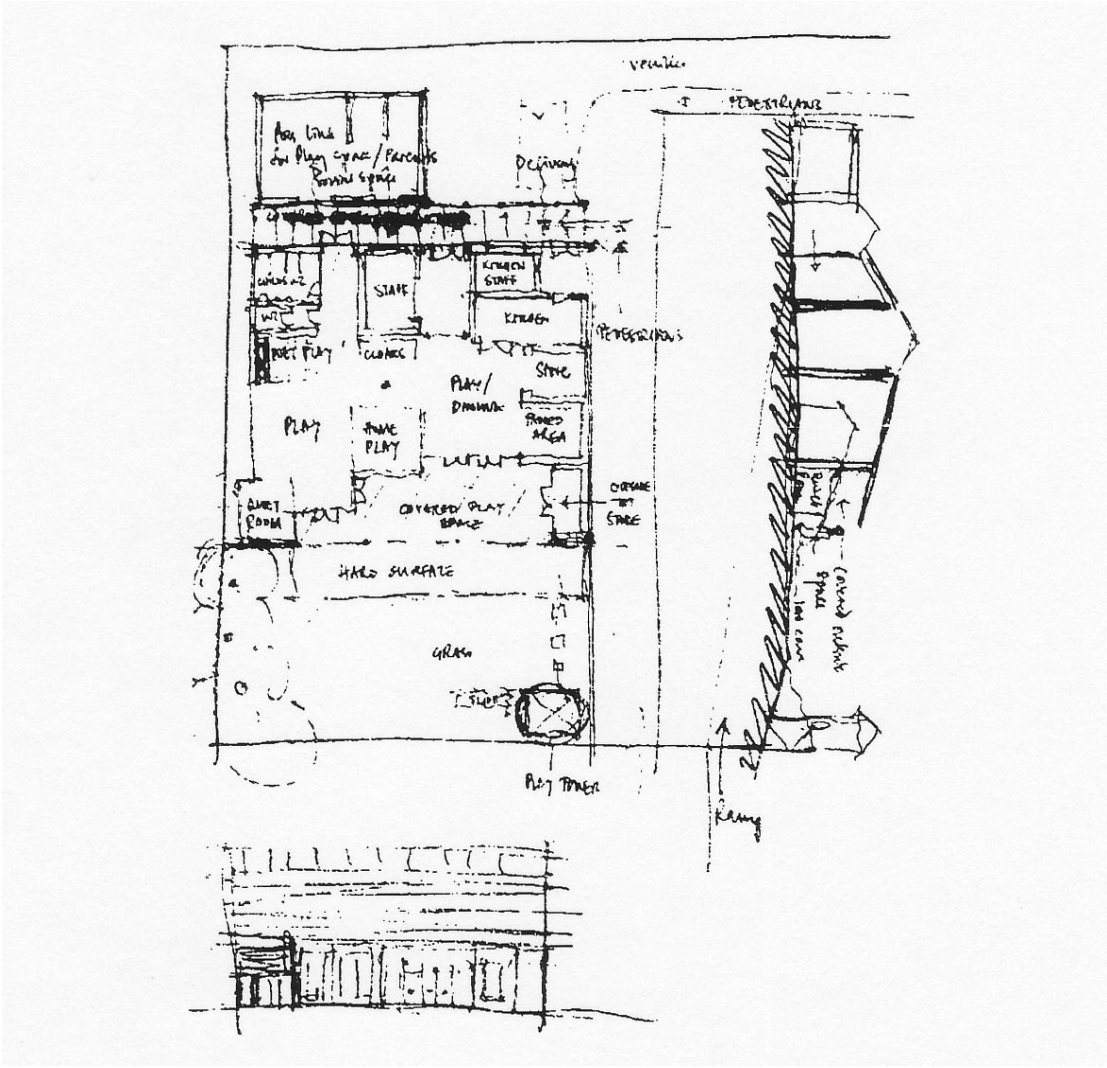
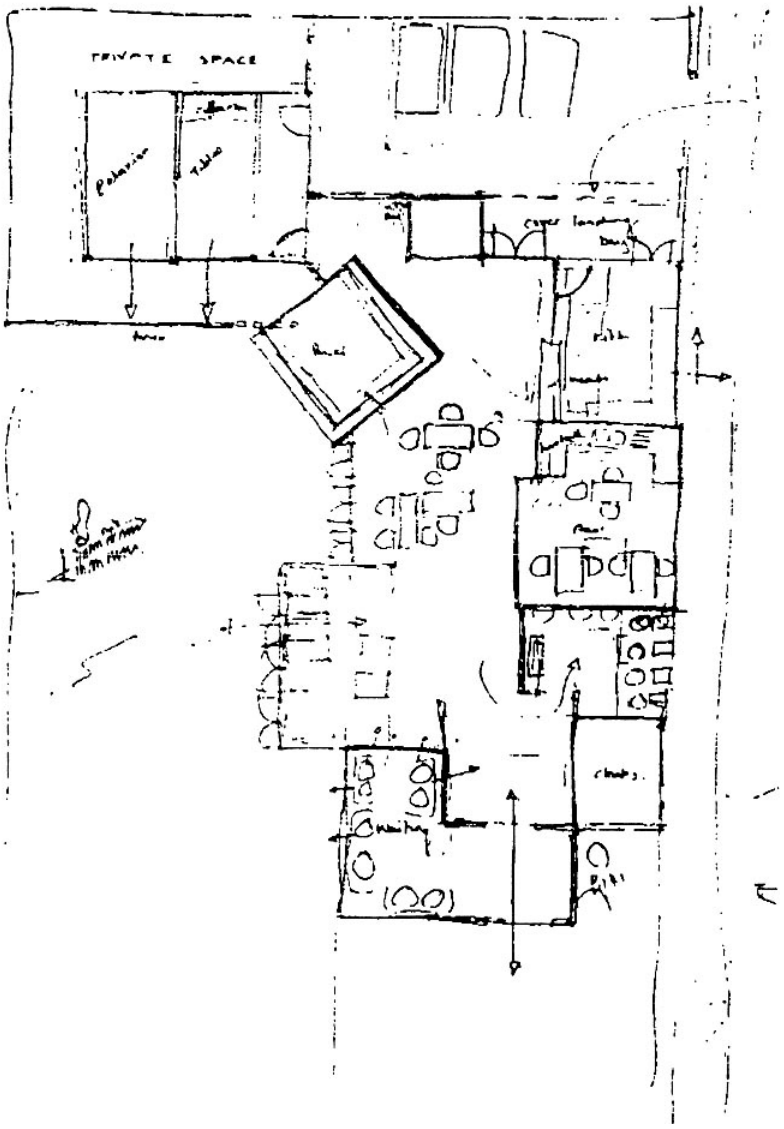
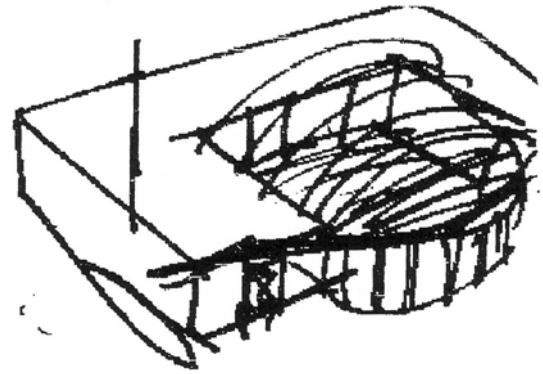
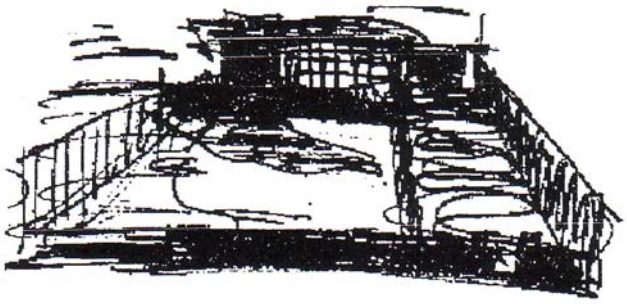

PEDESTRIANS
STAFF
KITCHEN STAFF
KITCHEN
CLOAKS
STORE
PLAY
HOME PLAY
QUIET ROOM
COVERED PLAY SPACE
HARD SURFACE
GRASS
PLAY TOWER
COVERED WALKWAY

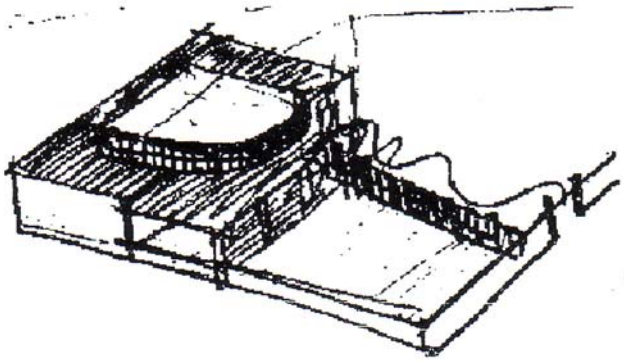
Participant A2



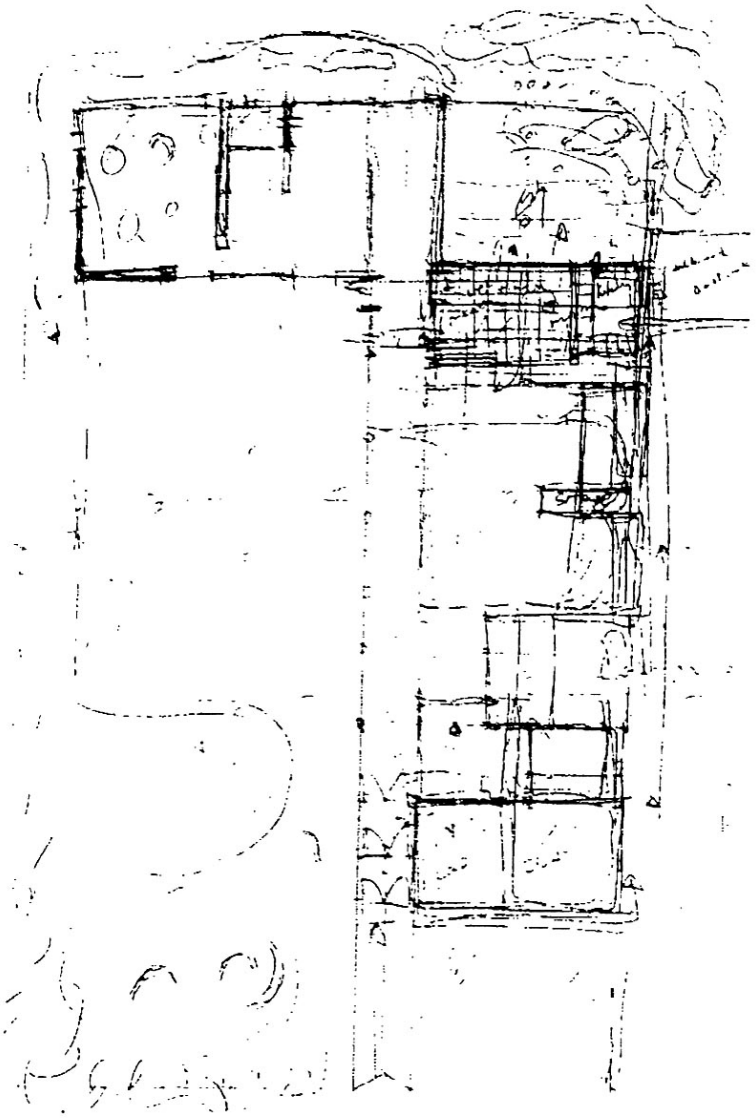
Participant A3



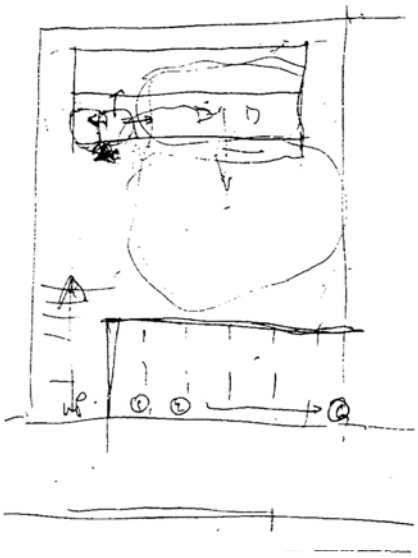


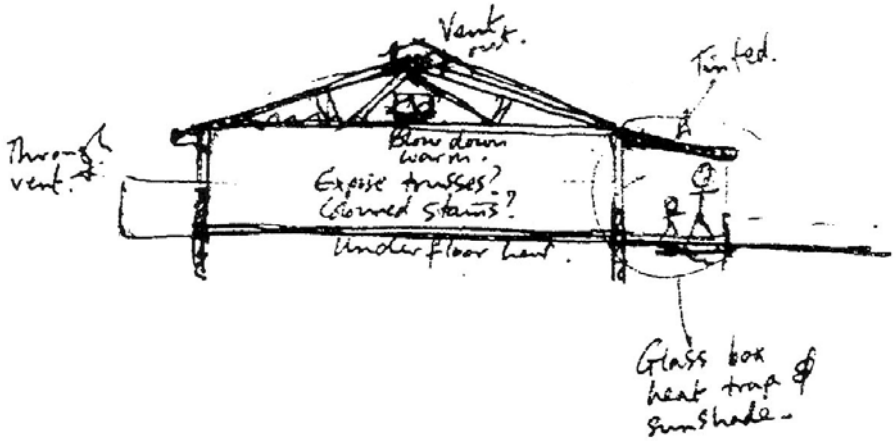


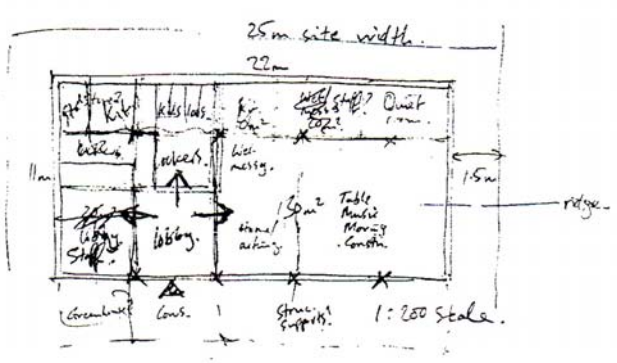
Participant A4

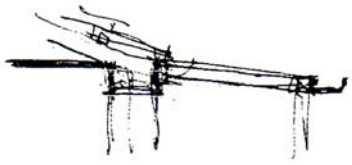


Participant A5

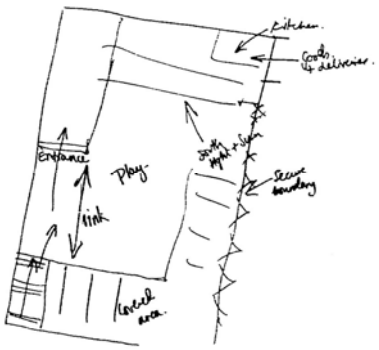


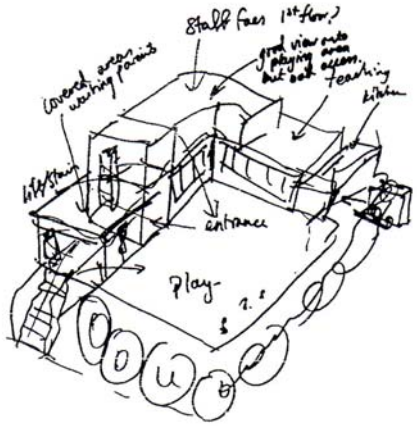


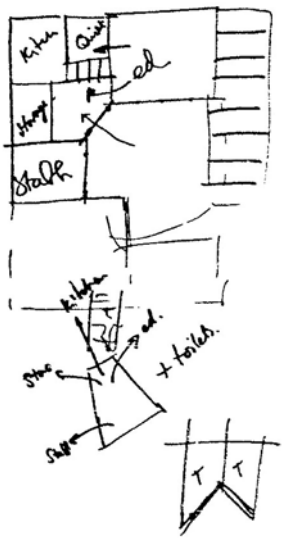


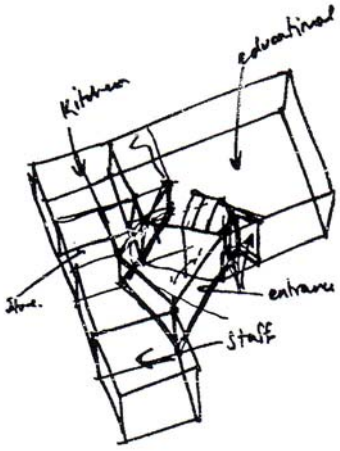


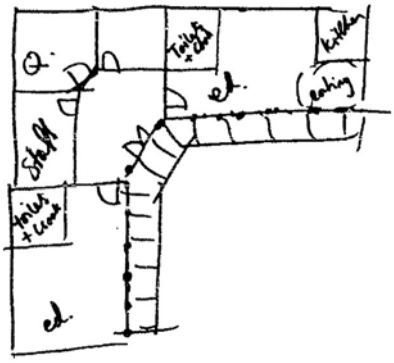
Participant NA1

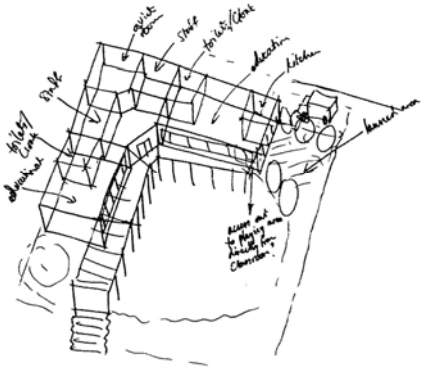


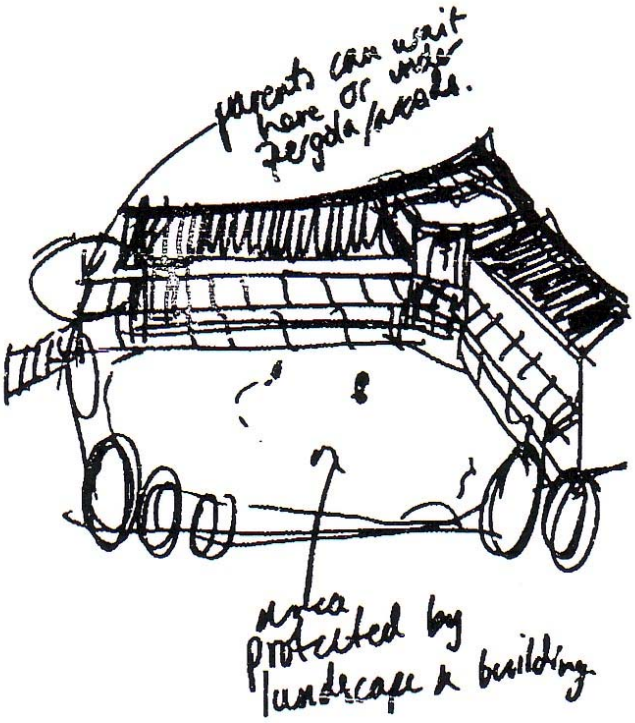




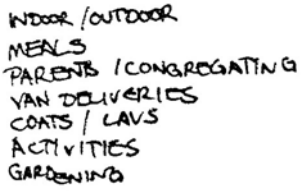




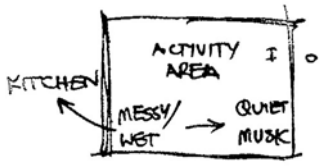


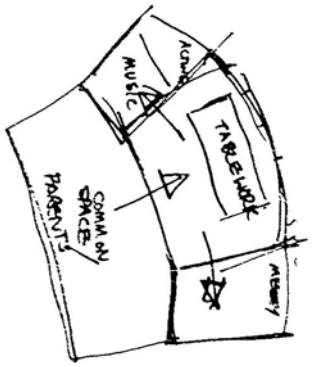


Participant NA2

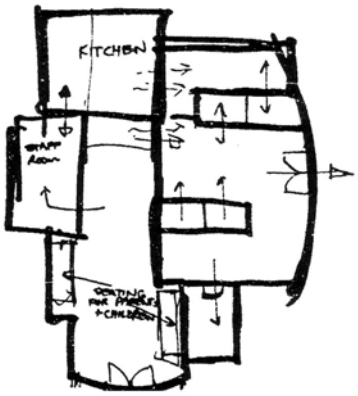


1

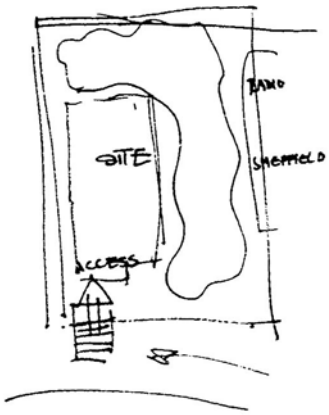



MUSIC
TABLETOP
COMMON SPACES
PARENTS

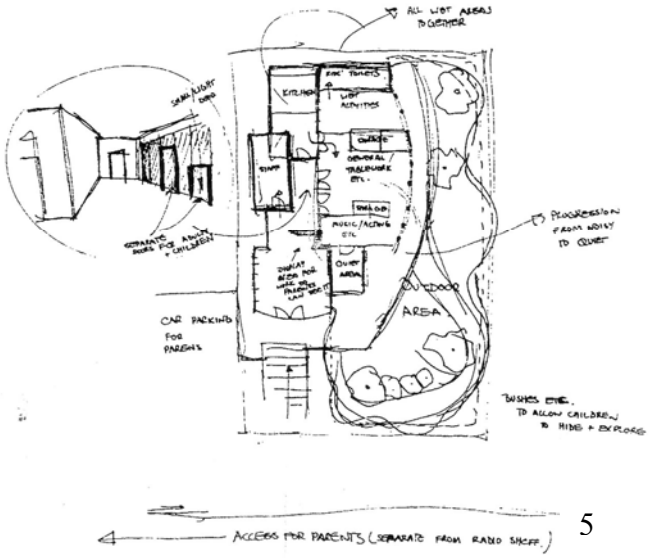
2


KITCHEN

4


LAND
SHEFFIELD
SITE
ACCESS

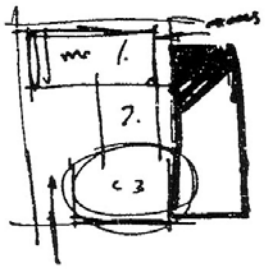
3


ALL WET AREAS TOGETHER
PROGRESSION FROM NOISY TO QUIET
OUTDOOR AREA
CAR PARKING FOR PARENTS
ACCESS FOR PARENTS (SEPARATE FROM RADIO SHEFF)

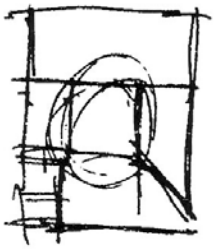
5

Participant NA3

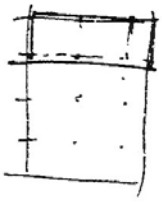
1



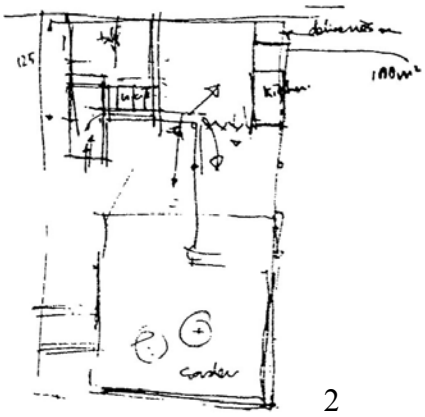
(3.1)



(3.2)

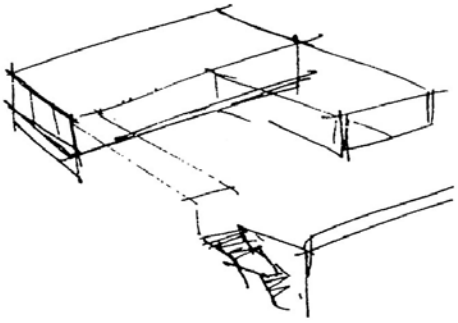


(3.3)

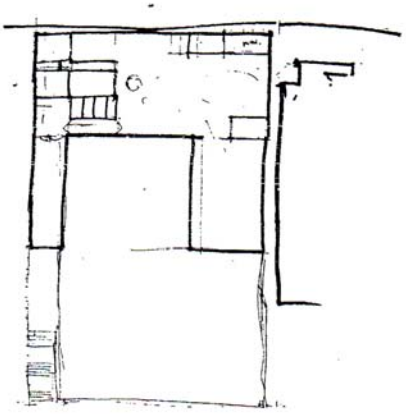


2

4

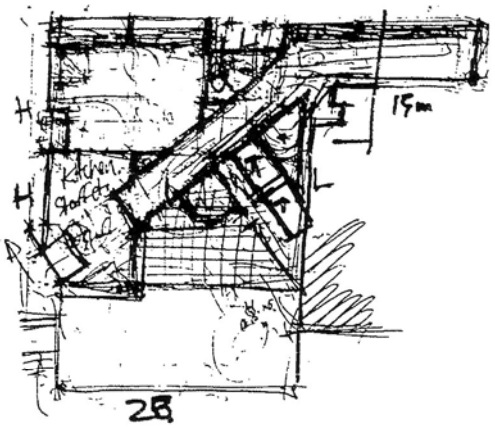


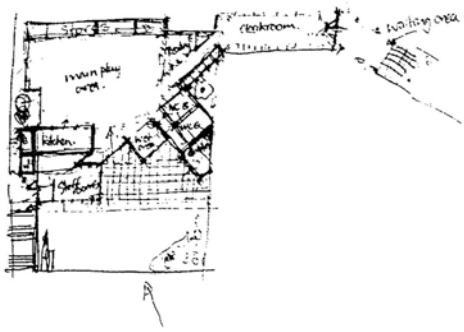
3

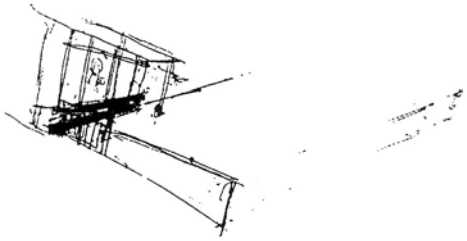


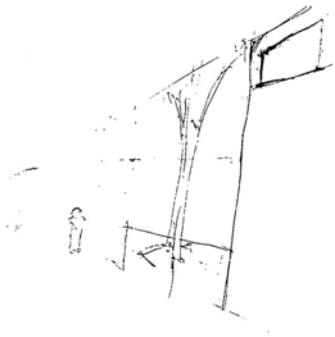
5

Participant NA4

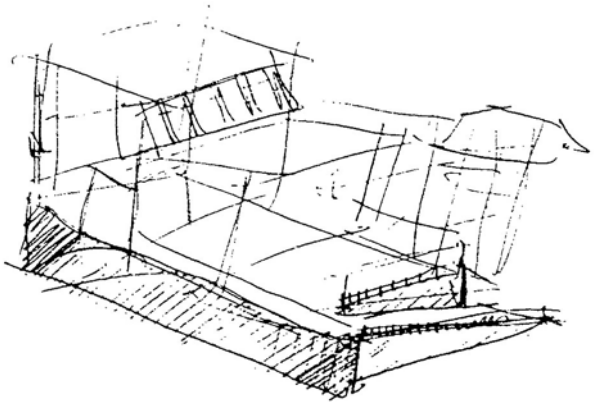


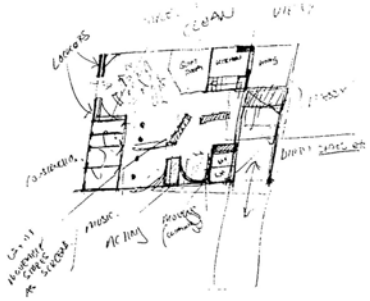


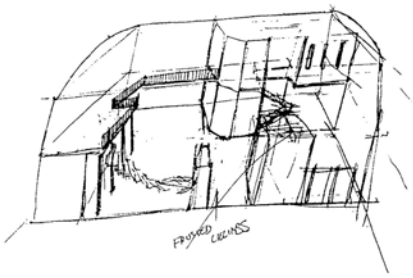


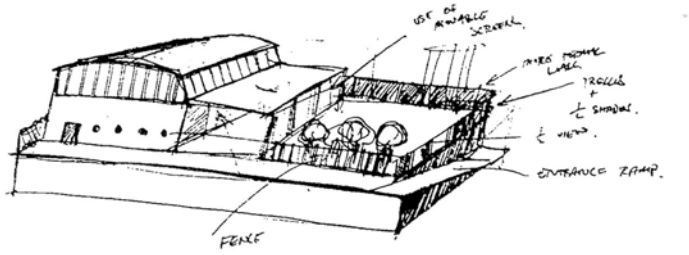


Participant NA5









APPENDIX I*

Sample Review Questions: Case Study 2

Questions varied according to the flow of the interview. Below are examples of questions asked during the review. In addition to those, questions were asked to clarify the understanding of the design process by the researcher. For specific questions see Lloyd (1994).

How would you describe your design process?

What was the concept you started off with?

What do you think the key points were?

What was the main idea of your design?

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APPENDIX J

Results of Analysis of Interview Language for Affect

TOTAL (protocol and interview)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	A1	A2	A3	A4	A5	NA1	NA2	NA3	NA4	NA5
Mean Pleasantness	1.85	1.85	1.86	1.86	1.86	1.89	1.91	1.86	1.86	1.86	1.87	1.89	1.89	1.9	1.82	1.86	1.85	1.83	1.84	1.85	1.84	1.84	1.82	1.83
Mean Activation	1.65	1.64	1.65	1.64	1.65	1.67	1.67	1.63	1.65	1.65	1.62	1.65	167	1.65	1.62	1.63	1.64	1.64	1.63	1.64	1.62	1.65	1.61	1.63
Mean Imagery	1.52	1.39	1.45	1.42	1.45	1.46	1.47	1.43	1.5	1.48	1.46	1.46	1.42	1.42	1.41	1.4	1.41	1.43	1.42	1.42	1.42	1.41	1.47	1.44
Known Adult Words	614	800	3639	8056	2291	1195	989	1766	1867	2899	2255	4118	3808	262	3409	4536	2961	3059	3732	2283	2398	1453	4510	1713
Child Pleasantness	4.47	4.6	4.65	4.62	4.59	4.76	4.79	4.7	4.66	4.75	4.66	4.7	4.63	4.99	4.45	4.56	4.55	4.4	4.39	4.42	4.38	4.36	4.38	4.36
Child Activation	4.13	4.32	4.13	4.14	4.27	4.41	4.35	4.28	4.25	4.33	4.21	4.3	4.36	4.46	4.03	4.03	4.13	4	3.98	3.93	3.97	3.95	3.97	3.98
Known Child Words	179.00	181	961	2353	594	339	281	500	483	694	604	1209	1060	65	908	1369	936	902	1070	680	733	431	1297	476
Total words	649.00	836	3839	8480	2444	1293	1028	1830	1973	3039	2376	4359	4023	275	3501	4682	3068	3214	3875	2375	2467	1518	4706	1792
Mean Frequency	2244.19	2603.18	2607.32	2502.91	2352.1	2343.31	2400.7	2603.81	2481.04	2333.52	2602.63	25981.4 8	2679.18	2926.67	2489.34	2323.67	2434.6	2265.78	2477.23	2572.13	2326.53	2305.87	2229.1	2477.72
Sentence Length	11.80	17.42	17.37	19.06	13.14	12.2	13.35	14.52	13.7	16.88	15.04	12.67	19.34	13.1	22.73	15.71	13.82	11.52	22.66	22.41	15.81	11.41	15.08	17.07
Sentences	55	48	221	445	186	106	77	126	144	180	158	344	208	21	154	298	222	279	171	106	156	133	312	105
Periods	49	44	205	413	178	88	73	119	136	170	156	322	201	21	129	280	205	262	167	106	142	121	299	94
Exclamation Marks	0	0	1	4	2	2	0	0	0	0	0	5	0	0	0	0	0	0	0	0	0	0	1	0
Question Marks	6	4	15	28	6	16	4	7	8	10	2	17	7	0	25	18	17	17	4	0	14	12	12	11
% Nice	3.58	3.38	3.87	3.66	3.32	4.44	3.24	4.93	5.52	4.07	3.15	4.98	4.73	3.82	5.4	5.18	5.03	4.22	5.2	4.47	5.71	4.54	4.72	5.2
% Pleasant	5.37	3.25	3.49	3.92	5.54	5.19	6.98	2.83	4.39	2.55	4.21	3.64	3.86	3.82	3.29	5.31	4.09	3.69	4.98	5.12	5.46	3.92	3.79	3.91
% Fun	2.61	3	2.78	2.57	4.85	3.68	5.26	1.98	3.75	2.79	3.41	3.89	3.23	4.58	2.76	2.47	2.23	2.03	3.38	2.37	3.63	1.51	2.26	2.1
% Active	5.37	4.5	4.23	3.6	2.49	3.68	4.35	3.51	3.16	2.69	3.24	3.5	3.18	3.05	3.23	3.33	3.61	3.14	3.16	2.58	3.29	3.51	2.13	2.1
% Nasty	4.72	2.38	2.23	2.31	1.88	2.93	1.11	2.38	2.41	2.07	1.2	1.55	1.55	1.15	1.47	1.57	1.79	1.67	1.66	1.84	1.88	1.58	1.55	1.81
% Unpleasant	4.40	1.5	1.57	2.46	1.48	2.68	0.81	2.6	1.71	0.97	1.29	1.85	2.23	1.91	1.88	1.5	2.57	1.9	1.69	1.53	1.63	1.93	1.75	2.1
% Sad	4.23	5.13	2.78	5.75	3.58	4.1	2.43	3.57	3.59	3.04	4.88	3.55	5.09	2.67	4.52	5.62	7.26	4.81	5.68	3.64	5.59	4.2	5.5	5.43
% Passive	24.76	24	19.29	21.04	19.12	18.24	18	20.44	17.14	20.59	22.35	20.88	17.23	19.85	23.38	23.39	22.8	23.08	21.73	22.16	23.73	20.23	24.32	22.71
% High Imagery	4.56	3	4.78	3.2	2.97	4.35	2.93	3.45	5.41	3.35	3.06	3.55	2.63	5.34	3.34	3.62	3.56	3.56	3.89	2.89	4	3.23	4.24	5.02
% Low Imagery	44.63	46	45.7	45.23	43.08	41.84	39.64	45.58	41.78	41.46	45.32	42.86	43.96	48.85	45.03	46.01	44.48	42.46	46.49	43.89	43.66	44.6	44.19	43.02

PROTOCOL	1	2	3	4	4'	5	6	7	8	9	10	12	13	14	A1	A2	A3	A4	A5	NA1	NA2	NA3	NA4	NA5
Mean Pleasantness	1.85	1.85	1.87	1.84	1.82	1.9	1.9	1.84	1.88	1.85	1.85	1.89	1.86	1.86	1.8	1.86	1.85	1.82	1.84		1.86	1.83	1.82	1.85
Mean Activation	1.65	1.64	1.61	1.62	1.6	1.67	1.61	1.58	1.56	1.65	1.57	1.63	1.65	1.64	1.61	1.63	1.63	1.63	1.62		1.63	1.62	1.61	1.66
Mean Imagery	1.52	1.39	1.44	1.43	1.4	1.44	1.4	1.43	1.4	1.47	1.43	1.42	1.42	1.39	1.42	1.4	1.43	1.45	1.41		1.4	1.4	1.49	1.41
Known Adult Words	614	800	1196	4439	478	594	219	819	255	2393	1110	2406	1914	162	1500	4206	2098	1787	2441		4206	174	3301	227
hit rate%	95	96	96	95	97	95	97	97	94	96	96	95	93	97	97	97	96	95	97		97	97	95	95
Child Pleasantness	4.47	4.6	4.65	4.57	4.54	4.76	4.6	4.58	4.6	4.733	4.64	4.61	4.52	5	4.34	4.57	4.48	4.41	4.42		4.57	4.34	3.34	4.21
Child Activation	4.13	4.32	4.02	4.02	4.1	4.35	3.85	4.15	3.98	4.28	4.02	4.15	4.26	4.34	3.93	4.03	4.06	4.03	4.05		4.03	3.89	3.93	3.84
Known Child Words	179.00	181	332	1338	115	187	71	222	66	574	305	676	541	38	389	1277	640	514	694		1277	41	966	68
Total words	649.00	836	1245	4668	493	623	226	843	270	2488	1160	2526	2056	167	1545	4343	2178	1878	2527		4343	179	3462	240
Mean Frequency	2244.19	2603.18	2733.43	2548.7	2426.37	2212.87	2327.57	2624.76	2827.74	2286.8	2694.97	2593.67	2641.02	2833.61	2339.55	2296.66	2362.44	2229.82	2515.39		2296.66	2232.26	2172.79	2395.4
Sentence Length	11.80	17.42	18.31	19.21	15.9	10.74	9.83	12.97	12.27	17.77	13.98	13.23	18.04	11.93	14.17	15.35	12.31	11.31	33.69		15.35	10.53	14.02	10
Sentences	55	48	68	243	31	58	23	65	22	140	83	191	114	14	109	283	177	166	75		283	17	247	24
Periods	49	44	63	228	28	42	21	58	18	132	82	175	108	14	86	265	161	151	70		265	7	234	14
Exclamation Marks	0	0	0	0	0	2	0	0	0	0	0	2	0	0	0	0	0	0	0		0	0	1	0
Question Marks	6	4	5	15	3	14	2	7	4	8	1	14	6	0	23	18	16	15	5		18	10	12	10
% Nice	3.58	3.38	4.93	3.51	3.14	6.06	3.2	5.86	3.53	5.39	3.42	6.4	5.17	2.47	5.87	5.14	5.77	4.09	4.67		5.14	5.17	4.91	4.41
% Pleasant	5.37	3.25	3.43	3.06	2.72	5.89	7.31	1.71	7.06	2.21	2.52	3.12	3.03	2.47	2.73	5.30	4	3.41	3.93		5.3	2.3	3.82	5.73
% Fun	2.61	3	1.51	2.05	1.26	4.04	4.11	1.34	1.96	2.59	1.89	3.12	2.46	3.7	2.67	2.52	2.29	2.24	2.62		2.52	0	2.51	2.2
% Active	5.37	4.5	2.51	2.82	2.09	3.2	4.11	2.32	1.96	2.42	1.62	3.33	2.56	1.85	3.13	3.28	3.43	2.85	2.79		3.28	3.45	2.27	4.85
% Nasty	4.72	2.38	1.51	2.19	2.3	2.53	1.83	2.32	1.18	2.3	1.26	1.87	1.62	1.85	1.27	1.47	1.86	1.85	1.93		1.47	2.87	1.42	3.52
% Unpleasant	4.40	1.5	0.67	2.77	2.09	3.37	1.83	1.83	1.18	1.04	1.53	2.37	2.98	2.47	2.4	1.45	2.48	1.79	2.05		1.45	1.15	1.48	3.96
% Sad	4.23	5.13	3.51	6.49	4.39	3.7	2.28	3.54	2.35	2.97	4.95	4.2	4.81	2.47	5.4	5.61	7.86	5.54	6.15		5.61	7.47	5.85	3.96
% Passive	24.76	24	22.24	23.9	27.41	20.03	26.94	26.13	30.59	22.15	30	24.44	20.01	22.84	24.73	23.37	22.78	25.24	23.35		23.37	22.41	25.08	24.67
% High Imagery	4.56	3	5.35	4.33	2.09	6.23	5.02	5.01	4.71	3.55	3.24	3.82	3.08	6.79	3.8	3.76	4	3.69	3.73		3.76	1.72	4.76	5.29
% Low Imagery	44.63	46	47.49	46.29	47.49	44.95	47.03	50.31	54.9	42.42	47.12	46.47	43.94	52.47	46.07	45.86	43.33	40.79	45.96		45.86	44.83	43.35	43.17
Average use of extreme emotional words	30.28	23.14	18.07	22.89	17.99	28.79	24.67	18.92	19.22	18.92	17.19	24.41	22.63 average	17.28 21.7428	23.47	24.77	27.69	21.77	24.14	0	24.77	22.41	22.26 Average	28.63 21.991

INTERVIEW	1	2	3	4	4'	5	6	7	8	9	10	12	13	14	A1	A2	A3	A4	A5	NA1	NA2	NA3	NA4	NA5
Mean Pleasantness			2.86	1.88	1.87	1.87	1.92	1.87	1.86	1.88	1.89	1.91	1.91	1.97	1.83	1.83	1.87	1.85	1.84	1.85	1.85	1.85	1.82	1.83
Mean Activation			1.66	1.66	1.66	1.68	1.69	1.67	1.66	1.68	1.67	1.68	1.68	1.66	1.62	1.64	1.65	1.66	1.63	1.64	1.62	1.66	1.63	1.62
Mean Imagery			1.45	1.41	1.47	1.47	1.48	1.42	1.51	1.52	1.49	1.5	1.42	1.46	1.39	1.34	1.34	1.41	1.43	1.42	1.4	1.41	1.4	1.44
Known Adult Words			2443	3617	1813	601	770	947	1612	505	1145	1712	1894	100	2312	330	863	1277	2101	2283	1631	1279	1209	1486
hit rate, %			94	95	93	90	96	96	95	92	94	93	96	93	98	97	97	95	96	96	97	96	97	96
Child Pleasantness			4.65	4.68	4.6	4.77	4.86	4.79	4.67	4.87	4.67	4.82	4.75	4.97	4.54	4.43	4.71	4.26	4.37	4.42	4.41	4.37	4.5	4.39
Child Activation			4.19	4.29	4.31	4.48	4.52	4.39	4.29	4.55	4.39	4.48	4.48	4.64	4.1	4.05	4.28	3.95	3.99	3.93	3.98	3.95	4.1	4
Known Child Words			629	1015	479	152	210	278	417	119	299	533	519	27	615	92	296	390	581	680	489	390	331	408
Total words			2594	3812	1951	670	802	987	1703	551	1216	1833	1967	108	2370	339	891	1341	2199	2375	1676	1339	1244	1552
Mean Frequency			2545.35	2447.1	2333.16	2470.53	2421.52	2586.05	2426.65	2555	2515.56	2564.99	2718.02	3071.95	2553.71	2671.01	2612.09	2307.79	254.25	2572.13	2417.74	2315.66	2383.33	2490.19
Sentence Length			16.95	18.87	12.59	13.96	14.85	15.42	13.96	14.13	16.21	11.98	20.93	15.43	25.48	22.6	19.8	11.87	28.56	22.41	17.83	11.54	19.14	19.16
Sentences			153	202	155	48	54	64	122	39	75	153	94	7	93	15	45	113	77	106	94	116	65	81
Periods			142	185	150	46	52	64	118	37	74	147	93	7	78	15	44	111	76	106	91	114	65	80
Exclamation Marks			1	4	2	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0
Question Marks			10	13	3	2	2	0	4	2	1	3	2	0	15	0	1	2	1	0	3	2	0	1
% Nice			3.36	3.84	3.36	2.83	3.25	4.12	5.83	2.57	2.88	2.98	4.28	6.00	5.06	5.76	3.24	4.39	4.71	4.47	5.82	4.46	4.22	5.32
% Pleasant			3.52	4.98	6.29	4.49	6.88	3.8	3.97	4.16	5.85	4.38	4.7	6.00	3.59	5.45	4.29	4.07	4.66	5.12	5.4	4.14	3.72	3.63
% Fun			3.4	3.21	5.79	3.33	5.58	2.53	4.03	3.76	4.89	4.96	4.01	6.00	2.68	1.82	2.09	1.72	3.28	2.37	3.49	1.72	1.57	2.09
% Active			5.08	4.56	2.59	4.16	4.42	4.54	3.35	3.96	4.8	3.74	3.8	5.00	3.29	3.94	4.06	3.52	2.71	2.58	3.74	3.52	1.74	1.68
% Nasty			2.58	2.46	1.77	3.33	0.91	2.43	2.61	0.99	1.14	1.11	1.48	0.00	1.51	2.73	1.62	1.41	1.33	1.84	2.08	1.41	1.9	1.55
% Unpleasant			2.01	2.07	1.32	2	0.52	3.27	1.8	0.59	1.05	1.11	1.48	1.00	1.95	2.12	2.78	2.04	1.56	1.53	1.84	2.03	2.48	1.82
% Sad			2.42	4.84	3.36	4.49	2.47	3.59	3.78	3.37	4.8	2.63	5.39	3.00	4.46	5.76	5.79	3.76	5.62	3.64	5.76	3.75	4.55	5.65
% Passive			17.85	17.53	16.93	16.47	15.45	15.52	15.01	13.27	14.93	15.89	14.41	15.00	23.44	23.64	22.83	19.97	20.28	22.16	23.61	19.94	22.25	22.41
% High Imagery			4.5	1.82	3.2	2.5	2.34	2.11	5.52	2.38	2.88	3.15	2.16	3.00	2.81	1.82	2.78	3.54	3.9	2.89	3.86	3.44	2.81	4.98
% Low Imagery			44.82	43.93	41.92	38.77	37.53	41.5	39.7	37.03	43.58	37.79	43.98	43.00	45.67	47.88	47.28	44.64	47.55	43.89	45.13	44.57	46.48	43
Average use of extreme emotional words			22.37	25.96	24.48	24.63	24.03	24.28	25.37	19.4	25.41	20.91	25.14	27	22.54	27.58	23.87	20.91	23.87	21.55	28.13	21.03	20.18	21.74
* see WDAL manual for details									82.93				Average	24.08167									Average	23.14

APPENDIX K

Results of the Content Analysis of Protocols

			Case Study 1		Case Study 2	
	THEMES	CATEGORIES	interview	review	interview	review
		word count	TOTAL	33950	17215	14977
		UNITS	TOTAL	1218	614	374
		TRAVEL				
		Travel	2	28	0	0
	EXPERIENCE	Influences	0	20	0	0
		Where lived	0	15	0	0
		EDUCATION	0	0	0	0
		Education	0	73	0	0
		Learning	0	37	0	0
		EXPEREINCE OF SPACE	0	0	45	26
		Experiential knowledge about space	0	0	14	10
		Experience-based design decisions	0	0	6	3
		Experience of space designed	0	0	25	13
		PERSONAL EXPERIENCE	4	2	0	0
		Professional knowledge	0	0	22	5
		PROFESSIONAL EXPERIENCE	1	89	24	32
		#	7	264	45	26
		FROM LIFE	0	0	0	0
		Happy	0	5	0	0
		Passion and fear	1	7	0	0
		Space/place related	0	8	0	0
		Different feelings	1	21	0	0
	FEEL	EXERCISE-RELATED	0	0	39	27
		Feel about the project	36	5	18	16
		Feel about client	1	1	0	0
		Feel of place/space	9	1	19	6
		Projected feeling	0	0	2	5
		Feeling about elements	10	0	0	0
		Other	3	2	0	0
		#	61	50	39	27
		Experiential notions	4	1	8	3
	SENSORY	Senses	50	2	0	0
		Senses as design considerations	0	0	16	10
		Memory / experience	7	1	0	0
		#	61	4	24	13
		METAPHOR	0	0	0	0
		Object	59	2	2	0
		Personal	6	0	0	1
		IMAGERY	0	0	0	0

			Case Study 1		Case Study 2	
	THEMES	CATEGORIES	interview	review	interview	review
		word count	TOTAL	33950	17215	14977
		UNITS	TOTAL	1218	614	374
	FORM GENERATOR	Personal	7	0	0	1
		Abstract	19	0	2	2
		Envisioning / imagining spaces and events	0	0	5	8
		ASSOCIATIONS	0	0	1	0
		Abstract associations	12	1	0	1
		Memory	10	2	0	0
		MEANING	0	0	0	0
		General	6	11	0	0
		Exercise	14	3	0	2
		AESTHETICS	12	3	1	2
		EXISTING ELEMENTS (like site) and their relationship	0	0	9	12
		INTUITIVE / SUBCONSCIOUS	0	0	1	5
		INSTANT IDEA	0	0	2	4
		Other	0	0	2	3
		#	145	22	11	17
	MEMORY	AFFECTIVE	12	1	0	1
		REMEMBRANCE	8	4	3	6
		#	20	5	3	7
	COLLABORATION	with others	2	16	0	0
		close collaboration	4	5	0	0
		talking to self	2	1	0	0
		#	8	22	0	0
	EXPLANATIONS	This is	29	7	15	13
		Explanation	44	3	0	0
		Story // walking through the space	25	3	35	17
		#	98	13	50	30
	CLIENT	RELATIONSHIP	0	0	0	0
		Relationship with client	16	13	0	0
		Collaboration with client	11	2	0	0
		ASSUMPTIONS	0	0	0	0
		About the client	31	0	0	0
		About the space	17	0	0	0
		#	75	15	0	0
	PROGRAM	Personal interpretation of the problem / scope	40	1	23	10
		Program / scope	7	0	29	9
		#	47	1	52	19
		QUESTION	0	0	0	0
		I don't know	7	1	7	2

		Case Study 1		Case Study 2	
THEMES	CATEGORIES	interview	review	interview	review
	word count	TOTAL	33950	17215	14977
	UNITS	TOTAL	1218	614	374
PROCESS	Do first, explain later / things resolve themselves	19	0	7	4
	Questions / general	17	3	0	0
	Questions / task related	0	0	62	1
	FROM PRACTICE	13	4	0	0
	PROCESS	0	0	0	0
	Concept	24	1	0	0
	Changes	7	0	16	18
	Process / usual steps	17	0	21	21
	MY process	14	0	6	5
	Assumptions	0	0	17	2
	Possible scenarios	0	0	30	6
	Analysis / defining scope / evaluating options	10	0	48	15
	Working through the problem	0	0	47	20
	I want / I feel	5	1	0	0
	Other Issues	6	0	0	0
		1142	0	2	12
	IMPORTANT TO ME	0	0	0	0
	Exercise	32	12	8	15
	Life	0	7	0	0
	Something to start with	37	0	4	5
	Keep simple / stop	14	0	0	0
	Return / restart	16	1	0	0
		0	0	0	0
	#	1380	30	275	126
INSPIRATION	Own pen	5	0	0	0
	Meditation and like	3	4	0	0
	Inspirations	3	7	0	0
	#	11	11	0	0
PRECEDENCE	Precedence	7	0	2	2
	Reference (materials)	3	0	0	0
	#	10	0	2	2
ATTITUDE / OPINION		11	43	2	8
	#	11	43	0	8
PERSONALITY	Self / personality	10	67	1	1
	Self / Architect	1	33	0	2
	Self-Architect / feel, fate, challenge	1	13	0	0
	BELIEFS	0	0	0	0
	Beliefs	0	34	5	4

		Case Study 1		Case Study 2	
THEMES	CATEGORIES	interview	review	interview	review
	word count	TOTAL	33950	17215	14977
	UNITS	TOTAL	1218	614	374
	VALUES	0	0	0	0
	Travel	0	6	0	0
	Family	0	11	0	0
	Architecture	5	5	3	3
	Other	3	22	0	0
	#	12	147	9	10
RESEARCH-RELATED	Questions	11	2	8	1
	Opinions / attitudes	6	6	0	0
	Other	0	0	3	2
	#	17	8	11	3
GRAPHICS	My way	2	4	1	3
	Presentation	5	4	3	6
	Graphic way of working	10	12	12	8
	Just rendering	6	0	0	0
	Get on paper	6	0	0	0
	Drawing skills (poor)	3	0	0	0
	Learning from / process essential	0	0	12	10
	Peception of size	0	0	12	2
	#	32	20	40	29
FAMILY	Places grew up / home	3	32	0	0
	Background stories	6	15	0	0
	Family growing up	0	40	0	0
	Current family	1	27	0	0
	Tourism, hiking, hobbies	1	12	0	0
	School	0	14	0	0
	Other	0	7	0	0
	#	11	147	0	0
THEMES	CATEGORIES // INTERVIEWEE	TOTAL	TOTAL	TOTAL	TOTAL

INTELLECTUAL
EXPERIENTIAL
EMOTIVE

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