# VISION AND THE EXPERIENCE OF BUILT ENVIRONMENTS: TWO VISUAL PATHWAYS OF AWARENESS, ATTENTION AND EMBODIMENT IN ARCHITECTURE

by

#### KEVIN KELLEY ROONEY

B.Arch., University of Arkansas, 2004

### AN ABSTRACT OF A DISSERTATION

submitted in partial fulfillment of the requirements for the degree

### DOCTOR OF PHILOSOPHY

Environmental Design and Planning College of Architecture, Planning and Design

> KANSAS STATE UNIVERSITY Manhattan, Kansas

> > 2016

### **Abstract**

The unique contribution of Vision and the Experience of Built Environments is its specific investigation into the visual processing system of the mind in relationship with the features of awareness and embodiment during the experience of architecture. Each facet of this investigation reflects the essential ingredients of sensation (the visual system), perception (our awareness), and emotions (our embodiment) respectively as a process for aesthetically experiencing our built environments. In regards to our visual system, it is well established in neuroscience that human vision divides into the central and peripheral fields of view. Central vision extends from the point of gaze (where we are looking) out to about 5° of visual angle (the width of one's fist at arm's length), while peripheral vision is the vast remainder of the visual field. These visual fields project to the parvo and magno ganglion cells which process distinctly different types of information from the world around us and project that information to the ventral and dorsal visual streams respectively. Building on the dorsal/ventral stream dichotomy, we can further distinguish between focal processing of central vision and ambient processing of peripheral vision. Thus, our visual processing of, and attention to, objects and scenes depends on how and where these stimuli fall on the retina. Built environments are no exception to these dependencies, specifically in terms of how focal object perception and ambient spatial perception create intellectual and phenomenal experiences respectively with architecture. These two forms of visual processing limit and guide our perception of the built world around us and subsequently our projected and extended embodied interactions with it as manifested in the act of aesthetic experience. By bringing peripheral vision and central vision together in a balanced perspective we will more fully understand that our aesthetic relationship with our built environment is greatly dependent on the dichotomous visual mechanisms of awareness and embodiment.

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# **Dedication**

With deep dedication to my wife, Sandra Rooney, who is an incredible human being from which the structure of all of this was possible.

And to my three, current children, for all that they have given up during this endeavor, may this sacrifice inspire them as they have inspired me.

### **Preface**

Provided by:

Harry Francis Mallgrave, Ph.D.

Honorary Fellow at the Royal Institute of British Architects and internationally recognized scholar and writer with current research on implications of neuroscientific research for design.

As we approach the centennial of the birth of the German Bauhaus, it is perhaps useful to consider the context in which it appeared. The idea of modernity, prior to 1919, was by many accounts a fragile notion. The passage of Euro-American societies from an agrarian to an urban culture brought with it many political hesitations and psychological anxieties, not the least of which was the convulsion of the First World War. Social forces were in no less a state of disarray, and with the devastation of the war Europe soon collapsed into a condition of Spenglerian doom. Out of the empyrean ashes of defeat, the German Bauhaus took root, not in pursuit of a grand philosophical narrative of cultural proportions but with an effort to trace the meaning of artistic modernism back to its most essential roots. Visual lines, colors, forms, textures, and tactile values—these were the themes of intensive research at the early Bauhaus. Threads of turn-of-the-century Lippsian psychology were woven into the new fabric of Gestalt psychology. Gains in our understanding of human sensory systems served art, and designers were not fearful of drawing upon the interdisciplinary resources of the sciences.

The present day, at least as it appears to me, shares many similarities with these times in both a positive and negative way. In a positive vein we have the great strides being made in our biological understanding of the human organism, and many of the humanities are now being strengthened and renewed with this new perspective. Such enthusiasm, however, has not yet

become visible in the arts, which in many ways are still constrained by the legacy of postmodernity. The last four decades of the twentieth century was architecturally built upon the promise of a conceptualized theology. Literary theory, semiotics, and deconstruction were proffered as the narrative of the new "theory" but they soon proved to be abstractions lacking not only substance but also testable hypotheses or connections to the way people actually perceive their built environments. Intellectual fashions within academe emerged with each passing decade only to be dismissed with equal alacrity. Some even consigned the metrics of design to the algorithms of the machine. Today architectural thought stands in much the same condition as it did in 1918—in a pessimistic state of disarray. Once again, we need to return the design arts to their most basic elements.

How can this be done? We must first understand that we have new means. A few years ago I made the comment in print that we, in the past few decades, have probably learned more about who we are as biological organisms than we have in all of human history. I affirm that statement today. The human genome has been sequenced and with it we have the means to attack a large number of diseases that historically have eluded human intervention. No less a scientific breakthrough has been our understanding of the cellular and intracellular dynamics of neurotransmitters, amino acids, proteins, and hormones, all of which have a host of implications for architectural design. If we know, for instance, the hedonic circuits that flood dopamine into the bloodstream, we can begin to understand the mechanisms by which people feel at ease or become "pleased" with their built environments. If we know that forest bathing—to invoke a Japanese turn of phrase that poetically describes three days of hiking in the wild—increases the production of NK white blood cells in the human immune system (those that ward off such things as tumors), then we know that biophilia is not just a psychological state of mind but a

physiological anti-carcinogenic event that should radically change how we think about "buildings" removed from the olfactory essences of nature.

Along another front we have the new tools of neuroimaging technologies and realistic virtual realities that can be composed in a multisensory way. We can now study the experience of architecture with very precise means. We can begin to discern how people perceive materials, scales, textures, colors, proportions, spaces, and urban environments with scientific rigor, but also with the requisite measure of artistic sensibility. Whereas such a promise of means may threaten the philosophical opining of many in liberal academe (and rightfully so), it did not threaten artists like Johannes Itten, Lázló Moholy-Nagy, Paul Klee, or Wassily Kandinsky. It simply made them better artists. The search for the elements of design is not a reduction of our existential or embodied natures but rather a frank and candid acknowledge of our ludic complexity and social attunement with each other. Design is the means by which we connect with one another and the potential reach of design research today is to challenge the designer to learn and draw upon the wealth of implications to be gained by these new resources—or more simply, to build more humane environments.

It is within such a context that I introduce this work of Kevin Rooney. He writes on a subject—the distinction between focused and peripheral vision—that is of interest to architects and designers because it reaches to the heart of how we perceive the built environment. I choose to describe the gist of his research thesis with the word "aesthetic." It is a word that was introduced in the eighteenth century by Alexander Baumgarten, who noted that the Greek verb aisthanesthai had the meaning "to perceive, to feel." He therefore came to define aesthetics as the "science of sensible cognition." It is in this sense of the word that we can learn from the Bauhaus and perhaps draw upon its spirit to explore the fundamental dynamics of the visual

system—among other things. We have greater breadth of knowledge and means at our disposal, and at the very least we can redirect architecture back to its fundamental mission, which is to focus its design efforts on the people for whom we design. Rooney's efforts are first exploratory steps in this direction, and it is my hope that he will follow up on this theme and continue to expand upon it with more sophisticated resources.

# **Chapter 1 - Introduction**

Since even the earliest paintings in the caves of Cantabria, Spain, the visual intensions of western cultures have often been centrally focused activities for producing the objects of art; see Figure 1.1. In the strict sense of vision, it seems these objects of art provide conceptual context of intention. In other words, their intent was to transfer meaning. We can see this trend in the Renaissance period with Christian paintings depicting every detail in sharp vivid character with the intentions of delivering contextual stories with every figure. During the Renaissance, architecture was no different in its fetish of details and orders, dogmatic deliverances of materiality, and expression of cultural icons imbedded in niches and friezes, all of which directed our focused attention to the particular pieces of the architecture.

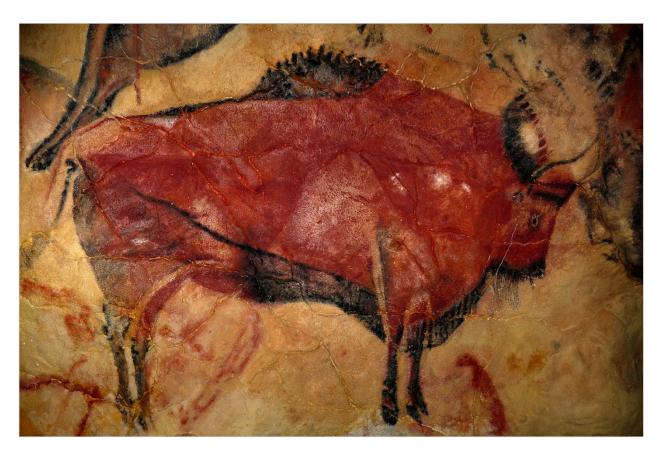


Figure 1.1 Altamira Bison by unknown artist. Caves of Cantabria, Spain.

By contrast, during the Salon de Paris art show in 1874, Monet's *Impression: Sunrise* decidedly took a different turn for the visual exploration of art, one which I argue is a peripheral experience which provides a type of phenomenal awareness much in the same regard as it's title bears; see Figure 1.2. In 1910, a very similar change in visual experience occurred in architecture, summoned by Adolf Loos's lecture on ornament and crime, where all ornament was abandoned due to it's reference of meaning within a given time period (Loos, 1910); see Figure 1.3.

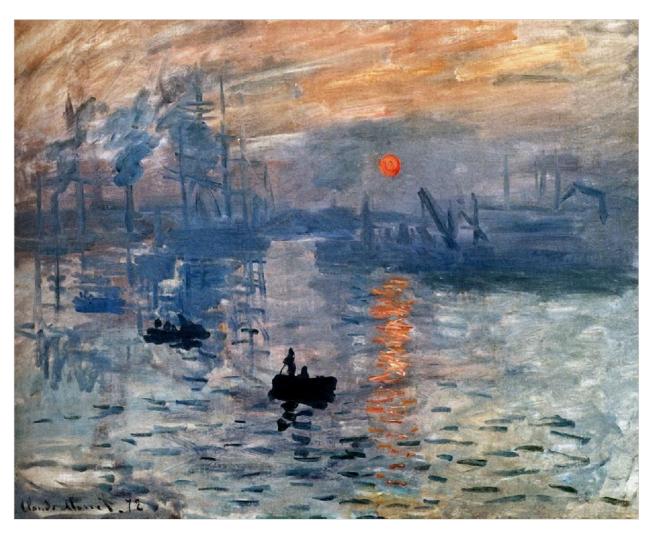


Figure 1.2 Claude Monet's Impression: Sunrise.



Figure 1.3 Adolf Loos's Villa Müller. Prag, Tschechien.

If Monet and Loos removed the ornament, and thus the focus, what then are we responding to when we experience their work? In regards to architecture, some might refer to the precise detailing of a great design or the well organized functionality of it's purpose. For example, the *AEG Turbine Factory* by Peter Behrens contains both of these qualities. Such a statement begs the question; are Behrens's details and functionality the experience of his architecture, or are they subservient to some other quality which is more critical to our experience of his work?

The answer may partially lie in the way our visual system processes the world it sees. Specifically, the breakdown of the central and peripheral visual fields and how each support a different feeling of connection we have with our environment. The suggestion is that, depending on where our visual attention and awareness is, the resulting experience of the architecture will change toward one type of feeling of connection over another. In this regard, architecture is often experienced through the peripheral visual field which seems to provide a feeling of an ambient mood or tone within a space rather than a specific meaning as an object. In this sense, Behrens was directly interested in the power of a space as the primary design principle for the AEG Factory rather than the meaning of its objects.

#### Behrens and the influence of Schmarsow

In 1893, Peter Behrens attended a lecture by August Schmarsow in Leipzig, Germany (Anderson, 2002). Schmarsow's lecture, prior to Behrens's design of the AEG Turbine Factory constructed in 1908, laid out a shift from tectonics to the experience of space. The critical account of Schmarsow's theory is that there is no concern for the "things" or objects of architecture. He was only concerned with the exploration of space within the context of the architecture.

Behrens's factory followed suit in deciding that the traditional dogmatic concerns of architecture were no longer applicable under the industrial setting. As Mies van der Rohe pointed out, Behrens was able to consider such new explorations outside of dogma because there existed no precedence for industrial factory design (Anderson, 2002). In this context, Behrens was able to see the would-be factory without the constraints of predesigned methods. Behrens was only limited by the structural and programmatic demands of the factory itself. In Behrens's

own words, "This hall should have an enclosed, planar definition emphasizing the architectonic proportions of its space. The principle vertical members were detailed with solid walls in order to give them mass, emphasizing their dual roles as both structural supports and space-definers" (Anderson, 2002); see Figure 1.4.



Figure 1.4 AEG Turbine Factory designed by Peter Behrens, Huttenstraße, Germany.

Concrete, for Behrens, became removed from the notions of structure and was used as a plastic filler in order to define a particular type of space. The detailing of the concrete thus became subservient to the desired feeling it would create. According to Stanford Anderson, Behrens did have a particular agenda to convey; "physical and cooperate power" (2002, p. 145).

He did so without bringing attention to particular details or ornament, but by creating an ambient feeling of strength and organization. The success of the Turbine Factory lies in its subservient nature of detailing which creates a feeling within the space. It is something we see in the space, not by looking directly at it, but by experiencing it visually through movement as Schmarsow suggests. If, on the other hand, one was to consider Behrens's factory as the penultimate of utilitarian design, they would have missed the point. Friedrich Krupp's factories of the same time would have fit the utilitarian constructs better because he aimed only to fulfill the "conditions of the site, use, process, and construction" (Anderson, 2002, p. 145); see Figure 1.5. We are left to understand Behrens's work more precisely as an experience of power supported by his details and functionality. Without the feature of power, his details and functionality would be more compared with Krupp Factory's functional execution.



Figure 1.5 Krupp Factory, Germany.

## Two visual perceptions

Visual science provides us with a few clues as to the differences between experiencing architecture peripherally and analyzing the details which support the experience. On one hand, we can place ourselves as one of the workers on the AEG factory floor working each day under the soft glow of the articulated rhythm of vertical members supporting the glass curtain facade. On the other hand, we can just as easily imagine working in a factory filled with fluorescent lighting devoid of articulation; see Figure 1.6. In either case, we are visually focused on our task of manufacturing and are therefore not looking directly at the architecture. In this regard, our emotional state is directly affected by our surrounding environment through the peripheral visual field while our central visual field is focused on our task.



Figure 1.6 Seagate Factory, Wuxi, China.

When critically analyzing architecture, we are looking directly at it in order to understand the objects which compose the environment. It is easy to see this during the traditional studio field trip to an architectural icon such as Carlo Scarpa's *Brion Cemetery*. Often I have seen students busy themselves by keenly studying the details of the ziggurat patterns which dominate throughout the design; sketching intersections of details and laying out plans in hopes of discovering the features that make it work; see Figure 1.7. How could one avoid doing so? I will later suggest that the students' efforts miss the aim of a full architectural experience.



Figure 1.7 Exterior of Carlo Scarpa's Brion Cemetery, San Vito d'Altivole, Italy.

My goal is not to validate or invalidate either method of experiencing architecture. My goal is to communicate that each method visually understands architecture under two separate processes. The workers in the AEG factory feel their environment, while the students at the Brion Cemetery critically search for meaning. Such an account is supported by the way our visual system processes the environment. The workers at the factory are looking at their work while the architecture of the space falls on their peripheral stream of vision. The students, on the other hand, are visually focused on the details of the Brion Cemetery which fall on their central visual field

### What is the visual experience of architecture?

With the description of the workers at the *AEG Turbine Factory* and the students at the *Brion Cemetery*, the hypothesis provided here is that architecture is a divided embodied experience of the built environment which is supported by the visual system. It is the relationship between the processing mechanisms of the human mind which connects us to the imbued intentions designed into our built environments (Scruton, 1979). Of critical importance to the hypothesis is the dominance of the visual system on our experience of the world (Posner et al., 1976) and thus built environments. When we experience architecture, vision dominates our interactions with it. Without vision, many of the designed elements of architecture would no longer reach our perception of them as they are exclusively meant to be seen, such as a spire high on top of a Church; see Figure 1.8.



Figure 1.8 Spire on top of Notre Dame, Paris, France.

Given this high reliance on vision as a dominate form of architectural experience, what then is the visual experience of architecture? What are its qualities which make it work and bind it to the perception of the mind? And finally, what implication, if any, do visual experiences have on the aesthetic experience of architecture? Each chapter provides scientific, analytical, and philosophical examples which together form the argument that our visual experience of architecture is divided into two categories of intellectual and ambient awareness allowing us to project and extend our embodied relationship into and with the built environment which surrounds us; see Figure 1.9. This distinction along a divided visual experience of architecture reveals that many of the aesthetic qualities of architecture are perceived outside of our conscious, focused awareness and often rest more in our ambient awareness of them as we focus our

conscious interactions with a variety of life aspects (e.g. working in a factory, reading a book in a coffee shop, having a romantic dinner, etc.).

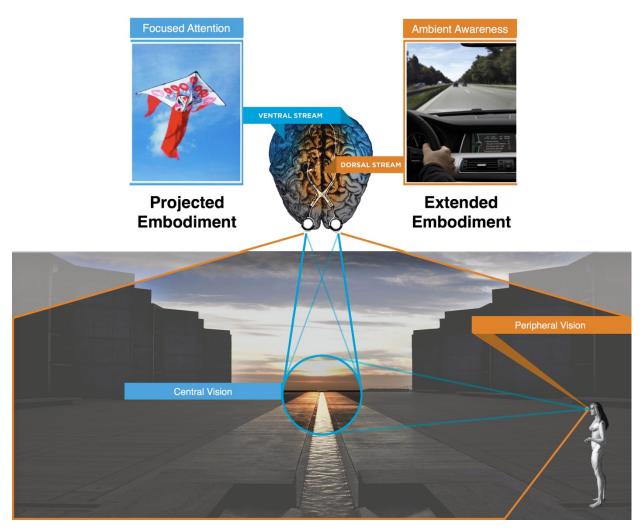


Figure 1.9 Diagram of visual processing, attention, awareness and two forms of embodiment.

With the understanding that architecture more often interacts with our peripheral visual field, architecture can be studied on the basis of how the peripheral visual mechanism retains information about built environments and how that information is transformed into our

connection with the built environment. In this connection, our prevailing sense is that the built environment extends from us similarly to driving a car without being focused on the car or the any particular aspect of the road (Summala et al 1996, 1998; Horrey and Wickens, 2004). The car and the environment become an extension of our bodies with our mind reacting as if the car was a prosthetic. This type of experience utilizes the dorsal stream of vision that is more interested in our place within the scene around us as well as our actions (and the action of objects and people) within the scene.

Additionally, the experience of architecture can be seen as dominant through central vision when we focus our attention toward it, often through critical inquiry of the design; such as the students at the *Brion Cemetery*. In this case, the experience of architecture is presented to us as something to visually consider intellectually while we focus our attention on it; not as an extension from our own bodies, but as something we project into like the act of looking at a kite flying above us. This type of experience utilizes the ventral stream of vision that is more interested in what something is.

By highlighting the differences between processing abilities of the peripheral and central visual field (and the subsequent visual streams beyond), architecture can be understood as providing differing sets of information depending on whether our focused intellectual awareness is intentionally placed on it, or when our ambient awareness processes it while we attend to more everyday tasks of life. The importance is understanding that there is a difference between these two types of visual experiences in architecture and the processes of each yields different types of aesthetic connections we have with built environments; one which is a projected embodiment and the other which is an extended embodiment.

## **Chapter 2 - Visual Awareness and Attention to Architecture**

The central argument in Chapter 2 is that the visual experience of architecture is divided into two types based on the mechanisms of the eye and brain which strongly affect our visual attention and awareness. The first type is our focused intellectual attention to architecture and the second type is our phenomenal awareness of architecture as atmosphere. The second type will ultimately be defended as the greater experience of architecture when considering the natural everyday interactions people have with architecture.

### The general division of the visual system

The key feature in understanding how the eye processes the world is the way in which light enters the eye and is absorbed into its sensorial structures. Light passes through the lens while the ciliary muscles focus light in specific ways to help us see clearly. By contracting and releasing the ciliary muscles, light is allowed to be focused (or unfocused) onto the back wall of the eye called the retina; see Figure 2.1. Like the camera obscura often used by artist during the Renaissance period (see Figure 2.2), the light falling on the retina is projected inversely from which the visual mechanism reverses the image downstream during visual perception.

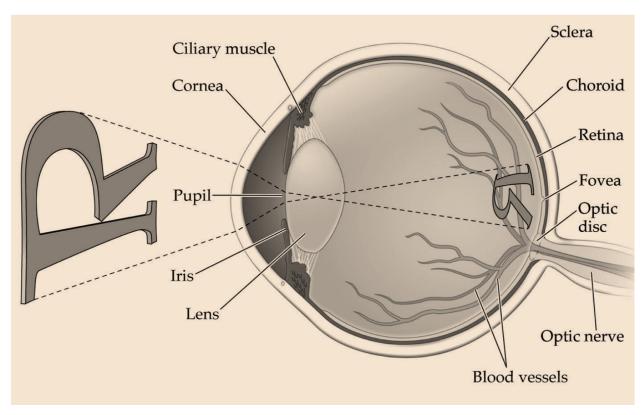


Figure 2.1 Diagram of eye showing transposition of light, "R", during projection from lens to retina. The center of the fovea designates the zero point of retinal eccentricity staring with central vision outward to peripheral vision; see Figure 2.3.



Figure 2.2 Drawing of camera obscura being used in art.

The retina, on where the light is now falling, has a network of receptors which react to various wavelengths, interpreting them into perceptual colors and luminance. This is the visual field of the human retina where about 100 million photoreceptors are divided into two types; cones and rods. Cones, which will be the focus of this discussion, number in the 4-5 million and have three types of photopigments. Each type of cone photopigment can transduce a certain range of wavelengths of light, with the three cone types often referred to in shorthand as the red, green, and blue cones. Combining the information across these cones allows the full perception of the visible light spectrum. Cones are differentially distributed across the retina. The center of vision, the fovea, has the highest density of cones, which drops off exponentially as they move away from the fovea; see Figure 2.3. Given the density of cones in the central visual field, as mentioned, color and details (high spatial frequencies) are best seen when we look at it with central vision (Livingstone & Hubel, 1988).

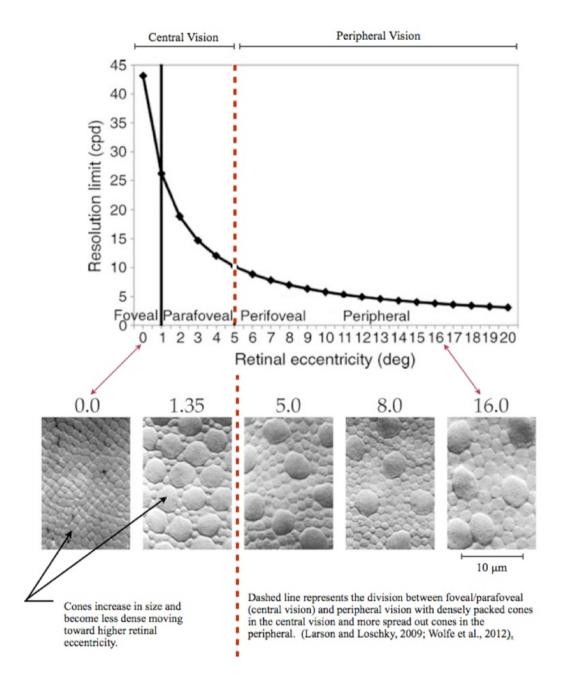


Figure 2.3 Distribution of cones across the retinal field beginning with the fovea (left of graph) and ending with the outer ring of the peripheral visual field (right of graph).

The second major issue is that ganglion cells pool information from cones differentially between central and peripheral vision when transferring that information to the brain. In peripheral vision, a single magno ganglion cell (M cell) will typically connect to a large number

of cone receptors. This convergence reduces visual resolution through aggregation. On the other hand, M cells are larger and have thicker myelin sheaths, and thus have higher processing speeds. The M cells are therefore better at conveying information useful in detecting motion, which plays an important role in spatial perception.

Conversely, in central vision, a single parvo ganglion cell (P cell) typically connects to a single cone receptor. This lack of convergence produces higher visual resolution of detail. On the other hand, P cells are smaller, with thinner myelin sheaths, and thus have lower processing speeds compared to M cells. P cells are therefore better at conveying information useful for detecting differences in color and form, which are very important for clearly identifying objects, but worse at detecting motion.

The M and P cells transfer their output to the subcortical structure of the lateral geniculate nucleus (LGN), which further amplifies the aforementioned differences between central and peripheral vision. The LGN then passes its output to the primary visual cortex (aka, V1) at the back of the brain, where there are many more cells devoted to central vision (the central 5° radius of vision), which is known as cortical magnification of fovea; see Figure 2.4.

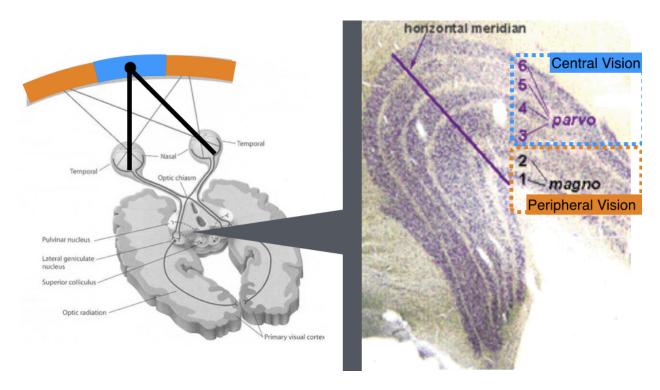


Figure 2.4 Visual processing from the retina on through to the primary visual cortex (V1) with enlarged image of LGN showing the layers devoted to the central and peripheral visual fields.

Beyond V1, information is separated along the dorsal and ventral visual streams. The ventral stream is generally understood to process what things are (Mishkin, Ungerleider & Macko, 1983) and our conscious perception of objects and their colors and shapes (Goodale, 1992). The dorsal stream is generally understood to process where things are (Mishkin, Ungerleider & Macko, 1983) and enables us to interact with things and our spatial environment (e.g., manipulating objects, navigation, etc.) (Goodale, 1992). For simplicity, and consistent with common usage, the ventral stream will be referred to as the "what pathway" and the dorsal stream the "where pathway" (Mishkin, Ungerleider & Macko, 1982); see Figure 2.5.

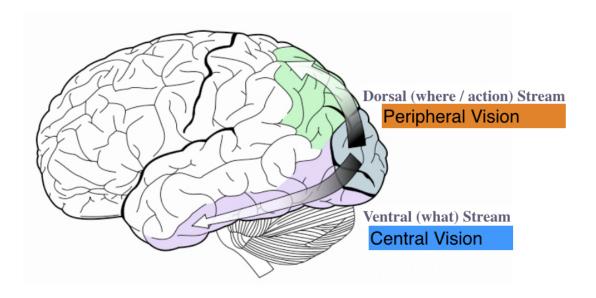


Figure 2.5 The visual system division between the dorsal and ventral streams with additional notation of central and visual field predominance toward each stream.

Importantly, the aforementioned transformations of visual information from the retina to V1 are passed along to the what and where pathways, which show biases towards central and peripheral vision respectively. The central visual field greatly supports the processes underlying the conscious perception of objects in the what pathway. For example, the lateral occipital area (LOC), which is in the what pathway and is greatly involved in object recognition, has a strong central vision bias (Grill-Spector et al., 2001; Larsson & Heeger, 2006). The peripheral visual field greatly supports the processing of spatial relations, actions on objects, and navigation of the environment in the where pathway. For example, area V6, which is in the dorsal stream, and processes motion information used to navigate (known as optic flow), exclusively processes information from the visual periphery (Pitzalis et al., 2010, 2013). Nevertheless, there is a visual area in the what pathway that has a strong peripheral vision bias, namely the Parahippocampal Place Area (PPA), which responds to places more strongly than to objects, people, or faces

(Arcaro et al., 2009; Malach, Levy, & Hasson, 2002; Nasr et al., 2011). Thus, even in this case, peripheral vision is associated with processing the big picture of the environment, rather than objects.

Conversely, areas of the parietal cortex in the what pathway are strongly involved in grasping things with the hands (Goodale, 1992), which crucially involves central vision; we look at things before grasping them, to guide fine hand movements. Thus, even in this case, central vision is associated with processing details and objects. These latter examples show that rather than there being a perfect division of central vision to the what pathway, and peripheral vision to the where pathway, central vision is devoted to detailed perception of objects and their forms, colors and shapes, and peripheral vision is devoted to coarse perception of our environment, our place in it, and movement through it.

The above discussion of the anatomical and functional specializations of central and peripheral vision, from the retina to the what and where pathways, lays the foundation for understanding the different roles of central and peripheral vision. Those functional distinctions map quite well onto what are called the focal and ambient modes of vision (Leibowitz & Post, 1982). In gist, the focal mode involves the use of central vision to scrutinize objects, whether distant or near, and our hands as we interact with them (Leibowitz & Post, 1982; Previc, 1998).

To those previously proposed functions, it should be added that focal mode generally concerns things we are paying attention to because we are looking at them. The ambient mode involves the use of our entire visual field, which is primarily in peripheral vision, in order to maintain our balance, and navigate through our environment (Leibowitz & Post, 1982; Previc, 1998). It should be added that the ambient mode also lets us roughly know what our

surroundings are (i.e., scene gist), and allows the brain to decide (usually unconsciously) what we should pay attention to next.

The argument in the remainder of the dissertation is that the focal and ambient modes are particularly important for our experience and appreciation of architecture. It will be argued that built environments can be perceived in central vision, in the focal mode, as an object (or collection of objects), or in an ambient mode through peripheral vision as a space to be in or move through. Furthermore, an exploration of our level of conscious awareness will include an intellectual engagement with architecture as primarily experienced through central vision in the focal mode and our phenomenal experience (often unconscious) of its atmosphere, as primarily perceived through peripheral vision in the ambient mode.

#### Simple objects and simple scenes

Given such a complexity of operations the eye completes in order to see, what then do we see? In this section, I will review how the two fields of vision breakdown and perceive stimuli in the world in order to show which features are important to which type of stimulus. First, will be object perception and its greater dependency on focal processing through central vision in the what pathway followed by a discussion on scene perception and its greater dependency on ambient visual processing through peripheral vision in the dorsal visual stream.

What is the difference between objects and scenes? For the sake of this section, objects will refer to those things being seen as whole, or countable as a single enclosed unit in-and-of-themselves when looked at -- a coffee cup for example; see Figure 2.6. Scenes, on the other hand, are the visual perception of a place we are looking onto -- a beach for example; see Figure 2.7. For the most part, it will be argued that objects (like cups) are best recognized when seen in

the central visual field, and scenes (like beaches) are best recognized when seen in the peripheral visual field.



Figure 2.6 Cup filled with coffee, Quay Coffee House, Kansas City, Missouri.

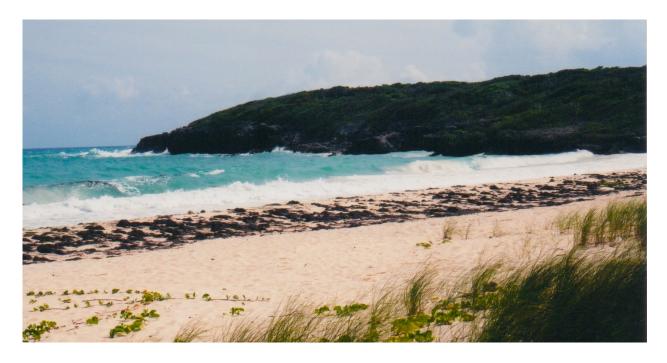


Figure 2.7 A beach scene, Vieques, Porto Rico.

### **Object perception**

At the outset of discussing what an object is and how it is perceived, consider the example of Jan van Goyen's painting, *View of the Rhine near Hochelten* (1653); see Figure 2.8. In the painting, we see many objects; several different types of boats, a couple of tents, and a number of people. The painting, however, is not made up of these objects, the painting is made up of paint. This leads to a certain interesting account, what then do we see when we see objects? Referencing back to the ventral visual stream originating from the central visual field, the basic answer is that we see objects based on a higher resolution on the perception of contrasts that create enclosed edges around a form with increasing confidence over our visual exploration of them. Paintings work because they exploit the way our visual system operates. The mechanisms of the central visual field retain very important information about high spatial frequencies and color which support the processing abilities that flow through to the ventral visual stream in order to recognize objects such as boats, tents, and people.



Figure 2.8 Jan van Goyen's View of the Rhine near Hochelten.

Irving Biederman presents an additional case for how we perceive objects in the world in his classic model called Recognition by Components (RBC). Biederman's RBC model shows us that object detection is critically based on the edge conditions of an object (1987). In one of his examples, he shows that "L", "Fork" and "Arrow" intersections of lines, formed by edge contrasts, can give us important information about an object's shape and intersection with other objects even when all collinearity is removed as seen in the middle column of images in Figure 2.9.

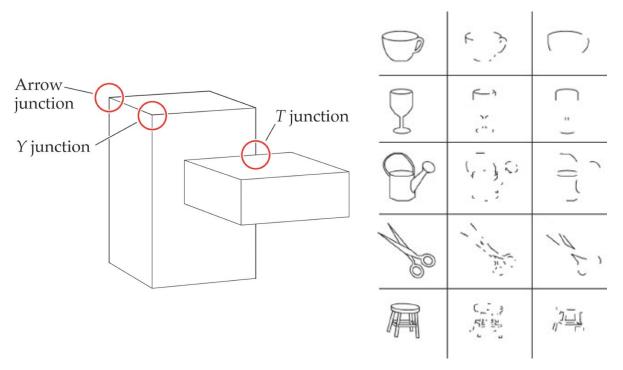


Figure 2.9 Biederman's RBC images. The middle column represents the retaining of "L", "Fork", and "Arrow" intersections. The column on the right represents their deletion.

In order to make such edge distinctions, we must look at the object with central vision. Making such distinctions in the peripheral visual field becomes severely degraded with eccentricity due to aggregated retinal processing to the M ganglion cells therefore making the peripheral vision a poor recognizer of objects (Livingstone & Hubel, 1988; Strasburger,

Rentschler, & Jüttner, 2011; Velisavljević, L., & Elder, J., 2002). In his model description, Biederman gives good evidence that our ability to see the finer details of edges and their intersections allows us to understand with better clarity what the object is that we are looking at. In addition, color also gives us additional information about an object as seen through central vision (Livingstone, & Hubel, 1988).

Sometimes looking at one area of the retinal field will yield conclusions about the other area. In Strasburger et al's review on the abilities of peripheral vision, they affirm that, in the absence of central vision, object and pattern identification is degraded due to the peripheral systems inability to distinguish fine grain detail (2011). In Velisavljević & Elder's study on the effect of eccentricity of visual acuity on visual short term memory, they found that spatial coherence diminishes with retinal eccentricity toward the peripheral visual field which suggests that we generally do much better at remembering detailed visual information presented in our central vision (2002).

In a similar manner, Võ & Henderson's (2009, 2011) studies on object-scene inconsistencies found that the peripheral system is inadequate for detecting objects in the periphery which were inconsistent within the scene presented. In their experiment, semantically inconsistent objects like a printer sitting on a stove, did not elicit a fixation from the subject indicating that the peripheral vision was not able to detect the fitness of objects in the periphery within the context of the scene, but rather objects in the periphery of a scene were providing global characteristics of that scene rather than specifics; see Figure 2.10. Considering that the samplings provided come from a much larger pool of research on object recognition, many of which point to the same findings, we see that there is considerable evidence that we have to look at an object with our central vision in order to consciously understand it best.

# Semantically consistent

### Semantically inconsistent

Syntactically consistent





Syntactically inconsistent





Figure 2.10 Võ & Henderson's (2009) study showing insufficient visual information to detect inconsistency of objects within scenes when viewed in the peripheral visual field.

#### Window vs. scotoma conditions

To further elicit the point that these examples are making, imagine that through experimenting with your own vision you were able to block out either the central visual field, an experimental method called a scotoma condition, or the peripheral visual field, an experimental method called a window condition. Window and scotoma conditions are useful in parsing out the visual system into two categories of central and peripheral vision. An example of a window condition would be the removal of everything outside the 5° of vision leaving a window to the image at central vision, while the scotoma condition removes the central 5° of vision leaving

only peripheral information available for viewing (Larson, A. M., & Loschky, L. C., 2009; Strasburger et al., 2011; van Diepen, P., 2002).

If, under the scotoma condition, you tried looking at a cup on the table you would find it nearly impossible to figure out whether it was a cup of coffee, a cup of tea, or a cup of hot chocolate; see Figure 2.11. If the blindness was reversed by being blind under the window condition, you would have a lot less trouble distinguishing what was in the cup, but you might have difficulty knowing whether the cup was located in a coffee house, an office, or for that matter your own house because you would be blinded to the scene of the place; see Figure 2.12.



Figure 2.11 Cup filled with coffee/tea? Scotoma condition shown with blue dot blocking central vision during eye movement.

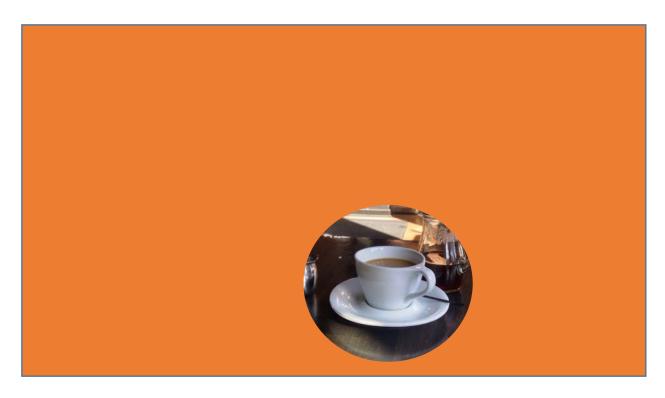


Figure 2.12 Cup filled with coffee. Window condition shown with orange surround blocking peripheral vision during eye movement.

### **Scene perception**

If, instead of understanding an object, we wanted to understand the place or scene we are located in, we would do best if our peripheral visual field was functioning correctly. Returning to Jan van Goyen's painting of the Rhein, we may easily say, even in the absence of its title, that it is a scene of some river. Referring back to the scotoma condition, without central vision, our sense of it being a river scene is still unchanged; see Figure 2.13. How is this so? Don't we need to analyze the painting first before coming to our understanding of the type of scene we are looking at? In Larson & Loschky's (2009) scene gist study which utilized the window and scotoma conditions, they found that the accuracy of scene gist identification with a 5 degree radius scotoma was no worse than when seeing the entire scene. Conversely, scene gist identification with a 5 degree radius window was considerably worse than seeing the entire

scene. Together these findings suggested that peripheral vision was more important for understanding what a scene is than central vision (see also van Diepen, P., Ruelens, L., & d'Ydewalle, G., 1999).

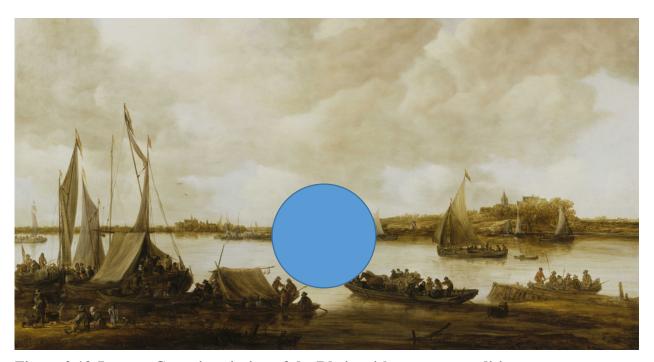


Figure 2.13 Jan van Goyen's painting of the Rhein with scotoma condition

In a more recent study, Loschky and colleagues (Loschky, Szaffarczyk, Beugnet, Johnson, Tang, & Boucart, 2015) used similar methods with panoramic views of scenes (180 degrees horizontally x 40 degrees vertically), and found similar results for 5 degree radius window and scotoma conditions. However, when a 10 degree radius window was used, it produced equal performance to the 10 degree radius scotoma condition, both of which were nearly as good as seeing the entire image. Thus, if one considers central vision to include only the central 5 degrees radius of vision, and peripheral vision as everything else, as many vision researchers do, then peripheral vision is more important than central vision for rapidly recognizing what scene you are looking at. However, if one considers the central 10 degrees

radius of vision to be central vision, then it is equally important to peripheral vision for rapidly identifying what scene you are looking at. Here, the more common and conservative 5 degrees radius definition of central vision will be used with the understanding that from this radius the expansion of either the window or scotoma conditions will have decreasing benefits in regards to two types of visual experiences through the peripheral and central visual fields.

Loschky and colleagues (Loschky, Szaffarczyk, Beugnet, Johnson, Tang, & Boucart, 2015) experiments suggest that the peripheral visual field provides most of the important information for recognizing scene gist and that the nature of this dominance is dependent on the type of features extracted from the analysis of the scene and the amount of area available to the peripheral system rather than the processing abilities found in central vision. The features most important to scene recognition are the same features the M ganglion cells are best at processing in the peripheral visual field. The aggregate nature of information along this pathway amplifies the visibility of larger contrasts and motion (perceived or real) resulting in a bias toward low spatial frequency, which is one of the main features accounting for the perception of a scene (Winawer and Boroditsky, 2008). Given the reliance on low spatial frequency in peripheral vision for scene gist recognition (Schyns & Oliva, 1994), it seems unlikely that individual diagnostic features from objects; like colors, edges, and intersections within the scene are supplying perception with enough information to construct awareness of scene gist types.

In conclusion, work by Loschky and colleagues (Larson & Loschky, 2009; Loschky et al., 2015) suggests that peripheral vision plays a critically important role in basic scene gist recognition due to the amount of visible area in a scene and low spatial frequency analysis. This is consistent with findings that the PPA, which is strongly involved in recognizing the gist of scenes, shows a strong peripheral vision bias.

#### Awareness and attention

After reviewing visual processing from the retina through the dorsal and ventral pathways, the division of the visual field into central and peripheral vision gives rise to a way for recognizing stimuli in the world referred to as object and scene perception. But what is meant by perception? The two important systems described so far merely reveal how the visual information is filtered and divided, but not in the method we come to be aware of it. If I am aware that the painting is a river scene with boats, tents, and people, then surely I must be consciously attending of it? The answer is yes and no, because awareness is also not a simple singular conscious process. It too has its own divisions of focal and ambient processing which interact with the mechanisms of the eye either consciously or pre-consciously (Merikle et al., 2001; Horrey and Wickens, 2004; Leibowitz and Post, 1982; Bánréti-Fuchs, 1967). In this final section prior to integrating architecture into the conversation, a description on the nature of awareness and attentional allocation will be provided and along with everyday examples on how it is achieved.

### Focal and ambient processing and awareness

So how does awareness work when we walk, drive, or, for that matter, when we stand? In Leibowitz and Post's work on ambient processing, they described how even the act of standing utilizes our visual processing of the world (1982). According to Liebowitz and Post, when we are standing, our visual processing of features in the world connects with other senses to give us our balance and our position among objects; see Figure 2.14. They describe the ambient mode of vision as pre-conscious and dependent on the "coordination of motor activity with the visual, vestibular, auditory and somatosensory systems, particularly, kinesthesis"

(1982). In other words, the ambient mode is the coordination of our senses, including vision, to aid in determining our place in the world rather than our conscious attention of it.

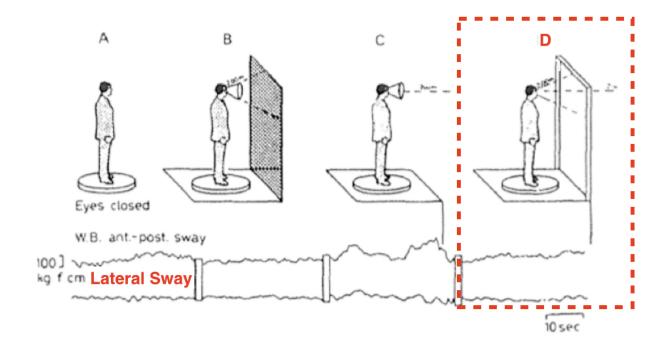


Figure 2.14 Leibowitz and Post (1982) showing how a simple frame seen in by the peripheral visual field (D) can minimize lateral sway and increase balance.

The ambient mode of vision, furthered defined by Horrey and Wickens (2004) as the ambient visual channel, is concerned with earth-fixed space, and spatial orientation and postural control in locomotion. It encompasses 180° of frontal vision and is dominantly influenced by the lower visual field, due to using the ground-based optic flow for walking. Visual ambient processing assess information at great distances, relies on earth-fixed coordinate systems and leg and head movements as the primary movements. Important cues are horizontal cues, linear perspective, and motion flow. Details about the environment are less important and can be seen even when vision is degraded. The ambient mode of vision is typically not processed in consciousness and reacts well to low luminance conditions, decreased quality of image, low spatial frequency and optical rearrangement. When considering the everyday act of driving,

Horrey and Wickens (2004) found that ambient modes of vision did near normal performance compared to natural driving conditions in keeping within a lane while driving, suggesting that ambient vision was sufficiently processing environmental cues in order to maintain trajectory even without focal attention. Alternately, ambient vision was not sufficient in processing sudden hazardous, or unexpected situations, such as a breaking leading car.

So as we are driving and daydreaming, it is our pre-conscious ambient visual awareness which keeps us on the road, but unfortunately this does not help very well in seeing the child between two signs about to dart out in front of us (Whitney and Levi, 2011); see Figure 2.15. To see the child, we would have to utilize our central visual field and attend to them with what Liebowitz and Post (1982) refer to as focal attention. Horrey and Wickens (2004) continue the definition of focal attention as operating in the central 20°-30° of the visual field, and upper field dominant possibly due to operations interested in distal cues. Focal attention also spans from 0.2 meters (8 inches) to great distance, relies on saccades as primary motor system, and is centered in the retinotopic coordinate system. It is also highly represented in conscious awareness and is adversely affected by low levels of luminance, decreased quality of retinal image, low spatial frequencies and optical rearrangement; switching left visual hemisphere with right. In this way, focal attention plays a critical part in our ability to be consciously aware of objects in our surroundings.

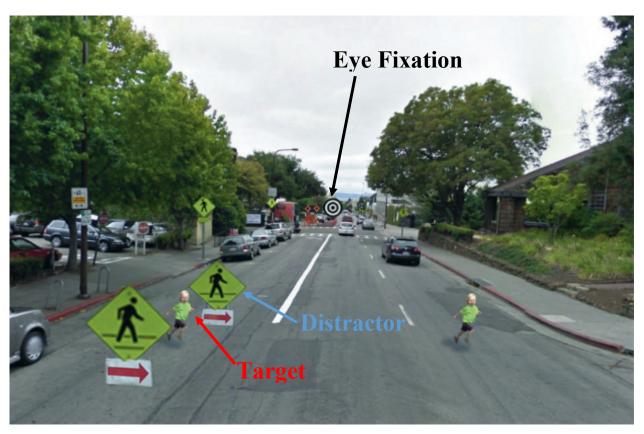


Figure 2.15 Boy darting out from between two street signs. When eyes are fixated at the center of the image, the distractor pedestrian signs visual crowd (blind) us from seeing the boy between the signs. Whitney, D., & Levi, D. M. (2011).

#### Attentional allocation and deployment

In greater detail to what attention is, vision scientist Marisa Carrasco provides an account of attention in her journal titled *Visual Attention: The past 25 years* (2011). Some of the critical features of her review which are important to defining the visual experience of architecture are; spatial, feature based, and object based attention; endogenous and exogenous deployment; and overt and covert attention. In her description, there are two basic ways we attend to the world. We can attend to it overtly with the movement of eyes (e.g. looking to the left after hearing glass break to the left of us) or we can attend to it covertly without movement (e.g. visually locating and making a pass to a basketball teammate on our right without focally attending to them).

In addition to these two basic ways of attending are methods from which we filter the information we are attending to through spatial, feature based, and object based attention. Spatial attention can be understood as attention across the visual field. Feature based attention is deployed to focus on certain features in favor of others, while object attention refers to structures of objects. These three types of attention can be intentionally deployed by the person, in what is known as endogenous deployment, or it can be solicited by an unexpected stimulus, in what is known as exogenous deployment.

Additionally, as Carrasco (2011) points out, our attention can be spread out or focused, in a process likened as a spotlight (Posner, 1980), a zoom lens (Eriksen & Yeh, 1985), or a Gaussian gradient (Downing & Pinker, 1985). The effect of our attention spreading and focusing is similar to the costs and benefits of central and peripheral vision. The more spread out our attention is; the less detail we are able to perceive. The more focused we attend, the more blinded we become to the things surrounding our attention.

Any form of attention, however, is limited to the mechanisms of the eye, so any attention deployed within the visual field is also held accountable to the limitations of that visual field. For example, if one attends without eye movement toward something moving in their peripheral visual field, they would find it difficult to determine what that object is because of the dispersion of cones and M cell relationships in that area of vision. They would also find it hard to recognize the total number of objects in the periphery due to aggregation of information in that visual field. Some features would simply be aggregated out of our ability to attend to them. This lack of perception based on aggregation in the peripheral visual field results in visual crowding which attention is also susceptible to. In Coy et al. (2014), they looked at visual crowding with interior rooms and found that the more crowded objects were in the room the more likely participants

would select a present distractor object from a random one when trying to choose the target object; see Figure 2.16. The selection of a distractor over a random object provides some evidence that participants were covertly attending to the area where the exogenous pre-cuing was presented at the target, but the aggregation of information in the peripheral visual field drowned out the target object in favor of more visible distracting targets.

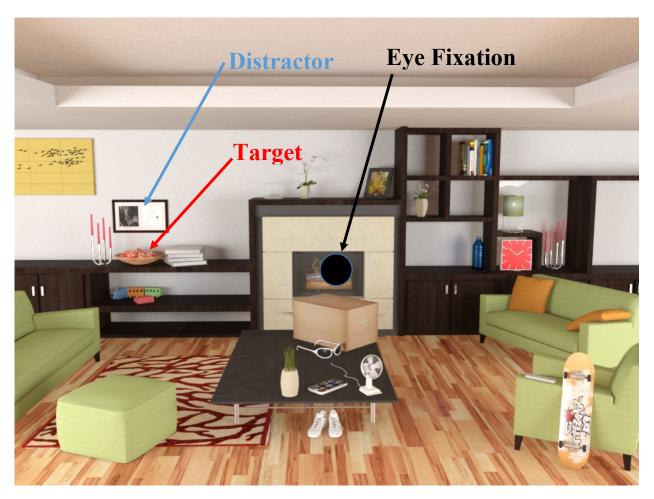


Figure 2.16 Coy et al. (2014) image of interior room with distractor targets.

To add to the complexity of attention, there are also modes or methods for utilizing ambient and focal processing. In the example of driving, Horrey and Wickens's (2004) study refers to ambient awareness as the reason we can maintain our lane even if our focal attention is

attending to areas of the car such as the radio (Summala et al., 1996; Summala et al., 1998; and Lamble et al., 1999). When we are attending with our focal mode to the radio and the striping of the lane with our ambient mode, Horrey and Wickens refer to this as the multiple resource model in which our visual system scans and processes our environment with ambient and focal modes in parallel. In other words, our attention is multitasking the ambient and focal forms simultaneously.

Another model Horrey and Wickens discuss is the optimal scanning model which they define as the participant's ability to scan the environment with focal modes at appropriate times, and thus degrading our ambient awareness to yield necessary information for decision making (2004). This would be seen as less of a parallel method and more of a serial method of attention.

If we go back to the tradeoff nature of focusing and spreading our attention, we can see why these two modes of attention might exist. As we focus in more strongly with our focal attention for greater detail with the optimal scanning model, we trade-off our ambient awareness of our surroundings. In the optimal scanning model, we are trying to discern something particular with greater detail; such as the words one might be texting while driving. Not so good for safe driving, since one's awareness of the peripheral visual field during texting is greatly depleted making us essentially blind to detecting some type of threat in our peripheral visual field. If we spread our attention equally across our ambient and focal awareness for greater breadth of visual attention as in the multiple resource model, we trade-off having greater detail about the objects in the environment. The multiple resource model, therefore, is a better one for driving, but not a good model for finding Waldo. To find Waldo, we would need the optimal scanning model; see Figure 2.17.



Figure 2.17 Where's Waldo? Example of optimal scanning model.

In sum, visual awareness and attention can be defined as a set of detection processes utilizing eye movements and the visual field that is concerned with perceiving the world through consciousness and pre-consciousness, internal and external responses, and expansion and contraction. At this point, we might come to the conclusion that visual perception is by no means a simple singular view onto the world. It is complex processing systems divided along the central and visual fields of vision which have evolved over time to tell us something particular about the world we are aware of and attend to. Our visual experience and awareness of architecture is therefore held accountable to the visual system from which we view the world;

an architecture I will suggest that is primarily experienced ambiently through our peripheral vision.

# Dividing the house of architecture

My intention for reviewing visual processing and awareness is to divide the house of architectural consideration into what we experience through our focal attention and our ambient awareness of built environments. To give two simple examples, first is an image of *Saint Peter's Basilica* in Rome; see Figure 2.18. What do you think of the architecture? If you have visually inspected the image you may have come to some judgment or impression about the design.

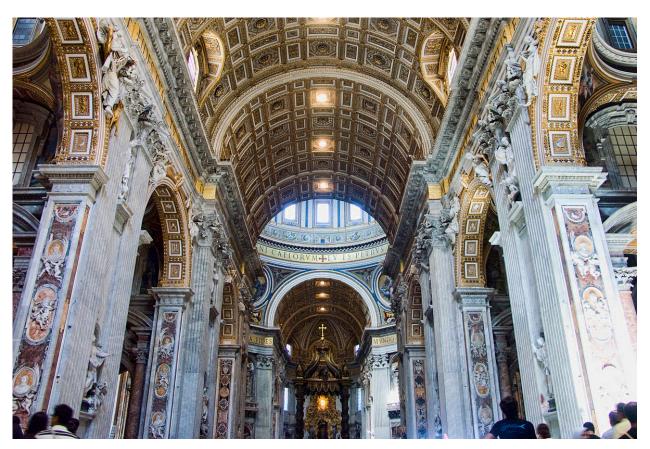


Figure 2.18 Interior of St. Peter's Basilica, Rome, Italy.

If you fixate your eyes on this page without moving them away, what about the surrounding space from which you are reading this dissertation? For me, the space is the *Quay Coffee House* in Kansas City, but for you, I am not sure.

The difference between the two examples is that the image of Saint Peter's Basilica relies on our conscious processing as we scan it with our focal mode of attention in attempts to find something in the architecture, probably under the optimal scanning model. The example of our surrounding space relies on our ambient awareness to covertly scan our spaces, probably under the multiple resource model. This simple exercise reveals the foundational argument that with architecture there are two distinctly different processes occurring; one through our focal attention which is often prompted by an intellectual search for something, and one that is ambiently aware of the atmosphere of space which surrounds us. This division of visual experience in architecture also has caused a great deal of problems in our contemporary understanding of it because we have become all too accustomed to regarding architecture only under its intellectual focal attention with lesser and lesser regard to its atmosphere of ambient awareness.

Additionally, I would like to give some examples of how built environments are typically experienced so that there is common ground from which to assess the position on the bisection of an intellectual and atmospheric architecture. In basic description, the experience of built environments usually begins with some type of promenade, or traveled path, which leads up to a building in the distance. This building in the distance begins as an object of our central vision for which our intellect can make judgments about what it is. As we move closer to the building, eventually entering the building, our experience transforms into the space which encompasses our peripheral visual field, shifting our focused attention to our ambient awareness of our location and action in the space. This same process can occur at various levels and degrees of

experiencing built environments such as urban rooms where an outdoor plaza, flanked by buildings, can have the feeling of an outside room. The same could be said for courtyards. Whether it is Le Corbusier's Chapel of *Notre Dame du Haut* in Ronchamp or *St. Peter's Basilica* in Rome, the visual perception of architecture can be defined along a spectrum of visual perception. With the pole of object perception through the ventral stream on one end of the spectrum and the pole of scene perception through the dorsal stream on the other end.

With the current body of research regarding object and scene perception and focal attention and ambient awareness, why consider architecture as unique among the vast array of visual stimuli? The first case in its uniqueness is that it can be experienced by all forms of visual awareness and attention unlike objects such as cups. We see a building as an object in the distance and enter it as a scene for human endeavors, see Figure 2.20. We cast our focal attention on to details of the building when asked our opinion of the architecture only later to find our ambient awareness consumed by its interiors. The second case is that architecture is a human endeavor and is therefore imbued with intention in regards to our perceptual system unlike beach scenes which are absent of human intentions.

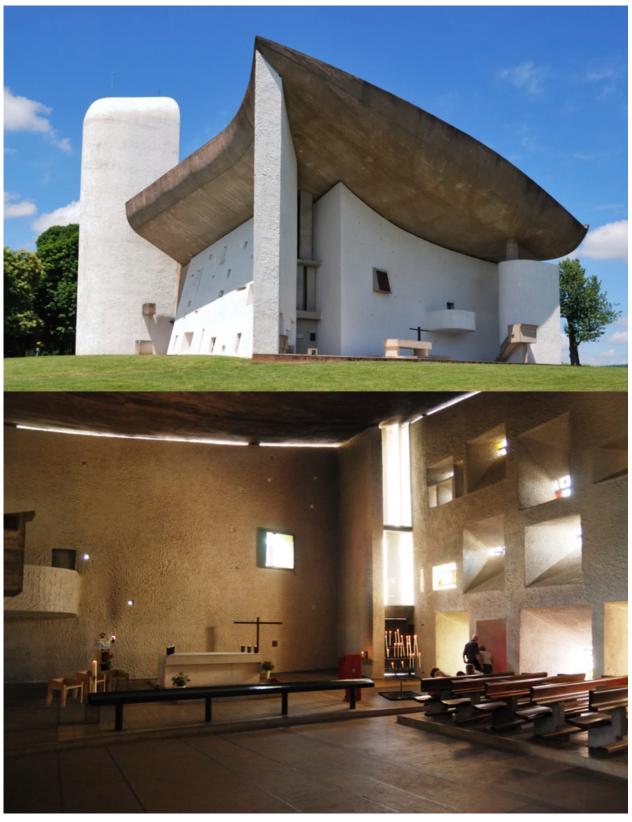


Figure 2.19 Le Corbusier's Chapel of Notre Dame du Haut, Ronchamp, France.

The first case brings to light a problem about architecture. Architecture cannot interact with our visual attention and awareness at all levels at once, but it can do so over time and exploration (Sauchelli, 2012b). Like in the multiple resource model or the optimal scanning model, we trade off visual awareness of the built environment depending on what we are tasking ourselves with. The problem is that architecture, under this claim, takes on at least two different modes; one that is intellectual (e.g. focally applying our awareness to particular aspects of the architecture) and one that is atmospheric (e.g. ambiently applying our awareness to the overall mood of the space).

#### Focal attention and the intellectual analysis of architecture

The intellectual form of focal attention with architecture is probably the most common way people think of when they consider architecture. When we flip through a book about great architecture, see a documentary about the works of Frank Lloyd Wright, see Figure 2.21, or maybe we even happen into a space such as the *Thorncrown Chapel* by Fay Jones, see Figure 2.22, we may find ourselves curious about the work. When we think of architecture, we may even find ourselves asking some basic questions like; *what makes it great, how did the designer achieve this*, or even *why does anyone like this building*? This line of questioning often prompts a very specific conscious, intellectual attention of the building from which our questioning is directed. This type of engagement is what aesthetic philosopher Roger Scruton claims as an intellectual form of judgment about a work of architecture (1979). It is intellectual because it is based on our conscious analysis of built features and the particular type of pleasure we find in them. It is with Scruton's emphasis on the intellectual process along with the mechanisms of

central vision, the ventral visual stream, that I claim the focal attention of architectural experience to be an intellectual one.



Figure 2.20 Frank Lloyd Wright's Falling Water, Mill Run, Pennsylvania.



Figure 2.21 Interior of Fay Jones's Thorncrown Chapel, Eureka Springs, Arkansas.

At the very first level of the intellectual form of attention, we find that it is more natural for us to look at architecture with central vision in order to address it in this way. The question, what makes the building great, typically prompts our looking around at it to find the answer, and assumedly putting us in the mode of the optimal scanning model as if we are looking for Waldo. In doing so, we are utilizing our central visual field and rely heavily on the ventral visual stream to distinguish forms and their intersections. The details of the building then come to the forefront in the analysis and subdue our overall awareness of the space in favor of what we are focusing on.

If we consider Carlo Scarpa's *Brion Cemetery* in San Vito d'Altivole, Italy, we find that the details of the design present a highly repetitive ziggurat pattern; see Figure 2.23. The pattern runs through many of the spaces and provide classic features of the Biederman's RBC model through their edge conditions and intersections. Our overt visual attention is constantly being held to these lines. One reviewing the building under the question of *what makes the building great* would no doubt find themselves drawn into this endless play of edge conditions captivating our intellectual awareness, but they would be misled in thinking that this is the *reason* for its aesthetic essence. Scarpa, knowingly or not, seems to overload our intellectual attention with the ever presence of edge conditions and intersections in order to free us in visually exploring the space with our ambient awareness through elevating the amount our eyes saccade from ziggurat to ziggurat. In assessment, it is hypothesized that to heighten the ambient quality of the space, he utilized the repetitive ziggurat pattern to give our intellect reason to be focused in a similar way Jan van Goyen's did when he provided the blackbird near the lower center of his painting; return to Figure 2.8.



Figure 2.22 Interior of Carlo Scarpa's *Brion Cemetery*, San Vito d'Altivole, Italy.

This process of intellectual attention of architecture not only resides with our questioning the great works of architecture, it extends into the more generic everyday life; as when we walk into a friend's house for the first time. We scan their home in hopes of finding some new piece of information about who they are as if the floor mat at the front door provides greater reasoning to the quality of our friend's hospitality. Similarly, when we are in the physician's waiting room, we look around the space, in most likelihood, to understand in what way we will be treated. Environments matter to us and by scanning them with our central visual field we allow ourselves to analyze their identity more closely in the same way we might analyze the cup to see if it is full of coffee or tea. The problem with solely relying on this intellectual attention of our built environment is that it does not tell the complete story of experiencing the architecture as it might with the cup of coffee and in doing so we have come too quick in giving judgment to features which are merely supportive to the larger ambient effect architecture can have on us. The cup of coffee can be known best by our focal attention of it, but the essence of architecture must be found in our full exploration of it, and it is here where we can distinguish the uniqueness of architecture from other objects, like the cup of coffee, by the way in which we visually consume each.

### Phenomenal awareness and the atmosphere of architecture

The ambient form of awareness with architecture is probably the least common way people consider architecture, and often people must be trained to become consciously aware of the features which are typically pre-conscious in nature. In regards to architecture, it is probably the vast majority of the way in which we experience built environments in our everyday lives.

Going back to Horrey and Wickens (2004) analysis between ambient vision and environmental

cues, the analogy of driving in a car and walking through a building can be drawn to analyze the separate information that focal and ambient modes are dependent on. When it comes to naturally experiencing architecture, it seems common that most tasks involved with built environments do not include direct focal attention, with possible exceptions to opening doors and windows. Instead, focal attention is typically directed toward some goal of speaking with people (e.g. attention to facial expression), object interaction (e.g. reaching for a cup to drink), or introspection (e.g. thinking/daydreaming) to name a few. Returning to Scruton's assessment that the appreciation of architecture involves an intellectual process, he suggests that we must inspect with focal modes of vision to assess the quality of the architecture (1979). But, in a more naturalistic interaction of experiencing architecture through the ambient mode, this would suggest a non-intellectual analysis because the ambient mode is not necessitated by conscious attention. Additionally, Lamme (2003) and Singer (2006) offer a finer definition to ambient awareness by adding the coarse level emotional response we have to visual stimuli early on in visual processing which often affect our physiological (emotional) activity mostly at a preconscious level. They referred to this type of emotional response as phenomenal because it relates to our awareness of sensorial feelings brought forth pre-consciously by visual stimuli, which is greatly dependent on the ambient modes of processing. In this description, phenomenal awareness of architecture refers conjunctively to the ambient process mentioned by Horrey and Wickens as well as a particular range of aesthetic feelings we have in regards to our awareness of the architectural environment which are often made aware to us through the feeling of atmosphere or mood.

If we again consider Fay Jones's *Thorncrown Chapel*, we may again find ourselves intrigued by the detail of joinery and the negative intersections at the trusses, but at this point we

know this intellectual attention is not the reason for the phenomenal feeling we might gain by being in the space; return to Figure 2.22. The quality of light, the height and width of the space, the presence of the trees seen peripherally through the expanse of windows, the rhythmic pattern of frames cascading, all give way to the full essence of *Thorncrown Chapel*. Without these features, assumed accessible through the peripheral visual field, through the M cells on to the dorsal stream, and attended to them phenomenally through the multiple resource model, do we fully experience the nature of the space. Our intellectual attention only provides the individual details of evidence that our friend is indeed welcoming us into their architecture as a place defined in the same way Fay Jones welcomes us to his own version of aspired transcendence with his design of the *Thorncrown Chapel* (Foley et al., 2009, 5m:58s). Even Fay Jones himself was quoted by his daughter as asking her "Do you feel it?" as they entered the space together in reference to the atmosphere of the space (Foley et al., 2009, 11m:23s).

### **Chapter summary**

Given the visual mechanisms of vision from the retina to the dorsal and ventral streams, the experience of architecture simultaneously operates within the central and peripheral visual fields through focal and ambient modes of vision. Due to this fluid state, architecture stands as a unique type of environmental stimulus which can transition between object and scene perception along a cognitive spectrum of visual and attentive responses unlike most other stimuli. The specific claim in this chapter is that there is an architecture which we intellectually assess through our focal attention and an architecture atmosphere we perceived through our phenomenal awareness of our surrounding environment; with the most important distinction being that these are separate forms of architectural experiences operating in parallel through the

visual perceptual system. Architecture, when described, must then be considered as a stimulus whose perception is dependent on the relationship between our focal and ambient processing, each of which plays a unique role in our visual experience of architecture.

# **Chapter 3 - Extended and Projected Embodiment**

Phenomenal awareness and intellectual attention describe the modes of seeing built environments, but this description lacks in explaining the feeling of connection which can be achieved when experiencing the world that most architects aim to design for. In the late 1800's philosopher Robert Vischer began to describe a type of connection he called *Einfühlung* which was later translated into English as empathy (Vischer, 1993). Empathy describes our emotional relationship with the world as something more than an external reference, but includes the world as something within us and we in it (Mallgrave, 2013). Now 200 years later, neurocognitive researchers similarly refer to this experience as embodiment.

Embodiment, for the purposes of this dissertation, will be referred to loosely as our feeling of connection with the world. This general notion of embodiment provides a way of understanding the types of connections which are possible in response to the ultimate category of architecture. The hypothesis is that there are two ways of describing embodiment through visual perception, and that the nature of experiencing built environments is held accountable to these two descriptions; one form of embodiment which is projected and the other form which is extended. In Chapter 4, I will focus more on the aesthetic feeling which transcribes from these two methods of embodiment when experiencing architecture. For this chapter, I will stay focused on the two modes of embodied connection and provide basic examples of each in order to give foundations to how we experience architecture in the following chapter.

# Connecting with the world

In 1979, James Jerome Gibson published *The Ecological Approach to Visual Perception* (2014). His work took aim at criticizing cognitive scientist for over emphasizing top-down, or

indirect, processing of the brain when experiencing stimuli from the world. Gibson promoted the bottom-up, or direct, processing to defining perception as originating from the affordances of the environment rather than from the origination of the brain in response to the environment. The fundamental difference is that Gibson defined the relationship of the environment and the perceiver as inseparably connected with each other. In similar regard, the idea of embodiment has also relied on the mechanism of connection with the environment as critical to our perception and action within it. The varying definitions of embodiment often rest on the strength of their reliance on Gibson's direct perception with some favoring a less reductionist relationship, allowing other ideas of indirect perception to coexist. Gibson merely provides the most severe conceptualization of how the connection operates.

According to Wilson & Faglio, (2011) there are four main experimental findings which help to support the nature of embodiment:

- 1) We typically gesture when we speak to one another, and gesturing facilitates not just communication but language processing itself (McNeill 1992).
- 2) Vision is often action-guiding, and bodily movement and the feedback it generates are more tightly integrated into at least some visual processing than has been anticipated by traditional models of vision (O'Regan and Noë 2001).
- 3) There are neurons, *mirror neurons*, that fire not only when we undertake an action, but do so when we observe others undertaking the same actions (Rizolatti and Craighero 2004).
- 4) We are often able to perform cognitive tasks, such as remembering, more effectively by using our bodies and even parts of our surrounding environments to off-load storage and simplify the nature of the cognitive processing (Donald 1991).

Of importance to this dissertation are items 3, and 4 because they rely on the form of the environment around us to influence our actions and thoughts. In Rizolatti and Craighero (2004), they refer to the mirror neurons as mechanisms for action, understanding, and imitation. The

mirror neurons, as Wilson and Faglio described, simulate the actions of others with the same network of neurons which would operate the function for the same operation from the perceiver.

Vittorio Gallese, referred to this as *embodied simulation* when showing how neurons in macaque monkeys will fire, when seeing the grasping hand movement of another macaque monkey, in a very similar way as if the observing monkey was actually moving their own hand in the same way as the observed monkey (Gallese, 2008). Research by Rizolatti, Craighero, Gallese and others has shown that a wide array of actions can be processed by mirror neurons in the brain, which essentially translate another's observed actions into mental and physiological responses of similar actions (Gallese, 2008; Gallese & Sinigaglia, 2011; Ebisch et al., 2011). Thus, when viewing someone hammering a nail, we too may simulate the sensation of swinging a hammer ourselves.

Another example of embodied simulation occurs when viewing facial expressions which are often processed by the Fusiform Facial Area (FFA) of the brain involved in processing the emotional expressions of faces (Kanwisher et al., 1997). When we see someone smiling, our mental and physiological mechanisms set into motion the actions of our own smile, even if it does not manifest itself in a visible smile (Achaibou et al., 2008); see Figure 3.1. In a similar example, the simple act of forcing an unnatural smile when placing a pencil between our teeth is enough to set into motion the same emotions associated with a genuine smile (Strack, 1988). Through the special processes of facial recognition dominated by the FFA, the preconscious act of emulating facial expressions (Achaibou et al., 2008) allow a gain for a sense of that feeling that usually accompanies the facial expression which in turns influences our actions (Strack, 1988; Davis et al., 2009). This is a good example of the feeling (i.e. physiological responses leading to changes in valence and arousal) of connection we have through embodiment.

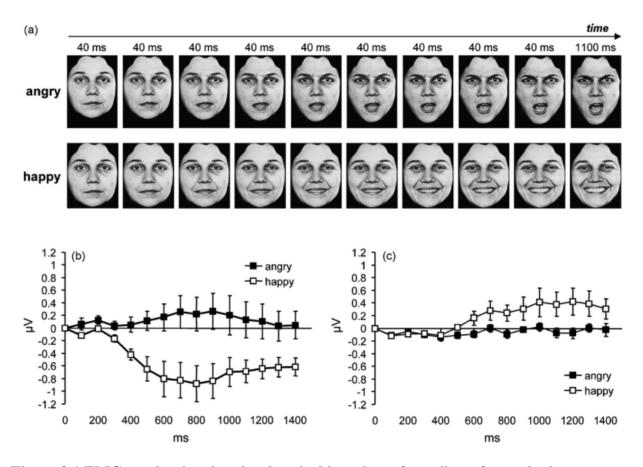


Figure 3.1 EMG results showing the electrical impulses of a smile or frown during exposure to a happy or angry face respectively.

For use of embodiment in this dissertation, the focus will be on the general nature of embodied connection without the need for explicitly defining to what degree we are *directly* connected with the environment around us, as in the case of Gibson. What is important is that our perceptual system functions to consume the world and presumably evolved in response to our (re)*action* with the world. That the world, specifically the built world for this argument, is not just casually important, but *is* an essential reason for our ability to act within it through embodiment. From this vantage point of embodiment arises the central question for this chapter; *In what way does the division of visual processing alter our embodied connection with the built world?* 

Following the discussion in Chapter 2 on the intellectual form of visual attention, the example of the cup of coffee yields a question beyond whether the cup is filled with coffee or tea. The question is; *In what way do we feel connected with either the cup filled with coffee or tea*? If we prefer coffee over tea, but by visual inspection discover that we have been served tea rather than the coffee we ordered, we might find our connection with the cup to take on a form of internal disgust. If, after informing the server of their error, we receive the coffee we hoped for, our feeling of connection with the cup might transform to an internal delight prior to drinking it. In this simple example, we can see the visual detail of objects in the world affect the nature of our connection with them.

On the other hand, if we arrive at our favorite coffeehouse to find they have rearranged the objects of the interior to suit the needs of the lunch crowd rather than the contemplative thinking crowd, we may quickly find displeasure in the new atmosphere and search for a new favorite coffeehouse. In this situation we find that our connection with the coffeehouse is more tied to our phenomenal awareness of the atmosphere rather than the details which make it up; since the details remain the same with exception to their location. The coffee cup represents our focused connection while the coffeehouse represents our peripheral connection. When considering the feeling of connection, these two visual fields provide differing distinctions on what way we gain our connection with the world.

# Central vision and the feeling of connection

When we focus through our central visual field on the world around us we often find that our focus is guided by some type of search prompted by a question. By looking at Boltraffio's *Girl Crowned with Flowers* we might be prompted to consider *what is she thinking* when asked

to view his painting; see Figure 3.2. Or, in the case of Leonardo da Vinci's *Saint Jerome in the Wilderness*, we might wonder *what is he doing* when confronted with his painting for the first time at the Vatican Museum; see Figure 3.3. Either example engages in a focused search with our focused central vision in order to understand intellectually *what* she is thinking or *what* he is doing by way of the ventral processing stream. A classic scientific example is Alfred Yarbus's (1967) eye tracking experiment which is one of the first to showcase the power of prompting our visual search patterns. In his experiment, he provided the participant a series of requests while they viewed a painting by I.E. Repin titled *an Unexpected Visitor*. Yarbus recorded the various eye saccades during each request and showed that the nature of the request affected the visual search pattern within the painting; see Figure 3.4.



Figure 3.2 Boltraffio's Girl Crowned with Flowers.

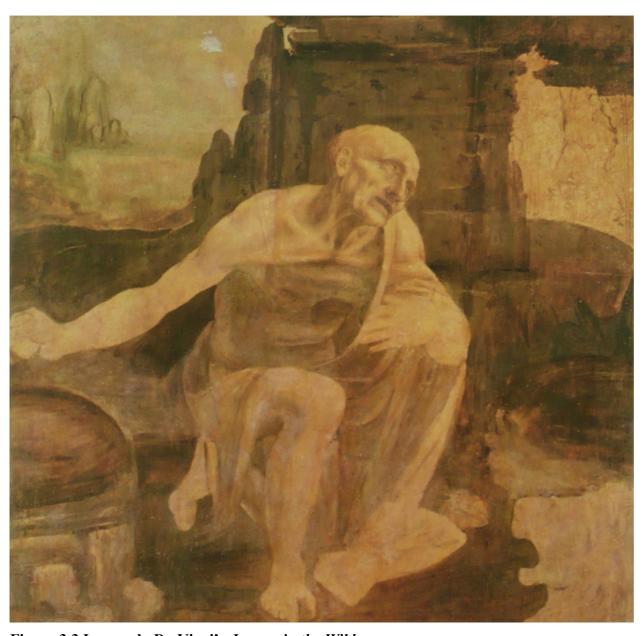


Figure 3.3 Leonardo Da Vinci's Jerome in the Wilderness.

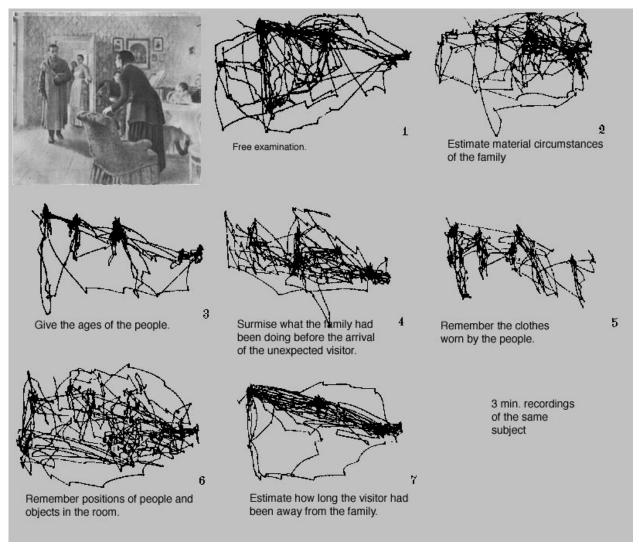


Figure 3.4 Yarbus's 1967 experiment with prompted request statements. Painting by I.E. Repin, *An Unexpected Visitor*.

In these three examples, we can see that a certain understanding of our environment is dependent on our focused inspection of it through the central visual field. Of importance to the idea of embodiment is the feeling we gain from our awareness of it. In the example of Boltraffio's *Young Girl Crowned with Flowers*, the act of considering what she is thinking is not the end result of our inquiry. It is only the means for coming to some connected relationship with her based on her facial expression. Like many artists, Boltraffio exploits our desire to

connect with her by creating an ambiguous facial expression on the girl's face which leads us to engage in a stronger visual search and assumedly a stronger connection with his painting.

Our feeling of connection can also be found in more simple examples such as a kite flying in the air; see Figure 3.5. Like Gallese's mirror neurons in macaque monkeys firing while seeing another monkey grasp with its hands, when we look at a kite flying in the air we can simulate the feeling of flight. As with Boltraffio's painting of the young girl, we must look at the kite in order to gain this feeling of connection with it. If we glance away, leaving the kite visible in our peripheral visual field, we lose many of the import features which the central visual field is more capable of processing (e.g. ripples of edges moving rapidly, arched shape of wing revealing tension caused by uplift, symbolic shape of kite).



Figure 3.5 The feeling of flight when seeing a kite with central vision.

### Peripheral vision and the feeling of connection

We don't, however, have to look directly at something with central vision in order to be connected with it. As Summala et al (1996, 1998) showed, we can attend to other things while we are driving our car, such as the radio, while still accurately maintaining our lane. Such an example reveals that our peripheral visual field is processing important information about the world in order to perform action tasks within it. Driving a car shows us that the peripheral visual field, through our ambient awareness, is tightly connected with our understanding of self and action potential. In other words, the car becomes an extension of ourselves in response to our action within the context of driving accurately between our lanes; see Figure 3.6. Unlike Boltraffio's painting of the young girl, we do not need to direct our focused attention on the car or the road in order to gain our feeling of connection with it. We only need our peripheral visual field to do so.



Figure 3.6 The feeling of exhilaration through the peripheral visual field as exemplified during driving.

Peripheral environments often, if not always, resonate with us by way of a phenomenal type of feeling. If we return to the idea of the coffeehouse, we find that the peripheral environment is important to how we connect with it in regards to our aim for a particular emotional state. For the specific example of the coffeehouse, it was the aim of contemplation; for dinner with my wife, the aim might be an intimate conversation. The two types of aims become the judgment from which we hope the atmosphere satisfies our desire; an atmosphere which resides in our peripheral visual field since the focus of our central vision would be either a book in the coffeehouse, or the face of our loved one in a romantic restaurant.

### Projected and extended embodiment

In the example of the cup of coffee in the coffeehouse, we can apply them to the processing of either the dorsal or ventral stream of vision in regards to embodiment respectively. In the case of the cup of coffee, our central visual focus on the details of the cup (e.g. opacity, color, liquid movement) allow us to decipher whether it is filled with coffee or tea as presumably processed by the *what* pathway of the ventral stream. In the case of the coffeehouse, our peripheral visual awareness on the atmosphere of the place (e.g. composition between objects, overall luminance, movement of people within the place) allow us to decipher whether it is a good place for coffee and contemplation or simply a quick bite to eat with friends as presumably processed by the *where/action* pathway of the dorsal stream. These two examples shed light on the difference between how we connect with the things and places around us and their relationship to the dichotomy of visual perception; a relationship which gives rise to two forms of embodiment along the dorsal/ventral visual divide.

With the simple examples of a kite flying in the air and the image of driving our car, we can more easily describe these two forms of embodiment. The first form, with the kite as its example, is a projection into something which is seen independently before us. The second form, with the example of driving a car, is a dependent extension of ourselves into the world. These two forms of embodiment rely on the division of the retinal visual field and the differing processing abilities of the dorsal and ventral stream and are assumed robust against window and scotoma conditions; See Figure 3.7. and 3.8. Of importance is the way these two forms affect our perception of the world and the different modes of questioning which result from their processes.

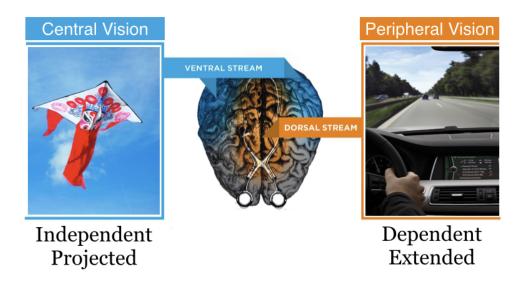


Figure 3.7 Ventral and dorsal stream divide exemplified by the perception of a kite and driving a car.

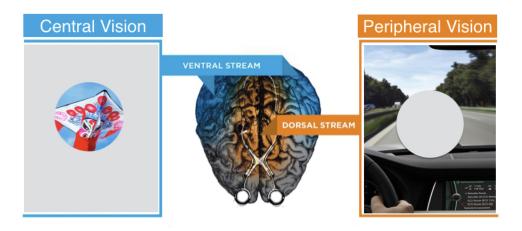


Figure 3.8 Ventral and dorsal stream divide exemplified by the perception of a kite and driving a car superimposed with window and scotoma conditions respectively.

Projected embodiment refers to the visual processing of stimuli through the ventral stream which yields the perception that the object of our gaze is something separate from us. In the example of the kite, we see it as being up in the sky away from our own body, but nevertheless we retain the feeling of connection with it as we sense the feeling of flying. Our embodiment with the kite is therefore a projection into the kite as something out there. In essence, the projected form of embodiment provides the feeling of *what it is like to be* something. We can look at the kite and simulate what it is like to be flying in the air like the kite.

In Gallese & Sinigaglia's (2011) work on mirror neurons and embodied simulation, they take into account our mind's ability to understand *what it is like to be* versus *what it is to be* since the mirror neuron can detect the origin of the stimulus as either internal or external, as when we distinguish someone else's disgust from our own due to the source of activation in the brain

(Jabbi et al., 2008). This effect of empathy, hypothetically, depends on our seeing it within the central visual field. Whether it is disgust, the feeling of flying when looking at a kite, or feeling our muscles tense in the presence of Michelangelo's unfinished sculptures the argument is that we must look at them with central vision in order to feel this type of empathetic connection; see Figure 3.9. Since the central visual field greatly supports the ventral stream processing, we can understand that projected embodiment is an empathetic effect of what something is like when looking at it. It is a projected type of embodiment because the object of our gaze is something out there in which we project ourselves imaginatively into in order to understand it more completely through the process of empathy.



Figure 3.9 Michelangelo's unfinished sculptures. Awakening Slave (left), Atlas Slave (right)

While projected embodiment refers to an intellectual awareness of things being separate from us, extended embodiment refers to the visual processing of the dorsal stream, which provides a phenomenal awareness of those things as which feel to be a part of our own body in a continuous cognitive extension into the perceived environment. In the example from Leibowitz and Post (1982), our vertical balance is increased by the presence of a physical doorframe as seen in our peripheral visual field; return to Figure 2.14. We do not need to focally attend to the

doorframe, but the dorsal processing connects the actions of our body with the frame through our ambient awareness of it. Like a prosthetic leg that helps us stand, the door frame becomes an extended prosthetic piece of our visual peripheral environment which helps us *to be* more balanced

Likewise, our ability to move inside a space like the Pantheon is affected by its spatial structure being processed through our peripheral visual field; see Figure 3.10. Thus, for the act of moving in the Pantheon to take form, both the person attempting the actions and the environment allowing such actions must exist (Michaels & Carello, 1981). The origin of myself moving in the Pantheon is dependent on my being in the Pantheon. Therefore, it is proposed, such an experience always involves an extension of a continuous mind-to-body-to-environment relationship. Conversely in projected embodiment, my having an empathetic experience of someone else moving (like the macaque monkey grasping) does not require that I be aware of a space and can be experienced discontinuously in the same way *Girl Crowned with Flowers* needs no particular museum to be appreciated. Extended embodiment, therefore, encapsulates ourselves in the world in a mind-to-body-to-environment relationship over time. As when we move inside the Pantheon, we are in an extended relationship with the built form around us. We are part of the Pantheon at that given moment in the same sense that we are part of the car when we are driving.



Figure 3.10 The interior of the *Pantheon*, Rome, Italy.

#### Two forms of embodiment in architecture

As mentioned by our movement in the Pantheon, architecture is inseparably tied to our feeling of connection with the world. When we experience architecture, at the level of details or the experience of a space over time, we find ourselves in every aspect of the built environment. To embody ourselves within the architecture, is to find our own relationship with the things around us. Without this relationship with the world, we are more than just disoriented, we fail to find use with our own selves. In this use of self, we project into the world by way of our imagination (see Figure 3.11), to know the world in regards to our own aims, and extend in to it through action (see Figure 3.12) in order to achieve those aims. In this description, the self is inseparable from the world. Our built environments serve us in the same way, allowing us to project into the details and extend into the space as guided by the principles which shaped it. As Winston Churchill so eloquently stated, "We shape buildings, thereafter they shape us".

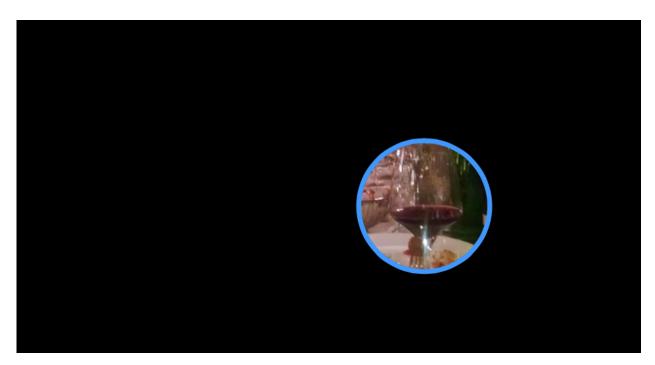


Figure 3.11 Projecting into the world through imagination. *Consolini's Restaurant*, Rome, Italy.



Figure 3.12 Extending into the world through action. Consolini's Restaurant, Rome, Italy.

#### **Chapter summary**

In this bifurcation of visual awareness and embodiment with our environment, we are left to consider what binds each branch of the bifurcation and what then does it afford us. Under the intellectual branch of projected embodiment, we are focused on the meaning of *what it is like to be* some thing when centrally foveating on it. What is it like to be the column capital holding the pediment? What is it like to be the sconce hanging from the wall? The question of what it is like to be uses as its vehicle of understanding a prediction beyond our current state. So, when we look at a kite flying above us, we can project ourselves into the feeling of what it is like to be flying.

On the other hand, the phenomenal branch of extended embodiment provides the complete essence of our place and action, *what it is to be*, within our environment through our peripheral vision. It is an unbroken cognitive extension of one's self to the outermost perceived

portions of the space. A building, like the Pantheon, therefore is prosthetic in nature not because we can control it, but because it shapes our moment-by-moment state of being through our actions within it. In relation to how we build, a complete understanding of our environment requires taking into account both our intellectual and phenomenal processing of it, which results in our projected embodiment into it (through the central visual field) and our extended embodiment with it (through the peripheral visual field).

As mentioned, built environments are unique visual stimuli in that they can encompass the complete visual field and are imbued with intension (i.e. designing with the aim of a particular experience) through a creative human act (Koestler, 1964; Okakura, 1964; Sauchelli, 2012b; Scruton, 1979). Our creative construction and relationship with built environments suggests a framework, that not only can architecture provide such examples of projected and extended embodiment, but some architects actively create a dialogue between these two types of embodiment through a process of designing buildings.

Michelangelo's scroll in the *Laurentian Library* in Florence (see Figure 3.13) and the ordered space of the *Pantheon* in Rome suggest that some architects intuitively employ design, in respect to the process of the dorsal/ventral divide, to provide human order within the natural environment. By reflecting on the stimulus of built environments, we find that we can imaginatively project ourselves into the structure of its form in an embodied relationship. This was presumably Michelangelo's artistic, intuitive intention when creating the scroll. However, when we move inside the *Pantheon*, the object of our central gaze no longer is the focus of our conscious intellectual attention. Instead, our ambient pre-conscious awareness, when moving, provides our location and actions within the space and does not depend on directing our focus to any particular object like the scroll in the Laurentian Library.



Figure 3.13 Michelangelo's scroll detail in the Laurentian Library, Florence, Italy.

The argument is that the building becomes an architectural prosthetic cognitively unbroken from our own body in our extension of ourselves within it. When moving, our embodiment is a physical action we take in response to the particular way the environment is composed (i.e. how we act in a subway tunnel versus a monastery) and this embodiment need not involve any intellectual thought processes (Sauchelli, 2012b; Winters, 2011). Thus, it is proposed that embodiment, may be shaped by the distinct separation of the central and peripheral visual fields. Therefore, in order to understand the ways in which built environments have effects on us, we must consider how the central and peripheral visual fields shape our projected and extended embodied experience.

# Chapter 4 - The Effects of Awareness, Attention and Embodiment on Architectural Experience

The ultimate aim of this dissertation is to answer the original question: What is the visual experience of architecture? In pursuit of this question, I have focused on the visual mechanisms of awareness and attention and our connection with world through embodiment. However, it would be difficult to immediately assume that architecture can simply be discussed through perceptual mechanisms and embodiment alone, for these two neurological and psychological constructs help to answer the how, but not the why. As aesthetician Roger Scruton stated in his 1979 book The Aesthetics of Architecture, architecture is fundamentally tied to our judgment of architecture, and judgment relies on the value we place on it through our experience of it.

Scruton goes on to say that the value we place on architecture comes from the feeling of what is right, not by some personal preference, but by a deep desire that our surroundings should fit a certain way of communal life which we often defend with those who disagree (1979, p. 253).

Given the complexities of aesthetics, I will focus only on the nature of experience and its relationship to vision as I have already laid out in Chapters 2 and 3. I will argue that discussions of experiencing architecture have been biased in favor of projected embodiment with little regard to extended embodiment. To begin, I will describe the nature of experience and its relationship to architectural aesthetics and further divide aesthetics into the visual forms of projected and extended embodiment. From there, I will argue that to correctly speak of the aesthetic experience of architecture is to include the projected and extended forms of embodiment in balance to the experience being had. In addition, I will suggest that the decline in popular value of architecture is due to our bias towards the over-marketing of projected embodiment over extended embodiment, and I will offer some potential remedies to this issue.

#### The function of experience as essential to architecture

The first question we might ask is why speak of experiences at all when speaking of architecture? I will show the nature of architecture cannot be spoken of without speaking of the aesthetic form of experience. The former is inseparably tied to the latter. To begin, I will describe perceptual experience separate from architecture so that you might see what it is at the broadest level, as well as what it is at the specific level with respect to aesthetics. Then, I will describe why architecture is inseparable from the act of the aesthetic experience in either its design or its participation.

Perception, in the broadest sense, is the container from which all experiences can be had, like a glass bottle waiting for its wine. As so, we desire our perception of experiences to be not only at their best but also at their fullest in the same regard we desire the glass bottle to be filled with the best wine. On this analogy, we might accept that an aesthetic experience is the bottle filled with the best wine. With respect to architectural aesthetics, do we not hope for the best and the fullest of our experience with it? As Scruton argues, "[Architecture] aims to reflect every significance that experience can bear..." (1979, p.137). This aim, I will argue, is one that we have almost altogether forgotten.

Why then claim that the architectural aim of aesthetics is not just important but critical to the nature of experiencing architecture? Consider a simple exercise in primitive building. We need shelter, so we wish to raise a roof. Our first goal is to establish a structure from which the roof shall be supported. Looking around for good candidates, we find a variety from which to choose from. Here in lies the problem which exposes the aesthetic need. How do we choose? There are round columns, square columns, fluted columns, thin, fat, tall, short; the list can go on;

all of which are appropriate for holding up the roof. We can, however, make a choice by the very nature of our desire towards one over the others. We desire one because it feels right to us, in Scruton's sense: "the appropriate form ministers... not just to present purposes, but to a sense of ourselves as creatures with identities transcending the sum of present purpose and desire" (1979, p. 240). This act of choosing is the first thing we must do in order to build. We cannot proceed without measuring our own selves as human beings. It is this measure which is described by our human values.

Neurocognitive scientist Alan Baddeley came to a similar conclusion while studying patients with lesions which handicapped their ability for emotional reaction. In these cases, patients are left with the inability to make choices between preferential options. They can describe the options before them but have no measure from which to value them (Baddeley, 2005; Carter, 2000). In this regard, Baddeley refers to Scottish Philosopher David Hume's proposition that the ability to be human is foremost guided by our emotions rather than any rational thought we might have (2005). We are emotional beings and it is this understanding that we find the glass bottle of experience to be the *emotional* potential of an event over time. Emotion then is an essential quality to the development of the structure of our values.

But how can this emotional potential take form as an aesthetic experience? As Scruton points out, an aesthetic experience is not one of personal preference but one of belief in what we *feel* should be true with the world around us (1979), and our feelings come from our emotional states (Baddeley, 2005; Carter, 2000). It is in this way that Scruton claims that the underpinning of an aesthetic choice is one based on human values as to how we feel we should live in the ideal form. If something does not feel right to us, we must then struggle with the structure of our own values to either accept it by changing what we believe or deny it by validating our current belief.

Our belief about the values of the built world is therefore essential to our decisions to construct it.

This example is from the perspective of creating our built environments, but what about the perspective of experiencing the building after it is built, without knowledge of why any of the choices were made? In that case, participants expect intentionality of some type of value to be present because the cause of the building's existence is a human one, and so they search within it in accordance to their own value structure. In the same way that designers must make a choice before selecting a column, participants must apprehend the architecture through themselves, by virtue of their own value structure, prior to understanding what it is that they are looking at. In other words, we can have no understanding of the architecture prior to our aesthetic relationship with it. Thus, architecture is not only dependent on aesthetics, but aesthetics is present in every aspect of the built form by nature of its human process of judgment based on values.

Architect Louis Kahn came to a similar conclusion that any decision based on anything other than human values is a search for an equality of means; a misguided search that all things are equal because all things are relative. As Kahn mentions, if we demand equality of means it can only be by the "trade of old lamps for new without the genii" (Tyng, 1984, p. 170). The genii, I argue in this case, is the essential value of what makes us human; an essence which Louis Kahn referred to as *volume zero*; an archetypal form of human desire that has been with us since our earliest days of self-awareness.

Has the appreciation, education, and practice of architecture traded the lamp without the genii? In our contemporary world, we find it difficult to define common value in the face of our quest for diversity as a means for individual expression; not because being accepting of diversity is the problem, but because focusing on the expression of individualism erodes away and

alienates the feeling of commonality that is essentially human; Kahn's *volume zero*. In our quest for diversity, we rarely build Cathedrals in the center of our towns because Cathedrals represent unity around some specific universal value rather than the acceptance of individualism, and so we find our buildings have followed suit in the pursuit of individual autonomy through valueless concepts rather than what is essentially human. At this point, I must remind those on either side of passion that I am not supporting a particular religion or upholding certain aspects of diversity in regards to this claim, I am simply revealing that the human values which bind our aesthetic relationship with the world are dependent not on what is diverse but on what is universal about being human, whatever that might be. Human values, then, are the pursuit of what is considered ideally righteous to all humankind, not just to the individual but to what is communal, which is what makes it defensible. In this regard, is the ideal aim of building and experiencing architecture.

To this claim, I offer up Gothic Basilica as examples of some of the highest representations. The organization of form and the execution of every detail in a Gothic Basilica are collectively aimed at the values of a particular type, specifically how we should act and feel within the space of an otherworldly presence. In the case of Gothic Basilica, these are the presence of the Trinity; Christ in the Tabernacle, God above, and the Holy Ghost throughout, as revealed by monks chanting in the space; see Figures 4.1 – 4.3. The resolution to all details of the Basilica call to this feeling of presence. We do not need to believe in God, Christ, or the Holy Ghost in order to agree that the built structure not only promotes this particular ideal human value, but was precisely designed to reveal it.



Figure 4.1 Christ in the Tabernacle. Basilica of St Denis, Seine-Saint-Denis, France



Figure 4.2 God above. Basilica of St Denis, Seine-Saint-Denis, France.



Figure 4.3 The Holy Ghost throughout. Basilica of St Denis, Seine-Saint-Denis, France.

If Gothic Basilicas can represent the highest forms of the architectural aim, then we have a particular problem. We no longer, for the most part, build Basilicas like them anymore. So what do we trade our Basilicas for when we construct the contemporary world? In what way can any of our contemporary designs pursue the values of human life which strive to provide for the everyday common experience of the masses? Louis Kahn sought to answer this question when designing the *Salk Institute* in which his value of inspiration between silence and light spoke to both the scientists and the public through the plaza which gazed upon the eternal vista of the Pacific Ocean (Lobell, 2008); see Figure 4.4. In Kahn's expression, the *Salk Institute* is to be a

cathedral to humans based on what it essentially means to be human; for what he called a deep wellspring of desire (Lobell, 2008).



Figure 4.4 Plaza at the Salk Institute by Louis Kahn, La Jolla, California.

The *Kimbell Art Museum* in Fort Worth, Texas is another example of Kahn's value between silence and light; see Figure 4.5. In this case, the development of the portico entry way was designed to reduce the scale of the city to a more intimate setting through the grove of tress, as well as provide shade from the hot Texas sun during the summer. The effect of shadow and light brings out the silence and the light Kahn referred to.

He also sought to answer this question in the design of the *National Assembly Hall* in Dhaka, Bangladesh; see Figure 4.6. Here again he did not imagine it to be a place for individuals to develop rules and regulations, but rather an institution of man (Lobell, 2008). All three

examples of Kahn's work ground themselves in his pursuit for an archetype of human experience; a *volume zero*.

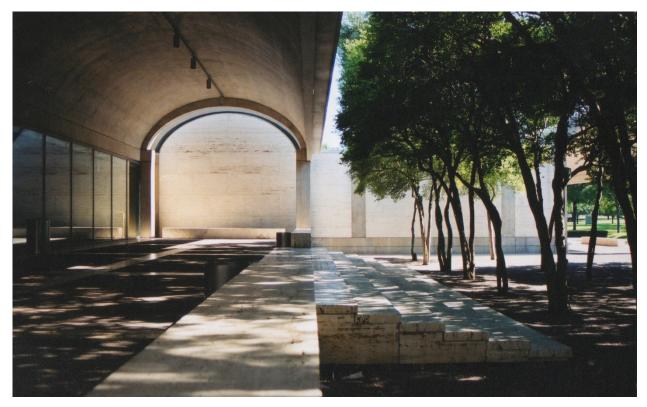


Figure 4.5 Portico designed by Louis Kahn at the Kimbell Art Museum, Fort Worth, Texas.



Figure 4.6 National Assembly designed by Louis Kahn, Dhaka, Bangladesh.

By providing these examples, I am not attempting to persuade any personal preferences towards Kahn's designs or the Cathedrals of past, but to reveal a particular aim of aesthetic experience in architecture which is evident in many of these works whether one prefers them or not. Specifically, their aim is to place a particular human value before any functional or individualistic consideration. Kahn called this aim of experience the aim of the institution. For Kahn, the development of an institution was the development of the way in which we should live through the built form and that the two ideas were inseparable (Lobell, 2008; Tyng, 1984). In researching for the book *Beginnings*, Kahn's daughter Alexandra Tyng discovered it to be impossible to explain Kahn's philosophy of life separately from his pursuit of architecture since the two were one in the same. As Scruton puts it, the separation of one from the world results from a separation of one's own self: "Only by transforming the world into the visible and tangible record of things rationally pursued, can a man find place for himself there: without that

place there will be no self to furnish it" (1979, p. 245; italics added by author for emphasis). In Kahn's words:

Institutions stem from the inspiration to live. This inspiration remains meekly expressed in our institutions today. The three great inspirations are the inspiration to learn, the inspiration to meet, and the inspiration for well-being. They all serve, really, the will to be, to express. This is, you might say, the reason for living. All the institutions of man, whether they serve man's interest in medicine, or chemistry, or mechanics, or architecture, are all ultimately answerable to this desire in man to find out what forces caused him to be, and what means made it possible for him. (Lobell, 2008, p.44)

Here I have set out in this section to provide examples in which aesthetic experience is essential to the creation of architecture and in which an internal structure of human values guides every aspect of decision-making and judgment of architecture. This pursuit of aesthetic experience cannot be based simply on personal preference since its mode is through the structure of values which are not based on individualism but rather on a community of shared human values. In providing these basic grounds from which the topic of architectural aesthetics rest, I aim to reveal what mode guides our visual interaction with architecture and thus the way in which we consider the structure of our values in the face of experiencing architecture.

## The impact of projected and extended embodiment on aesthetic experience

At this point, I have argued that architectural aesthetics aims to be at its fullest and at its best when it exhibits specifically designed human values. I have not yet explained how this relates to the visual mechanisms and processes I have mentioned in the previous chapters. My goal in this section is to illuminate the effects that projected and extended forms of embodiment have on our value structures and thus our aesthetic experience of architecture. In their description, I will point to features in each bringing premises to the argument that the visual

aesthetic experience of architecture is divided and that this division has separate influences on our understanding of our own values in regard to built environments. To do so, I will explain separately what is meant by the experience of architecture through the projected form and extended forms with examples. In the following section, I will pair them back together again to show how they inform each other and subsequently inform the nature of aesthetics.

Again, we might find ourselves asking: why speak of embodiment at all when speaking of architecture? The answer, as it was to our question regarding experience, is the same. Architecture is inseparably tied to the process of embodiment. As mentioned, when we experience architecture, whether at the level of details or at the level of space over time, we find ourselves in every aspect of them. To embody ourselves within the architecture is to find our own relationship with the things around us. Without this relationship with the world, we are more than just disoriented; we fail to find use with our own selves. In this use of self that we project into the world, by way of our imagination, we come to know the world in regards to our own aims and extend in to it to know ourselves in relation to those aims.

So then what does it mean to claim that our values are guided by the projected or extended forms of embodiment? Given that each of these forms of embodiment rely heavily on a distinct areas of the brain, we find that any given focus on either of these areas would lead to an emphasis on that particular type of processing. For example, if we claim that a building is the best of its type because of the way the column capitals visually express the weight of the building, we would have to assess it through our use of projected embodiment (i.e. we must look at the details of the capital with central vision to say that it is in compression); see Figure 4.7. This feeling of weight is an emotion we read into the form. This transference of visual

appearance to emotional reading is provided by way of our focused attention to the detail of the capital.



Figure 4.7 Ionic Column Capital. Temple of Portunus, Rome, Italy.

Upon closer examination of such emotions, we can see that there are limitations to the development of our values based on the type of embodied experience we are engaged in with the built environment. The three types of emotions I will reference are based on Antonio Damasio's descriptions of primary, secondary, and background emotions (1999, 2005). I will argue that the first two fit naturally into extended and projected forms respectively while they both are influenced by and influence our background emotion.

Beginning with background emotions, Damasio defines it as so deeply seated in our identity of self that if it were possible to remove it, we would find it wholly impossible to know

ourselves (Damasio; 1999, 2005). It is this underlying signature of self which we assess all our actions from; assumedly providing the foundational structure to the development of our values.

The first level from background emotions are the primary emotions. Primary emotions refer to the emotional reaction such as "happiness, sadness, fear, anger, surprise, or disgust" and often are processed pre-consciously (Damasio, 1999 pp. 50-51). Such features do not require high resolution but do require breadth of visual field and fast processing power for features such as large span and motion, which are optimal features for the peripheral visual field to capture. Damasio reminds us that in order to have a primary emotional reaction "one does not even need to 'recognize' the bear, or snake, or eagle, as such, or to know *what*, precisely, is causing pain" (2005, p. 131, italics added by author for emphasis). As mentioned, since central vision aims to determine *what* something is, is it possible that primary emotions are less dependent on central vision and more dependent on peripheral vision? If primary emotions are indeed tied to peripheral vision, then any act of extended embodiment would further define the type of primary emotions we would have with our surroundings as a type of underlying mood or phenomenal feeling we have with the environment.

At the second level from background emotions are the secondary emotions, which refer to those emotions that are more complex, conceptual, and conscious such as embarrassment, jealousy, guilt, pride. These types of emotions are concerned with "systematic connections between categories of objects and situations" which are often social in nature (Damasio, 1999, p. 51 and 2005, p. 134). Hence, there is an intellectual process connecting the object and the understanding of situations that elicit secondary emotions. It is through this process that secondary emotions seem predominantly dependent on central vision. This is because they appear to depend on the inspection of *what* something is which relies mostly on the ventral

stream. In the same regard as extended embodiment appears to be tied to primary emotions, so too does projected embodiment appear tied to our secondary emotions. If I can project my embodied self into the flying kite it is because I am aware of the systematic connections between what a kite is in the situation of flying.

In question to this relationship between emotions and the visual fields, Calvo and Nummenmaa (2008) study looked into emotional processing in peripheral vision and found that subject responses indicated an awareness of a course impression of emotions within the scene suggesting an *emotional scene gist*. These emotional scene gists occur within the first 150ms of exposure to the stimulus. Given that this time was less than a fixation, the subject was unable to foveate onto particularly salient emotional aspects of the image. Calvo and Nummenmaa (2008) suggest that such an emotional scene gist allows us to determine targets through covert attention. In other words, emotional content in scenes helps us to locate targets to foveate onto. Calvo and Nummenmaa (2008) also found that semantic information was not processed into the periphery which was supported by the subject's inability to precisely say what they had seen in the image. Their findings provide evidence that the more unconscious dorsal stream is capable of providing emotional response which in turn elicit action of covert attention and that the more conscious ventral stream provides us with more semantic qualities of scenes. It seems that the low spatial frequencies of emotional scene gist and the semantic abilities of central vision fit well within the context of primary emotions and mood being processed through the dorsal stream and secondary emotions being processed through the ventral stream. Extended and projected embodiments therefore appear to affect primary and secondary emotions respectively; see Figure 4.8.

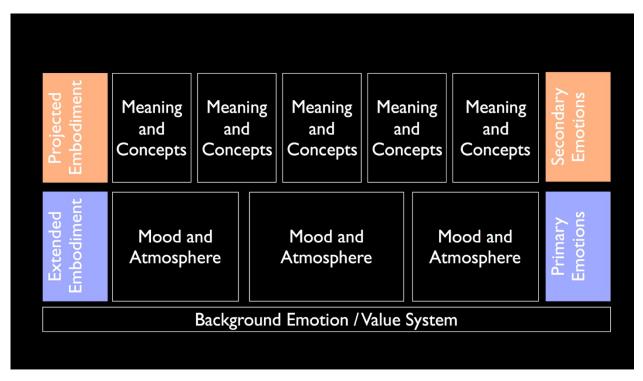


Figure 4.8 Diagram matrix showing the overlapping features of embodiment and emotions. The width and repetition of central boxes represents a diagrammatic comparison of time course for each type of emotion to transpire.

On one hand, at the emotional level of experiencing architecture, we find that the everyday experiences of built forms fall mostly into the category of primary emotions since such experiences are often processed through the peripheral visual field. This way of understanding the experience of architecture leads to an underlying mood or atmosphere (i.e. phenomenal awareness), such as a romantic restaurant, of what it is to be extended into the built environment; see Figure 4.9. On the other hand, we find that the critical analysis (i.e. focused attention) of architecture falls mostly into the category of secondary emotions because when focusing on the architecture through central vision we often consider the meaning and concepts of the forms we project into them to understand what it like to be the form we are considering; see Figure 4.10.

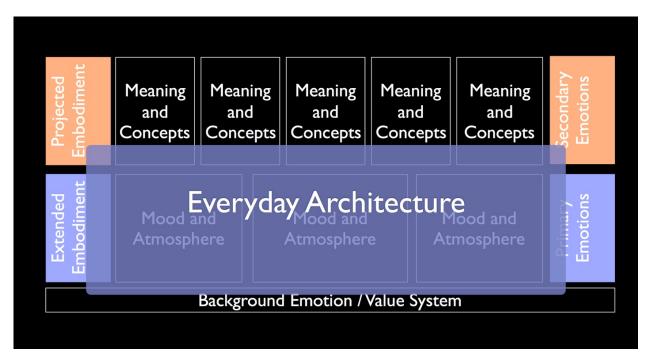


Figure 4.9 Diagram of emotion / embodiment matrix with 'everyday architecture' overlay.

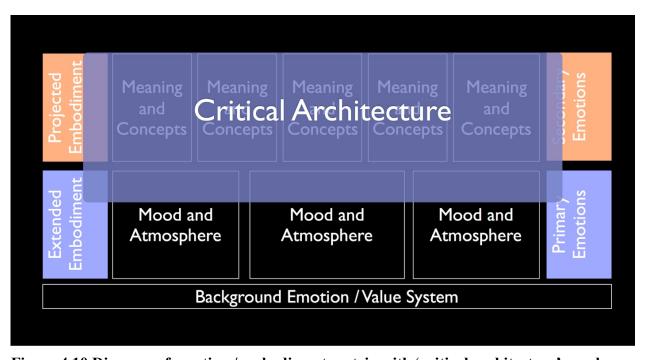


Figure 4.10 Diagram of emotion / embodiment matrix with 'critical architecture' overlay.

It is here that we come to know that the visual aesthetic experience of architecture can take form; along a spectrum which is polarized by the dichotomous nature of the visual

processing system which enables us to extend and project into it through the emotional processes of embodiment. When we project ourselves into the world we are essentially asking the question of *what it is like to be* as processed through the ventral stream, and when we extend ourselves into the world we are asking *what is it to be* as processed through the dorsal stream; see Figure 4.11. It seems then that any visual aesthetic experience must find its way through at least one of these two pathways and manifest itself into the primary and/or secondary form of emotions. Architectural aesthetics also appears to be bound in the same way. In this regard, I will now provide examples of both types of embodiment in the architectural form.

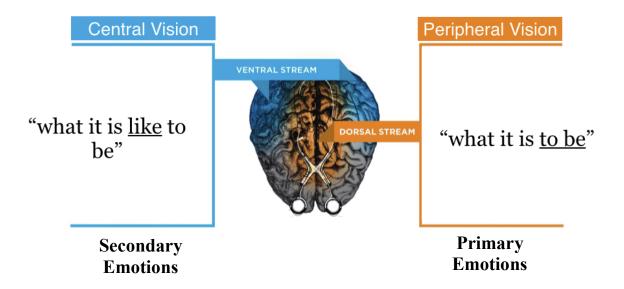


Figure 4.11 Visual pathways and embodiment as related to situational positions of being in the world.

For the first example, consider Roger Scruton's argument that the experience of architecture is contingent on our intellectual pleasures of the imaginative type. This argument rests completely on the mode of projected embodiment. To understand what Scruton means by imaginative forms of intellectual pleasure, we can see in a simple version our ability to

distinguish forms in clouds like a child pointing to one as a dinosaur and then claiming it to be a whale. The same cloud proceeds, but the child's ability to imagine it in various ways comes from their intellectual ability to project their own desires of perception onto the ambiguous framework of the cloud. In regards to the imaginative aspects of aesthetics, Scruton points to examples of virtual structures and historical accounts as reason to believe that imagination is critical to the aesthetic experience of architecture (1979). Virtual structures depend on the way in which we embody the structure and is therefore not completely dependent on the actual structure of an object, like the smiley face example in Chapter 2; return to Figure 2.19. Although we see the Gothic arch as springing effortlessly against gravity, its actual structure transfers more physical load to the column as than the other horizontal lintel springing arch has more mass by volume; see Figure 4.12.



Figure 4.12 Springing arches. Villa Adriana, Rome, Italy.

Another example Scruton gives is the resolving of classical colonnades in various courtyard settings. When one style is applied under two different courtyards their outcomes can stray from the original perception of the style (1979). There is no other conception of preference of seeing a style one way or the other that does not proceed from the act of our perception of it. To say that colonnade A seems weak and plastic at its corner resolve of the courtyard is to see it with a projected type of embodiment. The colonnade itself is not weak, it only looks weak when we project our own understanding of forms onto the colonnade when we look at it. To see it

under the extended form of embodiment would yield no comparison to the idea of weakness because seeing the colonnade as weak relies on our projected embodiment.

Scruton provides another example with the colonnade at *Palazzo Massimi alle Colonne*; see Figure 4.13. Here, he points out that our imagination provides a series of intellectual understandings in regards to the variety of different ways we can see the rhythms of the colonnade and windows. These various rhythms do not exist in the building itself, they exist in our intellectual projection of them onto the object through our imagination.

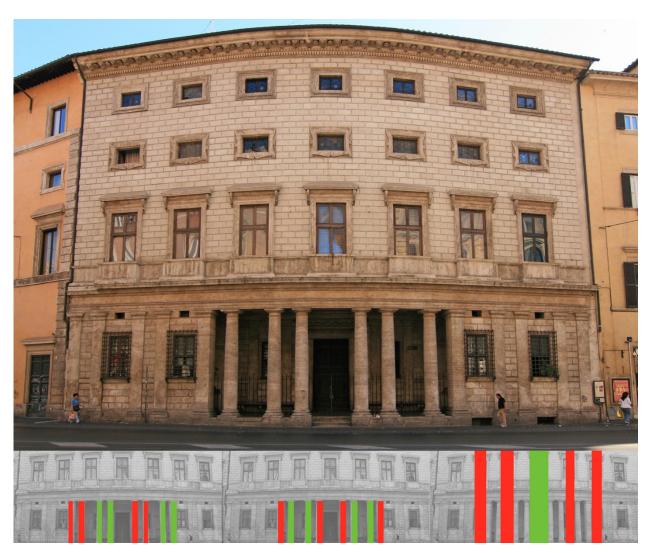


Figure 4.13 Different perceptions of column rhythms as seen on the façade of *Palazzo Massimi alle Colonne*, Rome, Italy.

In addition to virtual structures, Scruton points out that history can influence preference when its projection can describe portions of the experience of the form adequately. Here he gives credence that the knowledge of an idea can drive the way a building is designed as well as the way it is experienced. However, the two are not necessarily tied together. Even if the designers had no intention of making the arch appear authoritarian by over-scaling it, given the context of his nation's fascism, it may still be correct to think of the design as fascist during one's experience of the building; see Figure 4.14. In this way, historical accounts also rest on the imaginative form of intellectual projection just the same as the notion of virtual structures do.



Figure 4.14 *Palazzo della Civiltà Italiana* designed by Giovanni Guerrini, Ernesto Bruno La Padula and Mario Romano, Rome, Italy.

These examples show our ability to see in relation to projected embodiment. The features which seem so central to our ability to be embodied with something is our ability to imagine it in a particular way. The problem with Scruton's accounts is that the relationship of imagination to embodiment greatly favors the intellectual imagination to the things we are attending to as if awareness is synonymous with the central visual field and thus projected embodiment. This bias toward the projected embodiment is unnecessary and particularly misleading to the conclusive ends of architectural experiences because they fail to account for our place inside the architecture, which is fundamental to its experience.

Scruton is certainly not alone in affirming the bias tendency towards projected embodiment. There are many examples of theorists describing the potential of projected embodiment to connect ourselves to the world around us. During the 19th and early 20th century, philosophers such as Robert Vischer, Karl Köstlin and Hermann Lotze came to such conclusion separately. As Lotze mentioned "no form is so unyielding that our imagination cannot project its life into it" (Vischer, 1993) Harry Mallgrave provides a similar account in regards to Köstlin: "The forms that we encounter in the world are not merely beautiful or ugly, pleasing or displeasing; they resonate with symbolic meanings or expressive ideas that stimulate the imagination" (Vischer, 1993). This imagination is the same imagination that Scruton points out as being critical to the aesthetic experience and is the same one which leads to Vischer's *Einfuhling* concept of empathy.

It is this idea of empathy, relying on imagination, that provides to us what it feels like, in the same regard as Lotze points out that,

"Nor is it only into the peculiar vital feelings of that which in Nature is near to us that we enter — into the joyous flight of the singing bird or the graceful fleetness of the gazelle; we not only contract our mental dealers to the most minute creatures, to enter in reverie into the narrow round of existence of a

mussel-fish and the monotonous bliss of its openings and shutting, we not only expand into the slender proportions of the tree whose twigs are animated by the pleasure of graceful bending and waiving; nay, even to the in animate do we transfer these interpretive feelings, transforming through them the dead weights and supports of buildings into so many limbs of a living body whose inner tensions pass over into ourselves." (1885, p. 586; Vischer, 1993; Italics added for emphasis by author).

In his observation, Lotze points out that we enter into the world around us through our imagination, what he calls "mental dealers". That we feel the movement and expressions equally of creatures and the inanimate forms of the built environments we look at.

The projected form of embodiment, as seen through these examples, gives us a privileged perspective from which we look out onto the things of the world. It, however, disregards any notion of our place in the world. The extended form of embodiment places us back inside the world, and thus back inside the experience of architecture. Extended embodiment frames in who we are within the built environment. Referring back to Louis Kahn's plaza at the *Salk Institute*, we are left with nothing to consider of the architecture in our projection into the plaza because the plaza acts as frame for the Pacific Ocean and the anticipated arrival of the equinox sunset; see Figure 4.15. Through the proportions of the plaza, we are intoned to a type of balance in the space within the plaza in the same way that Liebowitz and Post (1982) showed us that a simple frame in the peripheral visual field provides us balance.



Figure 4.15 Image of the Fall Equinox sun setting on the stream in the plaza designed by Louis Kahn. *Salk Institute*, La Jolla, California.

The difficulty in speaking about extended embodiment is that it is often experienced preconsciously. This leaves us without the same words typically used to describe our projected form of embodiment. One reason may stem from that fact that extended embodiment is associated with primary emotions, which need no account of *what* something is, only how it makes us feel. Certain atmospheres of space simply make us feel a certain way by the composition of their shape and the quality of their light (Zumthor, 2006).

This difficulty in expression has led many theorists of architecture to speak of atmospheres in architecture poetically rather than descriptively. Of one example is Zumthor et al.'s passage in his book *Thinking Architecture* (2006). The baths at *Therme Vals* in Switzerland is an example of Zumthor's own work in which he actively pursues a phenomenal atmosphere

that calls to the deeper impression which is so often hard to describe; see Figure 4.14. Zumthor et al. states:

"...I am convinced that a good building must be capable of absorbing the traces of human life and thus of taking on a specific richness. Naturally, in this context I think of the patina of age on materials, of innumerable small scratches, of varnish that has grown dull and brittle, and of edges polished by use. But when I close my eyes and try to forget both these physical traces and my own first associations, what remains is a different impression, a deeper feeling...[a] feeling of deep melancholy." (2006, pp. 24-26, Italics added for emphasis by author).

Any theorist would be correct in providing such poetic accounts of architecture when their poetry, like any good poetry, can lead us to some particular understanding of emotional awareness—an awareness that leads us to imagine the details of the space in a particular way. As evident in the *Therme Vals*, Zumthor has no intention of elevating the details beyond their means of supporting the overall atmosphere of the baths. The composition of atmosphere is the source of deep impressions Zumthor refers to in his passage. Without the over-emphasis of details in the space, visually we have little to cast our central focus onto. We thus relinquish our awareness to the atmosphere of the space as an extension of ourselves. This is the value Zumthor places in the organization of the architecture; a value of immersing ourselves into the world.

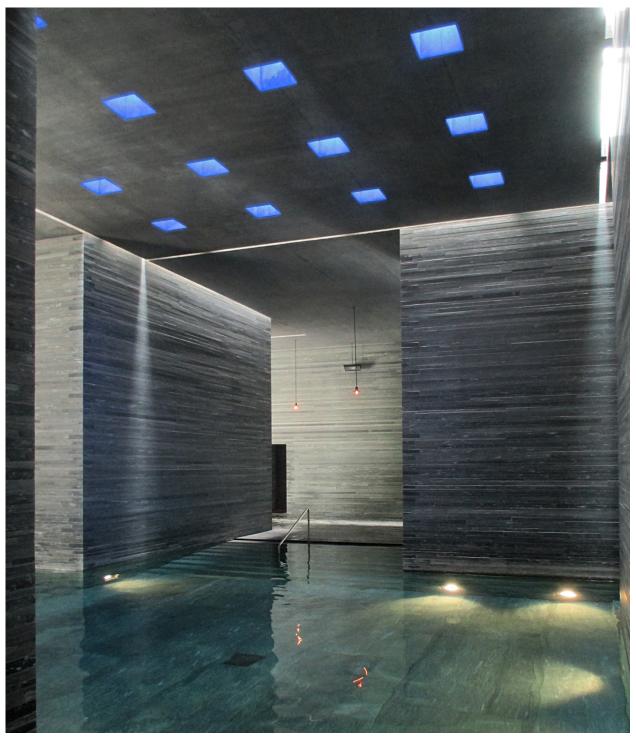


Figure 4.16 Baths designed by Peter Zumthor at the *Therme Vals*, Switzerland.



Figure 4.17 Blank wall designed by Michelangelo as seen from the top of stair exiting the reading room at the *Laurentian Library*, Florence, Italy.

For another example, The *Laurentian Library* holds a unique moment in which we are intentionally faced with an unadorned 'blank' wall opposite the stair; see Figure 4.17.

Left with no details or statues to project ourselves into, we are given the opportunity by Michelangelo to confront our own self, placed within that very moment, as if the wall asks as the mirror would 'who are you?'. It is unsettling, at best, when we discover the wall because we expect our buildings to give to us, not question us.

In its form as a library, the wall becomes a very fitting poetic question. Said another way, it might suggest that those who come to study its books are held accountable to transform knowledge into elevating the human life. If Michelangelo had continued the rhythm from the other walls, he would have suggested that the answers had already been achieved by the particular values associated with the classical details adjacent to the blank wall, and you were the soldier of knowledge simply called to act them out. This example is rare in which the details, which would have elicited our projected embodiment, were intentionally discarded in favor of a moment of contemplation about ourselves situated in the world which relies heavily on our extended embodiment.

At this point, we find that the intentions of the designer can fall on either side of the divide of projected and extended forms of embodiment. An intention of projection is one based on an imaginative form of intellectual pleasure through secondary emotions. An intention of extension is one which calls to who we are in a given moment in time: a primary emotion provoked by the atmosphere of the space.

Here, I have argued that our aesthetic understanding of architecture is divided along the two forms of embodiment, projected and extended, and manifests itself through the primary and secondary emotions. In this account, I have also shed light on the biased nature of our own

accounts of architecture because the projected form is much more available to us in our descriptions. But what then, if any, are the consequences of this bias toward projected embodiment? How then do we balance our account of the extended form with the projected form?

#### A concinnitas of embodiment in architecture

From here I must give way to my conclusion based on the premises I have provided. To review, I have stated that not only is the aesthetic experience present in every aspect of the built form, but that it is the essential quality from which architecture exists. I have also stated that its existence, by nature of its human process, is held accountable to our dichotomous mode of embodiment which affects the way we overlay our values onto built structures. If our values can define the aesthetic architectural experience, then embodiment is the mode by which they are achieved. No comprehensive pursuit of architectural aesthetics can be achieved without accepting the premise of our embodied nature with the built environment.

Additionally, under this premise, we must accept that our embodiment can be divided into the projected and extended forms as well as accepting whatever else may bear from this division. My goal in joining aesthetic experience with embodiment is to reveal that architecture is the product of their interaction. It is this interaction which I conclude must be balanced, for whatever that maybe, along the projected and extended forms of embodiment, if we are to take a full account of the aesthetic experience of architecture.

In final defense of my conclusion I provide Andrea Sauchelli's augmentation to Scruton's *The Aesthetics of Architecture*. Specifically, Sauchelli's addition is that architecture, in its complete form, is something experienced through movement over time rather than from a fixed

perspective; a theory he calls the *Reflective Movement Theory of Architecture* (2012b). Sauchelli points out, in a similar fashion as I have, that many of Scruton's claims about the aesthetics of architecture are based on a fixed vantage point much in the same way one might experience a work of art. Sauchelli's amendment is simply to restore our ability to freely experience the architecture for all its features which Scruton often limits to the fixed perspective. In this regard, I mentioned how the two forms of embodied aesthetics can operate independently of each other. Although these two forms of embodiment can operate relatively independent of each other, they become bound together when we are free to experience the full features of architecture as Sauchelli has suggested. In other words, architecture properly sits in both modes of embodiment when we fully experience it over time.

The final question then is: what is the nature of their binding? Once again we return to Scruton's idea of values and give to these values the same notion that the great 17th century architect Leon Batista Alberti referred to as concinnitas. Concinnitas, according to Alberti, was the idea of wholeness in the presence of parts (Scruton, 1979, pp. 208-209). At prima facie, the everyday task of perceiving wholeness may seem to be mundane, but from a cognitive perspective understanding wholeness of an object results in a complex process of our bestowing an identity onto something over time. The nature of identity is by no means mundane and finds itself as the subject of many speculations without full resolution as is evident in Roderick Chisholm's description of the puzzle concerning the Ship of Theseus (Kim, J., & Sosa, E., 1999). At best, we find that the nature of identity has some feeling of wholeness over time. Not just any type of wholeness, but a particularly anticipated type, which defines some thing in a certain way, much in the the same way you anticipate your friend's actions based on your perception of their

identity. This *certain way* is the thing which binds our dichotomous embodiment with the world and is the same which we judge the world around us under the human values Scruton describes.

In regards to architecture, it is a particular feeling we have about the identity of the building we are experiencing. The tighter the relationship between details and form are with a particular feeling, the more whole the building provides toward a particular presence. Projected and extended embodiment support this feeling as we pick up cues in respective modes of vision to describe *what it is like to be* the details projected around us and *what it is to be* placed in the environment as mentioned in the previous chapters. Our feeling of wholeness with architecture is bound to our experiencing the building both as the object in the distance we are approaching and the space from which we have entered into. In either case, its part-to-whole relationship is tied to a projected and extended embodiment that occurs in great part because of the mechanics of our visual system and mental processes that are engaged with it over time.

In an analogous example to the relationship between part-to-whole relationships, consider the word 'waltzed'. Without describing whether I meant it as "He waltzed into a room" or "their gaze remained intertwined as they waltzed to Chopin", it would be possible to have various interpretations without any motivation to claim the word within a particular experience. The word 'waltzed', as a detail, remains the same but our emotional understanding for the tone of the word changes by the context surrounding it in the same way any detail in architecture we fixate on is transformed by the tone or atmosphere of the surrounding space we extend into.

The inverse is true if the detail lacks specific clarity as when I replace 'waltzed' with 'moved': "He moved into the room". In this case, we are given the context but not given enough description from which to imagine the action. And in the most unfortunate of cases, if I spell 'waltsed' instead of 'waltzed' our entire attention remains on the error rather than the effect.

Architecture also falls victim to the same interrelated issues as language and often the concept of the detail overrides our conversations because we find it easier to discuss things which are consciously apparent by our focus on them. In regards to the tone or atmosphere of a space, it is more difficult to describe these things which are less apparent, however, still critical to our understanding like the context of a sentence or paragraph surrounding a word in a poem.

In this regard, Louis Kahn presented his own struggles in developing an architectural identity when he spoke of feeling and thinking from which he accounts "the nature of the space" and the "order" come from respectively. In his own words: "Now that is the reason why I had difficulty explaining order before. The basis [the nature of the space] from which order could be derived was absent..." (Tyng, 1984, p.64). For aestheticians, this may seem like a familiar echo to David Hume's "Reason is and ought to be the slave of the passions, and can never pretend to any other office than to serve and obey them" (Hume 1978; Baddeley, 2007, p. 287). Alberti's *Concinnitas* places the same passion, or emotion, of wholeness in front of the detail as to create a comprehensible identity or tone to the architecture. As Scruton mentions, values create a tone from which we see the world into how we experience it (1979).

The interaction between projected and extended embodiment can, once we bind them together by some designed value, amplifying the way we feel emotionally connect with the architecture. For example, consider Menashe Kadishman's Shalechet art installation at the Berlin Holocaust Museum by Daniel Libeskind; see Figure 4.18. When walking into the space, one might sense the bizarre nature of the concrete walls rising in height and colliding together at odd angles giving the sense of displacement. Upon looking at the floor, Kadishman provides approximately 10,000 inch thick metal plates cut to the size of heads with screaming faces representing Jewish lives lost during the Holocaust. The detail of the faces further elevates the

already present feeling of displacement by specifying what type of displacement that emotionally one might imagine the Jews endured at the time of their persecution. This particular exchange of the projected and extended form of embodiment provides a vivid wholeness to both the intended and experienced values present in the design of this space.

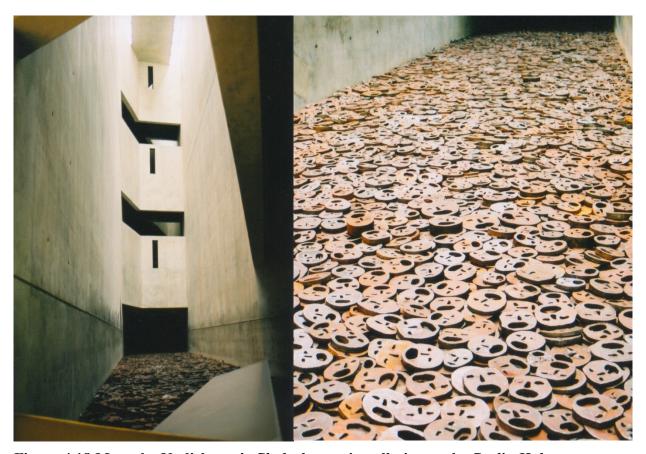


Figure 4.18 Menashe Kadishman's *Shalechet* art installation at the *Berlin Holocaust Museum* by Daniel Libeskind. Berlin, Germany.

I hope I have now provided a convincing argument that architecture is properly experienced as a *concinnitas* of visual perception that corresponds to our projected and extended embodiment; the result of which is where we find our exchange of self with the built world around us. Any form of bias towards one over the other results in a tipping away from the best

any intention of value may hope for. We must, as Hume accounted, begin with the raw primary emotion, the value, a feeling, which orders all details (Hume, 1739, p.217). This raw emotion does not come just from our fixated vision on objects and details but from the ever prevailing experience which surrounds us as we fully partake in the architecture over time through both projected and extended embodiments.

#### Balancing a biased culture of architecture embodiment

At this point, it would be beneficial to reflect on the consequences of a biased perspective of projected embodiment in architecture as I have described. In recalling the analogy of the glass bottle waiting for its wine, we find the problem in architecture is that we are no longer aware of the bottle or the wine, which has left us debating its label as if the label can replace, or even be better than, the experience itself. This is the case for many contemporary architects, critics, as well as the average person. We have forgotten the extent to which our bodies truly desire to experience all that architecture can offer because we have bought into the marketing (e.g. rational arguments, magazine publications, presentations, coming soon posters, etc.) rather than the need for fulfilling experiences. As the architect Richard Neutra railed: "Naturalness can be regained when the acceptance of design is guided physiologically and not just commercially pushed" (1969, p. 91). His point is that since the industrial revolution, we have come to know our products by their sales description rather than the thing itself. He gives a rather enduring example of linoleum that is sold as "marbleized" and easy to clean, giving the impression that linoleum is superior to marble (1969, p. 92). In this regard, Neutra would have agreed with Kahn's trade of new lamps without the genii in that the linoleum's only real claim is that it is

cheaper than marble and that we have emotionally bought into the marketing rather than the genuine experience.

A good architect, therefore, develops the design and final built form of the architecture to be the experience of some set of desired human values rather than designing for the marketing of it. Architects who design for the marketing often design with effects only directed at the central visual field since the various forms of marketing often utilize this visual field. Unfortunately, there are no good marketing methods for sharing architectural design ideas which utilize the full extent of the visual field leaving architects only the final built form as evidence to whether they have achieved a balanced design through both forms of embodiment.

The casualties of this biased representation of the projected embodiment throughout the centuries have yielded, as I've mentioned, a narrow debate about the label rather than the glass bottle filled with wine. In other words, we have unnecessarily elevated the conversation of intellectual meaning, symbolism, and concepts above what is truly necessary -- our own body's response in the presence of a well articulated experience.

Too much of architectural criticism and the development of designs are grounded in individual commentary around intellectual concepts which intend only to win over their audience at the level of presentation. Again, it is the label before the bottle. I would suggest, however, that the presenter did not come to this conclusion of representation because they thought it fitting, they came to it because their audience delights in it and expects it during the presentation. What their audience does not realize is that they are buying into the representation of the form as if it were *a priori* to the built experience. Nothing could be further from the truth. The label and the wine are independent of each other until we have consumed the wine and agreed with its label. In the same way, an architectural representation is separate from its built form until we

have walked through it. We fully appreciate Carlo Scarpa's drawings of the *Museo di Castelvecchio* because we have experienced the architecture first to understand his drawings second; see Figure 4.19. and 4.20. The problem then is that architects, when representing design intentions, have put the cart of intellect before the horse of value and continually forget to transpose it back.

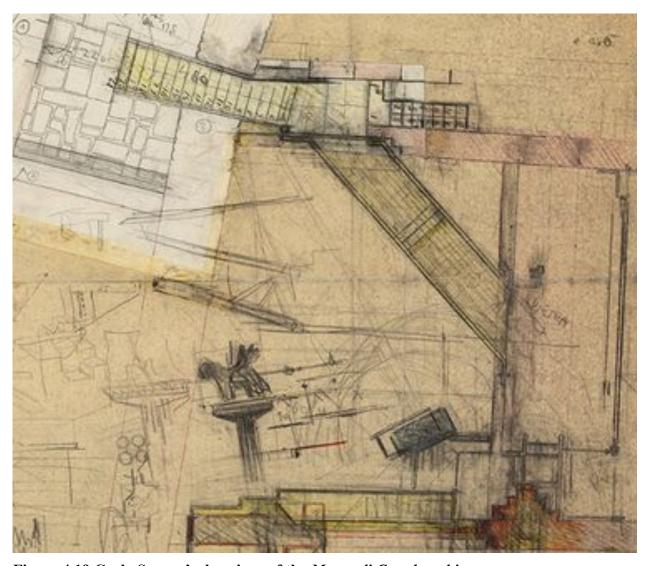


Figure 4.19 Carlo Scarpa's drawings of the Museo di Castelvecchio.



Figure 4.20 Exterior court designed by Carlo Scarpa. *Museo di Castelvecchio*, Verona, Italy.

Representations in architecture come in many forms which cannot be covered in totality here. However, we can make one valid claim to date, that no representation can replace the architectural experience it refers to. In other words, there is no technique to place a person inside the design that does not fail to describe it completely by the act of perception through the two forms of embodiment. Additionally, we can accept that there are very popular standards of representation such as plans, sections, elevations, perspectives, 3D models, and subsequently animations, either on screens or in virtual reality. But these methods of representations still fail in providing adequate visual information which can attest to the actual experience of architecture being designed.

The biggest correction is to recognize that any representation is held accountable to the final product, and that it is a specific feeling which we refer to when we question their congruity. So long as the designer intentionally intones their representations with their prescribed feeling of value, they will find their audience pleased in this respect in the final product, so long as the feeling is present in the final product. The importance is to place the person studying the representation as close as possible to the feeling you expect them to have in the final product. Kahn worked diligently on developing a value on what he meant by the *Institution of Silence and Light*. It was ever present in all the work and representations he provided.

If the relationship between the label and the wine seems to be confusing, take a step back and consider that the label and the wine represent our desire for fulfilling aesthetic experiences. Therefore, in the best accounts, the label is merely a placeholder for the human desire which already exists within us and the wine its fruition. I believe this to be what Kahn referred to as his pursuit of *volume zero*; to find deep within ourselves the basic structure of the values we hope to be present in our surroundings and so our communal way of life through architecture. It is the difference of waltzing and moving. A designer must be precise in founding their designs on a structured value which organizes both forms of embodiment which call to us as human beings.

We do not need architects to make our buildings stand, or perform nobly through sustainability, we could source any of these important components out to those more capable. We need architects because, when well educated, they can provide the real need of our desire to be human in communal relationship with our built environments.

#### **Chapter summary**

What is the visual experience of architecture? If anything, it is the feeling gained through vision of an embodied connection with the built environment from which we judge the value of that place. From the visual system's point of view, we have two visual fields and two streams of vision that affect the type of embodiment from which to experience architecture. One mode from which we project into every detail and form we see through our central visual field is through our focused vision. The other mode from which we extend our own perception of self into the built space around us is through our awareness in the peripheral visual field. Without explicitly considering these two forms together, we fail to understand "every significance that [architectural] experience can bear" (Scruton, 1979, p. 137).

### **Chapter 5 - Conclusion**

The visual experience of architecture is divided along the lines of our peripheral and central visual fields; understood now as two allied but distinct forms of embodied experience. Architecture, like the verb of its experience, is dependent on the relationship between these visual processing mechanisms of the human mind, dominated by the dorsal and ventral streams of vision, which connects us to the imbued intentions designed into our built environments. Aesthetically, it is a divided visual experience of intellectual attention and phenomenal awareness of built environments brought forth by central and peripheral vision respectively. Through the process of embodiment, the visual experience of built environments is bound by our feeling of connection with the architecture; a connection which is divided into the projected and extended forms. These two forms of embodiment visually intone our emotional connection with architecture by the values from which we judge our built environments; in Alberti's sense of *Concinnitas*. Through this tonality of visual experience, we find our phenomenal awareness, which the details and form serve, to be the mode which transforms architecture into "every significance that experience can bear" (Scruton, 1979, p. 137).

# Neurocognition, philosophy and concinnitas

In research, this dissertation combines the perspectives of neurocognition in visual psychology and analytical philosophy of aesthetics in application to the visual experience of architecture. As Scruton mentioned, architecture is not the building or the person, it is the relationship between the two (1979). Architecture *is* the relationship between the building (visual stimuli) and the person (neurologically constructed and philosophically aware). Of greatest importance to this relationship is how a person conceives the feeling of connection with

the architecture. Visual cognition gives us the framework from which to understand the limitations of our feeling of connection with the built form. Philosophy, on the other hand, questions why this relationship exists and to what is its importance.

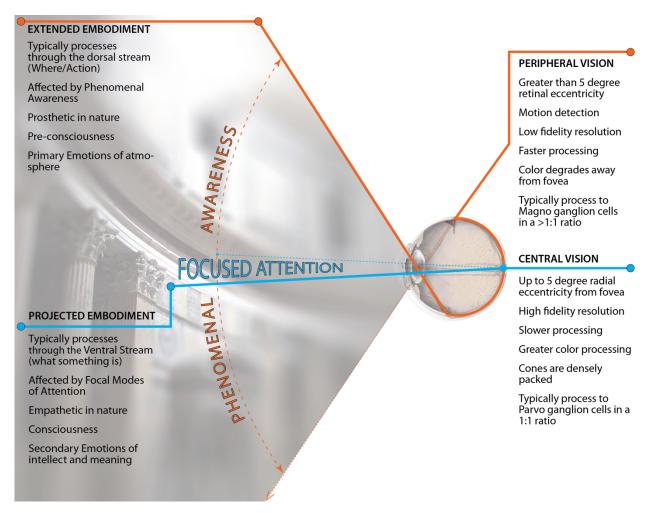


Figure 5.1 Diagram showing the bifurcation and interrelated connections between Peripheral and Central Vision (right), Awareness and Attention (middle), Projected and Extended Embodiment (left) and architecture.

Along the constructs of visual cognition, we find that vision is more than a simple singular conscious view; see Figure 5.1. Light passing on through the eye, is processed by the central and peripheral visual fields of the retina and divided along the visual stream on through to

the dorsal and ventral locations. Due to this complexity, we also find that the nature of architecture is not a simple conscious view but a divided experience dominated by our vision and its bifurcated process. With our focused, intellectual attention we achieve the form of projected embodiment. Through projected embodiment we find an empathetic relationship with the objects we see before us. We project into them to understand what they are like in relationship to our own actions in the same regard as Gallese's *embodied simulation* suggests in reference to the action of mirror neurons (2008; Gallese & Sinigaglia, 2011; Ebisch et al., 2011). In our attempt to understand these objects through projected embodiment, we gain an intellectual perspective about how these objects are imbued with emotions. In the case of designed objects, this reflection of emotion is precisely their means of communication such as Michelangelo's Atlas Slave; see Figure 5.2. Michelangelo imbues his intention into the sculpture because his aim is to project a particular type of emotion; specifically, the emotion of enslavement to the world. He can achieve this, because he exploits the nature of our visual focus on the work. Without our visual focus projecting onto his sculpture, we could not achieve our embodied connection with this particular *enslavement to the world*.

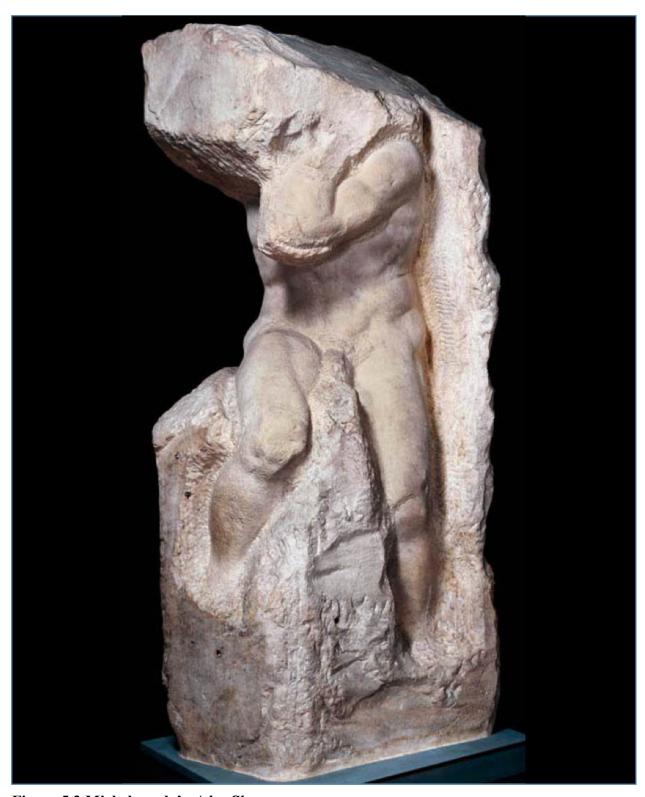


Figure 5.2 Michelangelo's *Atlas Slave*.

To understand the means of the visual perceptual systems is to understand that we often place a large amount of emphasis on what we are focusing our intellectual attention on. We do so, because it is easier for us to be consciously aware of what we are focusing on and thus our descriptions (verbally or visually) are easier to provide in account to what we are looking at. The problem, in regards to experiencing architecture, is that we are more often phenomenally aware of our built surroundings through our peripheral visual field on through to our dorsal stream. In our phenomenal awareness, we find it difficult to express what constitutes our feeling of connection with the space because the cognitive processes at work are often pre-conscious in nature. We find it phenomenal because we are pre-consciously aware of our own sensations and emotions in relationship to the space (Lamme, 2003; Singer 2006). In this way, the phenomenal awareness of architecture refers conjunctively to the ambient mode of processing as well as a course range of aesthetic feelings, the primary emotions we have in regards to our awareness of the architectural environment; which are often made aware to us through the feeling of atmosphere or mood.

Not only are we aware of these feelings of atmosphere or mood in a space, but our relationship with the space is one which extends outward from our own bodily actions and emotions much in the same way we extend ourselves into a car, feeling the outer bumper, as we park it between two objects. The space surrounding us is not something before us, as in our projected embodiment, the space surrounding us is something which becomes a prosthetic adaptation enabling our actions within it. It is an extension of ourselves to the outer portions of our visual perception of the space; the tone from which we come to know the space and ourselves situated within it. It is our reference point from which to achieve a holistic understanding between ourselves and the objects we find within it, as in Fay Jones's aspired

transcendence in the design of the Thorncrown Chapel (Foley, 2008, 11m:23s); see Figure 5.3. Without it, the objects we focus on and project into would largely become fragmented perceptions isolated from one another without being joined together under a common tone like random notes sounding without reason of a song.

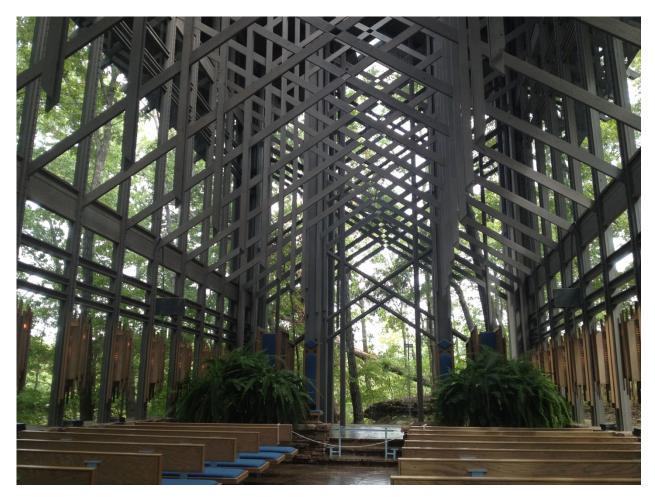


Figure 5.3 Fay Jones's Thorncrown Chapel. Eureka Springs, Arkansas.

It is the nature of the visual mechanisms, starting with the exponential distribution of cone photoreceptors at the retina, that affectively place limitations and unique abilities on our visual perception which help constitute the projected and extended forms of embodiment.

However, it would be misleading to describe the projected and extended forms of embodiment

from a reductionist standpoint, that visual perception is not more nuanced at various levels.

Truly the neurological and cognitive aspects of vision often are more nuanced and do find interconnections which do not follow a clear cut division from the central visual field on through to the peripheral visual field.

In such a nuanced example, as mentioned, there is a visual area in the what pathway that has a strong peripheral vision bias, namely the Parahippocampal Place Area (PPA), which responds to places more strongly than to objects, people, or faces (Arcaro et al., 2009; Malach, Levy, & Hasson, 2002; Nasr et al., 2011). Thus, even in this case, peripheral vision is associated with processing the big picture of the environment, rather than objects. Conversely, areas of the parietal cortex in the what pathway are strongly involved in grasping things with the hands (Goodale, 1992), which crucially involves central vision--we look at things before grasping them, to guide fine hand movements. Thus, even in this case, central vision is associated with processing details and objects. These examples, along with others, show that rather than there being a perfect division of central vision to the what pathway, and peripheral vision to the where pathway, central vision is devoted to detailed perception of objects and their forms, colors and shapes, and peripheral vision is devoted to coarse perception of our environment, our place in it, and movement through it. Fundamentally, the cone distribution at the retina is the greatest limiting factor in how visual information is processed and is the same fundamental factor in how we embody ourselves into the architecture.

From the philosophical perspective, architecture is an immersive experience of human intention and any human intention is tied to some value which structures its form. In the case of architecture, our judgment of it relies on our value of community, our sense of place in relation to the imbued intentions provided by those who design its form. The Gothic Basilicas provide

examples of buildings perfectly defining the values of a particular communal aspiration; the aspiration of communion with the Holy Trinity; see Figure 5.4. Likewise, many of Louis Kahn's public works offer examples of constructed space resonating Kahn's intentions such as *between silence and light* and *an institution of man* (Lobell, 1979); see Figure 5.5. As for many contemporary designs, the intention of value is wholly absent in favor of concepts and meaning which have no connection to human experience. On the other hand, we find that the best buildings somehow tap into the essence, the *volume zero* (Tyng, 1984), of what it means to be human; a strong desire calling within us to experience the values of life to the fullest.



Figure 5.4 Basilica of St Denis, Seine-Saint-Denis, France.



Figure 5.5 Kimbell Art Museum, Fort Worth, Texas.

It is here between the constructs of neurocognition and the philosophical premise of values where I summon Leon Batista Alberti's word *Concinnitas*, which he referred to as an inseparable relationship between the parts and the perceived wholeness of architecture, as the binding factor; intoned in wholeness by our extended embodiment within the space and supported by our projected embodiment into the parts which gain our focused attention. We feel the wholeness of the space extending into us as a vantage point from which we project into the objects before us.

### Everyday implications of visual experience in architecture

In our everyday understanding and experience of architecture, we should extend deeper into our phenomenal awareness of architecture, and understand that architecture provides our sense of place within a broader context of our community. It is not coincidental that we often find the quant streetscape of a village so calling to us; see Figure 5.6. It calls to us because it offers us a place within a community of people; with its built environment imbued with the values of everyday human life. The scale, proportion, vegetation, sunlight and shadows are all composed to provide a phenomenal sense of atmosphere which ties us back to our sense of belonging, with the details serving to strengthen the greater composition of atmosphere.



Figure 5.6 Quant streetscape in Montmarte, Paris.

In contrast to the quant streetscape, we can easily find modern replacements which precisely aim to reject our place within the architecture in favor of an idea or concept of design whose value is only obtainable through its description rather than its experience; see Figure 5.7.

Through this phenomenal, embodied extension are we more naturally tied to the environments we create. An environment which becomes our identity not only by its affect on our health (Ulrich, 1984) but by its affect on our being, on who we are over time. It is this understanding of extended embodiment as a pathway to an emotional connection of mood which is correct. An understanding which can allow us to investigate architecture in a deeper passion of emotional awareness of belonging rather than the narrow reasoning of particular rational details, function, and form; for "Reason is, and ought only to be the slave of the passions, and can never pretend to any other office than to serve and obey them" (Hume, 1739, p.217).



Figure 5.7 Le Corbusier's Unité d'habitatio. Marseille, France.

# **Educational implications**

Has our contemporary practice and appreciation of architecture placed the reason of intellectual discourse of details, function, and form over the phenomenal awareness of our experience with the built world? My suggestion in regards to the effects of our projected and extended forms of embodiment is yes. The description of architecture as an intellectual discourse solely concerned with our focused attention on it has narrowed our understanding and

appreciation of architecture to the features which fail to fulfill our real desire to live within the built environment. Rather, it idolizes meaningless pursuits of concepts and forms which only aim for completion in their descriptions, which often reject the presence of any real value of human experience.

For the educator of architecture, I would suggest the pursuit of atmosphere over form, from which the designer can begin with the challenge of developing a sense of place prior to any conception of *building as object*. Representations of space through perspective hand drawings can be one method to evoke the notion of phenomenal awareness. In these types of drawings, see Figure 5.8, there is a relatively low spatial frequency of information provided which diverts focused attention away from any particular detail in favor of a holistic feeling of the atmosphere as best processed by our phenomenal awareness.

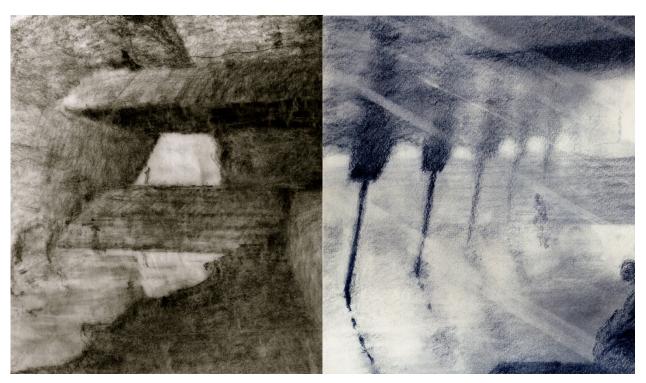


Figure 5.8 Atmospheric drawings for a Bath house design. Sylamore Creek, Arkansas.

I mention drawing (as well as building) by hand not casually out of preference, but specifically out of our neurological connection from the hand to the dorsal stream from which the extended embodiment is so dependent on. In these more fluid representations provided, the designer is more aware of the composition of space and the atmosphere it creates rather than the details. We do not need to rely on our focused intellect on the details which would guide the design toward the pursuit of meaning and concepts. We need the feeling of our total awareness of the space to find its way through the act of drawing; the details should follow from this pursuit of awareness. As Goodale (1992) recorded, our hands and our visual streams (especially the dorsal steam) work in unison to reveal our place and action within a space. If our hands simply move a computer mouse over the same area and our eyes experience the same bounding box of the computer screen, we severely disconnect our action of design from the feeling of the space being designed. We need our hands to continuously verify the proportions of our design if we wish to design with a phenomenal presence.

With many years of our expressed intellectual pleasure of projection into architecture and its educational following, the problem which remains is to develop our ability to express and educate architecture under its equally, if not more influential and meaningful quality of phenomenal pleasure of peripheral extension from which we emulsify ourselves into our experience of architecture. An experience much more difficult to express let alone educate, but critically important to bring our awareness towards.

## In final summary

The framework for the visual experience of architecture laid out herein remains rooted in the problem that it is not one experience but two parallel experiences intertwining and influencing each other which affect our emotional awareness of built environments. In this confluence, we find that our phenomenal awareness (from which we extend our embodiment into our surroundings) intones our feeling of place within the atmosphere of the architecture while our intellectual attention (from which we project our embodiment into the details) serves to amplify our connect with the imbued intentions of the designer. In this way, architecture finds its true aim when the intellectual construction of details and form serve the greater phenomenal awareness of our extension into built environment; an aim which originates from a deep archetypal longing to feel the values of human desire calling to our place within it.

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### **Appendix B - Experimental Considerations**

As stated, the hypothesis of this dissertation is that architecture is unique among visual stimuli in that it is an extended and project embodiment with the built environment which, when experienced over time, connects us to the intentions of human values designed into its form.

Much of the work provided stitches together published scientific discoveries in vision and embodiment along with published philosophical debates on the aesthetics of architectural experience in order to reveal the visual experience of built environments. Given the interdisciplinary nature of this investigation and breadth of topics including philosophical assumptions regarding human values, empirical evidence to support such a hypothesis offers a great challenge for validating its claims. In response to this challenge, I would like to offer some possible experimental designs that might be useful in establishing foundational knowledge toward the satisfaction of conditions for this hypothesis.

## Experimental design proposal 1: visual fields and building identification

One of the most pivotal means for supporting the hypothesis on divided visual experience is that the central and peripheral visual field do have a significant impact on the perception of architecture. In this experimental design proposal, the focus is to analyze the limitations of architectural identification when participants are subjected to window and scotoma conditions of comparable buildings (both interior and exterior) during eye tracking. The general hypothesis for this experiment would be building identification increases or decreases when presented with alternating interior or exterior images during window and scotoma conditions. For example, by utilizing rapid target presentation of architectural images, between 48ms and 330ms, combined with overlaying window or scotoma conditions (to remove peripheral or central vision

respectively), we can parcel out what these two systems are able to perceive and whether the accuracy of their perception is based on the architectural image they are viewing; in the case of this experiment, whether they are looking at facades or interior spaces; see Figure B.1.

The first testable hypothesis, H<sub>1</sub>, is whether accuracy is better under the window condition verses the scotoma condition when images of facades are presented from the same building or from a different building of a similar style; see Figures B.2 and B.3 respectively. The thought is that key information in a facade is found in its detailing as an object which is more efficiently identified by central vision (Biederman, 1987).

The second hypothesis, H<sub>2</sub>, is whether the scotoma condition verses the window condition reports a higher accuracy of response for interior images presented from the same building or from a different building; see Figure B.4. Such a finding would suggest that the interior of a space is less identified by its detailing and more identifiable by its spatial organization in regards to the composition of walls, ceiling, floor, and quality of light. If this is true, information presented to the peripheral visual system under the scotoma condition would be necessary to correctly identify a space while the window condition would only provide inadequate details of the space for making correct identification.

If the findings from H<sub>1</sub> and H<sub>2</sub> support the general hypotheses that accuracy for identifying buildings is dependent on which visual processing is being removed (central or peripheral) and whether they are looking at the exterior or interior, then it could be said that there is an inverse relationship between the visual systems used to identify the facade of a building versus the interior of a building; see Figure B.5. The contribution of this experiment to the larger hypothesis of this dissertation would suggest that the function of our vision should have an impact on our perception of a building's exterior identity as a separate factor from its interior

identity. This is not too suggest that the architectural experience of a building is distinctly separated from exterior to interior, but it is to suggest that the factors for forming a cohesive relationship between the exterior and interior of a building are based in two separate visual processing systems of the central and peripheral visual fields.

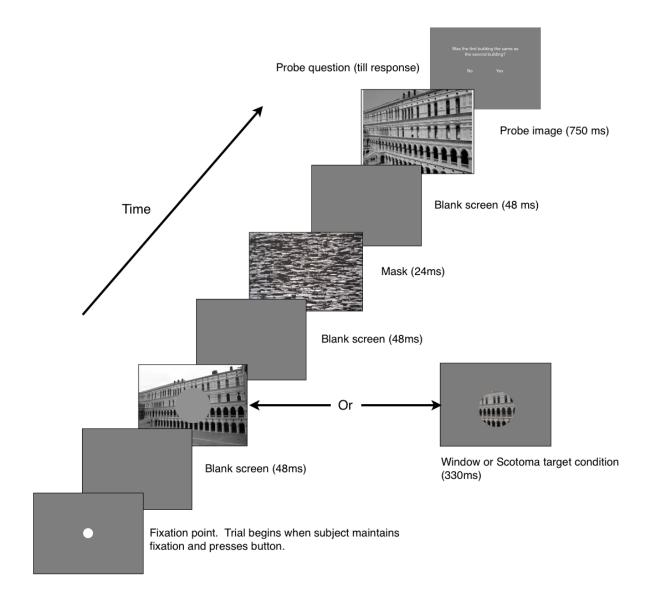


Figure B.1 Experimental design showing time course image set and final probe question "Was the first building the same as the second building? Yes/No button response.

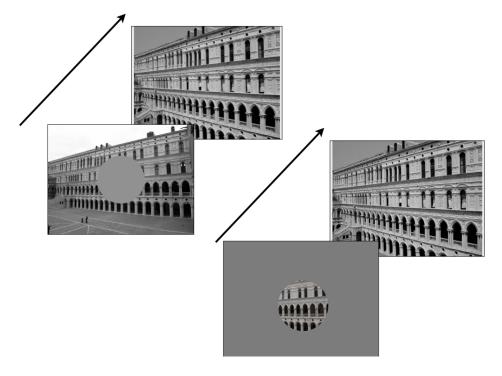


Figure B.2 Scotoma condition with same building facade presented (left). Window condition with same building facade presented (right).

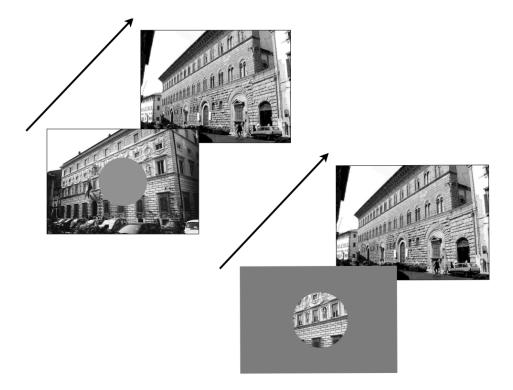


Figure B.3 Scotoma condition with two different building facades presented (left). Window condition with two different building facades presented (right).

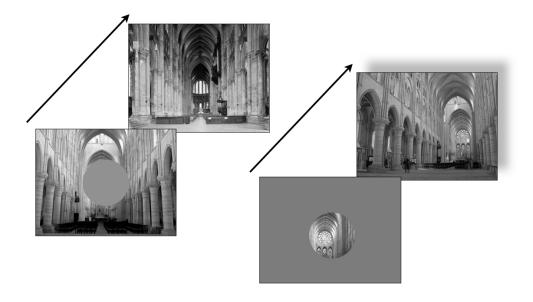


Figure B.4 Scotoma condition with two different interior spaces presented (left). Scotoma condition with the same interior space presented (right).

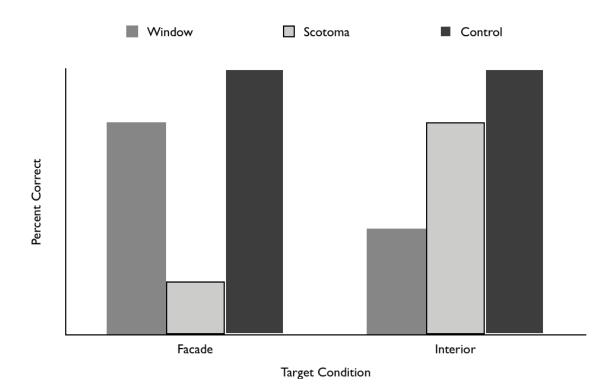


Figure B.5 Possible graph depicting results which would support the two hypotheses. Hypothesis 1 (left), Hypothesis 2 (right).

#### Experimental design proposal 2: visual fields and emotional valence

Similar to Calvo and Nummenmaa (2008), this proposed experimental design would examine the relationship between central and peripheral vision and Damasio's descriptions of primary and secondary emotions with the goal of supporting the dissertation claim that the two visual fields support each emotion through the type of valence visual stimuli presented (e.g. scenes versus objects). Hypothesis H<sub>1</sub>, states that the peripheral visual field better supports primary emotions: under scotoma conditions, subjects' physiological responses, along with Likert scale responses to valence, will reflect a particular biased relaxed/tense condition than with the window condition when presented with relaxing/tense scenes. Hypothesis H<sub>2</sub>, states that the central visual field better supports secondary emotions: under window conditions, subjects' physiological responses, along with Likert scale responses to valence, will reflect a particular biased relaxed/tense condition than with the scotoma conditions when presented with relaxing/tense objects.

To test  $H_1$ , participants will be presented with a series of scenes (including architectural scenes) with either a window or a scotoma condition applied to the images (in the control group, no condition will be applied to the images); see Figure B.6. The participants will rate their response on a scale from "tense / -10" to "relaxing / +10" for each image. At the same time, physiological responses will also be measured (galvanic skin response, temperature, heart rate, breath rate, EMG and EEG) to compare the participant responses with their physiological condition during the experiment. For the experiment to support the hypothesis, results should indicate that scene images with scotoma conditions receive higher ratings of valence along with corresponding physiological responses.

 $H_1$ :

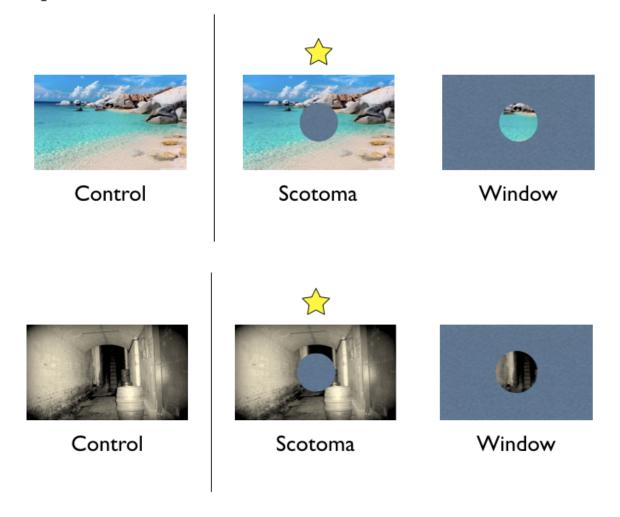


Figure B.6 Window/scotoma trial conditions for primary emotions (relaxed valence, top set and tense valence, bottom set) with star indicating target conditions for each

To test  $H_2$ , participants will be presented with a series of objects (including architectural objects) with either a window or a scotoma condition applied to the images (In the control group, no condition will be applied to the images); see Figure B.7. The participants will rate their response on a scale from "tense / -10" to "relaxing / +10" for each image. At the same time, physiological responses will also be measured (galvanic skin response, temperature, heart rate, breath rate, EMG and EEG) to compare the participant responses with their physiological

condition during the experiment. For the experiment to support the hypothesis, results should indicate that object/detail images with window conditions receive higher ratings of valence along with corresponding physiological responses.

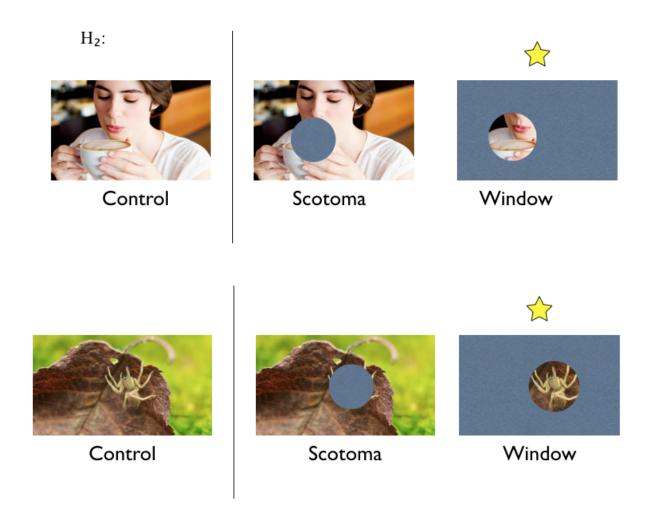


Figure B.7 Window/scotoma trial conditions for secondary emotions (relaxed valence, top set and tense valence, bottom set) with star indicating target conditions for each.

Additionally, fMRI studies could indicate location of processing during image presentation. Such measures might support whether the dorsal or ventral stream is more or less active during the presentation helping to correlate which images improve activation in comparison to Likert scale and physiological measures.

If the findings support both hypotheses (see Figure B.8) that different types of emotions are processed through separate visual systems, then a better understanding can be gained about which types of features in the world provoke which type of emotion since each visual stream is tailored to process particular types of information from the world (i.e. low and high spatial frequencies). This would support the central claim in the dissertation that the central and peripheral visual field (and presumably the ventral and dorsal divide downstream) are involved in increasing the valence/emotional response to stimuli that best represent Damasio's (2005) description of primary and secondary emotions.

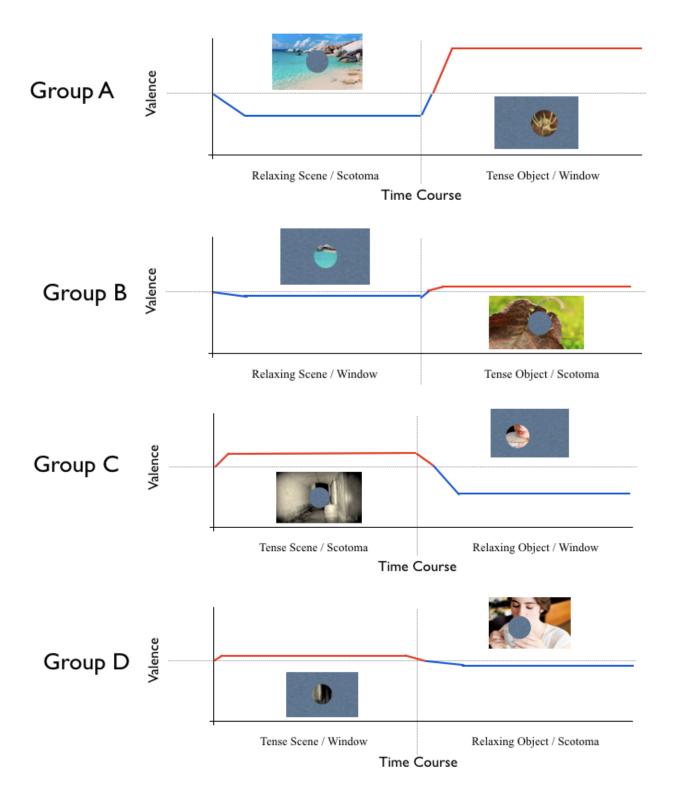


Figure B.8 Possible results supporting the hypothesis (group A and C) and hypothesis 2 (group B and D). Red line indicates level of tension while the blue line indicates level of relaxation.

#### Experimental design proposal 3: perceptual organization and design values

One of the more difficult points to scientifically verify in this dissertation is the reliance on the notion of human values. One method for testing the impact a value has on aesthetic awareness is the use of *perceptual organization*, (Kramer & Jacobson, 1991; Yantis, 1992; Watson & Kramer, 1999), by providing subjects with an architect's description of the value of their own work. After the subjects read the description, they will be provided with four images, one of which is the designer's work, and asked to rate each image by their aesthetic value; see Figure B.9. The hypothesis of this proposed experiment, H<sub>1</sub>, is: subjects will more often rate the designer's work more highly in aesthetic value versus images of designs from other architects, presumably because they have been pre-cued to attend to the qualities in the image of the designer's work that fit better with the description of that work. In other words, the subjects have been affected, through perceptual organization, to see those qualities more clearly. This hypothesis fits in the Yarbus's work that prompted requests given to the subject prior to seeing the image will alter the visual scanning pattern of the subject when viewing the presented image (1967); return to Figure 3.4.



1) United Nations Headquarters, Le Corbusier.



3) Doubletree Hotel, unknown.



2) Lou Ruyo Brain Institute, Frank Gehry.



4) Assembly of Bangladesh, Louis Kahn.

Figure B.9 List of images presented during experiment in order of their appearance. Image 4 represents the target image (i.e. Kahn's design as related to his value description).

Additionally, such a correlation between description of values and aesthetic ratings fits with the 1900's Japanese aesthetician Kakuzo Okakura's concept that semantics influence the arrangement of materials for the design of a tea house. For Okakura, the design of the Japanese Sukiya, or tea room, was based on some defined set of values. "The name, *Adobe of Fancy*, implies a structure created to meet some individual artistic requirement" (Okakura, 2003, p. 47). For the traditional Sukiya, naming was critical to the way in which the tea master would organize

the materials to create a particular type of mood in the space of the Sukiya. Such names as the *Adobe of Fancy*, *Adobe of Vacancy*, *Adobe of the Unsymmetrical* all provide imagery toward a concept which suggests the way materials are to be arranged to personify its value as described by its name (Okakura, 2003, p.47-51).

In an example of the experiment proposed here, Louis Kahn's own words describing the presence of silence and light can be used to prompt the subject:

Inspiration is the feeling of beginning at the threshold where Silence and Light meet. Silence, the unmeasurable, giver of all presence, by will, by law, the measure of things already made, at a threshold which is inspiration, the sanctuary of art, the Treasury of Shadow. (Lobell, 2008, p.20)

This description will assumedly affect the subject's search between the four images for its existence and at what level it exists at by virtue of a Likert scale response they provide (e.g. a response of 1 being the lowest aesthetic rating and 10 being the highest); see Figure B.10. Like the Yarbus experiment, eye tracking can be used to understand which areas of the image the participants fixated on to answer the aesthetic rating question and how the search pattern changed across each description of value provided from different architects. Secondly, eye tracking gives a direct link to fixation and material arrangement in the image if aesthetic ratings are high for a particular image giving insight to which portion of the stimuli was being focused on to establish aesthetic ranking.

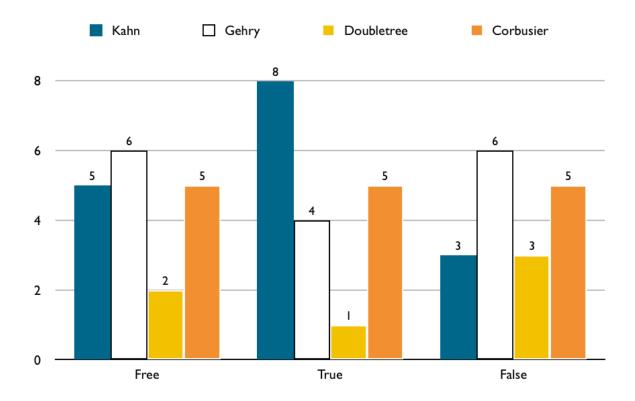


Figure B.10 Where Y is the aesthetic rating from the respondents and X is the image presented after reading an architect's value description: in this case, Louis Kahn's *Assembly of Bangladesh*. The results show theoretical responses that would support the hypothesis.

One of the issues of the experiment is that the conclusion can not be drawn that the existence of stated values alone creates higher aesthetic ratings. It can only be said that when false values are prompted or no values are prompted that the rating is less than when the real value is prompted. It is also not possible to conclude that the values spoken by the creator of the work will in fact be present in the work, for it is possible that the intensions of the creator are not present in the work and are superseded by some other mean. Additionally, adding physiological responses alongside Likert ratings, such as galvanic skin response, heart rate, EMG and EEG responses, could help reduce subject response bias and provide finer details to the reaction of aesthetics.

If the experiment provides evidence in favor of its hypothesis, it would generally support the argument made in this dissertation that human values do play a role in defining our visual aesthetic judgment of architecture. With the inclusion of eye tracking in the experimental design, other insights can be examined as to the location of fixation on the image (the design aspects of the architecture) and the ratings in regards to the value descriptions provided and the subject's aesthetic ratings.

#### **Experimental summary**

The understanding of architecture is a difficult and highly complex endeavor to pursue because of its multimodal existence across regions of knowledge; both academically and cognitively. If a better understanding of our relationship with the environments we build is to be achieved, interdisciplinary measures must be in place which challenge the standard silos of disciplinary methods; not by disregarding them, but by exploiting the weaknesses and strengths of how each work together in order to improve our understanding of architecture. By providing these three experimental design proposals in regard to the hypothesis of this dissertation, it is my aim to help direct more precisely any pursuit of vision and the experience of architecture, but it is not meant to replace the ultimate question of why we build the way we do. For the ultimate answer relies on the communal human values for which we hope are present in our environment.