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Triptych

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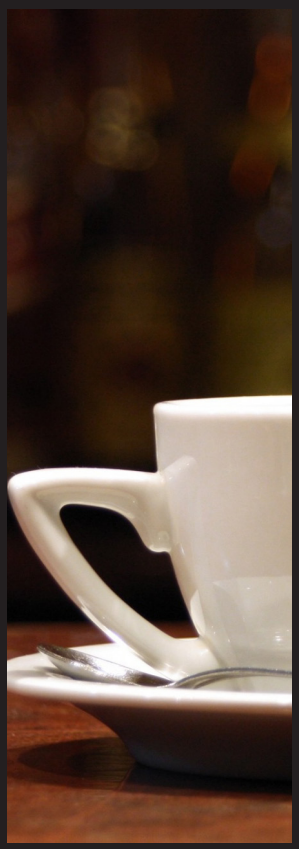
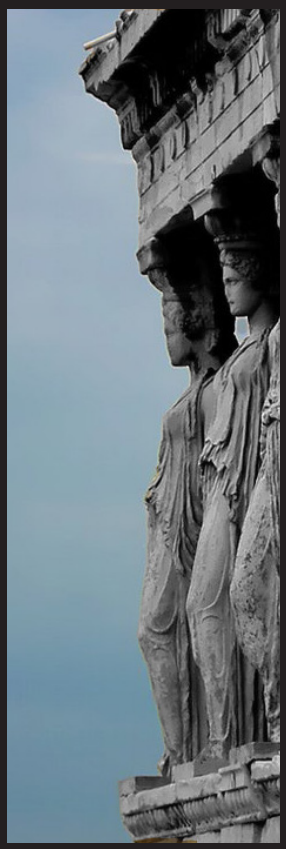
ARCHITECTURE | PHILOSOPHY | NEUROSCIENCE

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ACKNOWLEDGMENTS

Our desire is for this publication to be at the intersection of architecture and neuroscience; where the convergance of architecture (the art of building) and neuroscience (the biology of the brain) is aesthetic experience.

The biology of the brain returns architecture to a biological foundation of mood and atmosphere. As architecture students, the more we learn about architecture in terms of a sensory experience, the better we can design. Just as we learn architecture by doing it, flickering between theory and practice, by dancing between thinking and feeling, so can we learn any subject.

This publication is the product of a five month graduate seminar in which we studied introductory literature in the art and science of spatial experience and investigations into specific questions raised within our discussions. The topics of research are extensions of specific students curiosity, which has research merit relative to the collective's inquiries.

Our deepest gratitude to our advisor, Professor Bob Condia. We were fortunate enough to have a professor who gave us the freedom to explore on our own and guide us. Professor Bob Condia taught us how to question thoughts and express ideas through critical thinking and communication.

INTRODUCTION

Joshua Broadway and Bob Condia

"…a building's geometric proportions turn into shivers, stone into tears, rituals into insights, light into joy, space into contemplation, and time into heightened presence." [1]
Julio Bermudez

The historic expertise of architects is feeling empathy into both animate and inanimate objects. Today the science of mirror mechanisms and embodied simulation, essentially confirms this architectural practice. For most people, non-designers unmindful to their bodies in space, it is difficult to believe that others know the ethereal volume architect's call *atmosphere* as real, substantial, more than aesthetic bullshit. Yet, the art of architecture is as real as any other aesthetic occurrence, really more authentic than most artistic enterprises or objects. From facial expressions to the alphabet, *Poulnaborne Dolmen* to the *Kimbell Art Museum* (Figure 1), the *Panel of Horses* in the Chauvet Cave to a Vermeer or Picasso, banal to magnificent, we know forms are meaningful; it is the world we inhabit and the order we perceive. Like all artists, an architect knows more than they can say. They are lost for words about their crowded intentions for a design's proposition, yet through technical practice they place materials to affect

Figure 1. (a) At the beginning of architecture's purpose, circa 4000 BC, on the Irish Burren, stands Poulnaborne Dolmen (County Clair): a portal tomb that ostensive proclaims tribal boundary and magical powers. It continues to astonish to this day. ***(b)*** A consensus masterwork of mood and atmosphere is Louis Kahn's Kimbell Art Museum (Fort Worth), where the architect sought to establish a "silver light from above."
(Photos courtesy of authors)

1. Bermúdez, Julio Cesar. Transcending Architecture: Contemporary Views on Sacred Space. Washington, DC: Catholic University of America, 2015.

observers in pleasurable ways. To the point of the papers presented here, contemporary debate in the neurosciences, following the revelation of mirror mechanisms in the brain, give frame to the potential that aesthetic experience of architecture is vitally a biological unfolding from the evolution of our brains. We are built for architecture.

What then is architecture? What does it do? Architecture is something more than mere building. By bounding perception into ordered limits – a space, a volume, a room – it harbors emotions and moods. It is vital, as Martin Heidegger asserts, since only by building do we dwell on the Earth.[2] That this has always been so is not, apparently, empirical evidence. In an eccentric knot of modern logic, will the microscopic view of the biology of the brain infer a science of (or method to) architectural space? It is likely, if as yet controversial. These authors are charged with optimism by the literature of neuroscience and neuro-phenomenology in its application to aesthetic experience. Our intentions with *Triptych* are a triage of the onslaught of mounting evidences, that forwards two consequences this science has for architects' practice. Firstly, one's abrupt engagement with buildings is pre-reflective and meaningful. Secondly, the experience of architecture is kinesthetic and emotive; hence perceived through enactments with one's own body.

Architecture provides an interlaced experience of architectural space into object meaning and atmosphere. The impetus of these investigations are to identify the constituents of *sensory, or real* architecture. Herewith we discuss mood, empathy/embodied simulation, and atmosphere. Mood is the medium of exchange, negotiated through embodied simulation. Embodied simulation is validated by the presence of mirror mechanisms, and the collaboration of our central and peripheral fields of vision. The presence of these mechanisms is most likely an evolutionary artifact originating from the need to communicate. Before the advent of language our distant hominid relatives needed devices to understand intention and facilitate cooperation. Mirror mechanisms transformed gesture and action into comprehensible operations decoding inner thought/desire/intention. Written and phonetic language has since replaced gestural communication affording precision, structure and universality. Though embodied simulation (the product of mirror mechanisms) is no longer the exclusive method of connection, it endows another characteristic, perhaps just as substantial as communication. The body/mind event of perception. The body, a sophisticated living/seeing apparatus, through the agency of sense/sensation, participates in the comprehension of our environs, filtering information, and reconstructing a subjective and intimate image of its composition and potential (affordance). This is possible because the composition of the body and structure of our world are of similar building blocks. Universal matter.

Merleau-Ponty propagates that the world and the body are of the same flesh. "Visible and mobile, my body is a thing among things; it is one of them. It is caught in the fabric of the world, and its cohesion is that of a thing. But because it moves itself and sees, it holds things in a circle around itself. Things are an annex of or prolongation of itself; they are incrusted in its flesh, they are part of its full definition; the world is made of the very stuff of the body…the undividedness of the sensing and the sensed."[3]

[2.] Heidegger, Martin. "Building dwelling thinking." Poetry, language, thought 154 (1971).

[3.] Merleau-Ponty, Maurice. "Eye and Mind." In The Merleau-Ponty Aesthetics Reader: Philosophy and Painting. Evanston, Ill.: Northwestern University Press, 1993.

This claim is emblematic of the philosophical bridge between architecture and biology. Suggesting that all constructions, organic or man made, are analogs to the human body, and must not be regarded in autonomy.

Through the conflation of philosophy, biology, and architecture we understand atmosphere as the architect's medium of expression: a body/mind/building bond. Since the Roman architect and author, Marcus Vitruvius Pollio (c. 70-15 BC), there has been a suspicion of the transcendental and potent nature of "real" architecture. Real architecture seems to speak something about the dimensions of our reality beyond conscious attention. Sensations not seen so much as deeply felt: elusive yet palpable. For instance, a feeling of ascension and divinity one has walking through *Notre Dame du Haut* (Figure 2) and the awe and ecstasy of the *Pantheon* (Figure 3). The comfort of Grandma's kitchen. Positioned within the boundary of architecture and biology, we return to Peter Zumthor's nine ingredients of atmosphere.[4] To expound on his recipe, Zumthor explicitly regards the *body of architecture* as a one-to-one to analog of the human body. Not the notion of the body—but the body itself. *Material compatibility* is the relationship and reaction of tectonic precision and expertise. The *sound of space* is the revelation of space as an instrument. Shape, surface, material, all behave to produce unique aural quality, not unlike the combinations of keys, holes, and materials of a musical instrument. *Temperature of space* is resultant of material property and enclosure negotiating physical context and human occupation, with physical and psychological consequences contributing to comfort. *Surrounding objects* are the intentional cast of furnishings, things, people, detail, etc. The entourage of the scene. Between *composure and seduction* is tension, orchestrating pauses and movement in human participation. Signals

Figure 2. A modern masterpiece of mood, the pilgrim's chapel Notre Dame du Haut (Ronchamp), completed by Le Corbusier on an ancient and sacred hilltop, completed 1954. (Photo courtesy of authors)

Figure 3. A harmony of mood and atmosphere The Roman Pantheon (Rome), completed by the Emperor Hadrian about 126 AD. Here the architect made the world's largest unreinforced concrete dome. The diameter of the inscribed plan and dimension to the oculus and are the same 142 ft.

4. Zumthor, Peter. Atmospheres: Architectural Environments, Surrounding Objects. Basel: Birkhäuser, 2006. 10-73.

triggering impulse. *Should I stay here? Do I move forward? What is around the corner? Tension* between interior and exterior is the transition of inside and outside, and the development of place. *Levels of intimacy* are the sense of mass and space in relation to the human body. Size, scale, dimension, proximity, etc. These relationships have implications on comfort and sense of security. *Light* is perhaps the densest and most profound of the ingredients. Through its composition we comprehend volume, boundary, enclosure, activity. Through sensory simulation, with all physical stimuli of our environment, psychological consequence points to mood.

Mood is predictable. Recall setting up a romantic evening. A comfortably proportioned space, belonging to you and significant other. Mysterious. Music barely louder than a suggestion, in deference to romantically charged conversation. Light is minimal and ambient, punctuated by flickering candle light. Provocative. Aromas and flavors of a lovingly prepared meal saturate the nostrils and tongue. The setting is thick with temptation; the promise of physical intimacy. This is *atmosphere*. It is not by spontaneity or coincidence that this is a universal recipe for a romantic evening. The intentioned collaboration of sensations appeals not only to the softness of romantic sensibilities. It is an appeal to the human body and mind signaling safety, comfort, nourishment, connection. Our environs are a constellation of signals; the human body an inevitable receiver. The *felt* imprinting and reception of these signals is the phenomenon of atmosphere. A building /mind/ body transaction.

What follows is Triptych, a collection of pieces attempting to clarify the enigmatic building / mind/ body cooperation through which we engage with our environment.

The initiate piece, "*Embodied Metaphors and Aesthetic Experience in Architecture*," Matthew Baumann, Tyler Friesen and Joshua Ralls discuss the event of aesthetic experience, understood through the production of metaphor. Positioned alongside the understanding of mirror mechanisms and the composition of the human body, aesthetic experience is a reinterpretation of the external world to our internal likeness; the body as the chief apparatus through which our environment is appraised. In concert with mirror mechanisms, animate and inanimate objects are reinterpreted as a mosaic of intentions. The operative claim is, "We understand the world as a type of body through our body, as supported by embodied simulation through mirror mechanisms." In "*Is Atmosphere, By Nature, Aesthetic?*" Lindsey Leardi, Kelsey Middelkamp and Lucille Sadlon depart from the paradigm of atmosphere as a pre-reflective, involuntary event, instead positing that atmosphere is a cognitive product. In this context atmosphere is understood as an enterprise of sensorimotor, emotional, and cognitive mechanisms reconstructing an image of our external environment. The act of reconstruction is the qualifier, which makes this an inherently cognitive, and therefore, 'aesthetic' construct. Frederik Heuser's, "*Affordance of Beauty*," considers the role of beauty in the influence of human behavior. 'Affordance' is understood as a recognition of an object's—animate or inanimate—potential, conditioned by our conscious and unconscious skilled engagement of our environment. The idea of affordance surpasses simple Darwinian mechanics, rather, involving an embedding of meaning and association. Beauty is understood as a functional appraisal of our environs. Universal and fundamental, void of cultural and contextual baggage. Aaron Bolli and Andrew Huss argue in favor of "*Digital Craft in Architecture*," providing an account of contemporary building methods, and the departure from traditional manual construction expertise to digital fabrication. The authors pose a new paradigm of craft, where human intuition and skill work in confluence with the precision and ease of

digital mechanisms and operations. What is proposed is an ideology aimed at dissolving the boundary between human and machine, with potentials for architects to reestablish the role as master builder. Finally, Joshua Broadway and Nico Rallo find that the event of atmosphere is positioned between the realms of biology and neuroscience. More appropriately seated in the realm of philosophy. "*The Things After the Physics*", is a metaphysical account seeking comprehension of the interconnectedness of the mind/body/environment relationship. The authors posit that the sensation of '*atmosphere*' is akin to being in two places at once; the physical space of the present, and the imagined mental space of the past.

Triptych investigates the tripartite relationship of architecture, philosophy and neuroscience through the lens of *meaning in architecture*. Discourse became our venue for inquiry of science, philosophy, psychology, art, reality, creativity (among others). Architecture was a thread, mending the fabrics of disparate realms of comprehension. There is a fractal-like intention of this work to expand and contract in scale of observation. This compendium serves less a microscopic and precise account in the science of the mind/ body /building triality, and more a kaleidoscope of thought. The allegory of a kaleidoscope seems especially appropriate when reflecting upon its construction and mechanics. A telescoping container houses three mirrors, precisely positioned toward a fixed axis. When introduced to vision, an optical unfolding occurs as light, color, depth, angle, are introduced, producing nuance and clarity with each refinement. Furthering the metaphor, our telescoping container is atmosphere; our medium of vision is *meaning in architecture*, and our triangular mirrored prism is the reflective and mutually inclusive realms of mind/body/ building, or, philosophy/ biology/ architecture.

One's tryst with architecture is pre-reflective and consequential. An experience necessarily perceived through embodied simulation, with ones own body, the sensation of movement or strain in muscles, tendons, and joints. It is poignant.

EMBODIED METAPHORS AND AESTHETIC EXPERIENCE IN ARCHITECTURE

Matthew Baumann, Tyler Friesen and Joshua Ralls

"A body is like a building, and the building in turn is like the world. The metaphor returns in a more global similitude: the whole world is itself understood as a kind of body." [1]
Joseph Rykwert, 1996

ABSTRACT

Aesthetic experience manifests in architecture by way of embodied metaphors through the agency of mirror mechanisms. We postulate that the Greeks embedded proportions of the human body into the built form with the intent for an aesthetic experience. The historical foundation of embodied metaphors was recorded by the Roman architect Vitruvius, and revived in the Renaissance with a reinterest in the human body. We claim embodied metaphors are embedded in architecture through affordances, as defined by J.J. Gibson. We propose perfect geometry based on the human form is an affordance stimulating aesthetic experience in architecture. We claim creative intentionality embedded in architecture is an affordance, as in the example of perfect geometry. We use research by Gallese as proof we understand the actions of others through the activation of the same areas we use to perform the actions. Through studies by Di Dio, we know the brain understands intentional and unintentional touches between animate and inanimate objects through the same neural circuits. Architecture is the assembly of inanimate parts, which we propose are understood as a body. We use current neuroaesthetic studies regarding embodied simulation and aesthetic experience as scientific proof of what ancient Greeks, Romans, and Renaissance artists intuitively seemed to know. We understand the world as a type of body through our body, as supported by embodied simulation through mirror mechanisms. We therefore conclude architecture is an affordance creating the world as a whole.

1. Joseph Rykwert, The Dancing Column: On Order in Architecture, (Cambridge, MA: MIT Press, 1996).

ORIGIN OF METAPHOR

According to the Oxford English Dictionary, the root of metaphor originates from the Greek metapherein - 'to transfer.'[2] The idea of metaphor references literary technique as well as the juxtaposition or transfer of ideas. In literature, metaphors are differentiated from similes as a direct relationship; avoiding the words 'like' or 'as.' Rather than comparing qualities of each thing, a metaphor states the two things are each other, even though not literally true.

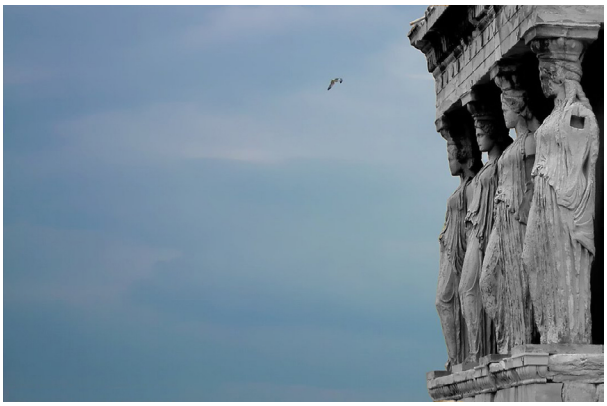

Figure 1. Jordan Kevrekidis, "Caryatids," Deviant Art Kevrekidis, 2011.

The Roman architect Vitruvius discusses metaphors embedded in Greek architecture, using this historical foundation to support his ideas. Vitruvius' Ten Books on Architecture borrow metaphor from the Greek philosophy of architecture. One apparent example of metaphor embedded in architecture are the caryatids imprisoned in the columns of the Erechtheion on the acropolis of Athens (Figure 1). In his Ten Books on Architecture, Vitruvius explains the myth behind the construction of the caryatids as an example of how an architect can embed metaphor in architecture. The state of Caryae in Peolponnesus had sided with the Persians against the Greeks. After winning their freedom, the Greeks declared war against the people of Caryae. After taking the town and killing the men, the Greeks carried their wives into slavery. They did not allow them to lay aside their robes and other signs they were married women, forcing them to march burdened by shame as atonement for their state. The architects of the time designed public buildings bearing the image of these women, carrying the load of the building so that the punishment of the people of Caryae would be known by future generations.[3] This metaphor embedded in the built form very literally exhibits an intention for embodying the human form in architecture, communicating a clear message to the observer. These obvious metaphors were continued in more figurative applications through the three Greek orders.

Intentional metaphors are also embedded in the proportions of the Greek orders. Vitruvius states the three architectural orders of Greek architecture represent forms of human bodies also reflecting higher order of the cosmos. The Greeks set up the proportions of the Doric column based on the proportion of the imprint of a man's foot to his height, and therefore, "the Doric column…began to exhibit the proportions, strength, and beauty of the body of a man." The Ionic order is based on the proportions of a woman and the Corinthian order is based on the proportions of a young maiden. Vitruvius also discusses the proportions of architecture based on the ideal human body. He states, "Symmetry is a proper agreement between the members of the work itself, and relation between the different parts and the whole general scheme, in accordance with a certain part selected as standard. Thus in the human body there is a kind of symmetrical harmony between forearm, foot, palm, finger, and other small parts; and so it is with perfect buildings."[4] In the chapter On

2. "Metaphor, n." OED Online. Oxford University Press, December 2015.

3. Vitruvius Pollio, Vitruvius: The Ten Books on Architecture, (New York: Dover Publications, 1960).

4. Ibid.

Symmetry: In Temples and the Human Body, Vitruvius discusses the relationship between the proportions of the body and the corresponding relationship between the parts of a temple." The design of a temple depends on symmetry, the principles of which must be most carefully observed by the architect… Without symmetry and proportion there can be no principles in the design of any temple; that is, if there is no precise relation between its members, as in the case of those of a well-shaped man."[5] Referencing the Greeks, he states, "Therefore, since nature has designed the human body so that its members are duly proportioned to the frame as a whole, it appears that the ancients had good reason for their rule, that in perfect buildings the different members must be in exact symmetrical relations to the whole general scheme. Hence, while transmitting to us the proper arrangements for buildings of all kinds, they were particularly careful to do so in the case of temples of the gods, buildings in which merits and faults usually last forever."[6] Vitruvius's body based architectural proportions derive legitimacy from the Greeks, and were rediscovered in the Renaissance. His discussion of the pure geometry inherent to the body was rediscovered in the Renaissance, most famously illustrated in Leonardo da Vinci's Vitruvian Man.

RENAISSANCE PROPORTIONS

Embodied metaphors in architecture reappeared during the Renaissance. Architects used metaphors to idealize the proportions of the human body as a divine geometry. Examples of these proportions appear in architecture and sculpture, which were based on the proportions of the human form, as shown in the Leonardo da Vinci's drawing of the Vitruvian man (Figure 2). Renaissance proportions are based on the revival of ancient Greek and Roman ideals. A primary element of Renaissance architecture is the perfect geometry of the circle and the square. For Leon Battista Alberti, the theoretical underpinning of geometry is a divine ideal that brings the imperfect human being into harmony with the divinely created order of the universe. Geometry is the humanization of space, and for Alberti is based on three braccia, the unit of measurement used by Alberti equal to, "the average height of a man's body." In his theory of corporeality- architecture is a re-creation of the human body - architecture is not to be formed in the manner of any human body, but the ideal human body of a sixteen-year-old Greek male. His opus on theory consists of lineaments of matter, in a duality where the raw materials of nature are at human disposal, upon which the

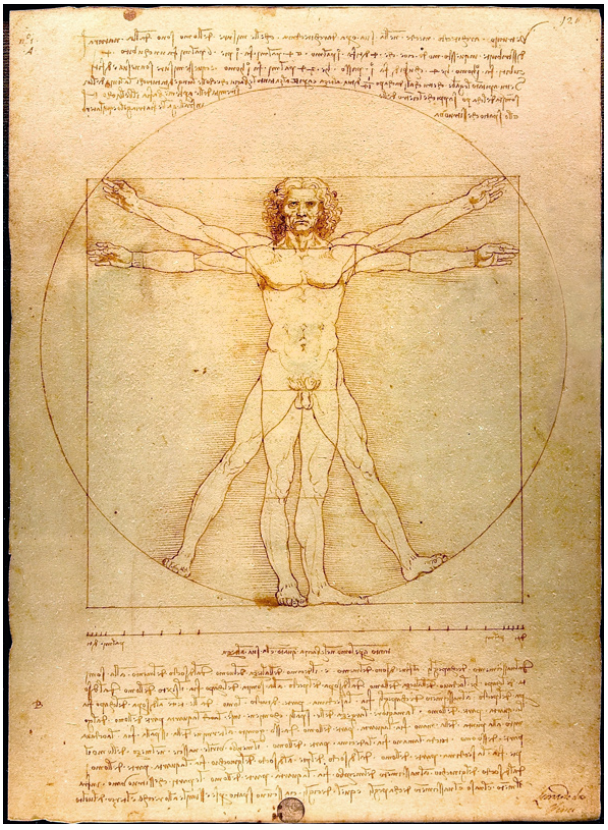

Figure 2. Leonardo da Vinci, "Vitruvian Man," Wikipedia, 1490.

5. Ibid.

6. Ibid.

architect impresses a design through the power of reason.[7]

In Architecture of Embodiment, Harry Francis Mallgrave discusses the inefficiency if the human brain were to store and commit to memory all of the images we receive on a daily basis over the course of a lifetime.[8] The brain would have the impossibly difficult task of retrieving images in any expeditious manner among billions of brain cells. If we view the classical temple of Hephaestus and appreciate its smaller scale related to the Parthenon, we find our memories reside in the brain's specific firing patterns- circuits dispersed over various parts of the brain and lay dormant until reignited. All input is processed by the brain, and though processed at different times, no one part assembles all processed input into a unified whole. It is possible the simplicity of perfect geometry is aesthetically pleasing because of the ease it affords the brain in the search for constancies. The epitome of this intention is seen in the Villa Rotonda by Andrea Palladio and Santa Maria della Consolazione at Todi.

The Villa La Rotonda (Figure 3) is created using the circle and the square as strict guidelines in determining its proportions. Clearly illustrated in its plan, section, and elevation, the geometric principles of the circle and square influence the proportions and rational in space creation, structural placement, and entry placement. The geometry seems implicit of its function, determining use, site lines, and more within the structure. As an architect, Palladio was acutely interested in engaging visitors to his works, accomplished by making use of meticulously crafted façades. What makes La Rotonda unique is that it displays four facades. Idiosyncratic choices rarely accomplish successful creations, yet Palladio was able to design a sophisticated construction by emphasizing balance, visual clarity, and uniformity. The design of the building is completely symmetrical; it presents a square plan with identical porticoes projecting from each façade. At the center of the building, a dome emerges over a central, circular hall. Palladio was concerned with harmony and mathematical consonance and used the square and the circle as essential, yet elegant forms.[9]

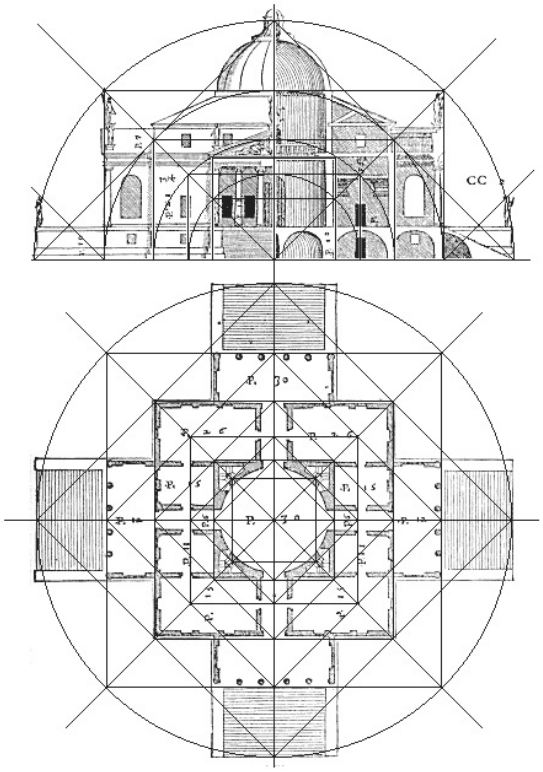

Figure 3. Andrea Palladio, "Villa Rotonda," Pinterest, 1571.

Santa Maria Della Consolazione at Todi (Figure 4) exemplifies the centralized Renaissance church, using geometry and symmetry like the Villa La Rotonda. With influences linked to Danato Bra-

7. David Freedberg and Vittorio Gallese, "Motion, emotion and empathy in esthetic experience," Trends in cognitive sciences, no. 11.5 (2007): 197-203.

8. Harry Francis Mallgrave, The Architect's Brain: Neuroscience, Creativity, and Architecture, (John Wiley & Sons, 2011).

9. Javier Berzal, "Khan Academy," Khan Academy, 2015. <https://www.khanacademy.org/humanities/renaissance-reformation/renaissance-venice/late-renaissance-venice/a/palladio-la-rotunda>.

Figure 4. Joshua Ralls, "Tempio di Santa Maria della Consolazione."

mante and his original design for St. Peters Basilica in Rome, Santa Maria Della Consolazione at Todi uses the Greek Cross plan to order its four apse around a central dome. This centralized church is a clear translation of the square and circle geometries, as they influence all parts of the design. The divine geometries not only give rise to the pleasing nature of proportion, but also make metaphorical connections to divinity. By using divine shapes within churches, Renaissance architects metaphorically embed the divine directly into the building. Since divine and perfect shapes are created from the idealized human body, we can assume architects of the Renaissance believed the human body is the closest creation on Earth to heavens.

Renaissance proportions are based on the human form constituted within harmonics, likening the assembly of parts to the mathematical relationships in music. Harmonics are the highest form of mathematics, and were seen by Renaissance architects as the divine connection between the human form and the sublime. Many Renaissance facades are embedded with the architect's interpretation of music, and the most perfect manifestations of these proportions seem to "sing" and resonate toward the observer. It seems these harmonic underpinnings are universally understood, as the individual recognizes the slight deviation from harmonic proportions and perfect geometries. In fMRI studies by Di Dio, canonical Renaissance statues with altered proportions were shown to elicit a different response from the originals (Figure 5). Studies illustrated that, "Behaviorally, symmetry was shown to strongly affect aesthetic judgment." "Imaging results showed that the observation of original sculptures, relative to the modified ones, produced activation of some lateral and medial cortical areas (lateral occipital gyrus, precuneus and prefrontal areas) and, importantly, of the right anterior insula."[10] These results indicate the brain's response to the altered sculptures and the altered proportions, indicating a biological and universal reaction to harmonic proportions.

Harmonic proportions and perfect geometries illicit a precognitive response through metaphors. These metaphors relate the geometric principles to something greater than arbitrary creation, whether to divinity or simply to pleasing shapes. The use of metaphors seems to be universal in the human mind implying a biological association.

EMBODIED METAPHORS

In studying the biology of the brain, it has been revealed memories are stored as images. In *The Body in the Mind*, Mark Johnson argues the mind and imagination are conditioned by the patterns of our bodily experience and "metaphor" is the means by which we project structure across categories to establish new connections and organizations of meaning to extend and develop

[10] Dio, Cinzia Di, Emiliano Macaluso, and Giacomo Rizzolatti. "The Golden Beauty: Brain Response to Classical and Renaissance Sculptures." PLoS ONE, 2007.

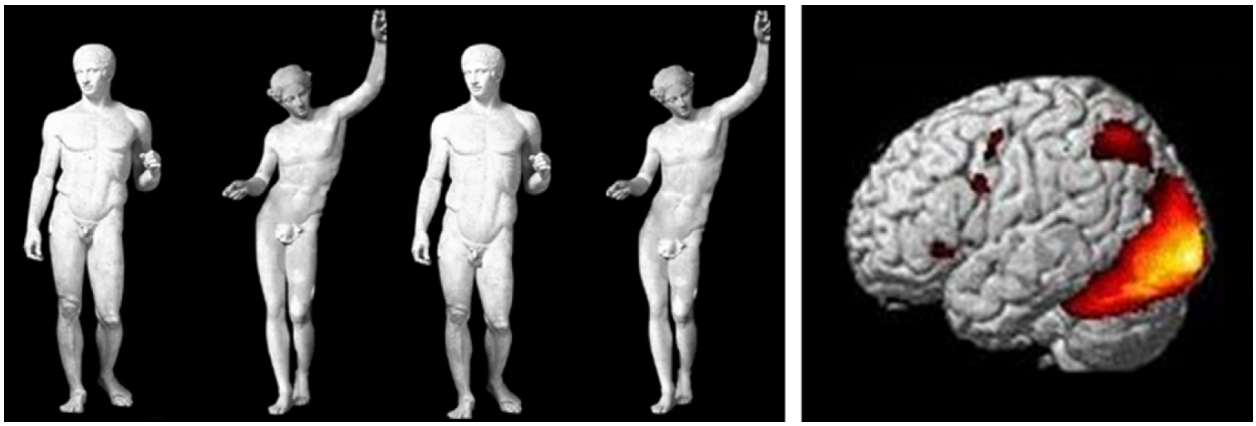

Figure 5. Statues of Renaissance sculputers. Dio, Cinzia Di et al. Digital Image. PLoS ONE, 2007.

image schemata.[11] Metaphor seems to underlie the creative patterns the brain's constructs.[12] In The Architect's Brain, Harry Francis Mallgrave states metaphors "are the essential rudiments out of which we conceptualize or think about the world."[13] The personal experiences of the architect and their understanding of space are stored in the brain of the architect as images. Through the act of creation, these images are recreated in the mind of the architect and different areas of skill collide to create a new imagined reality. As further elaborated by Mallgrave in The Architect's Brain, the metaphoric activity of the architect is primarily a process of image-making: a re-simulation of familiar or associative neural patterns drawn from experience and occasionally resulting in something new. Images are always perceptually driven; inherently material and textural in nature rather than abstract or semantic.[14] Images and their meanings are embedded in the work of architecture through affordances.

Affordances are all of the possibilities associated with an object; all of the possibilities for physical interaction with the object as well as social and cultural associations. In The Embodied Meaning of Architecture, Mark Johnson states, "objects, then, are clusters of affordances of possible interactions we have had, or might have."[15] Through the mirror mechanisms of the observer affordances stimulate embodied simulation in the mind of the observer. The imagination simulates all of the possibilities associated with the object, creating images in response to atmosphere. Imagination comes from the Latin imaginari "picture to oneself," indicating the presence of image in thought and creative processes.[16] In The Architect's Brain, Harry Mallgrave quotes Professor Emeritus of Archi-

[11.] Mark L. Johnson, "The Embodied Meaning of Architecture." Mind in Architecture: Neuroscience, Embodiment, and the Future of Design, (Boston: MIT, 2015)

[12.] Harry Francis Mallgrave, The Architect's Brain: Neuroscience, Creativity, and Architecture, (John Wiley & Sons, 2011).

[13.] Ibid.

[14.] Ibid.

[15.] Ibid., 11

[16.] "imagination, n.," OED Online, Oxford University Press, December 2015.

tecture Joseph Rykwert, stating "… a body is like a building, and the building in turn is like the world. The metaphor returns in a more global similitude: the whole world is itself understood as a kind of body."[17] Architecture is conceived of as the body. The different parts are understood as extensions of the self, and the qualities are understood through bodily relationships of parts. Architecture is also understood as the world. Historically, architecture has represented a view of the cosmos. Through this extended metaphor, we understand the world as a body, through our body. Architecture begins with the body projected into the world. The role of the architect is to give order to the parts composing the whole. The brain has been shown to categorize information by sorting and discarding information in a search for constancies. In Inner Vision, Semir Zeki discusses the single cell physiology specialization of visual processing. Each cell in visual regions of the brain is specialized to process and fire in response to very specific inputs. Specific cells respond to verticals, others to horizontals, and others to diagonals (Zeki 102). This evidence in how the brain breaks down images and sorts input for clarity supports the embodied relationship of pure geometry in architecture. The brain has a preference for pure geometry because of what it affords us and architecture based on pure geometry is more ordered and more clear. It is a question of quality, since the intention is of a higher level and more intentional.

AESTHETIC EXPERIENCE

Aesthetic experience is our cognitive and precognitive reflection of space. Precognition indicates our response is emotive and subconscious, similar to a first impression. This response is active in first-time encounters with a stranger or a visit to an unfamiliar place. It is so intrinsic to how we gauge settings we are seldom aware it is at play. Cognition elucidates a conscious response, where the observer reflects and feels, making a conscious thinking judgment of the conditions and meaning of the environment. Conscious judgment and interpretation comes after the subconscious emotive response. There are many ways these reactions can create an architecturally aesthetic experience. Art historian David Freedberg and neuroscientist Vittorio Gallese argue architecture works through the pre-cognitive activation of embodied mirror mechanisms, encompassing the simulation of actions, emotions and corporeal sensations. They also propose these mechanisms are universal, and these levels of reaction are essential to understanding the effectiveness of artistic works.[18]

Feelings towards works of art often result in an empathetic response or a simulated imitation of an observed action. One essential manifestation of architectural exchange takes place through the proportions of the built form weighed against those of the human body. Freedberg and Gallese use the example of viewers encountering Michelangelo's Prisoners to illustrate this exchange. As the sculptural figures struggle to free themselves of their prison, our muscles tense in a similar fashion, as if we were struggling to break free from the granite block (Figure 6).

A sense of physical involvement translates into empathy of the subject's emotional state, with the capacity to conjure visceral dispositions towards the work (Figure 7). This can happen when we appreciate art for its interpretive meaning. By admiring a painting of dancing figures, our conscious response may be a felt sense of lightness and motion. Yet simulation is

[17.] Harry Francis Mallgrave, The Architect's Brain: Neuroscience, Creativity, and Architecture, (John Wiley & Sons, 2011).

[18.] David Freedberg and Vittorio Gallese, "Motion, emotion and empathy in esthetic experience," Trends in cognitive sciences, no. 11.5 (2007): 197-203.

Figure 6. Michelangelo, Slave called Atlas, Florence, Academia (ca. 1520 - 1523), marble

not limited to literal works depicting the human figure. It can also occur in response to architectural forms, as is with the twisting columns and piers within the Monastery of Jesus in Setúbal, Portugal (Figure 8).

"Symbolically, the twisting visually strengthens the supports for assuming the load of the heavy vaults, while emotionally this tense gesture seems entirely appropriate in a chapel that was designed specifically to house the ritual sacrifice of Christ."[19]

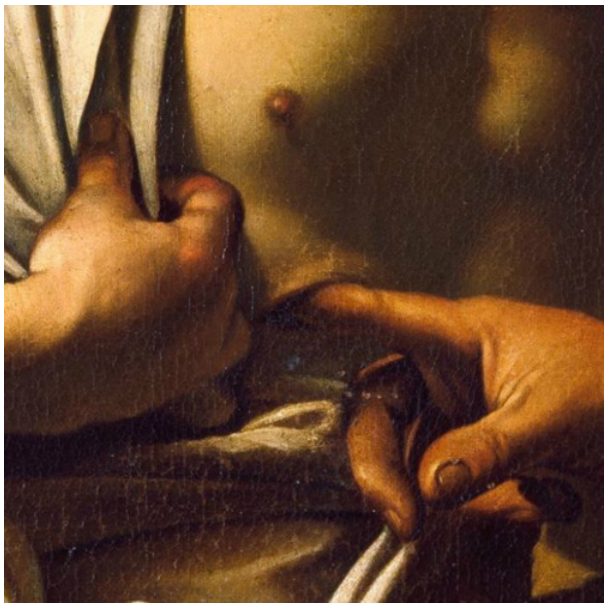

Figure 7. Carravaggio's incredulity of St Thomas (1601- 1602), Digital Image.

Figure 8. Church of Monastery of Jesus, Setubal, Portugal, c. 1498

[19.] Harry Francis Mallgrave, The Architect's Brain: Neuroscience, Creativity, and Architecture. pg 38. John Wiley & Sons, 2011.

Another embodied response lies in the creative gestures left behind by the artist. We can see the physical traces of chisels left upon ancient stone façades of Greek and Roman temples, reveling in the craftsmanship required for such intricate detailing. We can observe the textural quality, the minor ridges and imperfections that imply a presence of a human hand, and thus simulate the action as if we were the ones chiseling away the rough surface.

EMBODIED SIMULATION

Empathy and sensorimotor activities in the brain allow us an aesthetic experience. The biological and material basis for this resides recent research conducted of mirror mechanisms, the neural underpinnings of empathy and embodiment. As Freedberg and Gallese explain, this recent discovery makes clear the same neurons discharge when an action is observed as when it is executed.[20] Originally observed in the parietal cortices of macaque monkeys, this mirror neuron system (MNS) has also been found to exist in the human ventral premotor cortex and posterior parietal cortex. The MNS is directly responsible for coding the execution of motor acts, as well as responding to those visual features that trigger them. Many of these neurons were found to be activated not only when a macaque monkey performed a particular object-related action, but also when the monkey observed someone else performing the same action.[21] This explains our empathetic and embodied understanding of the actions of others. The human MNS can lead to action simulation when observing static images and actions, as represented in painting, sculpture, and architecture. It becomes a crucial component of the aesthetic experience of objects in art works.

Multi-modal activation of the brain also influences our sensory processing and social cognition. In Embodied Simulation and Touch, Gallese reveals the human neocortex to be divided into functionally and anatomically segregated regions responsible for the processing of stimuli such as touch, pain and temperature. These multimodal properties support our interactions between our body and the external world through action and perception, contributing to our conceptualizations of what we observe. Our tactile perceptions are perhaps the most crucial to our bodily observations and awareness in an external world. An fMRI study by Lacey et al. (2012) indicated an activation of the somatosensory cortex associated with the processing of metaphors from the domain of texture. This suggests metaphor comprehension could be percieved through our embodied mechanisms and sensory systems.[22]

In order to understand and appreciate how we process metaphors through simulation, we have to understand how the human body processes intentional and unintentional touch between animate and inanimate objects. Previous studies have shown a shared neural circuitry in the somatosensory cortices for the experience of one's own body being touched and the sight of intentional touch. An fMRI study was conducted to determine whether the activation of a visuotactile mirroring mechanism during touch observation applies to the sight of any touch, independent of the intentionality of the observed touching agent. During fMRI scanning, healthy participants viewed video clips depicting a touch that was intentional or accidental (Figure 9), occurring between animate or inanimate objects. Results showed equal overlapping activation for

19. Harry Francis Mallgrave, The Architect's Brain: Neuroscience, Creativity, and Architecture. pg 38. John Wiley & Sons, 2011.

20. David Freedberg and Vittorio Gallese, "Motion, emotion and empathy in esthetic experience" pg 197-203. TRENDS in Cognitive Sciences Vol.11 No.5 . Science Direct, 2007.

21. Vittorio Galesse and S. Ebisch, "Embodied simulation and touch: The sense of touch in social cognition," Phenomenol. Mind 4 (2013): 274,278

22. Ibid.

Figure 9. Sjoerd JH Ebisch, et al. "The sense of touch: embodied simulation in a visuotactile mirroring mechanism for observed animate or inanimate touch," Journal of cognitive neuroscience 20.9 (2008): 1613.

touch experience and the different touch observation conditions in the bilateral postcentral gyrus. This overlapping activation was independent of the intentionality of the observed touch stimuli, whether the touch was animate or inanimate.[23]

Activation of this visuo-motor system indicates we experience touch and visual touch through observation regardless of intentionality. It is a phenomenon of the bodily perception of our environments, and we can have these responses with architecture. Architecture becomes a bodily metaphor of lived experience where objects intentionally touch each other without any animate involvement. Viewing two objects touching each other activates the same areas of the brain activated when viewing two humans touch. Architecture is about the connection of the parts, meaning the brain understands the joints of the architecture similar to how people touch. We can feel the connections and embodied metaphors being communicated as a body of built work.

CONCLUSION

Aesthetic experience manifests in architecture by way of embodied metaphors through the agency of mirror mechanisms. The human world is defined by the embodied condition. Humans experience the world through their body, as a type of body. The human brain processes information and classifies it through the use of metaphor. The idea of metaphor traces back to the Greeks, and was adopted by the Roman architect Vitruvius, who postulated embodied metaphors were embedded in architecture. This idea was rediscovered in the Renaissance and pursued through the form of perfect geometry and harmonics. The recent discovery of mirror neurons and the theory of embodied simulation supports our claim that embodied metaphors are embedded in architecture through affordances. These affordances are related to the human body, one in the same, made of combined affordances–a whole. The whole world is understood as a kind of body. And as such, architecture is read as a body, and is understood through the body. We understand architecture as its own world in which our body exists (Figure 10).

[23] Sjoerd JH Ebisch, et al. "The sense of touch: embodied simulation in a visuotactile mirroring mechanism for observed animate or inanimate touch," Journal of cognitive neuroscience 20.9 (2008): 1613.

Figure 10. **Joshua Ralls, "Untitled," 2015.**

IS ATMOSPHERE, BY NATURE, AESTHETIC?

Lindsey Leardi, Kelsey Middelkamp and Lucille Sadlon

ABSTRACT

In the following document the authors open up their discovery with the question: is atmosphere, by nature, aesthetic? The solve this, the authors explore atmosphere, aesthetic experience, and embodied simulation. Where atmosphere is the sensorial presence of a space and processed precognitively, similar to a first impression. Atmosphere has the capacity to simulate a cognitive aesthetic experience, which allows the beholder to perceive, feel, and sense, through embodied simulation. With the recent discovery of mirror mechanisms, the concept of embodied simulation has gained clarity as to how it works within our brains. We project and extend our personal embodiment into our built environment and objects around us in order to perceive, or understand, them.[7] The authors propose that aesthetic atmosphere is the sensorial presence of a space which simulates sensorimotor, emotional, and cognitive mechanisms through embodied simulation. Proving that atmosphere is aesthetic, and therefore cognitive, the authors go on to explain how we can achieve aesthetic atmosphere. They use the work of Mark Johnson to prove architects can create aesthetic atmosphere through meaning and affordances which stimulate the imagination and memory. Where meaning is a creative process that give us a way of relating to inanimate objects and space. The authors delve into the controversial world of La Sagrada Familia to provide an example of aesthetic atmosphere created through meaning and affordances.

Understanding an architect's design is similar to understanding a comedian's joke; where the punch-line is the climactic concept that produces a desired effect. Atmosphere is the "punch-line" of architecture. Comedian's make sure the audience will understand their joke. Although each person's humor differs, the best jokes are the funniest. We venture to speculate that, in a general sense, the best architecture is the most aesthetic. Where the term, "aesthetic" relates to the notion of beauty or artistic impact of appearance or sensation.[1]

If we are reaching for aesthetics, we now inquire: is atmosphere, by nature, aesthetic? And if so, how do we create aesthetic atmosphere?

We propose that aesthetic atmosphere is the sensorial presence of a space which simulates sensorimotor, emotional, and cognitive mechanisms through embodied simulation. Architects create aesthetic atmosphere through meaning and affordances which stimulate imagination and memory.

1. "Aesthetic, n.," Dictionary.com, Dictionary.com, n.d.

ATMOSPHERE

The origin of atmosphere is the Greek "atmo," meaning air or vapour, and "sphere," indicating a sphere like enveloping mass. Atmosphere is defined as, "a surrounding or pervading mood, environment, or influence," such as the tense atmosphere of an impending war.[2] Architectural atmosphere is the sensorial qualities that a space emits.[3] In his book Atmospheres, Peter Zumthor defines architectural atmosphere as, "this singular density and mood, this feeling of presence, well-being, harmony, beauty...under whose spell I experience what I otherwise would not experience in precisely this way." Zumthor's recipe for atmosphere includes nine elements: bodily mass, material compatibility, sound, temperature, surrounding objects, between composure and seduction, interior-exterior tension, levels of intimacy, and light.[4] For the purpose of our inquiry, we define architectural atmosphere as the sensorial presence of a space; often eliciting a personal and transcendent experience.

FIRST IMPRESSIONS

Zumthor compares atmosphere to a first impression.[5] When we walk into a space we cast an immediate judgement with little information or cognition, just as we do when we meet a new person.

According to Carlin Flora's article in Psychology Today entitled, "The First Impression," first impressions are a holistic phenomenon in which there is a composite of signals emitted by a new experience that is formed by our brains. Our ability to create instantaneous judgements evolved as a survival skill, a way to protect ourselves in an eat-or-be-eaten world. However, it is not a purely biological skill. Culturally and socially we are taught how to judge others through social stereotypes, consciously or otherwise.[6]

In their 2006 psychological study at Princeton University, First Impressions: Making Up Your Mind After a 100-ms Exposure to a Face, Janine Willis and Alexander Todorov studied the nominal conditions under which people make characteristic assumptions from the facial appearances of other people. Five experiments were conducted, each focusing on specific trait judgement of unfamiliar faces with time exposure manipulation. Willis and Todorov's findings suggest that after as little as a tenth of a second, people are able to make characteristic assumptions from a stranger's face. With added exposure time, confidence increases and additional assessments can be made; however, the initial inferences anchor further judgements.[7]

When we enter a space the first thing our brains do is composite the signals emitted by the space. A first impression is formed. Architecture and art mentally and emotionally affect us before we begin to consciously understand them.[8]

Precognition, also known as the subconscious mind, is the time elapsed before one's brain reaches cognition, realization, and judgement of a space or situation. The realization that architecture affects us before cognition kicks in

2. "Atmosphere, n." Dictionary.com. Dictionary.com. n.d.

3. "Atmosphere (architecture and spatial design)," Wikipedia. Wikimedia Foundation, 13 May 2015.

4. Peter Zumthor, "Atmospheres," (Basel: Birkhäuser, 2006).

5. Ibid.

6. Carlin Flora, "The First Impression," Psychology Today. (Sussex Publishers, LLC, 14 May 2004).

7. Janine Willis and Alexander Todorov, "First Impressions: Making Up Your Mind After a 100-Ms Exposure to a Face," Psychological Science, 17.7 (2006): 592-98. California State University Chico. Sage Publications.

8. Juhani Pallasmaa, "Body, Mind, and Imagination: The Mental Essence of Architecture," Mind in Architecture, (Cambridge, Massachusetts: MIT, 2015), 51-74.

tells us that atmosphere is perceived pre-cognitively, just like a first impression.

EMBODIED SIMULATION

In order to answer how atmosphere can stimulate active cognition, we first need to grasp how observers perceive and interact with the built environment. Before we perceive atmosphere, we see it. Perception is more than seeing, it is understanding. Our visual system is divided into central and peripheral vision (Figure 1), predominating the ventral and dorsal streams respectively. If we are to consider atmosphere to be the built environment, for the sake of understanding with regards to the architecture field, then observers perceive atmosphere through both the central and peripheral visual fields respectively, which stimulates projected and extended embodiment. The ventral stream allows human beings to understand, perceive, and identify objects, while the dorsal stream addresses spatial perception, or the object's location. Through our visual processing we see the built environment, shaping our projected and extended embodiment and allowing us to perceive.[9]

Our initial biological responses to art and architecture, which we experience sensorially, are pre-conscious emotions, not unlike a first impression. We have yet to make any conscious judgements about this piece of art or of the space. Emotional responses condition interactions with our surroundings and stimulate feelings, our cognitive response. Once we see, then understand, active cognition begins and we are able to consciously judge said art piece or space. No longer are we simply taking in the space, we are observing and experiencing through our ability to empathize with the world around us.

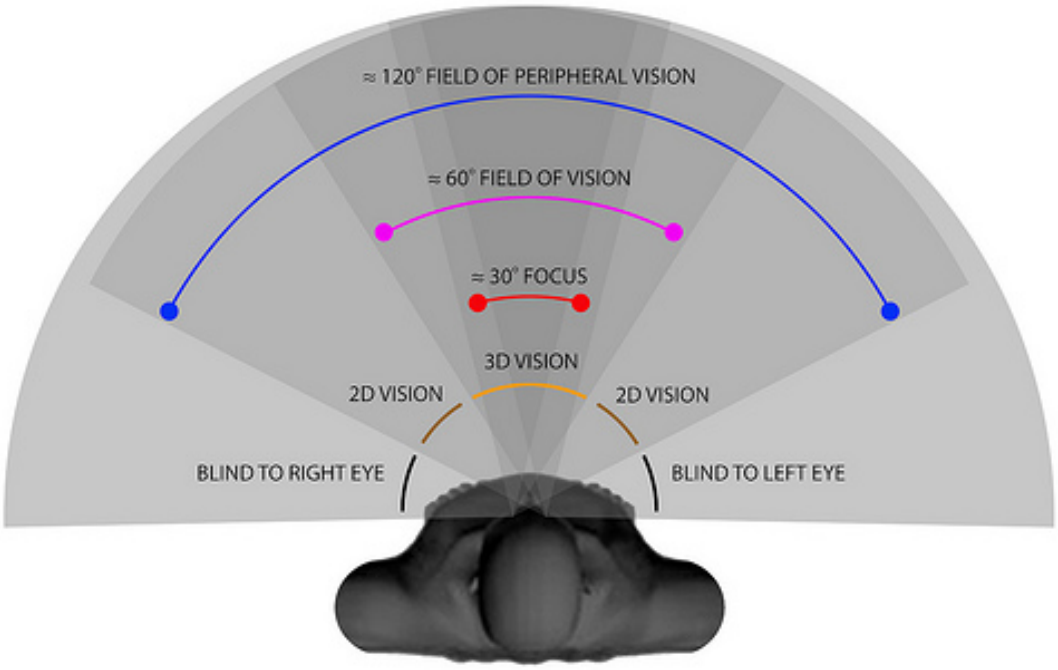

Figure 1. Cromar, William, "Stereoscopic vision," New Media Abington, 2014.

9. Kevin K. Rooney, Lester C. Loschky and Robert J. Condia, "Extended and Projected Embodiment," Cognitive Processing- International Quarterly of Cognitive Science, (Unpublished draft): 1-4.

Through the recent discovery of mirror mechanisms, we are able to define our empathetic relationship with the world. The Mirror Neurons System (MNS) causes our brain to translate the observed actions of others into mental and physiological responses of those same actions. In other words, we internally reflect and perform the behavior of others simply through observation, a monkey see monkey do mentality. This is what also allows us to experience our environment on a deeper level: our ability to empathize gives us an emotional connection with the built environment as more than an external reference. The same can be said for feeling this response, whether we are watching two people touching, observing a person touching an inanimate object, or even when we see two inanimate objects touching, we get a very similar response in all of these scenarios. We are not living a passive existence: we are skilled in the world and the world is within us.[10]

Embodiment explains our biological relationship with the external environment on a mental and physiological level. Projected embodiment is our intellectual awareness of things separate from ourselves. Extended embodiment is the mental extension of ourselves, which gives us the ability to respond to inanimate objects in a similarly emotional manner that we do to animate objects. Our ambient awareness of those external elements as being part of ourselves occurs through our use of peripheral vision, in which we perceive these things as a continuous cognitive extension. This form of embodiment encapsulates ourselves in the world in a mind-to-body-to-environment relationship over time.[11]

Mark Johnson suggests that what we need is "an embodied view of mind and meaning to appreciate the significance of architecture."[12] Embodied simulation is the new empathy. We simulate the forms and materials of architecture with our bodies, which prompts the anticipation of wanting to move within it.[13]

AESTHETIC EXPERIENCE

The word "aesthetic" comes from the Greek term aisthētikós, which literally means "of [or for] sense perception." When we say "aesthetic", we mean it in relation to the notion of beauty or artistic impact of appearance or sensation. Aesthetics is a means of reading craft and making judgement on quality (Figure 2).[14]

Following that, we can understand an aesthetic experience to be something which allows the beholder to perceive, feel, and sense art (or architecture, as is our focus) and implies the activation of sensorimotor, emotional, and cognitive mechanisms.[15]

British sculptor Antony Gormley explored our spatial relationship with architecture in his installation "Blind Light" (Figure 3), in which he enclosed a cloud of vapor within a brightly-lit glass box; in essence, he created a contained

10. Ebisch, Sjoerd J. H., Mauro G. Perrucci, Antonio Ferretti, Cosimo Del Gratta, Gian Luca Romani, and Vittorio Gallese. "The Sense of Touch: Embodied Simulation in a Visuotactile Mirroring Mechanism for Observed Animate or Inanimate Touch." Journal of Cognitive Neuroscience 20.9 (2008): 1611-1623. Print.

11. Sjoerd JH Ebisch, et al., "The sense of touch: embodied simulation in a visuotactile mirroring mechanism for observed animate or inanimate touch," Journal of cognitive neuroscience, 20.9 (2008): 1613.

12. Harry Mallgrave, "Emotion," and "Experiencing Architecture," Architecture and Embodiment: The Implications of the New Sciences and Humanities for Design, (New York, New York: Routledge, 2013), 89-164.

13. Mark L. Johnson, "The Embodied Meaning of Architecture," Mind in Architecture, (Cambridge, Massachusetts: MIT, 2015), 33-50.

14. Harry Mallgrave, "Emotion," and "Experiencing Architecture," Architecture and Embodiment: The Implications of the New Sciences and Humanities for Design, (New York, New York: Routledge, 2013), 89-164.

15. Merriam-Webster, Merriam-webster.com.

Figure 2. Rockwell, Norman, "Art Critic," 1955.

Figure 3. Gormley, Antony, "Blind Light," The Guardian, 2007.

atmosphere. Exhibit visitors moved through the disorienting space and experienced various states of emotion ranging from anxiety to an inspired sense of awe. After these pre-cognitive reactions they would consciously consider their surroundings by exploring the space through touch, sound, or limited sight. They experienced the transition from unconscious judgment to cognitive decisions regarding their environment. "Blind Light" demonstrates how atmosphere becomes an aesthetic experience by how it affects our feelings, perceptions, and decision-making process regarding our environment.

Therefore, atmosphere becomes an aesthetic experience through the process of embodied simulation and the constructive interference of mood. This involves a combination of thinking and feeling, in which atmosphere becomes cognitive through the act of human judgement. Embodied simulation leads to mood, which we define as an internal reflection of the external condition of atmosphere. It is a collection of thoughts and feelings which influence our perception and judgement of an atmosphere, ergo its relation to aesthetics, which is itself a cognitive judgement of quality. Hence atmosphere has the ability to become aesthetic through the combined forces of mood and embodiment.

AESTHETIC PARAMETERS

Where does environment end and internal processing begin in an aesthetic experience? What are the elements at work? We propose that an aesthetic experience consists of universals such as embodied simulation of actions, emotions, and sensations, in which the empathetic response is not merely an intuitive reaction but a biological one with a basis in the brain.[16] There is a basic set of human reaction mechanisms which everyone can experience, a theory supported by the discovery of mirror neurons. In addition, an fMRI study by Di Dio et al. suggests that there is a definite neural link between aesthetics and emotion, meaning that the brain's core centers of emotion (the insula and amygdala) mediate aesthetic preference.[17]

The perception of aesthetic qualities is also determined by the interest, knowledge, overall familiarity, and personal experiences of the in-

16. Peter Zumthor, "Atmospheres," (Basel: Birkhäuser, 2006).

17. Di Dio Cinzia and Vittorio Gallese, "Neuroaesthetics: A Review," Current Opinion in Neurobiology (2009): 682-87. <http://www.unipr.it/>

dividual; this also includes the meaning which a person may perceive. The idea of meaning, as explained by Mark Johnson, stems from the concept of embodied simulation. Meaning is relational; it points to possible experiences in any time frame, and is a creative process which involves the construction of a virtual experience in one's own brain.

> *My hypothesis is that architectural structures are experienced by humans as both sense-giving and signifying. That is, architectural structures present us, first, with a way of situating ourselves in, or being "at home" in, and making sense of our world, and, second, they provide material and cultural affordances that are meaningful for our survival and flourishing as meaning-seeking creatures.*[18]

Consequently architecture can be conceived of as both a projection of the architect's design intentions and a thing which projects affordances onto the beholder (affordances being the potential for actions or events). Following that logic, atmosphere can also be considered in the same terms: it can be both a projection of the architect's intentions and a projection of the architecture itself. Then the atmosphere is projecting onto the beholder, resulting in his internal reflection in the form of mood. The sense of meaning that the beholder will come away with — what he reads aesthetically from the architectural environment and atmosphere — will be shaped by personal factors.

Clearly there is some combination of biological and individual factors involved, and that is why we claim that the aesthetic experience of an atmosphere is determined by both universal and individual factors (Figure 4).

Figure 4. Christos Georghiou, "Brain Globe." The Huffington Post, 2015.

TRANSCENDENCE

Merriam-Webster defines the transcendent state as one that goes beyond the limits of ordinary experience, something which is far greater than what is normal. Peter Zumthor describes experiencing this type of state when he encounters "quality architecture."

> *Quality architecture to me is when a building manages to move me. What on earth is it that moves me? How can I get it into my own work . . . How do people design things with such a beautiful, natural presence, things that move me every single time. One word for it is atmosphere.*[16]

He describes atmosphere as the thing which "moves" the beholder on an emotional and pre-cognitive level; once again, we see the idea of a first impression (Figure 5). But then he poses questions regarding the nature of that atmosphere, wonders how it works and how it can be implemented. This means that when Zumthor experiences architecture that "moves" him, it's more than a merely precognitive experience and becomes something else entirely. He begins to consciously consider that which he finds moving, reflect on his feelings, and judge the aesthetic qualities of the design in order to

[18] Mark Johnson, "The Embodied Meaning of Architecture," Mind in Architecture, (Cambridge, Massachusetts: MIT, 2015), 33-50.

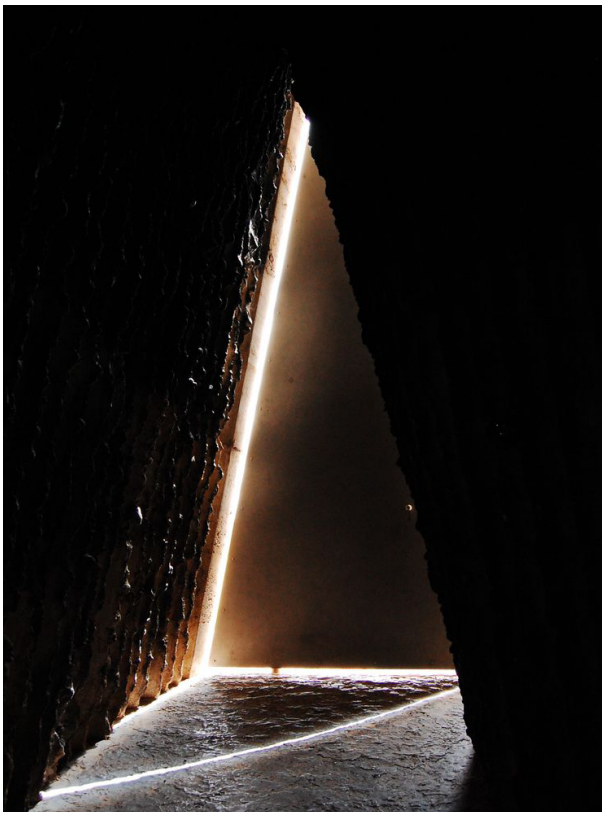

Figure 5. Peter Zumthor, "Bruder Klaus Field Chapel." ArchDaily, 2011.

better understand the experience and possibly replicate it. And to be "moved" by architecture implies an embodied experience, especially if we assume Merleau-Ponty was correct when he said that we see with our entire body.[19]

REALITY DEFINED

The aesthetic experience of atmosphere can also be explained as a frame of reality. Initially, the act of vision occurs in the visual cortex at the rear of the human brain, and we possess a series of cortical processing stations which serve as the preliminary sites of perception. Mallgrave references Zeki's suggestion that our sense of reality exists in a series of micro-consciousnesses that are processed and assembled in the brain.[20] If this is the case, then the architect — through his design of a building or space, and subsequently the atmosphere — has a hand in forming the personal reality of the individual, and therefore the aesthetic experience.

AESTHETIC ATMOSPHERE

Aesthetic atmosphere is the combination of aesthetic experience and atmosphere. Where an aesthetic experience implies the activation of sensorimotor, emotional, and cognitive mechanisms and atmosphere is the sensorial presence of space. Therefore, aesthetic atmosphere occurs when the sensorial presence of space simulates the activation of sensorimotor, emotional, and cognitive mechanisms. In order for aesthetic atmosphere to be realized sensorimotor, emotional, and cognitive mechanisms must be activated.

MEANINGFUL ARCHITECTURE

Aesthetic atmosphere can be achieved by designing meaningful architecture which activates the observer's imagination and memory. We touched earlier on meaning as a creative process defined by Mark Johnson. According to Mark Johnson, humans are relational beings who desire meaning and are constantly searching for it. Meaning being the process by which people perform an act of virtual creation by constructing the experience in their brain. Architects are able to make meaning through the creation of atmosphere. Once the observer experiences meaning through virtual creation, they are more easily able to create a memorized image and utilize their imagination.[21]

Juhani Pallasmaa discusses the impactful Egyptian pyramids and how they are a common memorized image (Figure 6). The Egyptian pyramids

19. Harry Francis Mallgrave, The Architect's Brain: Neuroscience, Creativity, and Architecture, (John Wiley & Sons, 2011).

20. Alberto Perez-Gomez, "Mood and Meaning in Architecture," Mind in Architecture, (Cambridge, Massachusetts: MIT, 2015), 219-232.

21. Mark L. Johnson, "The Embodied Meaning of Architecture." Mind in Architecture, (Boston: MIT, 2015).

Figure 6. History Videos, "Egyptian Pyramids," YouTube, 2015.

are easily memorized because they scale time down and have human measure and meaning.[22]

Once meaning and memorization are established, observers are capable of testing and evaluating atmosphere using their imagination, a process that occurs beyond the senses and enters active cognition. We become aware of our visceral and emotional feelings in the area of the brain called the insula. Alberto Pérez-Gómez discusses Frederick Kiesler's idea that an atmosphere would challenge the observer to provoke their imagination.[23] So that an atmosphere's affordances become more than just things and would be perceived and experienced. Affordances, possible experiences related to an object, ground the objects meaning. When we create a personal account of affordances they play a vital role of an experienced quality.

Johnson says that in order to appreciate architectural significance we must have an embodied view of mind and meaning. Architecture gives us a world and a way to inhabit that world. Within architecture, affordances provide possibilities for meaningful architectural interaction.[24]

LA SAGRADA FAMILIA

Barcelona's Sagrada Familia is an aesthetic atmosphere by virtue of its unique affordances, which anchor its meaning. A highly controversial building, La Sagrada Familia was designed in 1883 by chief architect, Antoni Gaudí and is still under, seemingly never-ending, construction today (Figure 7). Gaudí's concept was grounded in Gothic and Byzantine cathedral traditions with a symbiosis between form and Christian iconography. Meaning is communicated poetically through the form and expression of Sagrada Familia, as well as through the more literal Christian symbols. Each of the 18 towers has explicit biblical significance. Gaudí's architectural gestures are inspired by nature, while light and color play a starring role (Figure 8).[25]

La Sagrada Familia is often called one of the most controversial architectural wonders. George Orwell called it "one of the most hideous buildings

Figure 7. Leardi, Lindsey, "La Sagrada Familia exterior," 2015.

22. Juhani Pallasmaa, "Body, Mind, and Imagination: The Mental Essence of Architecture," *Mind in Architecture,* (Cambridge, Massachusetts: MIT, 2015), 51-74.

23. Alberto Perez-Gomez, "Mood and Meaning in Architecture." Mind in Architecture, (Cambridge, Massachusetts: MIT, 2015), 219-232.

24. Mark L. Johnson, "The Embodied Meaning of Architecture." Mind in Architecture: Neuroscience, Embodiment, and the Future of Design. (Boston: MIT, 2015).

25. "History and Architecture," Basilica de la Sagrada Familia.

Figure 8. Leardi, Lindsey, "La Sagrada Familia interior," 2015.

in the world." Whereas, Salvador Dalí talked of its, "terrifying and edible beauty," stating that it should be kept under a glass dome. It has been condemned a tourist trap, as well as praised for its technical perfection.[26] But any way you slice it, La Sagrada Familia is an aesthetic atmosphere. It clearly activates sensorimotor, emotional, and cognitive mechanisms which can be displayed via the extensive commentary it has received over the years. So even though there is no unanimous consensus of awe surrounding La Sagrada Familia, the architecture is so powerful and meaningful that it provokes an aesthetic experience. Whether you like it or not.

CONCLUSION

An architect's job is to create an aesthetic atmosphere where architecture becomes more than mere setting and the observer has a deep cognitive connection to their external environment on a mental and physiological level. Through our visual processing, we see the built environment. Our projected and extended embodiment allows us to perceive it.[27] We simulate the forms and materials of architecture with our bodies. Architecture prompts the simulation of materials and forms with the anticipation of wanting to move within it.[28] Embodied simulation affords us an aesthetic experience through the use of atmosphere. Aesthetic atmosphere is the sensorial presence of a space which activates sensorimotor, emotional, and cognitive mechanisms through embodied simulation. Architects create aesthetic atmosphere through meaning and affordances which stimulate their imagination and memory. An aesthetic atmosphere challenges the observer to provoke their imagination through its affordances and meaning. Architecture seduces you, it makes the observer want to stay within a certain space, simulating the senses and human nature of curiosity. Making atmosphere cognitive and, therefore, aesthetic.

26. "Barcelona's Sagrada Familia: Gaudí's 'Cathedral for the Poor'- a History of Cities in 50 Buildings, Day 49," The Guardian (2015).

27. Kevin K. Rooney, Lester C. Loschky and Robert J. Condia, "Extended and Projected Embodiment," Cognitive Processing- International Quarterly of Cognitive Science (Unpublished draft): 1-4.

28. Harry Francis Mallgrave, The Architect's Brain: Neuroscience, Creativity, and Architecture, (John Wiley & Sons, 2011).

AFFORDANCE OF BEAUTY

Frederik Heuser

ABSTRACT

Beauty's un-rationalistic undertones have largely forced its exclusion from academic dialogue. Throughout past decades, function and reason have unarguably been the preceding factors in the installation of the current built environment. The following document provides insight into beauty's entwined relationship with the built environment through corporeal mechanisms. The author inquires how beauty affords meaning to the individual through largely pre-reflective neural functions. The proposal replaces beauty as a mere variation of slight judgement with a variable constantly active in our surroundings. Beauty not only resides in the brain but is deeply-rooted in our somatic engagement in the world.

The word Beauty is one of the most common words used in the english language. Beauty derives from Latin bellus (pretty, handsome); and later in the 12th century via modern French beauté which leads to the modern definition being "a combination of qualities, such as shape, color, or form, that pleases the aesthetic senses, especially the sight" (Figure1). [1] This definition, though rather crude, represents what many understand of the notion or nature of something being beautiful. The definition also recalls the well known proverb – beauty is in the eye of the beholder – is distilled from the dominating cartesian understanding world. Beauty cannot be judged objectively, and we experience the world passively (Figure 2 and 3). Well suited for our

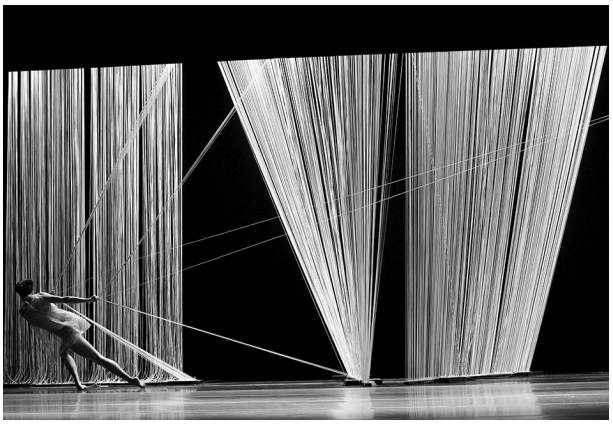

Figure 2. Angela Sterling, "Triangle of the Squinches" 2011.

Figure 1. **Frederik Heuser, "St. Benedigt Chapel." 2015**

1. "Beauty," Oxford Dictionaries Online, 11th ed., 2015.

egocentric nature, the world comes to us, the central being, that everything revolves around. Beauty doesnt belong to Cartesian rationalization (Figure 4), and to architects who are fixated on this belief, it, is seen as an old fashioned or mystical, and weightless word. Often beauty is described as a classicist notion ruled by Vitruvious, Alberti, or Palladio, and irrelevant to contemporary architectural thought. Beauty belongs to the emotional world, and is decidedly a subjective opinion.

This has proven inconsequential to the architectural profession and in an architectural theory, this term has taken a dramatic fall. The industrial era set a new trajectory for the architectural course that completely removed the word from its discussion. Beauty is pushed aside for the narrowed attention of functionalist thought, the hallmark of modernity; 'Form follows function'. Buildings become analyzed as components, assessed merely as a set of physical relationships and their pragmatic uses. Additionally, architects have removed themselves from historical precedent, and defined a completely new trajectory of creating buildings that are built upon the above principles.

Douglas S. Kelbaugh's Repairing the American metropolis dicusses the recent trajectories of architectural theory and the severe consequences that followed its line of thinking. Thinking in the literal sense of an intellectualized cartesian understanding of the world. "Since functional requirements change quickly in modern society, buildings are often designed to be adaptable over the years and flexible during the daily or weekly cycle. Therefore, functionalists argue that architectural composition should visually express as well as physically accomodate these temporal changes.[2] This attention to the future, reduces the intentions of a building to the immediacy of cartesian time. Human experience is intentionally regulated to static instances, the power of functionalism is relevant only within its immediate purpose. But what about the

Figure 3. Teresa Royce "Kansas City," 1985

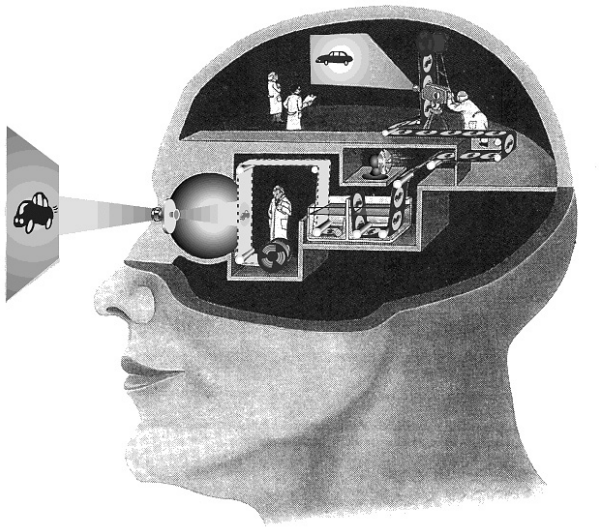

Figure 4. Smithsonian 16 "Cartesian Brain". 1985

[2.] Doug Kelbaugh, "Repairing the American Metropolis," (Seattle: University of Washington Press, 2002) 102.

function of beauty? Can beauty become accepted in the discussion of architecture, both for the architect and those living in the spaces created?

Alain de Botton in his lecture the questions of Beauty in architecture stated that even the seminal modernist architects, contrary to their philosphy, were concerned with beauty and appearance, rather than mere function (Figure 5).[3] Le Corbusier, who had created the archetypal machine age building, payed extreme attention to the building's appearance, rather than how it performs (Figure 6). It has been recorded that this building was severely flawed in its performance. Yet, the architect even hired Swiss artisans to craft the building by hand.

Mark L. Johnson in his brief essay "The embodied Meaning of Architecture" noted that the structures created by humans loosely fit the functions we enact in them, and only a portion of those functions are necessary for our survival. He argues that there is another side to our being in the world, which includes the need for making meaning, and he does so through architecture, as it plays a large role in ordering our environment. Johnson defines meaning in this way:

"The meaning of any object, quality, event, or action, is what it points to by way of some experience. Meaning is relational, and the meaning of a certain object would be the possible experiences it affords us –either now, in the past, or in the future (as possibilities)".[4]

He bases his definition of meaning on the appropriation of two terms; J. J. Gibsons "Affordances" and John Dewey's "pervasive unifying quality". An Affordance, is literally what an object, quality, event, or action affords us by way of an experience (Figure 7). This experience is rela-

Figure 5. Aurello Monge, "Villa Rotunda," 2012

Figure 6. Villa Savoye, Poissy, France, 1930

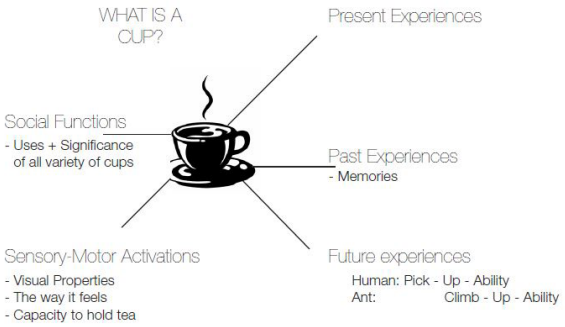

Figure 7. The Affordances of a Cup, 2016

[3] Alain de Botton, "The Question of Beauty in Architecture," Gresham College Lectures, Vimeo Videos, 18:50, 2011.

[4] Mark L. Johnson, "The Embodied Meaning of Architecture." Mind in Architecture, (Boston: MIT, 2015), 35.

tional, meaning it is the result of our biological body and brain. An affordance can be sensory-motor, since we engage the world multi-modally through our body with all of our senses. It can be a cultural or public affordance, since we exist primarily as social beings. It may also serve as a personal affordance through past experiences or how it may provoke deeply engrained memories.

Dewey's pervasive unifying quality stems from his extensive criticism of scientifics preference for cause and effect abstractions over the qualitative dimensions of lived experience. By definition, this unified quality belongs in every experience giving it its name. "To find yourself enmeshed in an experience is to feel the qualitative unity that gives meaning and identity to what is happening to you". [5] This notion has a strikingly similar definition, to a term many architects are familiar with; Atmosphere. Peter Zumthor famously related an atmosphere to a first impression. "I enter a building, see a room, and – in a fraction of a second – have this feeling about it". [6] Much of it is felt immediately. Atmosphere is the medium of the architect, as there is no architecture, or building for that matter(important distinction) that has no atmosphere. This quality and affordances are intimitely related. "It is only within such a unified situation do we then experience individual objects, persons, and events, with their particular qualities and affordances... So, objects are events with meanings that 'stand out' within the context of a situation" (Figure 8).[7] When considering the affordance of beauty, we must establish that it is relational to its context.

Figure 8. Renee Bresson, Seaton Hall, 2014

As a prerequisite, I would like to inquire how does Beauty afford us? If beauty is relevant to the human's "deep desire for meaning as part of our attempts to grow and flourish" as Johnson put it, than we must explore beauty's role in meaning making. Thereafter, I will ask, what aspect of this beauty is universal?

Gary Coates explores how "Deep Beauty" can be created in a beauty-less age. This term reveals the irreducible mystery of an "ecological ethos or spiritual worldview". It is an elegantly simple proposition that emerges through a love of life, self, the world and people we engage with. He explores this notion through a tri-partite model of progressively "deeper" levels of meaning; The functional level, the typological level, and the archetypal level.[8] As you will see, deepness is directly proportional to its universality. Each level becomes even more universal, and the

5. Ibid, 39.

6. Peter Zumthor, "Atmospheres," (Basel: Birkhäuser, 2006).

7. Ibid, 4.

8. Ibid.

earlier levels will vary more often from person to person and across cultures. Yet, it is important to recognize that a building characterized as deeply beautiful must satisfy all three conditions of the model.

The Functional Level reveals our direct engagement with the building. We are generally more cognizant of the functional aspects of a building, especially practicing architects who concern themselves with these issues regularily. The rest of the population tends to be more cognizant of the aspects of buildings that fail to function or misguide us, such as a faucet that does not afford us the flow of water, when its characteristics convince us it can. We may not be aware of the cold weather freezing our pipes, or the note left on our front door reminding us of water maintenace being performed on the street today. We are aware when there is a lack of fresh air exchange, or air movement in the buildings we inhabit. This level contains a large portion of our affordances; how the program functions, how the building controls the climate to suit our needs, and additional means of comfort to our physical being and the larger ecological environment.[9]

The Typological Level acts at the regional scale.[10] These regional boundaries are complex and may relate to geographical or climactic boundaries; between structural patterns that stem from ancient or modern typologies. The conflict of this level resides in designing between familiarity and novelty. Critical Regionalist writings attempts to provoke, as it suggests, a critical analysis of a vernacular building history. Culture meanings develop at this level, provoking traditions, and broader social meanings.

The Archetypal Level is universal to humans. According to Coates, this level typically belongs to the sacred architecture of the world. “This is the deepest level of meaning and metaphoric signification, leading users through the layers of consciousness, space and time...”.[11] Interestingly enough, the definition imply’s the same as that which Johnson provides; a non- literary definition of meaning, one that is embodied in the world through our senses and corporeality. We face the world through oppositions and these are understood through our body. Palasmaa discusses when seeing Taliesin West by Frank Lloyd Wright, we not only experience the building, but also the surrounding landscape, and our refined, sensuously self-conscious existence. “we are invited inside a unique ambience, an artistically structured world of embodied experiences, which addresses our sense of being, balance, horizon, and temporal duration in a way that bypasses rationality and logic”.[12] Some of these dialectic experiences are caving in and flight, separation and togetherness, enclosure and vista, gravity and weightlessness among others. Coates would add some others, such as enticement and peril and complexity and similarity. [13] Through the theory of affordances, we understand that we exist or that taliesen west and surrounding landscape exists because of our relative bodily structure. This structure, we know belongs to humans across the world.

French philosopher Maurice Merleau-Ponty challenges the Cartesian view of the world in his

9. Gary Coates, “ARCH 716: Deep Beauty Toward a Sustainable and Life-Enhancing Architecture of Place,” 2015.

10. Gary Coates, “ARCH 716: Deep Beauty Toward a Sustainable and Life-Enhancing Architecture of Place,” 2015.

11. Ibid.

12. Ibid.

13. Juhani Pallasmaa, “Body, Mind, and Imagination: The Mental Essence of Architecture,” Mind in Architecture, (Cambridge, Massachusetts: MIT, 2015), 59.

essay the Eye and Mind, claiming that the mind, body, and environment are intimately connected. They are not separate external/internal constructions. He does so through the painter, who investigates the world through painting. The painter evaluates and projects what of the subject is seen within the artist himself. To this he says "we cannot imagine how a mind could paint. It is by lending his body to the world that the artist changes the world into paintings". [14] Just as the painter, we have a skilled participation informed by our body. Painting, therefore, is a form a vision to the painter. Hubert L. Dreyfus' analysis of Ponty's essay recognized three ways that the world reveals itself to us through our body; a basic general skill, a cultural skill, and through our innate structure.[15]

Basic general skills are acquired in our interactions with the world and are generally unconscious. Walking on, ducking under, grasping, etc... are the result of how we cope with things. They are a direct response to the affordances we interact with in our perceived environment. Affordances then solicit our skillful responses. Equally we understand and choose those affordances because of the skills we have developed. This skill set is most attuned to the buildings functional level. A pragmatism belongs to the functioning building; one that we cooperate with through our senses and needs. According to Johnsons definition, we seek things in our environment that 'stand out', which may most likely afford us our next experience. A cupboard that opens may afford us a graspable cup that we may pour our coffee into, and the handle that affords us the ability to hold the cup as its ceramic surface becomes too hot.

Yet this cup does not have the same purpose across cultures. And certain cups are embedded with different social functions within the same culture. Someone from a certain cultural background may not experience the tradional values that are associated with certain cups from another, rendering them less meaningful to that individual. The mailbox, as Deyfrus recounts, doesnt belong to all cultures and mailing letters is a skill only developed by those who experience the mailbox. Just as the basic skill, the cultural world is defined through our body. [16]

Humans are multi-modal beings who experience the world through their body. "In so far as I have hands, feet, a body, I sustain around me intentions which are not dependent upon my decisions and which affect my surroundings in a way which I do not choose. These intentions are general... they originate from other than myself, and I am not surprised to find them in all psycho-physical subjects organized as I am".[17] Ponty describes the way the world becomes meaningful to us through our innate structure, here the physical unity of human corporeality is at play.

One method of clarifying this idea is through the theories of many behavioral scientists of the 19th century whose principles are being exposed through the light of neuroscientific discovery. It is Robert Vischer who introduces the concept of Einfhülung. Vischer was Inspired by Karl Scherner's analysis of dreaming. By referring to the dream state as imagination that lacked rational thinking and needed to translate ideas into metaphors or visual impressions, he suggested that a building symbolizes the body and its elements symbolize specific organs. It is

14. Ibid, 7.

15. Maurice MerleauPonty, "Eye and Mind." The Primacy of Perception. Ed. James E. Edie. Trans. Carleton Dallery. (Evanston, IL: Northwestern UP, 1964), 159190.

16. Hubert L. Dreyfus, "The Current Relevance of Merleau-Ponty's Phenomenology of Embodiment," The Electronic Journal of Analytic Philosophy, 4 (Spring 1996).

17. Ibid.

by this, Vischer defined Einfhülung as "the unconscious projection of our own bodily form... into the form of objects"[18] implying an internal process required to understand the environment. This notion of Einfhülung plays a large part in the relationship between architecture and the visitor (Figure 9).

It was not until 1996 when mirror neurons were discovered through experiments with macaque monkeys.[19] Defined as the mirror neuron system (MNS), neurons existing in the human brain fire during the observation of goal-oriented actions. These are the same neurons that are activated when executing that action oneself and occurs in the cortical motor areas of the brain. It was also proposed that this mechanism was involved in social cognition and empathy, [20] the term most accurately used to translate Einfühlung. Even actions represented in static images produced the same simulation in the brain as if the person was executing themselves.[21] Images of abstract paintings that imply previous goal-oriented motor acts also evoke cortical motor activation in the brain.[22] What is of particular interest to architects is that this cortical activation occurs even when two inanimate objects touch each other.[23] The same brain processes used in social cognition and empathy are activated when observing the makings of an architectural space, namely details or touching of inanimate objects.

Figure 9. Frederik Heuser, Schwallpass, Zurich, 2016

Johnson points out that "our capacity to experience, make, and communicate (share) meaning is not just a result of the makeup of our brains and bodies, but equally depends on the ways our environments are structured".[24] Craig Bragdon, in his book The beautiful necessity discusses principles found within architecture that have outlasted the aesthetic appreciation of a single generation. Rather, these principles have extended beyond any generational era and exist to this day. Take for example buildings such as the Pantheon (Figure 10), or Hagia Sophia (Figure 11), that have are astounding to any one experiencing the space. Bragdon describes the dualities that are present in our experience with architecture; not only through the unconscious understanding of the "latent" or secret geome-

18. Hubert L. Dreyfus, "The Current Relevance of Merleau-Ponty's Phenomenology of Embodiment," The Electronic Journal of Analytic Philosophy, 4 (Spring 1996), 14.

19. Vittorio Gallese, "The roots of empathy: the shared manifold hypothesis and the neural basis of intersubjectivity,"*Psychopathology,* 36(4), (2003): 171-180.

20. Vittorio Gallese, C. Keysers, and G. Rizzolatti, "A unifying view of the basis of social cognition", *Trends in Cognitive Science*, 8(9), (2004): 396-403.

21. Ibid.

22. Ibid.

23. Sjoerd J. Ebisch, "The Sense of Touch: Embodied Simulation in a Visuotactile Mirroring Mechanism for Observed Animate or Inanimate Touch," *Journal of Cognitive*, 20.9 (2008): 1611-623.

24. Mark L. Johnson, "The Embodied Meaning of Architecture." Mind in Architecture, (Boston: MIT, 2015), 35.

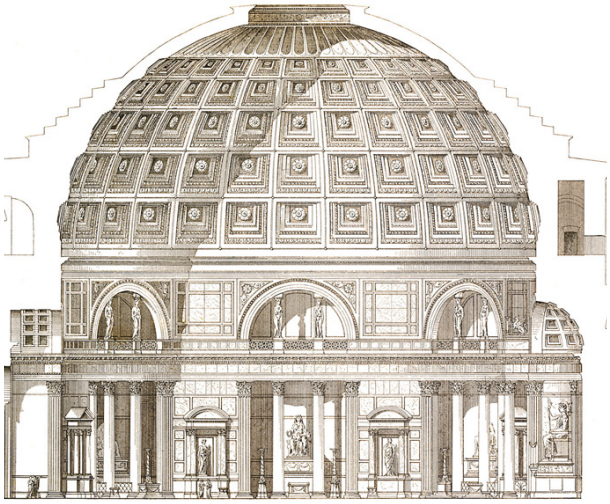

Figure 10. Dehio, G and Bezold von G. "Die Kirchliche Baukunst des Abendlandes," 1884

Figure 11. Orthidix Arts Journal, Hagia Sophia, 2015

try underlying masterful works of architecture, but also through the corporeal relationship and unity that we share with those works.[25] These theories have existed in many of the architects theoretical frameworks that even the author uses to compare. For example Vitruvious' Ten Books on architecture acknowledges the perfect proportions of man in relationship to the geometric rational of architecture. Equally, Alberti and Leonardo DaVinci have displayed similar anatomical correlations in their works of architecture.

It is human nature to focus on the differences rather than the similarities of people we are surrounded with. In our society, humans are encouraged to strive towards defining a unique way of life, an identity. We seek recognition for those traits that makes us stand out. While our society does place value on individuality, neuroscience is proving that we are a largely homogenous culture. Harry Francis Mallgrave has done extensive research on neuroscience in the architectural field. He proposes that our brains contain deep-rooted biological similarities that unite how we respond to architecture. The idea of a universal reaction to our environment may seem unagreeable to a society that values individuality. Mallgrave discusses the relevance of beauty in the contemporary architectural profession, which he uses to set up a larger commentary on the profession in his book architecture and embodiment. Introducing the book through this chapter was most likely intended to be a sattirical criticism of architectures academic world, or the "ivory-tower design studios" so many young architects idolize today.[26] He notes that beauty activates large areas of the hedonic system which is known for its role in experiencing pleasure. Pleasure involved in percieving

[25] Vittorio Gallese, "The roots of empathy: the shared manifold hypothesis and the neural basis of intersubjectivity," *Psychopathology,* 36(4), (2003): 171-180.

[26] Vittorio Gallese, C. Keysers, and G. Rizzolatti, "A unifying view of the basis of social cognition", *Trends in Cognitive Science*, 8(9), (2004): 396-403.

beauty is a neurological phenomenon. The Orbital Frontal Cortex (OFC), which one of the following studies will discuss is often interpreted as the core emotion and reward processing center. Additionally, the amygdala, and right insula are two elements that activate during judged beautiful experiences.

Semir Zeki's Inner Vision: An Exploration of Art and the Brain discusses the function the brain has on the perception of art and also the function of art itself in terms of its creation and purpose. Zeki does this through a branch of research he terms "neuroaesthetics". Zeki claims that the perception of art happens at a biological level and that the brain, in a Darwinian fashion, seeks the elemental characteristics of our environment. Further included is that vision is an active process that requires the brain to discount change to extract those elemental objects from our environment.[27]

in 2003, Ideaki Kawabata and Semir Zeki gathered 10 college students to evaluate 300 paintings on a scale of 1 to 10, from ugly to beautiful. Each student then arrived at a baseline for ugly, neutral, and beautiful paintings. The intention of this study was to asses the neurological footprint present when assessing something beautiful. "The results show that the perception of different categories of paintings are associated with distinct and specialized visual areas of the brain, that the orbito-frontal cortex is differentially engaged during the perception of beautiful and ugly stimuli, regardless of the category of painting, and that the perception of stimuli as beautiful or ugly mobilizes the motor cortex differentially".[28] Beauty is found in the OFC. and judged-ugly images reveal fear similar to the observation of frightened facial expressions.

Another seminal study was done by Cinzia Di Dio et. al in 2007 attempting to find a biological basis for the experience of beauty in art. Masterpiece sculptures were observed by a series of subjects naive to art criticism. Photographs of the original sculptures were presented to the subjects followed by modified versions of the same image. What they discovered was that with the presence of a certain proportional structure (the golden ratio), the stimuli activated certain parts of the brain; namely, the insula, which is responsible for emotion. These were not active on the other sculptures that lacked this proportion. These same proportions are the basis for much classicist architecture.[29] The Pantheon and Hagia Sophia along with our natural world is latent with these proportions.

Beauty is not in the eye of the beholder, but in the brain, and it has a direct relevance to to how we engage with our environment. But we must understand not only how it affords, but what it affords us. In simple terms, beauty affords us pleasure; and by way of experiencing the world through our body, beauty is meaningful in that it reinvigorates our soul. Pallasmaa offers a new task for architecture. "Architectures task is to reinforce our sense of the real and, through doing that, to liberate our senses and imagination".[30] Beauty reminds us of by way of its inherent proportions and multi-modal affordances, of our wonderful qualities and truly meaningful buildings can do so over and over.

27. Ibid.

28. Ibid.

29. Sjoerd J. Ebisch, "The Sense of Touch: Embodied Simulation in a Visuotactile Mirroring Mechanism for Observed Animate or Inanimate Touch," *Journal of Cognitive*, 20.9 (2008): 1611-623.

30. Sjoerd J. Ebisch, "The Sense of Touch: Embodied Simulation in a Visuotactile Mirroring Mechanism for Observed Animate or Inanimate Touch," *Journal of Cognitive*, 20.9 (2008): 1611-623.

A certain building may be more meaningful to some than others, yet we may conclude that beauty presents itself regardless of cultural differences. And much of this, as we have seen, occurs at a deep conscious level of processing. Architects and the like must realize that the opposite is quite detrimental to our being in the world. We do not passively accept the world, but rather we actively interact through the world, engaging with both beautiful and ugly objects. With the current definition of beauty it seems quite obvious that not everything can be beautiful, or its counterpart, since beauty is a relative term. But we see that in our new definition, beauty resides in our brain, and it exists through a bodily interpretation as Visher was able to discover many years ago, and many classicist architects far earlier (Figure 12). Beauty must find its way back into the architectural profession. It is no longer a weightless term that varies completely from person to person, but rather one that we find in humans alike, across the entirety of the world. How could we ignore such a discovery?

Figure 12. Frederik Heuser, "St. Benedigt Chapel." 2015

DIGITAL CRAFT IN ARCHITECTURE

Aaron Bolli and Andrew Huss

ABSTRACT

Craft is a highly evolved demonstration of skill with origins predating language. The bodily skills associated with craft have been passed down through a lineage of mimetic learning. Homo-sapiens passed down corporeal knowledge of tool-use from generation to generation. Craft is understood and appreciated similarly today as it was at the dawn of mankind. Aesthetic appreciation of craft is defined by a meticulous and masterful articulation of attractive materials. The digital era has not reshaped how theorists view craft, but professionals, such as architects, have enthusiastically handed their profession to the machine for better or worse. A middle ground must be reached, based on understanding the computer as a mind-tool. It is replacing traditions of craft through the veil of false precision, while its strengths in fabrication are ignored in favor of its easier functions. The computer is a way for the architect to reclaim the role of master builder. It is the format through which architects can merge their design intentions with production.

SOCIAL EVOLUTION OF HOMO SAPIENS

The story of man can be traced back to the great southern apes that descended from trees and began to walk and run upright. Upon the open savannah the hands were liberated from movement and climbing. The co-evolution of the hand and the brain began to take place, which extended to the simultaneous evolution of tool-use and social structure (Figure 1). The structure of modern man must be the result of mutations in natural selection which occurred with the tool-using way of life, argues Sherwood Washburn.[1]

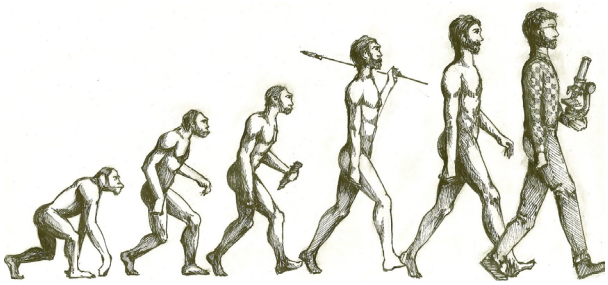

Figure 1. "Breaking News: How to Deal with Racism in 2014," *Spaced Out Magazine,* 2014.

Bones of homo sapiens in Ethiopia, dating back almost two million years ago have been uncovered by John Shea. Some of these bones were found with the bones of large cats and dogs indicating that many homo sapiens were eaten by large predators. Stone tools were discovered alongside these bones. Tools such as spearheads, knives, and arrowheads were critical for fighting off large predators, obtaining food, and developing complex social behavior, such as language. It is thought that language is the prelude to the coming of man, but purposive thinking in terms of tools and what they made possible predated language. In his book, The Hand, Frank Wilson argues:

"It is a virtual certainty that complex social structure – and language – developed gradually in association with the spread of more highly elaborated tool design, manufacture, and use."[2]

There was a tool for a task before there was a word for an object; the thingness of a thing existed long before its definition. Embodied in complex society, is a natural desire to share discoveries with others which is accomplished through behavioral observation. Skills passed on through observation are called a shared agency, which could be language, wood chopping, or hand waving. After all, humans are social animals.[3]

The use of a tool is embedded in its physical form and perceived as an extension of the hand. With a tool the hand fails to be a hand, but becomes a tool-hand. Philosopher Michael Serres said, "the hand is no longer a hand when it takes hold of the hammer, it is the hammer itself."[4] The tool and the hand come to understand each other (Figure 2). The creative desires of the hand grow and, in turn, tools gradually evolve to become more capable of reproducing the desires of the hand.

CRAFT

Craft is the intimate process of meticulously engaging material reality to create objects. At first, craft was aimed at fundamental aspects of survival, namely shelter, weapons, and fire. By the paleolithic era, craft evolved beyond basic survival needs. Thirty thousand years ago, Ethiopians painted in various colors, sculpted fertility

1. Juhani. Pallasmaa, "The Thinking Hand: Existential and Embodied Wisdom in Architecture," (Chichester, U.K.: ***Wiley***, 2010).

2. Ibid.

3. Vittorio Gallese, "The Shared Manifold Hypothesis. From Mirror Neurons to Empathy," *The Shared Manifold Hypothesis, From Mirror Neurons to Empathy,* 2001.

4. Juhani. Pallasmaa, "The Thinking Hand: Existential and Embodied Wisdom in Architecture," (Chichester, U.K.: ***Wiley***, 2010).

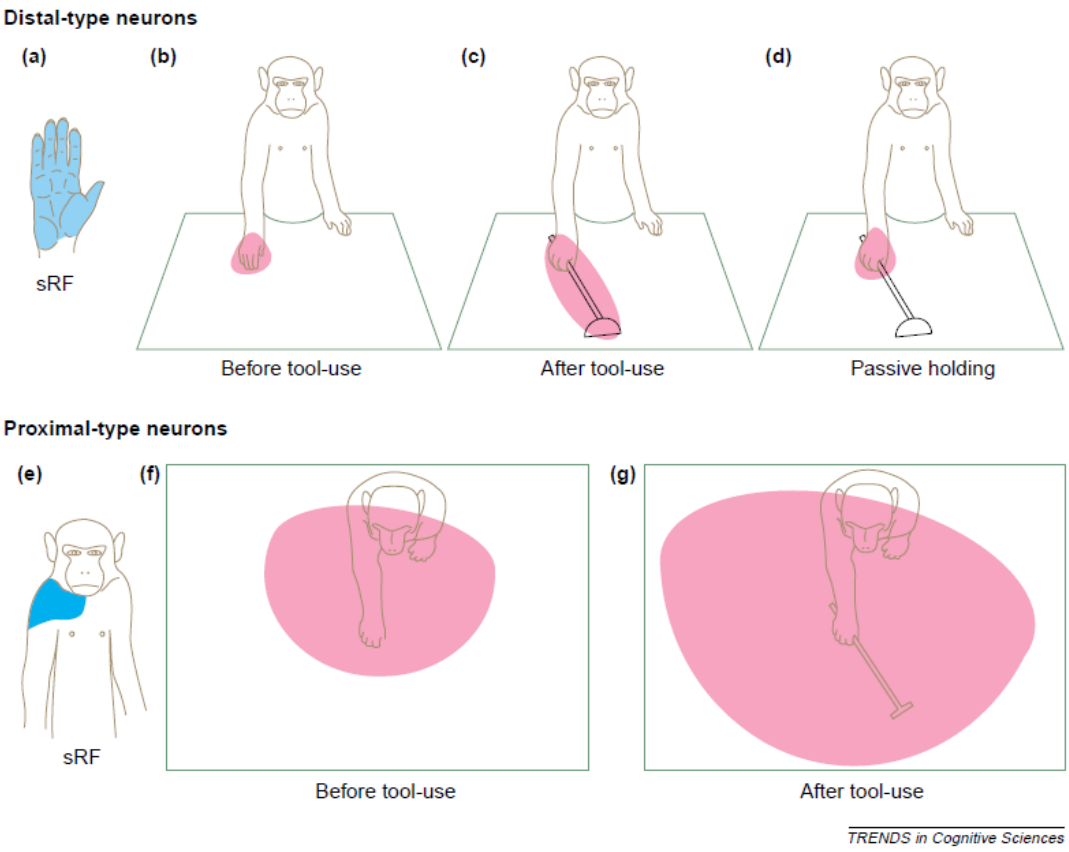

Figure 2. Angelo Maravita, "Tools for the Body," 2004.

statues, and wore jewelry. Man is an acquisitive animal with limitless desire to become intimate with material things. By enhancing tools, mankind can enhance the material world. Tools afford humans a high degree of autonomy and control over the quality of craft.[5]

In a traditional sense, craft is a skill which has gone through a lineage of teacher-student relationships. Skill is transferred from the muscles of the teacher to the muscles of the apprentice through mimetic learning.[6] The student observes, then recreates the actions of the teacher. The phenomenon of mimetic learning is biologically corroborated by the discovery of mirror neurons, which stimulate the motor system of the brain and recreate observed actions. Therefore, before the apprentice ever raises his hammer-hand to strike a nail, the action has been simulated and tested neurologically while observing the teacher's actions. This intersubjective agency allows us a higher level of communication than verbal communication in isolation.[7] How does the hand grip the hammer? Where do the eyes focus to hit the nail? At what angle does the hammer come down atop the nail to

5. Albert Borgmann, "The Moral Complexion of Consumption." *J Consum Res Journal of Consumer Research*: n.d. 418-22. Print.

6. Juhani. Pallasmaa, "The Thinking Hand: Existential and Embodied Wisdom in Architecture," (Chichester, U.K.: ***Wiley***, 2010).

7. Vittorio Gallese, "The Shared Manifold Hypothesis. From Mirror Neurons to Empathy," *The Shared Manifold Hypothesis, From Mirror Neurons to Empathy,* 2001.

best strike it? Questions like these become redundant to the observed learner, but could fill an entire book if all the body-schema involved were intellectually verbalized.

Neural circuitry actively engages the material world which forms the intersubjective relationship between tools and the brain. A brain codes for action by creating and modifying neurological representations of the body, or body image, based on visualization, somatosensation, and proprioception. Tools neurologically integrate into our body image as an extension of self and an enhancement of biology. Our neurology extends to the tips of our tools, to the action space they afford, and beyond.[8] Neurology refers to body image in terms of its schema. Schema were defined as a stream of proprioceptive signals.[9] Self-perception, remaining vital to body image construction, is now accompanied by action-oriented modalities in a modern definition of body-schema. Namely the somatosensory receptive field (sRF), and the visual receptive field (vRF). A group of bimodal neurons were discovered in the intraparietal cortex that activate from the somatosensation of bodily regions and the visualization of adjacent space.[10] Bimodal activation occurs when the vRF anchors itself to the sRF. For example when you wash your hands, you simultaneously feel the soap and visualize the soap. Action is then spatially coded from a multisensory stream of information. Action space coding would be limited by the body, your arms only reach out so far, but tools extend man's physical structure thereby broadening the space potentially coded for action. Japanese macaques can be trained to do just that. In one recent study a rake was placed in the cage and then a food pellet dropped out of reach. After two weeks the monkeys were trained to pull the food closer with the rake. Bimodal neural activity was analyzed in the monkeys intraparietal cortex. Before tool-use some neurons activated by the sRF in the hand and some activated by the vRF of the space around the hand. The vRF anchored itself to the hand until after tool-use and then expanded to the length of the rake. The monkeys demonstrate that tool-use neurologically reconfigures body image to incorporate tools as plastic extensions of the body. In essence tools become part of the body and expand its potential.[11]

Aesthetic appreciation is intrinsic to the nature of crafted objects. Without beauty an object is not considered craft. Charles Darwin argued that artistic endeavors evolved out of the same biological game as natural selection, that is the fittest survive. The creation of beautiful objects stems from sexual selection, which attests that fitness is displayed through skilled performance. The earliest displays of virtuoso craftsmanship date back to Aechulian hand axes created about 2.5 million years ago. That is fifty to one-hundred thousand years before speech.[12] The most intriguing aspects of these hand axes are the qualities they display. Symmetry, attractive materials, and meticulous workmanship are all qualities of the axes. These qualities are consistent with a modern notion of craft as well, which indicates that humans and their ancestors have considered the same creations beautiful for 2.5 million years. Methods of producing craft changes along with the tools of the craftsman, but its appreciation remains the same.

8. Angelo Maravita and Atsushi Iriki, "Tools for the Body (schema)," *Trends in Cognitive Sciences* (2004): 79-86.

9. Henry Head, and Gordon Holmes. "Sensory Disturbances From Cerebral Lesions." *Brain* (1911): 102-254.

10. Michael Graziano, "How the Brain Represents the Body: Insights from Neurophysiology and Psychology," 2002.

11. Angelo Maravita and Atsushi Iriki, "Tools for the Body (schema)," *Trends in Cognitive Sciences* (2004): 79-86.

12. Dennis Dutton, "A Darwinian Theory of Beauty," *TED Talks,* 2010.

Corporeal experience goes beyond that of the creator in appreciation of craft, becoming part of the aesthetic experience through shared agency. Observation of artwork forms an empathetic understanding before historical, cultural, or other contextual factors come into play. Mirror neurons biologically ground the pre-cognitive empathetic response, starting with vision.[13] Visual perception is an active and multimodal process which activates the cortical motor system.[14] One study in 2006, by neuroscientist Marieke Longcamp, experimented on the difference in neurological response between hand written and printed letters. The results demonstrated that hand written letters stimulated the motor cortex more than printed letters.

A more recent study focused on motor activation in response to abstract art. The study used an electroencephalogram (EEG) to measure mu rythm suppression in response to original Lucio Fontana artworks and simplified digital re-creations acting as a control (Figure 3). The 14 participants were asked to judge the original and control images in terms of aesthetic appraisal, familiarity, per-ceived motion, and artistic nature. Statistical comparisons were then made between the judgemental categories and neural response yielded by the EEG. Overall the original Fontana's induced more neural stimulation than the control. Regardless of familiarity, the originals also had higher perceived motion and aesthetic appraisal, which indicates the value of Fontana's creative gestures. Familiarity also yielded results. Remarkably, in most cases the participants who were familiar with Fontana recorded higher stimulation than the unfamiliar group.[15] This finding demonstrates the difference between a trained and untrained brain

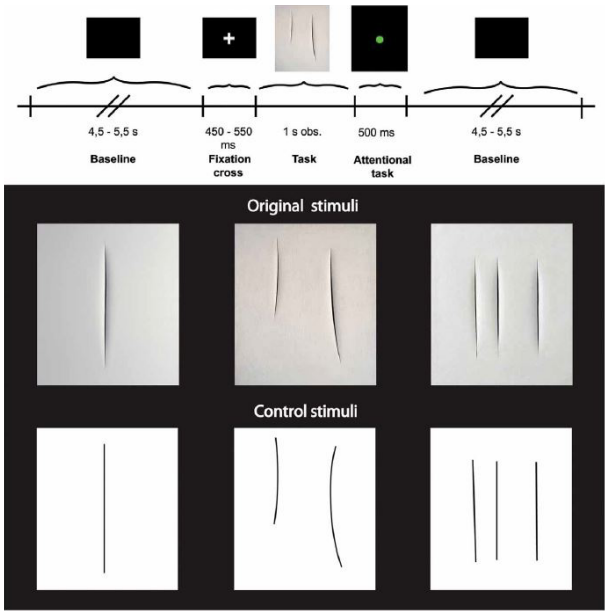

Figure 3. M. Umilta, C. Berchio, D. Freedburg, V. Gallese, "Abstract Art and Cortical Motor Activation: An EEG Study," 2012.

being the level of neurological perception. The more expertise one has, the more one pre-cognitively and empathetically perceives. Thus, aesthetic experience may be neurologically enhanced in through increased expertise and perceived bodily motion.

In this light, there are two types of empathetic response when observing a work of art. In figural art the observer is capable of empathizing with emotions represented in the image. In figural and abstract works of art the observer empathizes with the visible traces of the artist's creative actions. The latter response being of more consequence to non-figural artisans such as architects. In the words of David Freedburg:

"Observers often feel a form of somatic response to vigorous handling of the artistic me-

13. Christian Keysers, and Valeria Gazzola. "Expanding the Mirror: Vicarious Activity for Actions, Emotions, and Sensations." *Current Opinion in Neurobiology* (2009): 666-71.

14. Di Dio Cinzia and Gallese Vittorio."Neuroaesthetics: A Review." *Current Opinion in Neurobiology* (2009): 682-87.

15. Alessandra Umilta, Cristina Berchio, Mariateresa Sestito, David Freedberg, and Vittorio Gallese. "Abstract Art and Cortical Motor Activation: An EEG Study." *Frontiers in Human Neuroscience* Front. Hum. Neurosci. (2012).

dium and to visual evidence of the movement of the hand more generally."[16]

The physical object is a mediator that allows for the inter-subjective relationship between the creator and the observer. More understandable visual traces of creating an object will strengthen the intercorporeal agency between the creator and the beholder, thus raising the value placed upon its craft.[17]

Craft is rooted in the human body through its actions and intentions. It is created through the movements of the craftsman and appreciated through the observer's understanding of the object. The tool-hand was steadily unchanged before the digital era. Generations acquired the skills of the previous generation through embodied simulation made possible by mirror neurons. Adding a claw to the back of a hammer does not change how it is used to hammer. The hammer-hand remains unchanged in terms of hammering, but gains the additional benefit of removing nails.

UNDERSTANDING DIGITAL

If humans perceive the tool-hand in place of the hand, then it seems that a mind-tool would become part of our psychology. In the early stages of computers in education, there was optimism and excitement about the potential of the computer as a mind-tool.[18] However, the insight and excitement of Jonassen and his colleagues was replaced with an uglier reality when they realized the computer was being misused. The computer became a show-and-tell machine where all were familiar with powerpoint and word processing. More challenging aspects of the computer, like spreadsheets and databases, which would expand a student's ability to creatively analyze information, were being ignored. This application of the computer resulted in a reduction of higher-level thinking, which is quite opposite of its intended purpose. Higher-level thinking consists of critical thought applied to the mind-tool in order to increase the capabilities of the mind, not make it obsolete. The divide between intention and implementation of the computer must be gapped if it is to realize its potential as a mind-tool. Understanding underlies all effective tool-use, so for the computer to become a compatible mind-tool it must be understood.

In the mid 19th century mathematician and philosopher George Boole set into motion the digital era. Boolean logic dictates that any problem can be broken down into true/false logical propositions and solved via algebraic equations. For example, the decision of whether or not to carry an umbrella can be broken down into the equation: R v F = U. R is true if it is raining, F is true if rain is in the forecast, and U is true if you should carry an umbrella. Meanwhile, the v states U is true if either R or F is true.[19] Nearly a century after Boolean logic was theorized, Claude Shannon gave it a physical counterpart using the presence or absence of a voltage in a circuit to correspond with a true or false statement. These were translated into ones and zeroes and formed the logic behind the digital revolution, which initiated great changes in communication, computation and manufacturing.

Shannon went to work for Bell Labs (Figure4). Telephones of the early 1940's were connect-

16. David Freedberg, and Vittorio Gallese, "Motion, Emotion and Empathy in Esthetic Experience." *Trends in Cognitive Sciences* 11.5 (2007): 197-203.

17. Vittorio Gallese, "The Shared Manifold Hypothesis. From Mirror Neurons to Empathy," *The Shared Manifold Hypothesis, From Mirror Neurons to Empathy,* 2001.

18. Mary Burns, "Tools for the Mind," *Educational Leadership* 63.4 (2005): 48-53.

19. Neil A. Gershenfeld, "The Coming Revolution on Your Desktop--from Personal Computers to Personal Fabrication," (New York: Basic, 2005).

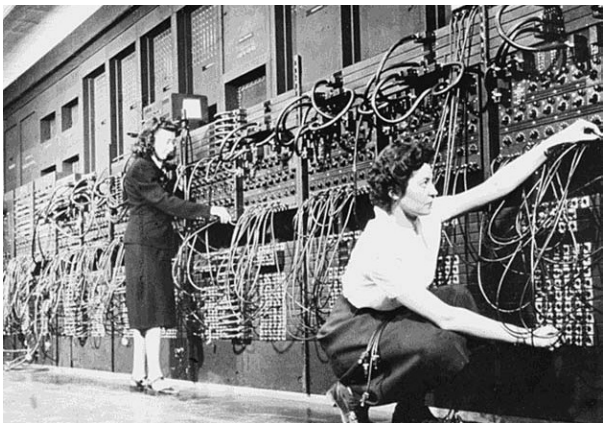

Figure 4. "The World's First Computer," *ebusinessinusa.com*, 2012.

Figure 5. Heart Vision Church, *Wordpress*, 2012.

ed by telephone wires and everybody knew it, but the phones were inaccurate due to errors called noise. Long distances and crowded areas attributed to the amount of noise in a phone call. Shannon revolutionized communications by digitizing the industry. Instead of recreating analog signal, telephones now created a digital signal, which could be easily corrected. Bits that came in as a 0.1 instead of a 0 could still be understood. Signals that entirely flipped could be corrected by sending three signals and taking a majority vote. The acceptance of imperfection through error correction would immediately translate into computation. Robust computers would follow suit and dramatically improve by developing fault-tolerant approaches.[20] The better a machine can tolerate error the more user-friendly it becomes; it gets smaller, faster, and easier to use. Today, people carry their telephone and computer in their pocket (Figure 5) and have immediate access to almost anyone, almost anywhere, in any format.

On the other hand, manufacturing remained mostly unchanged after its original digitization. The machines were large, ugly, and difficult to use, much like the original computers. However, bulky manufacturing equipment lagged behind while the computer and the telephone became personalized and widely distributed. Right now fabrication equipment is in the same stage as the minicomputer, which was the stepping stone from mainframes to personal computers. Manufacturing plants used to cost around $5 million and produced goods for large companies. Today MIT and the US Fab Lab Network are establishing Fab Labs nationally and around the world for about $50,000.[21] These Fab Labs impact the community scale. Localized problems are solved with local solutions, which fosters innovation and expanded knowledge on the community level.

The tools accessible today are primarily subtractive and additive machines. Subtractive machines, like computer numerically controlled (CNC) mills and laser cutters remove material to generate multiple components from a single object (Figure 6). These machines have been applied all over industry to create objects from microchips to aircraft. Desktop laser engraving machines may still sound like science fiction,

[20] Neil A. Gershenfeld, "The Coming Revolution on Your Desktop--from Personal Computers to Personal Fabrication," (New York: Basic, 2005).

[21] Glen Bull and Joe Garofalo, "Personal Fabrication Systems: From Bits to Atoms." *Learning and Leading with Technology* (2009): 10-12. ERIC. Institute of Educational Services.

Figure 6. "CNC Mill," *Opensource,* n.d.

Figure 7. "REP Buildplate Rabbit," *Monroe Street Studio,* n.d.

but they have been reduced in size and price to basic desktop models that cost around $300. Additive machines do not remove material to create forms, but utilize raw material to build up forms from bottom to top. The most common form of additive fabrication machine is the 3d printer, which has also become smaller and cheaper (Figure 7). Fabrication will become localized and a person's control over the atoms in their physical world will become as commonplace as a person's manipulation of bits for email, research, or games.[21]

DIGITAL CRAFT

Craft involves a meticulous handling of attractive materials, which was once associated solely with the tool-hand. The mind-tool will inevitably find its way into a discussion of craft. Juhanni Pallasmaa scorns the computer for its role in design for a multitude of reasons: it applies false precision to a project in its vulnerable stages, it disconnects the designer from the haptic qualities of a design, and it favors conscious intellect over unconscious intuition.[22] The perceptual problem in design is similar to the problem in education: The strengths of the computer are not being leveraged properly. More difficult functions that are capable of raising higher-level thought are being ignored, while show-and-tell features, such as rendering and drawing programs, are favored by today's design community.

Anton Ehrenzweig illustrates the problem of design consciousness:

"Creativity is always linked to the happy moment when all conscious control can be forgotten. What is not sufficiently realized is the genuine conflict between two kinds of sensibility, conscious intellect and unconscious intuition." [22]

The computer has expedited architectural process, but is dangerous if not used in conjunction with the slow saturation of a problem. Alvar Aalto used soft-sketches at the beginning of his process, which engaged and enthusiastically expressed vagueness (Figure 8). Pallasmaa uses Ehrenzweig and Aalto to build a case for vagueness and corporeality in design (Figure 9). He presents the acceptance of the computer in design as total and enthusiastic. The result of which is occulocentrism.[23] A trend in which the designer favors the eye over the flesh and

[22.] Juhani. Pallasmaa, "The Thinking Hand: Existential and Embodied Wisdom in Architecture," (Chichester, U.K.: ***Wiley***, 2010).

[23.] Vittorio Gallese, and Alessandro Gattara, "Embodied Simulation, Aesthetics, and Architecture: An Experimental Aesthetic Approach," *Mind in Architecture,* (Cambridge, Massachusetts: MIT, 2015).

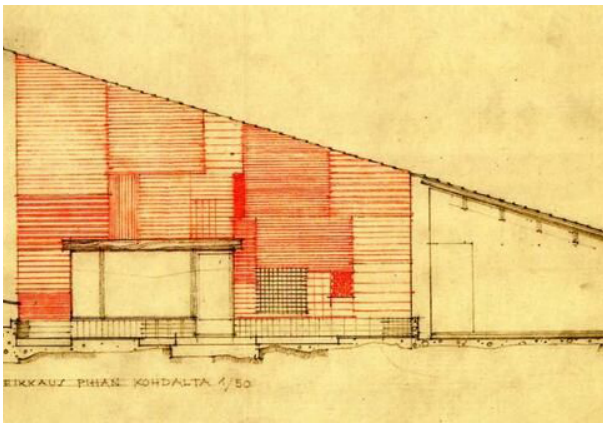

Figure 8. Alvar Aalto Sketch Drawing of Brick Patterns

Figure 9. Aalto's Experimental House in Muuratsalo, Finland

mediated construction over mimetic molding of line, shade, and color; a definition more in-tune with a traditional notion of craft. Charcoal drawing and physical models put the designer in skin-contact with a design, which gives it a vague and corporeal basis linked to intuition before intellect. This is not the region in design where the computer can prevail over the hand; the hand-tool will always play a critical role in unlocking the fragile vagueness of an infant project, which is essential to the design process.

The computer becomes a friend of the architect, because it unlocks modern methods of production. Pallasmaa argues that traditional craftsmanship is gaining value in today's culture, because of the regretable loss of the hand in today's mass-produced world.[22] However, architecture is a mass produced medium, pointing towards mass production as a controllable means of craft for the architect. By controlling production the architect comes to manipulate material expression first-hand rather than through the medium of numerous programs and a contractor. The computer and fabrication equipment bypass the synaptic gap between computer design and material object. (Figure 10) In his first book on architecture, Vitruvius illustrates the importance of the architect being theoretically based alongside understanding production:

"It follows that architects who have aimed at acquiring manual skill without scholarship have never been able to reach a position of authority to correspond to their pains, while those who relied only upon theory and scholarship were obviously hunting the shadow, not the substance".[24]

Craft for modern architects resides in a profession that toes the line between architect and contractor; between between theorist and engineer; between philosopher and mason. Computer fabrication is essential to the architect in particular, because of the nature of buildings and their numerous components. While the mass production of smaller goods such as furniture may diminish the sensibility of craft, the architect must be capable of mass production if they are to create something so large as a building in an economically feasible way. The day of hand producing each brick is gone, so the architect must become attuned to the production methods of this era, especially since they will be available to everyone before long.

[24.] Vitruvius Pollio, Vitruvius: The Ten Books on Architecture, (New York: Dover Publications, 1960).

Figure 10. Gramazio Kohler, "Winery Gatenbein," n.d.

CONCLUSION

Architects have always resided at the junction of design and production. Developments in technology sometimes result in the loss of identity and corporeality in design process. Notions such as industrialization and mass production detach users from crafted objects. However, the role of digital tools in the design process was not intended to replace human ingenuity, rather to assist in the production of material objects. Architects must become more than a mere designer or producer. Engaging modern tool development is an opportunity for architects to become more involved in the construction process, thereby placing them more in control of their material world. The simultaneous engagement of creativity and production may allow the architect to reclaim the title master builder.

THE THINGS AFTER THE PHYSICS

Josh Broadway and Nico Rallo

ABSTRACT

Atmosphere is a harmonious event between two realms, which we engage with our senses, aware of time, spatial position and understanding of self. The magic and profoundness of atmosphere is in its capacity to suspend the observer within two realms simultaneously. Conjuring recorded image, memory situates the participant between the mental space of 'then' and the physical space of 'now'. As an event it stimulates the philosophical notion of a beyond. It is however made manifest through the laws of physics and biology. Our investigation is a constant navigation between philosophical and scientific property, working in cohesion instead of opposition; each reconciling the other. It requires the comprehension of multiple scales simultaneously; the scale of the human body, architectural body, and body of existence. The cooperation of vision, touch, projection, embodiment, perception, time, space and existence are among the multiple realms of thought constituting the wholeness of atmosphere. Our contention is that Atmosphere is a harmonic episode between self and world, staged through the agency of sense, marking time, place, position, and comprehension of Being.

INTRODUCTION

If you asked someone to define atmosphere, specifically the atmosphere of architecture, they might characterize it as a feeling. In varying degree all humans are aware of the 'feeling' of atmosphere. Even if someone can't recall a specific occurrence, they are aware of its mystery, and immediately know it when they 'feel' it. Language is often insufficient in the task of describing feeling and sensation, and especially atmosphere. The static-ness of words fall short in provoking the wholeness and seduction of the experience. Here are a few that seem to be within reason: evocative; potent; intimate; honest; comforting; unpretentious; authentic; imaginative. In a lot of ways atmosphere is like home cooking. If you were privileged to be raised around your grandmother, perhaps you know precisely the sensation I am talking about. The sound of the crackle and pop of things cooking on the stove. Watching the precision of each cut through raw vegetable, as blade and hand are of one coordinated appendage. The feeling of heat—a warning—when you venture too close to the oven. Aroma floods the nostrils, building anticipation for the delight you are about to experience. And then of course, taste. The familiar flavors as the result of expertise, experience, craft, and care. Home cooking is an intimate, unique, familiar, gift from maker to beholder. The act of its creation—and consumption—embeds its image and sensual memory. Memories not easily forgotten, suspending you through time and space to the genesis of what it was that makes those sensations familiar. Perhaps your mind began to recall images of specific events as you read this; images vague, yet curiously specific.

Just as 'good' food possesses this mysterious power to arouse the wholeness of senses and mark time and place for the recipient, 'good' architecture imprints itself. Its raptness vibrates through our bodies, and weaves itself into our internal fabric. Swiss architect Peter Zumthor explains atmosphere as perception channeled through emotional sensibility, mobilized through bodily sensation.[1] It is a first impression, immediate and unencumbered by the baggage of conscious judgment. 'Good' architecture seems to communicate, as though to whisper something about the operations of our Being and the construct of our world. Architects of Gothic churches were aware of this sublime quality. The endeavor of structural rationalism, to attenuate and slender its members, denied the building of its earthly weightiness; as though fingers stretching toward the heavens. Just as the building opposes its earthliness through the concert of proportion, scale, motion, and light from above, the human spirit does the same; departing from the crudeness of the world in ascent to divinity. It isn't by chance that all significant religious structures of antiquity (seem to) provoke a profoundness and sense of comprehension, of self and something grander.

Atmosphere is a wholly engaged event (Figure 1). Bodily sensations activate in synchronicity, tuning to their context. The material architec-

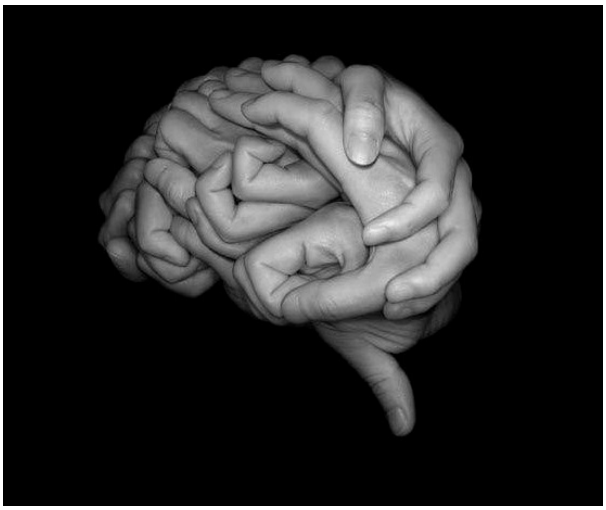

Figure 1. "The Hands of God." Accessed Decemeber 14, 2015.

[1] Peter Zumthor, "Atmospheres," (Basel: Birkhäuser, 2006).

tural body imprints itself within the material human body, and the act is reciprocated. We attempt to call out the disparity between the realms of 'how' and 'why'. The 'how' of science is preoccupied with craft and technology. The 'why' of philosophy investigates motive. Modern science is praised for rigor and innovation. It however breeds a skeptical and mechanistic attitude of the world, and its inhabitants as biological computers ripe for dissection. Philosophy helps us sort out and comprehend existence and intention, seeking the understanding of harmony and relationship. Philosophy is often disregarded, treated as superfluous mental activity without productive or tangible outcome. Philosopher Merleau-Ponty and neuroscientist Vittorio Gallese are situated within the rift of these thought structures. Their work seeks to dissolve the boundary between "why" and "how," insisting that they are of the same objective. Merleau-Ponty condemned the intentions of modern science. Calling for a return to the traditions of classical inquiry. "But classical science clung to a feeling for the opaqueness of the world, and it expected through its constructions to get back into the world." [2]

Figure 2. "Gothic Cathedral." June 24, 2015.

Good architecture is nestled within the exchange of invention and insight. (Figure 2) Partness and wholeness. It is in this spirit that the authors find dissatisfaction in the current prevailing notion of atmosphere, which implies a one-directional transaction between person and environment. Humans don't simply furnish the world; we are one with it. "Constructed of the same flesh."[3] Evolution has ensured the development of human biology and psyche to cooperate and exchange with our environs and its inhabitants. The presence of mirror mechanisms provides evidence that we are wired to involuntarily cooperate and embody. Atmosphere is constructed in the space between 'why' and 'how'. We contend that Atmosphere is a harmonic episode between self and world, staged through the agency of sense, marking time, place, position, and comprehension of Being.

SCIENCE (BODY + WORLD VIEW)

There is an intentional heaviness to our position on atmosphere. It is an event of profound reflection and awareness of surroundings and self, conjuring image, stimulating memory and forming new mental markers. Its feeling, ephemeral and ethereal. The surroundings are however very tangible. Light, material, smell, sound, taste; each physical property has a sensual corollary. Atmosphere as an event stimulates the

2. Maurice Merleau-Ponty, "Eye and Mind," *The Primacy of Perception. Evanston*, (IL: Northwestern UP. 1964), 159-190.

3. Ibid.

philosophical notion of a beyond. It is however made manifest through the laws of physics and biology. Our investigation relies upon philosophical and scientific property, working in cohesion instead of opposition, each reconciling the other. It requires the understanding of multiple scales of comprehension simultaneously; the scale of the human body, architectural body, and body of existence.

Here, 'body' is analogous with 'instrument' or 'apparatus'; tools through which we measure. Humans engage with things, evaluating and appraising them, based on their relationship to our physiological composition (Figure 3). The understanding of scale, distance, danger, pleasure (etc.) are assessed through the instrument of the human body. It has another analog, too; a vessel. Vessels possess a multiplicity of incarnations, but for our purposes we will advocate two. First as an object which collects, protects, and molds things in its likeness. For example, a vase or bowl filled with water. The liquid is shaped by its container, repurposed for consumption, nourishment for plants, display, etc. Human physiology behaves not dissimilarly. It accepts stimuli, shaping it, embedding it within the container of the body's internal likeness. The second manifestation of vessel we will rely upon is that of a craft facilitating transport. The material body mobilizes the immaterial mind through its environs. If we were to collect these analogs we conceive of the human body as a mobilizing container through which we measure and appraise the world through our internal likeness. Any reference to the body from here on carries the weight of this analogy.

Departing from the argument of etherealness we will begin investigating the 'how' of atmosphere. Every external property has an internal, sensual, consequence. All five senses; vision, touch, hearing, taste, and smell constitute the wholeness of our embodied engagement with the world. We will, however, reduce our scope to the sensations of vision and touch.

Figure 3. F, Patryk. "Victoria Station. 2011.

VISION

The process of vision is multimodal. A layered system of optic nerves relaying impulse to the visual cortex of the brain, located in the occipital lobe located in the cerebral cortex. The visual cortex is a complex of six distinct areas coded V1 through V6. The understanding of a layered, cooperative, visual brain was pioneered by Swedish neurologist Salomon Henschen. His account of vision was a partnership between passive and active processes. The region V1, also known as the 'cortical retina', is positioned in the rear of the brain, possessing a dense bundle of fibers bridging the retina and cerebral cortex. The site actively records what is 'seen', and if severely damaged results in complete blindness. The processing of seeing and comprehension are actually disparate processes. Though V1 is active

in its capacity to 'see' an object or scene, it is passive in the acquisition of information, and does little in its recognition.[6] The responsibility of comprehension and interpretation are relegated to the adjacent 'association' cortex. Here the object or scene receives appraisal and category. The wholeness of vision is a cooperation between the passive V1 and the active association cortex.[4]

This relationship is still widely accepted; however, the advent of increasingly sophisticated tools suggests this may not be the case. British neurobiologist Semir Zeki, recognized as the father of neuroaesthetics, views the duty of vision as an active mission to acquire information from the world; accepting the valuable, and discarding the nonessential. Zeki describes the mechanics of the eye as highly selective, relying upon the brain's stores of images. New stimuli are appraised through the criterion of each person's unique patterned visual history. The objective, Zeki posits, is the seeking of constancy. Visual stimuli are dismantled, stripped of anything extraneous, until nothing is left except essence. Constancy gauges the relationship of things situational—a scene resembling other similarly observed scenes in the past, and implicit—an incomplete image where the mind completes the composition. This argument is most likely grounded in human evolution and adaptation. In order to ensure the safety from predators and the continuity of species, the visual brain most likely sought to recognize and mitigate risk and danger through pattern.[5]

Millions of years in human evolution has tuned our visual mechanisms to ensure survival. Years of scanning our environs to recognize predators have produced a nimble visual complex, with selective cells coordinated and biased enough to recognize singular properties. One cell might be responsible for the exclusive processing of horizontal lines, neglecting directionality or color. An adjacent cell might instead exclusively process directionality. I imagine a jaded department store employee witnessing a coworker who needs help, then exclaiming, "that is not my job". Selective cells are the jaded department store employees of the visual brain, pre-occupied with a single task, disinterested in doing more than necessary. However, in this instance, the segregation of specific tasks is more productive and precise than a single cell burdened with processing all visual stimuli. The fastidiousness of selective cells most likely allowed for a quicker and clearer visual comprehension of our surroundings to assist in our survival.[6]

VISION, EMBODIMENT + (MIRROR NEURONS)

Vision is separated between two visual streams; central and peripheral. The activity of both constitute human awareness, both in spatial positioning and recognition. Central vision occupies the ventral stream, possessing a visual range of roughly 10 degrees. Its assignment is the comprehension and meaning of objects. Peripheral vision, seated in the dorsal stream, possesses an approximate 90-degree angle of eccentricity and processes the extents of space. In concert, the two constitute the 'what' and 'where' within our environment. Kansas State University professor, Kevin Rooney contends that the dual streams share a more significant role. Central and peripheral vision coordinate with mirror mechanisms (which we will discuss shortly), establishing emotional bond and non-linguistic communication. They act as conduits through which we embody our surroundings and neighbors. Rooney dubs these phenomena extended

4. Semir Zeki and John Nash, "Inner vision: An exploration of art and the brain," Vol. 415. (Oxford: *Oxford University Press*, 1999),13-19.

5. Ibid.

6. Ibid.

and projected embodiment. He illustrates the event of projected embodiment with the example of flying a kite. Through the activity of central vision, an observer involuntarily participates in a similar feeling of uplift and freedom, producing internal impulses as if it were them soaring through the sky. The event of parking a car demonstrates the phenomenon of extended projection. Mental extension in to the physical presence of the automobile, aware of its mass, helps to more precisely situate within the parking space. Rooney appropriately refers to the extended object as a prosthetic.[7]

These links are pre-conscious and involuntary relying on both vision and motor reflex. A shared awareness and partnership between psychological and physiological has gained traction in neuroscience, referencing it as embodied cognition.

TOUCH + (MIRROR MECHANISMS)

> *As we look, the eye touches, and before we see an object, we have already touched it and judged its weight, temperature and surface texture. The eye and the hand constantly collaborate; the eye carries the hand to great distances, and the hand informs the eye at the intimate scale." -Juhani Pallasmaa[8]*

The human sense of touch, manifest through the hands, has two primary functions; sensory interpretation and motor activity (Gallese). The two services are mutually inclusive. Motor activation mobilizes the hand; perhaps grasping a cup of coffee; sculpting a mound of clay; caressing a loved one. It enables movement and action, resulting in the collision of hand and object. Sensation enters. Contact possesses sensual consequence, where properties such as rough and smooth, hard and soft, coarse or fine, produce distinct impression. The event of sensation is a correspondence between individual and external nature.[9] Tactile impression communicates through somatosensory receptors directed through the central nervous system and third cranial nerve, destined for the neocortex. Similar to the visual cortex, the neocortex is a segregated complex of regions with discretely appointed processing duties for somatosensory stimuli, including touch and proprioception (perception manifest as an understanding of bodily position in relation to stimuli).[10] The seemingly self evident understanding that the brain possesses a dedicated 'pain center' is false. Pain sensations are distributed through disparate networks towards processing regions associated with attention and emotion.[11] Pain seems to intensify when under emotional burden, and inversely feels less so when attention is elsewhere.

Evidence of the multiplicity of our sensory and motor systems illustrates the complexity and multimodality of our engagement with the world. Motor and sensory activity can be rebranded as perception and action and begin to provide a narrative to the sequence of the body through space, directing our subjective composition of the world.

Within the past two and a half decades, the notion of Robert Vischer's Einfuhlung (German for empathy, more precisely: 'feeling into'), has

7. Kevin Rooney, Lester Loschky, Robert Condia, "Extended and Projected Embodiment: two forms through the dorsal and ventral streams of vision," (unpublished draft) 2015.

8. Juhani Pallasmaa, "The Thinking Hand: Existential and Embodied Wisdom in Architecture," (Chichester: Wiley, 2009), 100-102.

9. Vittorio Gallese and Sjoerd Ebisch, "Embodied Simulation and Touch: The Sense of Touch in Social Cognition," *Phenomenology and Mind,* 2007, 269-291.

10. Ibid.

11. Rita Carter and Christopher D. Frith, "Mapping the mind," (Univ of California Press, 1998).

experienced a renaissance in the realm of scientific inquiry.[12] Its rebirth was sponsored by the work of Italian Neuroscientist Vittorio Gallese. Gallese dwells on the understanding of the body being wholly and intimately linked to cognition through physical sensation and concerted efforts of visual stimulation. His findings demonstrate the cooperation of vision, touch and action to the construction of perception. The multimodality of this condition activates internal motor and somatosensory mechanisms.

Tactile stimulation is understood as mechanical events occurring at the periphery of the body, where neurons communicate sensation to potential action. These impulses reach the neocortex which is segregated physically and functionally. These discrete processing areas are known as SI and SII and are uni-modal functionally; performing discrete processing tasks including the translation of tactile, proprioception, pain and temperature stimuli. This suggests that the brain's motor circuits influence the interaction of the body and the external world, forming our conception of the world. Our own motor knowledge, formed through bodily experience, is employed to interpret action through the phenomena of embodied simulation, initiated by the activation of mirror neurons. This produces the internal sensation of, "as if I did it". Gallese posits that this condition is critical for the understanding of social awareness, and the bonds we forge with the environment. Tactile sensation is the first to develop in our collection of senses, and is the most critical mechanism for our early comprehension of the animate and inanimate realms, and the connections with which we create. The act of touch is critical in social interaction by communicating nonverbal intention and effect. For instance, when someone else initiates an action- perhaps grasping a coffee mug- internal mirror mechanisms excite and similar to as though we were grasping the coffee mug.[13] In this phenomenon the participant is visually aware of the intention to grasp through the mapping of the other person's bodily experience, initiating the internal representation of the act while also possessing the haptic understanding of the mug as a tactile object. This condition is critical in understanding the internal and social domains.

PHILOSOPHY/SCIENCE (SELF/WORLD)

> *"A human body is present when, between the see-er and the visible, between touching and touched, between one eye and the other, between hand and hand a kind of crossover occurs, when the spark of the sensing/sensible is lit, when the fire starts to burn that will not cease until some accident would have sufficed to do..."* [14]

Merleau-Ponty's theory of perception relies on the Gestalt understanding that isomorphism-the mapping of preserved sets and relations among elements-ties consciousness to specific neurological events. There are three operating dialectical orders that reveal themselves in the psychological realm: perceptual, phenomenal, and cultural. This perceptual order refers to the dialectic of the physical world that our intentions provide the world with vitality. The phenomenal body is ordered gestures and attitudes imbued with meaning. The cultural- human- order is the creation of new milieus through the creation of

12. Robert Vischer, "On the Optical Sense of Form: A Contribution to Aesthetics," Empathy, Form, and Space, (Leipzig: Herrmann Credner. 1872), 92.

13. Vittorio Gallese and Sjoerd Ebisch, "Embodied Simulation and Touch: The Sense of Touch in Social Cognition," Phenomenology and Mind, 2007, 269-291.

14. Maurice Merleau-Ponty, "Eye and Mind," *The Primacy of Perception,* (Evanston, IL: Northwestern UP. 1964), 159-190.

literature, music, architecture, and language. Merleau-Ponty refers to the body as the fabric into which all objects are woven, and the instrument of comprehension.[15] Consciousness exists outside of the body and through the senses.

> *"We perceive atmosphere through our emotional sensibilities—a form of perception that works incredibly quickly, and which humans evidently need to help us survive."* [16]

Until now we've operated with an assumption of atmosphere from the lens of a beholder. The account is still valid and honest, however, lacks the understanding of tectonic assembly and craft. Peter Zumthor is regarded as the authority on atmosphere; his architecture more tectonic poem than building. In his book—unpretentiously titled, 'Atmospheres'— Zumthor describes the ingredients present in the perception of the phenomenon.

To summarize his process:

Atmosphere is movement or suspension of spirit between the earthly and ethereal, metered through the participant's emotional sensibility. Emotional response is gauged immediately, spontaneously, while everything unnecessary is discarded. The idea that 'beauty is in the eye of the beholder' adopts a deeper and more profound understanding of the participation between person to thing/environment. Beauty is gauged through all senses; therefore the conjuring of atmosphere is completely within the participant. The body of architecture is a one-to-one analog of the human body. Not the notion of the body—but the body itself. Material compatibility is the relationship and reaction of material composition; combinations are infinite, and their employment, precise and intentional. The sound of space is the revelation of space as an instrument. Shape, surface, material, all behave to produce a unique aural quality, not unlike the combinations of keys, holes, and materials of a musical instrument. Temperature of space is resultant of material property, and the degree to which its enclosure behaves with its surroundings and human occupation. Its effects are both physiological and perhaps psychological.[17]

PHILOSOPHY (SELF VIEW)

Time

Time is a human construct. It functions to describe change and motion relative to things that have happened or not yet happened. It operates independent of the body. Though void of material and earthly boundary, time feels variable, speeding or retarding without our permission. In more immediate terms, perhaps working toward a deadline that seems to rapidly approach, or in the long term, watching your niece or nephew grow bigger seemingly too fast. Inversely, if you have had the misfortune of experiencing a car crash, you may recall a certain slowing down or lengthening in anticipation of collision.

When I was about five years-old I attended a pool party. I hadn't learned how to swim yet, and in some confusion I was pushed in to the deep end. I sank immediately. My aquatic surroundings consumed me. My lungs failed. Vision blurred, yet had a strange alertness I can only describe as an animal instinct anticipating the 'end'. There was a thickness to the event. To this day I recall being underwater for minutes. The image of the event still persists. To this day I swear being submerged for no less than three minutes. This couldn't have been the case. Some year ago I learned at roughly one-minute void of oxygen, barring you aren't holding your

15. Maurice Merleau-Ponty, "Eye and Mind," *The Primacy of Perception,* (Evanston, IL: Northwestern UP. 1964), 159-190.

16. Peter Zumthor, "Atmospheres," (Basel: Birkhäuser, 2006).

17. Ibid.

breath, brain cells begin to atrophy. At roughly three-minutes, brain damage is likely, and you will lose consciousness. In my aquatic episode I was eventually found and my life spared. There was no enduring damage— physically at least, psychologically perhaps a different story—so I couldn't have been submerged for over a minute. The person that saved me watched as I sank, recalling that I was underwater for about 15 seconds maximum. How is it that I felt to be submerged for so long?

Time is perception. The quickening or slowing down we experience is proportional to the response to change, movement and temporal relations to things. Aristotle attributed time to change and movement. "Every alteration and all that changes is in time". Without movement or fluctuation, there is no time, and the inverse is also true. The modern conception of time is linear. Properties of modern physics define time as a duration between two points, x and y. Our perception of an impressed image in point x directly influences our perception of point y.[18]

The religious construct of time by the ancient Greeks, Incans, Mayans Buddhists (etc.) rely upon a cyclical— 'wheel'—of time, organized based on season and ritual. Time rotated about itself in cycles corresponding with the solstices to organize harvest. The Judeo-Christian organization is linear with an alpha and omega; beginning and end. The beginning was God's act of creation. It anticipates an end, with the second coming of Christ for final judgment of the living and dead.[19]

Space

"The process by which a spatial image can be transposed into the emotional sphere is expressed by the spatial concept. It yields information on the relation between man and his environment. It is the spiritual expression of the reality that confronts him. The world that lies before is changed it. It forces him to project graphically his own position if he wants to come to terms with it." [20]

The idea of space is a construct or code, through which we navigate and skillfully negotiate. It is both parameter and infinite potentiality. The routine understanding of a three-dimensional boundary through which we inhabit, is thin and insufficient. It is sterile and void of the weight of presence, embodiment, memory, and image. Space exists within the exterior realm, as well as the interior domains of abstraction and cognition. Norwegian architect and theorist, Norberg-Schulz, typifies five primary incarnations of space: The pragmatic space of man's involvement with his natural context; the perceptual space inherent in identity; the introspective realm of cognitive space, allowing man to reflect on its existence; abstract space, which affords the mental equipment to reason all things; and the cultural and social wholeness of existential space.[21]

Inherent in any conception of space is the activity of motion, the conjuring of image, and the relationship of the human body's interior to the body of the exterior environment. Humans participate in a woven, holistic, embodied contract

18. Ursula, Coope, "Time for Aristotle: Physics IV. 10-14," (2005).

19. David Lewis Anderson, "Religion and Time," *Religion and Time*. n.d.

20. Sigfried Giedion, "Die Ungreifbarkeit des Raumes," (Neue Zurcher Zeitung, 1965).

21. Christian Norberg-Schulz, "Existence, Space & Architecture," (New York: Praeger, 1971).

with our surroundings through the projection of our unique internal composition on to our immediate context.

EXISTENCE

The understanding of existence is the most difficult to pinpoint. It is simultaneously everything and nothing, for it has no physical property or parameter by which to study its workings, like the function of time or the habitable and engaged space. It is yet preoccupied with the wholeness of being. Existence is a causal occurrence, in that it is present only in the presence of other things. It is reliant on the presence of space and time. Humans exist within space, active through the construct of time. Existence is, then, a referential composition, contingent on the continuity of material and animate beings.

CONCLUSION

The magic and profoundness of atmosphere is in its capacity to suspend the observer within two realms simultaneously. It is a harmonious event between two realms, which we engage with our senses, aware of time, spatial position and an understanding of self. Conjuring recorded image, memory situates the participant between the mental space of 'then' and the physical space of 'now'. The divinely scaled space of gothic churches suspends the presence of its observer between earth and heaven, denying our earthly matter. Our finely developed biology, tuned through thousands of years of evolution to participate with our environment, receives information of our context through bodily sensation. Composition of light, subtly moving through space as the sun tracts through the sky provides clues to the passage of time. Our eye's peripheral range of view, agented through the dorsal stream, allows us to place and position ourselves within space. The wholeness of sense, vision, and memory, surpass their scientific essence and explanation. Self enters. Science's objective explanation of things is ill-equipped to describe our sense of Being.

Surely we exist beyond the animate material vessel of the body. Surely there is a beyond which is indescribable; un-dissectible. A beyond where boundary does not exist and everything is connected; harmonious. Philosophy's objective is the rational investigation of the truths and principles of being, knowledge, or conduct.[22] Through the equipment of philosophy, we are able to comprehend our situation between the material Earth—from its engagement we understand 'how' we exist—and the heavens, for which we seek 'why' we exist. The event of atmosphere is situated between these realms. Tangible through its physical properties and meaningful because of its ephemeral quality. It is possible atmosphere is more sophisticated than this, and it exists in a realm we aren't meant to comprehend. One thing I am certain; it exists within the things after the physics.

[22] Dictionary, Oxford English. "Compact edition." Volume Two 130 (1971).

CONCLUSION

Lucille Sadlon

We have poked at several weighty topics in this edition; from metaphors and memories, to mirror neurons and sensorimotor activities, to the concept of "deep beauty" and even the constructs of time and space. As introduced, Triptych should be viewed as a kind of intellectual kaleidoscope. The range and scale of ideas presented by the authors are immense, with different elements sometimes reflecting each other while revealing yet another facet of thought. Taken in sum, it leads back to our original proposal: that an aesthetic experience is the direct result of architecture and neuroscience merging as one, where mood and atmosphere become the foundation of the architectural experience as a direct consequence of the body\brain's biological processes. The result of these assertions is that a person's abrupt engagement with buildings is both prereflective and meaningful while the architectural experience itself is kinesthetic and emotive.

The common theme through these discussions is perhaps a simple one: the fact that humans are relational beings. The diversity of the human race is nigh inconceivable and yet at the root of all things is an innate desire to draw connections between people, places, things, and ideas. Be it the vengeance of the Greeks against the state of Caryae as immortalized in Caryatid columns, or the evocative forms encased in marble by Michelangelo's Slaves, or a simple coffee cup for which a person might hold a particular sense of affection, people skillfully relate to the world around them and gain better understanding of and meaning for their existence. Humankind's desire to be more than the sum of its parts—to become more than what it is and further relate to greater things—has been in play since the birth of the first tool and continues through this new age of computer technology. If we were not relational entities at even the most basic level, what would we care for craft? Why wouldn't we just choose to live in a box devoid of all evidence of human touch? Why would we have built centuries' worth of glorious cathedrals meant to reflect the magnificence of heaven? I doubt we would recognize or care for the features that constitute beauty and differentiate it from that which is ugly or banal. We could not understand the subtleties of a romantic dinner setting, nor would we grasp the concept of comfort derived from a grandmother's kitchen. The manner in which this yearning for relation manifests itself and the direction in which it leads us may vary based on the individual, yet it is there nonetheless. The differences exist but so do the universals. It is the key aspect of our biological makeup which brings us in a full circle and leads us back to the concept of an aesthetic experience.

It is our prospect that Triptych leaves a reader with a greater sense of appreciation for the complexity of the human experience in regards to architecture and design. We think that many of the suggestions here have been long acknowledged if not inferred by architects (a professional intuition) and laymen alike (experience as real). Unfolding from newly conceived biological foundations of contemporary science in perception, these intuitions and experiences seem much more than irrational ambiguities. By recognizing the role which neuroscience plays in the human experience of designed environments,

and by understanding the means through which people relate in regards to philosophy, biology, and architecture, there lies the potential to make a true impact on people's lives through informed architectural design.