REPOSITIONING NEUROAESTHETICS THROUGH CONTEMPORARY ART

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Abstract

Neuroaesthetics, as a locus of research on art and cognition, has tended to privilege neuroscientific understandings of the art experience that elide centuries of art historical research on perception and culture. Instead, this dissertation proposes that neuroaesthetic research can be extended to understanding the specific social, sensorial and perceptual processes occurring as artworks are encountered in exhibition contexts. How does neuroaesthetic perception operate in contemporary artworks? What modes of cognitive address are involved? How can neuroaesthetic engagement facilitate embodied knowledges?

This dissertation first inquires into the neuroaesthetic literature in order to establish its neuroscientific foundations, and then advances a perceptual standpoint stemming from art and art history. Drawing from feminist theories of experiential and cognitive embodiment, I reposition neuroaesthetics to incorporate art historical inquiries into body and mind through direct engagement with art. I argue that such a revised neuroaesthic perception must take into account post-humanist troublings of nature/culture dichotomies. I also suggest that the paradigm for embodied perception that has emerged from both cognitive neuroscience and affect theory can expand neuroaesthetic understanding. My investigation has led me to first-hand experience as a research subject of neuroscience experiments, which show that current fMRI contexts in fact delimit the perception of art and inhibit possible neuroaesthetic significance. Instead, I undertake neuroaesthetic research in exhibition contexts where self-reflexive awareness developed in practiced art apprehension facilitates insights into perception and cognition that are inaccessible within the epistemological conditions of neuroscience labs.

The first case study examines how an installation by the FASTWÜRMS collective reveals cognitive processes of abduction by inviting navigation through an infinitely complex web of objects and images. Turning from association to visual cognition, I then consider how Olafur Eliasson's immersive light installations manipulate colour perception thereby facilitating critical awareness of techno-mediated environments on the human visual system. Third, my analysis of a conceptual work by Kristin Lucas explores how the performance of digital and legal technology invites imaginative yet embodied transformations. Finally, my study explores how the affective tensions produced in a video by Omer Fast activate an awareness of intersubjective communication that corresponds with recent neuroscientific developments in mirror-neuron theory. By taking contemporary artworks as its focus, the dissertation extends neuroaesthetic inquiry to demonstrate contextual understandings of how the cognitive processes of art constitute physiological engagements between body, brain and world.

Key Words: neuroaesthetics, art and the brain, art and neuroscience, art and science, nature and culture, abduction, visual cognition, mimesis, mirror neurons, aesthetics, embodied mind, art history, contemporary art, FASTWÜRMS, Olafur Eliasson, Kristin Lucas, Omer Fast

I dedicate this dissertation to artist Rebecca Diederichs.

Years of intimate engagement with your ineffable artworks and your brilliant, inquiring mind have compelled me to write at the intersections of art and science. Your practice continues to inspire and motivate my research. Had I never encountered your work, this project would never have been born. Thank you.

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Introduction

I have never felt more disembodied than during the time I spent in a Magnetic Resonance Imaging (MRI) scanner. There was a small window inches above my face, equipped with a periscope, so that although I was lying on my back staring straight up toward the ceiling, I was looking at my own feet, seemingly very far away. I experienced an eerie floating sensation, as if I my body had been removed from the world and set adrift in zero gravity. The technicians had instructed me to relax and lie perfectly still for the two hours it would take the scanner to record my neural anatomy. Unfortunately, the aesthetics inside the machine were more conducive to stress than they were to relaxation. On top of the claustrophobic confinement, the operations of the scanner itself created an abrasive audio environment. In the background, I could hear a steady, rhythmic chugging sound, like a distant washing machine. At the same time, I was bombarded with a relentless, loud and grating series of arrhythmic grinding noises. I struggled to control my breathing and calm myself. In an effort to accept the confinement of my situation, I tried to mentally conjure positive physical encounters – petting my cats, snuggling with my partner, walking in the forest. I concluded that my life was pretty good and I should be able to endure this temporary state of confinement. I eventually began to distinguish odd harmonics and interesting dissonances in the ongoing audio, and, after about thirty minutes, I fell asleep.

My second session in the scanner was more challenging. This time I was performing a task designed to produce specific neural activations for the scanner to record. The task involved staring through the periscope at crosshairs in the centre of a

screen, where graphic shapes popped up and disappeared. I held a key pad in my hands which I had to click to indicate whether each target shape had popped up on the left or on the right. A high pitched audio cue told me to click on the opposite side of the target and a low pitched cue told me to click on the same side. I have always had trouble distinguishing left from right and I quickly became befuddled and a little panicky. Despite understanding, rationally, that my personal ability to perform the task correctly was irrelevant to the research, I badly wanted to please the technicians by trying to do well. The space was confining, I was not supposed to move my head at all, and the anxiety caused by the task itself made it much harder for me to relax. After awhile, however, my thoughts began to wander while my eyes and hands remained engaged in the task. I pondered my state as a confined animal organism, my perceptions narrowed and circumscribed by the apparatus of technoscience. I thought about *Animal Farm, 1984*, *The Matrix*, *Clockwork Orange*, Josef Mengele's experiments on human captives, and Stockholm Syndrome. I thought about similarities between objectification and death. How, I wondered, would the Italian Futurists feel about this technoscientific construct? I decided they would probably be enthusiastic if they were the ones operating the machine. All the while, I remained passive and compliant as the great machine around me chugged and ground, producing powerful magnetic fields to alter the subatomic configurations of my grey matter, parsing the flows of blood to my active brain cells in fine detail.

The scenario had distinctly dystopic qualities, and yet I was free to leave at any time. If I chose to abort the test, all I had to do was say so and I would be released. I stayed because I wanted to be there. I had volunteered on this experiment in order to

learn first-hand what it would feel like to perform as a scientific subject in a neuro-imaging experiment. As a curator, artist, art theorist and art historian, the artworks I study operate in the social contexts of galleries and museums, producing embodied experiences within discursive paradigms and the localized conditions of display. Thus, when I embarked on my neuroaesthetic research for this dissertation, I wanted to establish my own first-hand, subjective basis of comparison between ways that art can facilitate situated awareness of cognitive process, and the ways that knowledge about the workings of brain is produced in the neuroscience lab.

In both contexts – inside the art gallery and inside the MRI scanner – embodied knowledge emerges, in part, through the situated standpoint of participants and observers. Despite the seeming passivity of art audiences and scientific subjects, one does not perform either role as a blank slate or empty vessel, but as an alert and active entity primed and conditioned by personal past experience and collective cultural knowledge. My critical standpoint has been informed by Donna Haraway's epistemological work on "situated knowledges."[1] As a philosopher of science and technology, Haraway has activated a feminist account of embodied experience; the situated bodies she posited were specific, historically and spatially located entities – thinking bodies, culturally conditioned and socially engaged.[2] Haraway's work informs interdisciplinary research at the intersections of art and science because she acknowledged the bio-physical dimensions of human perception, yet she simultaneously imbricated the senses within the cultural contingencies of an individual's lived experience. I take from Haraway the impossibility of detached and omniscient points of view. Situated knowledge is

necessarily partial, and the feminist challenge for researchers of art and science alike is to remain alert and open to the unknowable alterities embedded in any knowledge claim.

In this dissertation I will adopt a standpoint epistemology to conduct neuroaesthetic inquiries into contemporary art, theorizing how certain artworks can facilitate embodied knowledge about perceptual cognition. Since the 1990s, art historians such as Barbara Maria Stafford and John Onians, and neuroscientists such as Semir Zeki, V.S. Ramachandran, Martin Skov and Oshin Vartanian, have been studying art and the brain under the name of "neuroaesthetics."[3] Yet, the practices of art history and neuroscience are methodologically and epistemologically distinct. Art historians conduct their primary research in galleries and museums, seeking to understand artworks in the cultural contexts of the eras in which they were created, while neuroscientists do primary research in labs, seeking to understand the workings of the brain. Both art history and neuroscience, however, produce detailed observations and analysis of material objects, and both inquire into interconnections between sense perception and cultural knowledge. Under the interdisciplinary umbrella of neuroaesthetics, the two disciplines rub up against one another; each provoking critical questions about the other's findings while simultaneously addressing lacunae produced by the other's methodological constraints. In contemporary Western society, however, neuroscientific research holds a vaunted position of authority and much of the neuroaesthetic literature to date privileges neuroscience as having greater access to fundamental truths about material reality than art history and art theory, including some art historical contributions that appropriate the authority of neuroscience to underwrite or explain aesthetic experience. Furthermore, an

ideology of biological determinism occasionally invoked by both neuroscientists and art historians under the name of neuroaesthetics threatens to relegate aesthetic experience exclusively to the non-conscious level. I will address this tendency of neuroaesthetics to privilege the non-conscious, or cognitive processes of which the subject is unaware, by drawing on art historical methods of analysis to consider how artworks can facilitate conscious awareness of perception itself. Thus, in this dissertation I aim to demonstrate that the specific modes of neuroaesthetic address that certain artworks make to their audiences can provoke a critical challenge to deterministic and reductive assumptions about the causal role of cellular activity in the brain prevailing in much of the existing neuroaesthetic research.

At the time of this writing, neuroaesthetic researchers have largely positioned neuroaesthetic theory a-historically, as a novel endeavour to explain how art functions according to the "laws of the brain."[4] Some art historians and art theorists have rejected the determinist implications of this reductive formulation, a discourse that I will elucidate in Chapter One. Nevertheless, what remains largely missing from cross-disciplinary neuroaesthetic debates is an understanding that neither art theory nor neuroscience comprises a monolithic enterprise;[5] researchers practice different methodologies within different epistemological frameworks and those differences inspire the critical discourse inherent to each discipline. A neuroscientist may be unaware, understandably, of the critical debates about aesthetics that take place in art historical discourse as well as the epistemological conditions of the art context or gallery itself. Likewise, an art historian can be forgiven for neglecting to parse technical debates in neuroscience about

appropriate experiment design and the ways that the procedures and apparatus of the neuroscience lab condition the types of knowledge produced. The tendency is for researchers to reach across disciplines to cite one another as external authorities. But such critical understanding falls short in acknowledging the constraints that condition the other's disciplinary knowledge claims. As in any act of translation lacking the complexities of cultural context, this can lead to over-simplification, misunderstanding and stereotyping behaviour. The interdisciplinary challenge for neuroaesthetic researchers working in both neuroscience and art history is to engage in more comprehensive analysis of the critical scope of both disciplinary practices.

Embodiment

The inquiries I will conduct in this dissertation take as a starting point the neuroscientific premise that mind emerges from physiological process.[6] The notion of "embodiment," in this sense, serves as an important reminder of critical shifts underway in neuro- and cognitive science that reject epistemological constructions of the brain as a mechanism operating in isolation. In 1993, cognitive scientist Francisco J. Varela, philosopher Evan Thompson and psychologist Eleanor Rosch teamed up to publish a book titled *The Embodied Mind: Cognitive Science and Human Experience*.[7] This book addresses fundamental problems in the empirical study of consciousness by drawing connections between Western and Eastern philosophical traditions as they inform cognitive science. The authors set out to redress a contemporary Western cultural condition in which scientific explanations of consciousness are ascribed with more authority than immediate

experience. Scientists studying consciousness face a problematic paradox because an observer has no means of empirically verifying another human being's conscious experience. The solution, according to the authors, is not to bracket off experience from observable behaviour, but to embrace an understanding that "cognition is not a representation of a pregiven world by a pregiven mind but is rather the enactment of a world and a mind on the basis of a history of the variety of actions that a being in the world performs."[8] In other words, cognition is an active, rather than a passive, process, and cannot be reified in isolation from other ongoing processes of interaction and engagement. In cognitive science and philosophy of mind, the term "embodied" has come to invoke not just the entangled associations of the brain with the rest of the body, but also its cognitive relationship with the external world.

As I will argue, embodied experience situates the brain and body as co-constitutive elements that are further entailed as co-constitutive with the world. As a biological organ, the human brain inheres in nature, but the deeply social nature of the human organism demands consideration of the ways that the brain and culture are mutually engaged. Thus, the term "embodied" in my formulation, resonates with both Susan Buck-Morss' concept of the "synaesthetic system," which situates the brain as part of a nervous system that, in her words, "begins and ends in the world"[9] and with Donna Haraway's idea of "situated knowledges," her formulation that all modes of knowing are always partial and subjective, localized to the specific conditions of life experience.[10] In my consideration of aesthetic art engagements, the term embodied experience refers to the ongoing entanglement of collective cultural knowledge within individual acts of

perception. My use of the term "embodied" also pertains to my assertion that experience of art in art contexts produces particular forms of knowledge, capable of illuminating neuroaesthetic research to the same extent as neuro-imaging studies conducted in science labs.

While contemporary cognitive neuroscience strives to contend with the social implications of the physiological functions of the brain, recent aesthetic theory emerging in the humanities likewise embraces an integration of physiological and social modes of engagement. This contemporary aesthetic turn builds on feminist theory about embodied experience developed in the 1990s. In 1992, for example, Buck-Morss argued for an understanding of aesthetics that incorporates the brain/body/environment as an integrated system.[11] While Buck-Morss critically explored the social dimensions of aesthetic engagement, art historian Rosalind Krauss situated the cerebral dimensions of aesthetic experience firmly in the body, insisting that, "the cerebral cortex is not above the body in an ideal or ideated remove, it is, instead, *of* the body, such that the reflex arc of which it is a part connects it to a whole field of stimuli between which it cannot distinguish."[12] In Krauss' aesthetic formulation, even works by such a cerebral artist as Marcel Duchamp reveal the co-constitution of the brain with the rest of the body. In their aesthetic formulations, neither Krauss nor Buck-Morss consider the brain in isolation, but importantly situate it in dynamic engagement within larger systems. Departing from Buck-Morss, Krauss, and Haraway as well as Merlin Donald, Jerry Fodor, Nancey Murphy and Warren S. Brown (among others), I will examine how contemporary

artworks and their audiences perform as neuroaesthetic assemblages of brain, body and world, co-constitutive elements operating in social spheres.

Counter-arguments

I would like to begin by addressing three counter-arguments that could be levelled against neuroaesthetic research in general, or my neuroaesthetic practice in particular. One refutation to neuroaesthetics that I have heard expressed by artist colleagues can be summarized as follows, "art does not need neuroscience," meaning that artists do not need science for external validation. In this sense, I do find it troubling that art advocates occasionally enlist neuroscientists as authoritative voices to legitimate art experience. For example, in 2011, The Art Fund, a British national arts organisation, posted a YouTube video in which neuroscientist Semir Zeki, a key exponent of early neuroaesthetics in the 1990s, suggests that, "We have recently found that when we look at things which we consider to be beautiful the activity in the pleasure-reward centres in the brain goes up."[13] The narrator puts a particular spin on Zeki's statement, "[a]rt lovers have long thought that art is important to our well-being, but they had no proof – until now."[14] This video, which circulated on social media networks, generated artworld concern about the field of neuroaesthetics. Art makes valid, vital and necessary contributions on its own terms, and the video's implication that art requires a social stamp of approval from the realm of science raised the hackles of many artists, art theorists and art historians. While invoking neuroscience in aid of arts advocacy, the Art Fund had inadvertently de-legitimated art discourse.

James Croft, researching neuroaesthetics towards a PhD in Human Development and Education at Harvard, has coined the term "neuro-advocacy" to describe the phenomenon of using neuroscience to justify arts in education, based on the "beneficial effect [the arts] have on the brains of those who pursue them."[15] As Croft demonstrates, neuroscience on the arts is still very speculative, and while promoting arts education is certainly a worthwhile undertaking, the neuroscientific study cited – which found a correlation between taking music lessons and improvements in overall scholastic performance – did not actually support the claims of neuro-advocates, who as Croft explains, assume "correlation" to imply "causation," and therefore assert that music "boosts performance."[16] As often happens when advocates enlist findings from science to support their cause, they elided important qualifying facts from the study. Specifically, in this instance, advocates failed to note that the scientists who produced the study themselves suggested the correlations they found were inconclusive and that many additional factors enhancing brain activity might be contributing to their results.[17] Likewise in the case of the Art Fund YouTube video citing Zeki, which also enlists neuroscience in the advocacy of art, Zeki's research paper on the neural correlates of beauty did not suggest that art contributes to public health, nor did he design his experiment to validate art in any way. Furthermore, as Zeki makes clear in his paper, beauty comprises only one of many ways that art can be appreciated, and he explains that, "[t]his leads us to divorce beauty from art in this discussion and focus on beauty alone."[18] Thus, the research, which the Art Fund claimed was justification for supporting the arts, did not even address art directly, but rather set out to better understand specific

aspects of neural anatomy. In both instances, art advocates applied neuroaesthetics unscientifically in their appropriation of scientific research, glossing over the conditional qualifications clearly expressed in the neuroscientific studies they invoked.

While I support national arts funding and art education, in these instances I believe neuroscience has been misappropriated, enlisted merely on the basis of its authoritative position in society rather than on actual conclusions drawn by scientists from their research. Such misrepresentations demean and diminish the validity of art as a worthy practice in and of itself, while simultaneously glossing over any valid claims of neuroscientists in favour of a deterministic spin. Unfortunately, the elevated social position of neuroscience is currently so powerful, that anyone practicing neuroaesthetics, myself included, can easily be implicated as trying to garner validation from neuroscience for one's own claims about art. One of the stakes of this dissertation is to inquire into this interdisciplinary pitfall from the standpoint of art theory, while at the same time taking concrete steps to engage critically with neuroscience on its own terms.

A second counter argument to neuroaesthetics, cogently raised by philosopher Alva Noë (among others such as Ernst Gombrich[19] and Amy Ione[20]), suggests that the disciplinary goals and constraints of art theory, art history and neuroscience are simply too different to result in productive dialogue. Neuroscience studies the brain, first and foremost, and for neuroscientists such as Zeki this can result in hyperbolically reducing all of human experience to brain function alone. Noë objects to the neuroscientific proposition that "you are your brain" on the grounds that it propagates the Cartesian notion that there is "something inside us that thinks and feels."[21] Instead, he suggests that

many things besides brains are also required for mental life, such as bodies, the environment, and other people. Noë reminds his readers that, "it is the normally embodied, environmentally- and socially-situated human animal that thinks, feels, decides and is conscious," and asserts that, "[i]t is *people*, not their brains, that make and enjoy art."[22] Furthermore, he goes on to note that neuroscience cannot offer much of value to art theory because it can't distinguish between modes of perception that take place in engagements with art from those that take place in engagement with anything else that has sensorial dimensions. In this, Noë expresses a view widely held among art theorists that the findings of neuroscience only take on meaningful resonance within the disciplinary context of neuroscience itself.

Like Noë, I will argue that brains are only part of the complex assemblage that makes up an aesthetic experience. To date, the neuroscience undertaken in the name of neuroaesthetics largely entails bottom-up models of mind that privilege the brain as an isolated entity with deterministic powers of causation. But Noë neither takes up the vast body of neuroscientific research into the embodied and socially embedded aspects of neural development, nor does he mention art historian Barbara Stafford's comprehensive book on neuroaesthetics, *Echo Objects, The Cognitive Work of Images* which takes this broad range of neuroscientific practice into account. Stafford makes important interventions into neuroaesthetic discourse by acknowledging that neuroscientists do not present a united front in their aesthetic investigations and by advocating for the role of conscious attention in aesthetic engagement, thus challenging reductive, bottom-up models of mind.[23] Part of my project is to build on Stafford's work to extend the scope of

neuroaesthetic research to engage critically with neuroscience as a negotiated discourse. Furthermore, while neuroscience may not yet be able to fully discriminate between art experience and other forms of aesthetic encounter, perhaps it does not have to. If neuroaesthetics is to be an interdisciplinary inquiry, input from art theorists like myself, and philosophers like Noë, can help articulate the range of art experience. The problems that Noë raises only inhere if art is situated in sycophantic relation to neuroscience. Neuroscientists don't have fixed and final answers to questions about aesthetics, but neither do art theorists and philosophers. Rigorous interdisciplinarity, where all parties commit to taking one another's epistemological paradigms seriously, provides the best medicine for reductive, atomistic determinism. What is required is a more robust, interdisciplinary neuroaesthetic methodology, capable of contributing productively to ongoing conversations that arise at the conjunctions of art and science.

While the previous two rejoinders are levelled at neuroaesthetic research in general, a third counter-argument, stemming from revisionary aesthetics, could be addressed to my research in particular. My exploration of neuroaesthetics through the specificity of art experience promises to be fruitful in part because art critically challenges the limits of neuroscientific method. As neuroscientists struggle to develop empirical models of consciousness, this dissertation contributes neuroaesthetic consideration of the specificity of art contexts in order to provide new understandings of perception as a socially entangled process. My approach, however, could be criticized as bringing nothing new to the table for art theorists and art historians. Indeed, the humanities have already processed the duality of aesthetics as both a physiological and a

social mode of engagement. As art historians Francis Halsall, Julia Jansen and Tony O'Connor point out in the introduction to their 2009 anthology, *Rediscovering Aesthetics*, art historians, theorists and curators are reconfiguring aesthetics as a socio-political domain. The authors explain that, "[a]s a consequence of the social character of human identity, aesthetic judgments (or experiences) are never politically neutral, but they are utterly implicated in structures of social power and division, without however – and this is important – being reduced to narrowly political or social concerns."[24] Aesthetics, they propose, can be considered as a liminal zone, where culture and the senses intertwine. While art historians already embrace the embodied nature of aesthetics, I believe that I can contribute something new to the discourse by drawing on neuroscience, not as a form of validation, but as an epistemological framework that accounts for thoughts as physiological phenomena. My neuroaesthetic investigation will explore two key claims: first, that the aesthetic engagement of artworks manifests as a sensorial mode of knowing the world; and second, that the physiological dimensions of social engagements constitute embodied perceptual processes in and of themselves. Thus, I will argue that the neuroaesthetic awareness of cognition facilitated by certain artworks reveals the co-constitution of social conditions and physiological response.

Aesthetics

I will now briefly situate my neuroaesthetic methodology in relation to the discourse on aesthetics, a theoretical framework that already takes into account the dual nature of aesthetics as both a sensorial and a social mode of engagement. Within Western

philosophy, aesthetics has been associated with sensory experience – as Terry Eagleton puts it, "[a]esthetics is born as a discourse of the body."[25] The word "aesthetics" derives from the ancient Greek word *aisthesis*, meaning sense perception. It wasn't until the mid-18th century that aesthetics came to be particularly connected with culture, when German philosopher Alexander Baumgarten identified the sensual appreciation of art as an activity distinct from the exercise of reason. In Eagleton's analysis, Baumgarten's dichotomy sustains, and aesthetics and reason have remained entangled for centuries as twin modes of bourgeois culture. The aesthetic, for Eagleton, has been essential to sustain hegemony in modern society because it acknowledges and accommodates the irrationality of sensory experiences, while at the same time containing and subsuming them within ordered, rational and elitist conventions such as taste and judgment. Nevertheless, hegemony never completely subsumes the aesthetic, which remains potentially disruptive as a site of resistance and compassion for the suffering of others.[26] For Eagleton, the physiological dimension of the aesthetic establishes a zone of political potential, while notions of the aesthetic as a refined mode of cultural engagement continue to contain and suppress that potential.

Buck-Morss shares Eagleton's position on the dual nature of aesthetics. Quoting Marxist critic Frederick Jameson she situates the Enlightenment conception of aesthetics as "a kind of safety valve for irrational impulses."[27] However, like Eagleton, she shares the conviction that while the aesthetic can serve to stabilize social power structures it can also provide a site of resistance. She suggests that at times "cultural meanings can be sensed bodily as being wrong. Just plain wrong. How else are people capable of social

protest?"[28] For Buck-Morss, the political potential of aesthetics lies in its formulation as a physiological process. In an interview with art historian Grant H. Kester, Buck-Morss advocates for a less esoteric meaning of aesthetic as a "biological" process by which "the body senses reality."[29] The aesthetic, she argues, reveals universal aspects of human physiological experience as the basis for solidarity and compassion across difference. The provisional universalism that she extends to the body, "is true of the brain as well," which, she says, she likes to "think of as a body part and not as some decorporealized *Seele* or *Geist*."[30] In situating the brain as biological organ rather than a spirit or soul, Buck-Morss' position aligns with the anti-Cartesian materialism of neuroscience. Her strategic universalism, however, is neither deterministic nor reductive and she emphasizes the contingent entanglement between perceptual capacities and the particular environments in which they develop.[31] For this reason, Buck-Morss' assertion that cultural conditions can resonate as "wrong" in the body does not imply that the body operates independently from culture, providing some kind of underlying, essentialist truth factor, but rather that embodied processes make a key contribution to cultural processes of political change.

The notion of aesthetics, formalized by Kant as a judgment of artistic taste, makes a universal value claim about sensory perceptions which, as Eagleton explains, "raises and elaborates such supposedly natural, spontaneous expression to the status of an intricate intellectual discipline."[32] It is precisely the disciplinary nature of aesthetics that Buck-Morss rejects, suggesting that, "if aesthetics were freed from 'art' as its object, it could come into its own as a form of cognition – not a discipline, not just another way of

doing 'cultural studies,' but as a self-reflective, cognitive practice."[33] By firmly situating aesthetics as a material process, Buck-Morss makes an important contribution to contemporary considerations of the term. The problem, she explains, is that "a great deal of what passes for 'aesthetic' experience veils material reality rather than opening it up for our critical perception."[34] When matters of taste commodify art experience, they obscure art's aesthetic capacities as Buck-Morss wants to define them.

It is striking then, that neuroscientists Skov and Vartanian, in their (2009) anthology on neuroaesthetics, also advocate for a definition of aesthetics that exceeds the notion of art. They describe aesthetic functions as "phenomena that characterize our interactions with a wide array of objects,"[35] and they go on to suggest that "ultimately we will need models that can account for our aesthetic experience with all objects rather than just artworks, although the field's current focus on the latter is a justifiable starting point."[36] For Skov and Vartanian, neuroaesthetic research promises a better understanding of human sense perception, rather than the particulars of art experience. As neuroscientists struggle to arrive at a working definition of aesthetics within the constraints of neuroscientific experimentation, they make the observation (similar to Buck-Morss) that aesthetic experience must be understood to pertain beyond the sphere of art. They also acknowledge that the particulars of art experience can provide directions toward more general understandings of perception.

Buck-Morss, working in dialogue with texts by Walter Benjamin, demonstrates how aesthetics, as deployed by fascism and the phantasmagoria of mass media and spectacle, can serve rather as an "anaesthetics" that fatally fractures subjectivity,

deadening awareness of the senses. The synaesthetic system, her model of embodied subjectivity, is vulnerable to such totalizing aesthetic experiences. "The role of 'art' in this development is ambivalent," she suggests, "because, under these conditions [of phantasmagoria], the definition of 'art' as a sensual experience that distinguishes itself precisely by its separation from 'reality' becomes difficult to sustain. Much of 'art' enters into the phantasmagoric field as entertainment, as part of the commodity world."[37] Aesthetics and art, then, can be effectively instrumentalized to the detriment of the synaesthetic system. However, if the material dimension of aesthetics acts as a potential site of resistance to hegemonic forces, as elucidated by Eagleton and Buck-Morss, then it follows that the aesthetics of actual artworks can comprise the radical potential for political change.

Sustaining the paradoxical nature of aesthetics as an oscillation of body and culture is necessary, I believe, for neuroaesthetics to remain politically charged. Furthermore, while aesthetics apply to sensorial engagements beyond those of art experience, the aesthetics of art experience, in certain circumstances, can manifest as a critical form of knowledge. Buck-Morss describes the critical capacity of the body as a kind of "sniffing danger,"[38] an embodied ability to identify and resist cultural impositions while nevertheless remaining culturally engaged. Given the question of neuroaesthetics specific to art experience, then, I aim to explore how aesthetics provides a forum for celebrating, flexing, assessing and extending potentially radical human cognitive capacities.

In this dissertation, I will engage a neuroaesthetic analysis of artworks that effectively intertwine conceptual and material practices to invoke aesthetics as a conscious, embodied awareness of sense perception – a non-linguistic, but transferrable, form of experiential knowledge. While Buck-Morss locates the possibility for dissent in the body, her synaesthetic system does not describe a body without culture, but a body situated in his or her "(culturally specific, historically transient) environment,"[39] and when Krauss rescues the aesthetics of modern art from detached transcendence and restores it to the temporal bodies of artists and audiences, those bodies come with experiential knowledge that informs their engagements with the art. Mind itself is not the enemy of critical aesthetics, nor is reason, but rather it is the mind/body split that fractures the subject and situates culture and nature as polar opposites.

Aesthetics, as historically positioned by Eagleton, embodies a nature/culture dialectic; but within his articulation mind and body co-exist uncomfortably, oscillating in a paradoxical configuration in which the body produces resistance to hegemonic cultural conditions that engage the mind. In contrast, while neuroscientific research perpetuates dualisms of various kinds, it also perpetuates an anti-Cartesian materialism that collapses the mind/body split; neuroscientists do not separate mind from body, but rather consider mind as a physiological process of the brain. I am interested in how neuroaesthetics, in entertaining the anti-Cartesian, or embodied, principles of neuroscience, provides an opportunity to reconsider the conceptual address made by certain artworks as a physiological mode of engagement in itself. Rather than segregating mind and body into different orders of experience, I hold that neuroaesthetics would insist that *all* forms of

cognition – including those that derive from collective cultural interactions – constitute biological processes. In this respect, neuroaesthetic analysis can productively extend contemporary notions of the aesthetic –such as those put forward by Halsall, Jansen, and O'Connor as well as Eagleton and Buck-Morss – that argue for the consideration of both social and sensorial modes. Fundamental to the perception of artworks, then, the collective, social dimensions of aesthetics manifest as embodied processes in individual experience.

The Argument

The beginning of the dissertation will establish a critical framework for my neuroaesthetic analysis of art by introducing new voices to the neuroaesthetic discourse and delineating some of the methodological constraints of neuroscientific experiment. I will then proceed to present case studies of contemporary artworks, exploring the embodied processes by which each work may facilitate a different form of neuroaesthetic awareness through the art experience. The aim of this project is to extend the neuroaesthetic conversation beyond the select group of participating neuroscientists and art historians. Current neuroaesthetic discourse tends to overlook a range of thinkers – from art history, art theory, science and technology studies, and affect theory – who contribute valuable insights about the situated body as a site of critical knowledge production.

In Chapter One, I will undertake to provide an orientation to the contemporary field of neuroaesthetics to introduce my perspective within a broader, interdisciplinary

context. In addition to bringing more thinkers from the humanities into the discussion, I will also engage with cognitive and neuroscientific research that impacts theories of embodiment differently from the neuro-imaging experiments currently implemented under the umbrella of neuroaesthetics, thus problematizing current neuroaesthetic polemics between conscious and non-conscious perceptual processes as they impact on emerging theory about the aesthetic experience of art. The first chapter will establish a theoretical framework for my later interrogation of neuroaesthetic research.

As a practicing curator, artist, art theorist and art historian, I have found it necessary to formulate my own embodied relationship as a subject of neuroscience in order to better understand the critical discourse around methodology emerging from within the neuroscientific field. As mentioned above, I adopt a standpoint methodology informed by Haraway's notion of situated knowledge. To this end, I spent a number of hours inside an MRI (Magnetic Resonance Imaging) scanner as a volunteer subject of a neuroscientific study at Sunnybrook Hospital in Toronto. In addition, I audited a course at York University on the physics of MRI and the necessary conditions for neuro-imaging experiment design. I also met with a number of neuroscientists to tour their labs and learn from them first-hand about their experimental methodologies. Chapter Two will begin with a report on this field research in order to introduce readers without neuroscientific backgrounds to some of the methodological challenges inherent to neuroaesthetic experiments using neuro-imaging techniques. The chapter will then proceed to examine and problematize some of the more strident claims being made for fMRI (functional Magnetic Resonance Imaging) research. My assessment of the methodological limitations

of neuroscientific inquiry that I observed as a research subject in specific conditions of embodiment will open the door of the field for my ongoing investigation into alternative research sites that do not share the same limiting conditions. As a result of my experience, I will theorize that artworks considered in art contexts can provide forms of neuroaesthetic knowledge that augment those produced in neuro-imaging labs. The first two chapters will serve to establish this critical foundation and working method for the neuroaesthetic case studies that follow.

In the case studies that follow in Chapters Three, Four, Five and Six, I will examine how artworks operate neuroaesthetically by facilitating audience awareness of their own cognitive processes. I will endeavour to demonstrate that art considered in art contexts can produce neuroaesthetic knowledges about perceptual cognition that are methodologically inaccessible and epistemologically irrelevant in the context of the neuroscientific experiment. Of course, the converse also applies – neuroscientific experiments produce generalized knowledge about the physiology of perception that can't be gleaned through first-hand experience of artworks alone. My goal for the case studies is not to polarize aesthetic and neuroscience against one another, because to do so would be to mask certain interdisciplinary relationships between art and science that can help resituate neuroaesthetics as a critical methodology. Alongside research conducted in the lab, I aim to extend the scope of neuroaesthetic inquiry to entail research conducted in the gallery. In the case studies that follow, I will engage with both art theory and neuroscientific theory research paradigms as equally informative modes of inquiry, and elucidate points where they converge and diverge.

At the same time, however, I will attempt to demonstrate that while neuroaesthetics produces materialistic accounts of perceptual cognition, a theoretical embrace of the physiological dimensions of art experience does not have to thereby adopt an ideology of biological determinism. Rather, neuroaesthetics can sustain the contingent, provisional and intersubjective variables of social conditions as they manifest corporeally in the workings of the embodied brain. The case studies will support two interconnected goals for this dissertation: one is to establish a neuroaesthetic methodology that considers how particular artworks and their audiences operate as agents in the co-production of knowledge about perception and cognition emerging in the context of the gallery rather than the lab, while the other is to enlist those same artworks to help resituate neuroaesthetics critically within a broader interdisciplinary matrix of embodied aesthetics.

Each of the artworks I will examine operates in the manner of performative assemblage. By this I mean to suggest that the neuroaesthetic experience of these works emerges as an active process, performed collectively by multiple, interconnected agents. In coming to this formulation, I will draw from theories of collaborative knowledge production put forward by theorists in science studies – specifically Donna Haraway, Bruno Latour and Karen Barad – each of whom resists traditional understandings of scientific objectivity. These three thinkers reject the possibility of a singular, detached and comprehensive viewpoint by taking account of the contributions to knowledge formation made by subjects and objects of study and technical apparatus, in conjunction with subjective observers. Knowledge, in this formulation, emerges as a performance in

that it comprises an ongoing, contingent process. Thus, in taking stock of knowledge, the theorist must situate herself as one of many participants in a multivalent assemblage. I will draw parallels between this model of scientific knowledge production as a collective process and aesthetic modes of knowing that emerge in art experience, drawing on Haraway, Latour and Barad to offer additional support for Stafford's neuroaesthetic proposition that artworks themselves make contributions to cognition in their engagements with audiences.

In the four chapters that constitute the case studies, I will examine artworks by contemporary artists FASTWÜRMS, Olafur Eliasson, Kristin Lucas and Omer Fast, each of whom creates artworks that address their audiences as situated, active participants in the co-production of heightened, embodied awareness of their own cognitive processes, or what I would term neuroaesthetic knowledge. In each case study I will ask what specific forms of cognition the artworks in question reveal and I will explore in detail the processes by which that knowledge comes about.

Chapter Three comprises the first case study, examining *Donky@Ninja@Witch* (2007), a large and multivalent installation by the artist collective FASTWÜRMS. Entering the exhibition was somewhat like entering a living brain engaged with multiple systems of sensory and intellectual stimulation. Structured as an impossibly complex intersecting web of associations, the installation defied detached viewpoints, rather inviting audiences to navigate through the diverse plethora of potent images, objects and icons. This chapter will link a discussion of the associative webs presented by the configuration of artistic elements in the exhibition with research on cognitive processes

of association emerging from computational neuroscience. I will suggest that FASTWÜRMS' installation contributes to neuroaesthetic knowledge by facilitating embodied awareness of associative processes as they are taking place. Furthermore, this chapter will explore how FASTWÜRMS situate themselves and their human audiences as animals engaged in social networks that also entail non-human animals in ongoing, communicative interaction. In focusing so closely on the biology of human perception, neuroaesthetic theory risks invoking a polemic that would situate nature and culture as distinct and mutually exclusive causal domains. To answer this problem, I intend to examine FASTWÜRMS' formulation of how nature and culture emerge conjoined as co-constitutive spheres of influence operating in all forms of material engagement. This chapter will contain a detailed analysis of FASTWÜRMS' practice at the confluence of nature and culture, informed by theoretical texts from both contemporary art history and science studies, thereby establishing a frame of reference for neuroaesthetic consideration in which neither nature nor culture can be considered in isolation from one another.

Just as I will propose that nature and culture operate as co-constitutive fields, I will also suggest that the neuroaesthetic dimensions of the artworks that I consider conjoin both social and physiological modes of knowing. To this end, Chapter Four will examine artworks that address the sense of sight as an embodied, social process. In the history of art, vision, more than any other sense, has been reified as a transcendent and isolated perceptual mode. The prevalence of departments of visual art, and the more recent conjoining of art history with visual culture, are just two indications of the extent to which fine art discourse privileges the sense of sight. In the context of neuroaesthetic

inquiry, it is also interesting to note that neuroscience has amassed more knowledge about vision than any of the other senses. Despite the work of feminist art theorists and art historians to problematize the reification of vision, practitioners in both art and science continue to position sight in isolation from other modes of perception and cognition. Olafur Eliasson contributes to neuroaesthetic inquiry with artworks that trouble notions of vision as a discrete perceptual process. As distinct from neuro-imaging experiments on vision which commonly produce scientific knowledge about nonconscious visual processes that operate without the subject's knowing, Eliasson brings normally nonconscious dimensions of visual cognition into conscious awareness.

Chapter Four will ask how colour installations *Room For One Colour* (1997), *360° room for all colours* (2002) and *Your utopia* (2003) by Eliasson produce neuroaesthetic awareness of vision as a capacity for embodied knowledge of contemporary, techno-mediated environments. Eliasson's works facilitate awareness of the physiological limitations of human colour perception. Drawing connections between Haraway's notion of primate vision and the neuroscience of colour perception as they reciprocally inflect and are informed by Eliasson's work, Chapter Four will perform a neuroaesthetic inquiry into how vision operates as a subjective and culturally conditioned mode of interactive engagement with the environment, rather than an objective window on the world.

As mentioned above, neuroaesthetics can offer a theoretical position from which to consider the material dimensions of cognitive processes that include ideas themselves. In the final two case studies, I will examine how artworks by Kristin Lucas and Omer

Fast make an explicitly conceptual address while at the same time situating conceptualization itself as an embodied, aesthetic mode of knowing. Chapter Five will take up a conceptual performance by Lucas. In this chapter, I will conduct an in-depth analysis of Lucas' performance in the context of recent theories on mimesis and mental simulation arising out of neuro- and cognitive science, and attempt to demonstrate how neuroaesthetic awareness produces thoughts themselves as physiological processes carrying aesthetic effects. Furthermore, just as Lucas stages her performance in the dual social spheres of the legal system and the internet, so too my inquiry will extend neuroaesthetics to considerations of collective, social engagement as integral to processes of perception. In this way, this chapter will deepen and extend neuroaesthetic explorations of how artworks can facilitate culturally relevant, critical knowledge about the conditioning effects of techno-mediated environments.

Chapter Six will explore the neuroaesthetic significance of relationships between mimetic theory and neuroscience as implicated in *Talk Show* (2009), a video work by Omer Fast. Emphatically conceptual in address, the work simultaneously presents a series of mimetic performances that engage audiences through affect. I will examine the ways in which the work's mimetic operations recall the shifting discourse emerging from neuro- and cognitive science on mirror neurons – groups of brain cells that activate the same way when someone is observing an action as when they are performing an action. Exploring mimetic engagement as a mode of intersubjective communication that entails both conceptual and affective dimensions, I will consider how Fast's video as well as

recent mirror neuron discourse both support the notion of embodied experience in terms of a socially inflected and conscious mode of knowing the world.

Each case study will examine how artworks, considered in art contexts, can facilitate specific forms of neuroaesthetic knowledge through their embodied modes of address and experience. The neuroaesthetic methodology that I will advance here is specific to artworld knowledges. I will show some of the ways that art, considered in its contexts, can augment knowledges regarding art produced in neuroscience labs. Such a neuroaesthetic methodology is interdisciplinary, engaging embodied awareness of cognition produced by specific artworks while simultaneously extending the neuroaesthetic conversation to include perspectives from art history, art theory and science studies. Such a modality of analysis defies biological determinism by troubling hierarchical dichotomies between nature and culture, physiological and social modes of engagement, non-conscious and conscious neural process, body and mind to posit a neuroaesthetic theory in which such dualities converge as co-constitutive dimensions of art experience. •

End Notes to Introduction

[1] Donna Haraway, "Situated Knowledges: The Science Question in Feminism and the Privilege of Partial Perspective," *Feminist Studies*, vol. 14, no. 3 (1988): 575-599.

[2] Ibid.

[3] The prefix "neuro" derives from the Greek word *neuron*, for nerve, and refers to activity in the brain. In this usage, the term "aesthetics" broadly refers to processes of perceiving and/or creating art although, as I shall demonstrate, neuroaesthetic researchers continue to grapple with the task of defining aesthetic experience.

[4] Semir Zeki, *Inner Visions: An Exploration of Art and the Brain,* (New York: Oxford University Press, 1999), 1.

[5] One notable exception is the comprehensive book on neuroaesthetics by art historian Barbara Maria Stafford, *Echo Objects: The Cognitive Work of Images* (Chicago & London: The University of Chicago Press, 2007). As I shall explain in detail later in the dissertation, Stafford makes an important contribution to the interdisciplinarity of neuroaesthetics in that she undertakes to present critical discourse within neuroscience, thus engaging with critical contingencies inherent to the discipline, rather than drawing on findings from science as an authoritative voice to underwrite or empirically explain art experience.

[6] Even neuroscientist Antonio Damasio – who troubles the neuroscientific convention that mind is a product of the brain alone by examining the significant role of the rest of the body in formulating mental processes – operates on the premise that "mind depends on brain-body interactions," firmly asserting the physiological dimension of mental activity.
Antonio Damasio, *Descartes' Error* (International: Penguin Books, c. 1994, 2006), 225.

[7] Franciso J. Varela, Evan Thompson and Eleanor Rosch, *The Embodied Mind* (Cambridge, MASS & London: The MIT Press, 1993, c.1991).

[8] Ibid., 9.

[9] Susan Buck-Morss, "Aesthetics and Anaesthetics: Walter Benjamin's Artwork Essay Reconsidered," *October*, no. 62 (Fall 1992): 12.

[10] Donna Haraway, "Situated Knowledges: The Science Question in Feminism and the Privilege of Partial Perspective," *Feminist Studies*, vol. 14, no. 3 (1988): 575-599.

[11] Buck-Morss, Ibid., 12.

[12] Rosalind Krauss, *The Optical Unconscious* (Cambridge, MASS & London: The MIT Press, 1998, c.1993), 124.

[13] "Art Gives Same Pleasure as Being in Love" YouTube video uploaded by National Art Fund (May 2011) http://www.youtube.com/watch?v=D_5twGr9l_0
(accessed April 11, 2012)

[14] Ibid.

[15] James Croft, "The Challenges of Interdisciplinary Epistemology in Neuroaesthetics," *Mind, Brain, and Education* 5, no.1 (March 2011): 9.

[16] Ibid., 9.

[17] Croft gives the examples of unfounded claims that participation in the arts will help the brain perform better at other kinds of activities as well, including a quote from educator Eric Jensen who claims that a study by Catterall et al. demonstrates that "[m]usic-making not only supports the development of math skills, but of all skills, for all kinds of students." In fact, Croft explains, the study does not support such a claim but merely shows correlations which the authors themselves acknowledge could easily be attributed to a number of other factors.
James Croft, "The Challenges of Interdisciplinary Epistemology in Neuroaesthetics," *Mind, Brain, and Education* 5, no.1 (March 2011): 9.

[18] Tomohiro Ishizu and Semir Zeki, "Toward A Brain-Based Theory of Beauty," *PLoS ONE,* vol.6, no.7 (2011): 8.

[19] E.H. Gombrich, "Concerning 'The Science of Art': Commentary on Ramachandran and Hirstein," *Journal of Consciousness Studies* 7, no. 8/9 (2000): 17.

[20] Amy Ione, "Examining Semir Zeki's 'Neural Concept Formation and Art: Dante, Michelangelo, Wagner'," *Journal of Consciousness Studies 10*, no. 2, (2003): 58–66.

[21] Alva Noë, "Art and the Limits of Neuroscience," *New York Times: The Opinion Pages*, (December 4, 2011) http://opinionator.blogs.nytimes.com/author/alva-noe
(accessed June 29, 2012).

[22] Ibid.

[23] Barbara Maria Stafford, *Echo Objects: The Cognitive Work of Images* (Chicago & London: The University of Chicago Press, 2007), 199.

[24] Francis Halsall, Julia Jansen, Tony O'Connor, eds., *Rediscovering Aesthetics* (Standford: Stanford University Press, 2009), 9.

[25] Terry Eagleton, "The Ideology of the Aesthetic," *Poetics Today* 9, no. 2 (1988): 327.

[26] Terry Eagleton, *The Ideology of the Aesthetic*, (Malden, MA; Oxford, UK; Victoria, Aus.; Blackwell Pulbishing Inc., 2004, c.1990).

[27] Frederick Jameson, as quoted by Susan Buck-Morss in "Aesthetics and Anaesthetics: Walter Benjamin's Artwork Essay Reconsidered," *October*, no. 62 (Fall 1992): 7.

[28] Susan Buck-Morss, interview by Grant H. Kester, "Aesthetics after the End of Art: An Interview with Susan Buck-Morss," *Art Journal* 56, no. 1 (Spring, 1997): 40.

[29] Ibid., 39.

[30] Ibid., 43.

[31] As Buck-Morss explains, "If the conception of 'aesthetics' here is pre-Kantian and pre-Hegelian, it does not mean that, as philosophical anthropology, it is precritical. And it takes history into account,

understanding that somatic experience itself has changed, given the prostheses of machines and now of electronic media. On that account alone, eighteenth century empiricism is not an adequate description of bodily cognition today." Susan Buck-Morss, interview by Grant H. Kester, "Aesthetics after the End of Art: An Interview with Susan Buck-Morss" *Art Journal* 56, no. 1 (Spring, 1997): 43.

[32] Terry Eagleton, *The Ideology of the Aesthetic*, (Malden, MA; Oxfor, UK; Victoria, Aus.; Blackwell Pulbishing Inc., 2004, c.1990), 2.

[33] Buck-Morss, Ibid., 43.

[34] Ibid., 40.

[35] Martin Skov and Oshin Vartanian, introduction to *Neuroaesthetics,* eds. Martin Skov and Oshin Vartanian (Amityville, New York: Baywood Publishing Company, Inc., 2009), 1.

[36] Ibid., 4.

[37] Susan Buck-Morss, "Aesthetics and Anaesthetics: Walter Benjamin's Artwork Essay Reconsidered," Ibid., 23.

[38] Buck-Morss, interview by Grant H. Kester, Ibid., 43.

[39] Buck-Morss, "Aesthetics and Anaesthetics: Walter Benjamin's Artwork Essay Reconsidered," Ibid., 12.

The Co-constitution of Nature and Culture in Embodied Art Experience

In this chapter I present an overview of some of the key works of neuroaesthetic literature to date, with a view to broaden the discourse to consider texts from other disciplines that resonate closely with neuroaesthetic concerns.[1] My inquiry builds on wide-ranging inter-disciplinary research on embodied knowledge produced by thinkers in art history, art theory, neuroscience, cognitive science, philosophy of science studies, philosophy of social and political thought and affect theory. I do not aim to present a comprehensive review of the neuroaesthetic literature. A great deal of neuroaesthetic research has been produced on music and the brain[2], for example, which is beyond the scope of this investigation. In order to establish a theoretical framework for the consideration of embodied experience of artworks as a form of neuroaesthetic knowledge, I will delineate four key, interrelated themes; a troubling of the Cartesian polemic between conscious and non-conscious experience emerging from foundational neuroaesthetic texts; a theoretical turn in art history toward assessing the presence of artworks rather than their representational qualities; a collapse of the dichotomy between culture and nature expressed by thinkers in science studies; and the notion of the feedback loop as a paradigm for embodied perception emerging in both cognitive neuroscience and affect theory. I aim to demonstrate that, when taken together, these interdisciplinary investigations support the notion that body, brain, mind and world conjoin as co-constitutive elements of neuroaesthetic experience. This interdisciplinary framework will provide essential

grounding for the case studies that follow, in which I will argue that certain artworks facilitate specific forms of neuroaesthetic knowledge through audience awareness of cognitive processes.

Neuroaesthetic Polemics of Conscious and Nonconscious Experience

The early days of neuroaesthetics in the late 1990s and early 2000s were marked by territorial discord. Since then the discourse has broadened and become somewhat less polemic. Some art historians and theorists have embraced the field as a fruitful site for research and analysis, while the number of neuroscientists involved in experimental neuroaesthetic research has also expanded. Nevertheless, interdisciplinary conflicts continue to fulminate around questions of causality and intention invoked by neuroscientific privileging of nonconscious neural processes as the engines that drive human experience.

The first neuroaesthetic debates, instigated by neuroscientists V.S. Ramachandran and Semir Zeki, largely took place in the *Journal of Consciousness Studies* in 1999-2000. One of the early papers, and certainly the most controversial, was by neuroscientist V.S. Ramachandran and philosopher William Hirstein proposing "eight laws of artistic experience."[3] Ramachandran and Hirstein playfully directed their neuroscientific assertions about art as an explicit act of interdisciplinary provocation.[4] The authors' list of laws, or neuroscientific principles, included various aspects of perception such as grouping and binding – the brain's tendency to organise even random visual data into

shapes – and contrast extraction – the brain's tendency to focus on edges and boundaries rather than extensive surfaces. The latter was invoked to support the authors' assertion that line drawings are more aesthetically compelling than photographs.[5] The neurological law which seemed to have had the most traction was "peak shift" – the brain's tendency to prefer an exaggerated form of that which is desired.[6] This concept derived from experiments on rats who were rewarded for choosing a rectangle over a square. After they had learned the task, the rats were then presented with the original rectangle and an even more rectangular rectangle, and they chose the latter. According to the authors, peak shift indicates that the exaggerations of caricature comprise a compelling aspect of almost any art experience. They drew from examples in Indian art, such as a statue of the Goddess Paravati from the Chola period (circa 11th century), arguing that peak shift explains why observers consider the abstraction of the female form to be beautiful. (Unfortunately, what the authors gained from the cultural diversity of the art forms they considered, they lost in their unreconstructed performance of gender essentialism.)[7]

The paper received vociferous negative response from thinkers in the humanities. Notably, in the same issue of the journal, art historian Ernst Gombrich published a short and damning response to Ramachandran and Hirstein's suggesting that their universal statements about art were unfounded, that they simply didn't know enough about art to make a convincing argument, suggesting that "[e]ven a fleeting visit to one of the great museums might serve to

convince the authors that few of the exhibits conform to the laws of art they postulate." [8] John Hyman, philosopher and professor of aesthetics published an essay at *Interdisciplines* online (since reprinted in the book *Beyond Mimesis and Convention*[9]) stating that the concept of "peak shift" had been misunderstood and exaggerated by Ramachandran and Hirstein, specifically suggesting that their theory was not really about art but about sexual attraction, and that they demonstrated a very limited knowledge of art. At the same time, he was also critical of Gombrich's response, and explicitly rejecting a "closing of the ranks" of expertise.[10] While Gombrich's response was territorial, implying that neuroscience had no business addressing art, Hyman was more open to the possibility of interdisciplinary dialogue.

While I agree with Hyman that Gombrich's "closing of the ranks" was unnecessarily pre-emptive, I can understand some of the latter's frustration. A number of the issues raised by Ramachandran and Hirstein were discussed by Gombrich in his book *Art and Illusion*, first published in 1960. While the authors cited Gombrich,[11] indicating that they were aware of his work, they did not raise the fact that he reached different conclusions than they did, based on similar evidence. For example, the experiment of the rat and the rectangle that Ramachandran and Hirstein used to support their Peak Shift theory could be read in different ways. For Ramachandran and Hirstein, it was the rectangularity of the rectangle itself that the rat learned to prefer, a kind of reified rectangular ideal. But what if, rather than producing a caricature of rectangularity, the rat had

learned a relative relation between the shapes presented? In 1960, Gombrich cited a similar experiment.

> According to a classic experiment by Wolfgang Köhler, you can take two gray pieces of paper – one dark, one bright – and teach the chickens to expect food on the brighter of the two. If you then remove the darker piece and replace it by one brighter than the other one, the deluded creatures will look for their dinner, not on the identical gray paper where they have always found it, but on the paper where they would expect it in terms of relationships – that is, on the brighter of the two. Their little brains are attuned to gradients rather than to individual stimuli. Things could not go well for them if nature had willed it otherwise. For would a memory of the exact stimulus have helped them to recognize the identical paper? Hardly ever! A cloud passing over the sun would change its brightness, and so might even a tilt of the head, or an approach from a different angle. If what we call "identity" were not anchored in a constant relationship with environment, it would be lost in the chaos of swirling impressions that never repeat themselves.[12]

Rather than suggest that the chickens had learned to prefer the attribute of brightness, Gombrich emphasised the chickens' process of parsing visual stimuli as a relational condition of performing identity in ongoing interaction with the environment. He positioned the chickens as active agents making perceptual distinctions to help them navigate the world. Ramachandran and Hirstein's suggestions stand in marked contrast to Gombrich's as they construe the rectangle-preferring rat as a passive receiver of stimuli, driven by a predetermined urge for rectangularity. Sadly, Gombrich passed away in 2001 and the public debate between he and Ramachandran ended at an interdisciplinary impasse.[13]

In his latest book, published in 2011 and written for a popular audience, Ramachandran again raised his set of universal laws of art and the brain, but this time he proposed a caveat.

> Before moving on to the next seven laws, I want to clarify what I mean by "universal." To say that the wiring in your visual centres embodies universal laws does not negate the critical role of culture and experience in shaping your brain and mind. Many cognitive faculties that are fundamental to your human way of life are only partly specified by your genes. Nature and nurture interact. Genes wire up your brain's emotional and cortical circuits to a certain extent and then leave it to faith that the environment will shape your brain the rest of the way, producing you, the individual. In this respect the human brain is absolutely unique – as symbiotic with culture as a hermit crab is with its shell. While the laws are hardwired, the content is learned.[14]

Ramachandran's concessions to the role of culture in the emergence of consciousness were refreshing, but he nevertheless continued to situate the brain primarily as a passive object determined by genetics and environmental forces. The term "hardwired" requires critical examination, implying as it does that neural networks are fixed for life, while there is no doubt that Ramachandran himself thoroughly understands the concept of neural plasticity[15] – the fact that new neural networks can sometimes be formed in adult brains as a result of certain activities. The adjective "hardwired" references the history of relations between neuroscience and robotics, raising the spectre of artificial intelligence as applied to robotics, which gives rise to a host of poignant cultural anxieties about the reification of humans in the service of military technoscience. Ramachandran, then, has chosen a term that functions as a red flag to readers in the humanities. His provocations, teasing at territorial disciplinary boundaries, have certainly

helped to ignite neuroaesthetic debates, primarily through his consistent privileging of nonconscious neural processes.

The same 1999 issue of *Journal of Consciousness Studies* published an essay by neuroscientist Semir Zeki, titled "Art and the Brain."[16] That year, Zeki also published a book on neuroaesthetics, *Inner Visions: An Exploration of Art and the Brain*,[17] and established a department of neuroaesthetics at University College London. In *Inner Visions,* Zeki made it clear that he was not addressing the art experience comprehensively, that through the lens of neuroscience he could not address emotions in art, and that he was not proposing a formula for art but rather exploring his own curiosity on connections between art and the brain.[18] At the same time, however, he also made the following claim.

> All visual art is expressed through the brain and must therefore obey the laws of the brain whether in conception, execution or appreciation and no theory of aesthetics that is not substantially based on the activity of the brain is ever likely to be complete, let alone profound.[19]

Zeki's statement read as an interdisciplinary provocation, suggesting that art follows laws that are the purview of neuroscience while seemingly dismissing the centuries-long history of aesthetics in the humanities. The statement has functioned as a rallying call for those arguing both for and against the value of neuroaesthetics, sparking a considerable amount of negative response. As mentioned earlier in the Introduction, philosopher Alva Noë reacted to Zeki's reduction of human experience to brain activity, responding that "[i]t is people, not their brains, that make and enjoy art."[20] Students of mine, studying

neuroaesthetics in an undergraduate sculpture seminar at the University of Guelph, reacted defensively to Zeki's authoritative tone, while vehemently rejecting the notion raised by both Zeki and Ramachandran, that art obeys laws that are the purview of science. In science, laws are derived from a collective, historical process of theory and experiment why which numerous researchers test and negotiate one another's claims over long periods of time. The scientific notion of a law is imbued with the understanding that any law is provisional, and may someday be overturned if enough substantial evidence is gathered to challenge it.[21]

Nevertheless, speaking across disciplines, Zeki's assertion that art must obey the laws of the brain reads as a statement of authority over art analysis from the privileged position of neuroscience. Both Zeki and Ramachandran had clearly set out to stake a claim in aesthetic theory, making statements that invoked their own authority to scientifically assess nonconscious neural process inaccessible to anyone other than neuroscientists. When taken in context, however, these statements read less like an empirical assault on other disciplines and more like justifications for conducting speculative research within the discipline of neuroscience. To this day, for example, neuroscientists remain unable to explain empirically how consciousness is produced by the brain, and their neuroaesthetic investigations allow some of them a forum for speculation and exploration that challenges the methodological and epistemological boundaries of their discipline. The neural processes that are most easily observed and measured by neuroscience

are nonconscious and they have traditionally been associated with inherited and supposedly immutable neural structures. Zeki has always been particularly invested in researching vision, and the neural laws that he invoked in *Inner Visions* primarily described visual processing in the brain. His research has consistently adhered to a bottom-up model of consciousness, a traditional neuroscientific paradigm in which it is assumed that small components of brain anatomy – localized networks of neurons assigned with particular tasks – transfer signals upward through the complex system, from the nonconscious zones low in the network toward the higher cognitive areas where conscious thought occurs. Operating with the bottom-up model, Zeki, like many other neuroscientists, assumed the traditional stance of privileging nonconscious processes as the first, and therefore causal, events determining human perception. He turned to art analysis, however, as a means of querying the extensive neuroscience of vision, a collective body of knowledge to which he has made significant contributions. In his more recent book, *Splendours and Miseries of the Brain* (2009), for example, Zeki elaborated his speculative theory of microconsciousness. According to Zeki, certain perceptions such as colour, do not require involvement from the so-called higher brain areas, such as the cerebral cortex, in order to become conscious. He suggested that certain spots in the synaptic chains operate as "essential nodes," sites where the sensory information becomes a perception, giving rise to local microconsciousnesses.[22] Zeki made it quite clear that his theory was speculative, and not yet supported by neuroscientific experiment. In this way, while Zeki has

consistently adhered to a bottom-up model of the brain privileging non-conscious processing, he also used neuroaesthetics to problematize and open up this model from within.

In Zeki's research on human colour perception, he demonstrated that colour itself is a construct of contingent and relational neural processes. Thus, he construed the laws of the brain as active processes of engagement, conveying impressions of the brain as a living organism formed through ongoing interaction with the environment rather than the passive machine invoked by Ramachandran's use of the term "hard-wired." Similarly situating art as an active process, Zeki insisted that the artist and the brain[23] share a common goal; to gather knowledge about the world.[24] I will explore specific implications of Zeki's neuroaesthetic research on colour in Chapter Four. What I want to note for now is that while Zeki has presented a bottom-up model of vision – meaning that non-conscious processes are understood to form the foundation for conscious processing, and are thereby driving the entire system – he has nevertheless emphasised the active character of vision as a meaningful process of engaging with the world. While Ramachandran suggested that the brain was passively driven by sensorial stimuli, the brain that Zeki described was actively seeking stimuli and making contingent decisions, even at nonconscious levels of perception. Thus, a close reading of Zeki problematizes the hierarchical dichotomy between conscious and nonconscious neural processing.

Two art historians, John Onians and Barbara Maria Stafford (both former students of Gombrich) have written books of neuroaesthetic theory. These authors presented two markedly distinct frames of reference for considering the role of nonconscious neural processes in the art experience. Onians chose to embrace the authority of neuroscience as an empirical validation for his art historical claims, while Stafford chose to enter the conversation by engaging with a wide range of contingent negotiations within neuroscience, considering those debates in concert with her art historical investigations into the perception of art.

In his book, *Neuroarthistory: From Aristotle and Pliny to Baxandall and Zeki,* Onians presented a somewhat whimsical historiography examining twenty-five diverse historical figures including Aristotle, Alberti, Hogarth, Winckelmann, Kant, Marx, Wölfflin, Freud, Gombrich and Zeki. Explaining that his book was about "brains" rather than "minds," Onians privileged the brain as a nonconscious organ driving human experience.

> More habitual terms [than "brain"], such as "mind" and "intelligence," with their lofty, even godlike, associations, distort our view of the people to whom they are credited in a precisely opposite sense, by overemphasising the active character of their relation to the world.[25]

Here, Onians indicated that part of his motivation for producing neuroaesthetic research was specifically to counteract theories of art that emphasise conscious thought.

In the book, Onians attempted to show how certain art historical theories had been "validated" (Onians' term) or not by contemporary neuroscience. For

example, he asserted that William Hogarth's suggestion that the serpentine line is the essence of beauty was "wrong" because neuroscience has since "proven" that people prefer symmetry.[26] The neuroscience on symmetry, however, pertains to perception of human faces, and links with the evolutionary theory that people tend to prefer symmetrical faces because they indicate healthy potential mates.[27] Turning his attention to Winckelmann, Onians here suggested that the neuroscience on symmetrical preference proves the art historian was correct in his assertion that some standards of beauty are universal.[28] In this way, somewhat haphazardly, Onians applied evolutionary theory as a empirical truth underwriting neuroscientific findings on symmetry, which he then activated to underwrite principles of form and composition in art.

In his chapter on Gombrich, Onians dismissed his former teacher's reluctance to embrace biological imperatives as underlying factors in the art experience. While Onians employed neuroscientific laws to confer empirical authority on his claims, Gombrich used the science of perception to help him articulate a relational dimension to aesthetic experience. In order to understand how a painter can create a convincing image "despite the fact that no one shade corresponds to what we call 'reality,'" Gombrich suggested that "science has to explore the capacity of our minds to register relationships rather than individual elements."[29] As in his invocation of the chicken experiment mentioned above, Gombrich characterized perception as an active process of engagement rather than a passive mode of reception.[30] His interdisciplinary explorations were framed as a

mode of questioning with the aim of opening up hitherto unrecognized possibilities for configuring art experience rather than a totalizing world view that enlisted neuroscience to fix the art experience as a biologically determined process. "My sympathies," he wrote, "are with those who warn us against rash speculations about inborn reactions in man [sic]..."[31] and he explicitly argued against mechanistic models that posit human experience as form of passive response to stimuli.[32]

Onians identified a conflict in Gombrich's work between his interest in the biological factors that influence perception and style and his reluctance to diminish human agency and volition. Onians encapsulated Gombrich's concerns, saying, "Brought up in Austria as an assimilated Jew, his experience, first, of anti-Semitism in the twenties and, then, of Nazism in the thirties, had made him wary of biology in general and a biology of inheritance in particular."[33] But, Onians continued, "Fortunately, we no longer need to be so cautious, and it is possible now to revisit his arguments and note where neurobiology and neuropsychology either support or weaken [Gombrich's] claims."[34] In an era when evolutionary theorist and renowned atheist Sam Harris, for example, invoked the supposed empiricism of fMRI (functional Magnetic Resonance Imaging) technology as a means of establishing the moral superiority of Western atheism over Islam,[35] it is unclear how Onians could be so confident that biological determinism was no longer a threat in contemporary society.[36]

Onians opened his book *Neuroarthistory* by explaining that, in light of

contemporary understandings of postcolonial theory, art history was currently undergoing various forms of reinvention because it comprised a "framework developed for the study of a single tradition."[37] For Onians, neuroscience offered a solution to the art historical problem of understanding the social contingency of diverse cultural experience by positing empirical observations that could be universalised across the human species.

> After all, whatever the social and cultural differences between individuals and groups making and using art at different times and in different places, they all share, and have always shared, a common biology. Being members of a single species that left Africa perhaps only sixty thousand years ago, they all had the same genetic make-up, and this meant that their brains were essentially the same, the formation and operation of their neural apparatus being governed by the same principles.[38]

Aligning himself with recent neuroscientific investigations by Norman Bryson, Onians claimed, through Bryson, that "subjectivity is an even more real phenomenon than he and others had realised, being formed less by ideologies and discourses than by cerebral and visceral experiences."[39] What Onians neglected to mention, however, was the fact that, like art history, neuroscience was also a Western cultural tradition and that the findings of neuroscience emerged provisionally within a critical, contingent and negotiated discourse. While the biophysical phenomena of aesthetic experiences do indeed demand acknowledgement from art historians, it is far too easy, and culturally naive, to fully delegate that task to the empirical authority of science.

Onians elided the interdisciplinary challenges of neuroaesthetics by deploying the contemporary findings of neuroscience as empirical validation for

past art historical inquiry. He positioned the empiricism of neuroscience as a welcome return to nature, in contrast to deconstruction and poststructuralist theories that, in his opinion, over-emphasize the importance of cultural context in the creation of meaning in art. [40] Onians should be read in the context of other contemporary art and science theorists, such as Dennis Dutton[41] who strive to justify art's importance by imbuing it with scientific authority but neglect to account for the critical negotiations that comprise scientific practice.

By contrast, Barbara Maria Stafford took a different approach in her comprehensive book *Echo Objects, The Cognitive Work of Images*, critically engaging a wide-range of neuroaesthetic issues and debates. Acknowledging the negotiated and contingent aspects of neuroscientific knowledge she took up issues such as the universal grammar of form, the implications of mirror neurons for mimesis and empathy, the relationships between geometric pattern and hallucination, and more. Stafford's central theme, to which she returned repeatedly, was that artworks themselves manifest cognition by facilitating a process of synthesis and assemblage in which the audient's automatic neural systems of perception intertwine with volitional attention, situating the brain in reciprocal relation with the body, other people, and the environment. She traced art historic precursors to contemporary neuroaesthetic theory, paying particular attention to the associationists of the Romantic era who believed in a universal grammar of form. Stafford argued, however, that much of the neuroaesthetic literature tended to privilege automatic neural processes, and thus ignored the

possibility that conscious thought might sometimes play an important role in art experience.[42]

Stafford aimed, in part, to validate conscious and wilful attention as a viable subject of neuroaesthetic study that ought to be considered alongside the nonconscious processes already embraced in the field. She imbued this argument with a certain urgency, worrying that the contemporary techno-media fosters the automation of intelligence and the fragmentation of subjects into component parts.[43] A particular capacity of certain artworks, she argued, was to "snap [viewers] to attention: they make [viewers] awake and aware of the present."[44] For Stafford, art served to make audiences aware of their own cognitive processes as they directed their attention to the task of combining diverse elements into a meaningful synthesis. While she accepted and embraced the neuroscience of nonconscious perception, she resisted bottom-up models of the brain and, drawing from cognitive scientist Andy Clark, argued instead for a theory of extended mind, formulating cognition as a distributed relational network in which the nervous system and its environment could be considered co-constitutive and entangled.[45] The argument Stafford advanced was not that conscious modes of engagement should be privileged over nonconscious processing, but that the two should be considered in concert.

While Stafford identified value in the work of Zeki and Ramachandran for reconsidering the "formal side of historical art making,"[46] she questioned the limitations of the bottom-up model that they employed. She explained that, "[t]he

difficulty with this atomization of the processes of segmentation is that it can have the effect of dissociating seeing from thoughtful, that is, learned action."[47] Examining dozens of diverse artworks – including emblematic engravings from the 16th and 17th centuries; landscape, still life and portrait paintings from the 18th and 19th centuries; and contemporary video, photo and collage works by artists as diverse as Joan Jonas, Andy Goldsworthy and Warren Neidich – Stafford argued that the composite image was "the prototype for how [viewers] integrate sensation and concept."[48] She emphasized that the cognitive work of unifying disparate visual elements demands active attention and foreknowledge as well as automatic, nonconscious neuro-visual response. In contrast to Onians, for whom the role of conscious thought in art experience was overrated,[49] Stafford problematized the polemic between nonconscious and conscious processes that other neuroaesthetic researchers sought to reinforce.

Stafford's neuroaesthetic contribution is invaluable for several reasons. Firstly, her comprehensive research into a variety of conflicting neuroscientific models gave her a critical perspective, and she understood that neuroscience itself was a negotiated, critical discourse. In contrast to Onians, Stafford did not confer neuroscience with the authority to validate or invalidate aesthetic propositions, rather she considered artworks themselves as theoretical agents capable of generating knowledge and provoking questions about embodied aesthetic experience. Thirdly, she insisted on the role of conscious thought, suggesting that neuroaesthetics must expand in order to account for the importance of volitional

attention as a condition of aesthetic experience. Finally, Stafford also acknowledged that the interdisciplinarity of neuroaesthetics required some humility and a suspension of disciplinary authority. Those in the humanities, she suggested needed to concede that there are lawlike, or physiologically determined, aspects to art in that automatic neural systems are involved in perception. In return, neuroscientists needed to concede that art is not just an illustration of modular brain function, but in itself performs cognitive work. "Compound images in particular," she argued, "are the medium or interface where world and subject get co-constructed, that is, echoically presented to one another's view."[50] In this way, she located artworks as the engines of her neuroaesthetic theory, while at the same time emphasising the role of conscious awareness as an important facet of the art experience.

Ramachandran and Hirstein inaugurated the neuroaesthetic debates by provocatively suggesting that neuroscience could provide universal explanations for human art experience based on nonconscious neural processes. In doing so, they dismissed previous art historical research on the science of perception, blatantly neglecting to contend with theories put forward by Ernst Gombrich decades before, to advance their own theory that privileged a mechanistic model of the brain. Zeki also made bold disciplinary assertions implying that no theory of aesthetics would be adequate if it was not based on the laws of the brain. At the same time, however, Zeki advanced his investigation into insightful, speculative territory, probing beyond the limits of neuroscientific experiment and positioning

the brain as an organ seeking knowledge in active engagement with the environment, rather than a passive machine awaiting inputs. Onians attempted to imbue his speculative neuroaesthetic historiography with an empirical authority derived from neuroscience, but failed to account for any of the epistemological complexities of negotiating knowledge claims across disciplines. He made a conceptual leap between the fact that neuroscience tends to focus on the study of nonconscious neural processes and his own assertions that those processes alone are sufficient to explain the perception of art. Finally, Stafford introduced epistemological contingency to the interdisciplinary discourse by researching neuroscientific models that problematize Ramachandran and Zeki's assertions. As an art historian, she joined the neuroaesthetic conversation with a combination of disciplinary confidence and critical questioning, demonstrating that the dichotomy between nonconscious and conscious experience remains unresolved even within the discipline of neuroscience and advancing art historical theories of perception to help illuminate and usefully complicate the interdisciplinary neuroaesthetic discourse.

In this section, I have provided a brief overview of some foundational texts in the neuroaesthetic literature, linking territorial conflicts emergent in the interdisciplinary discourse with cross-disciplinary privileging of nonconscious over conscious experience of art. My aim has been to draw out key themes in neuroaesthetics, rather than to provide a comprehensive report on the literature. In part due to Zeki's high profile and influence, a variety of neuroaesthetic

experiments are now being conducted in various neuroscience labs, under various auspices around the world, and more art historians and theorists are taking up neuroaesthetic lines of inquiry. While the discourse still contends with interdisciplinary conflicts and provocations, many researchers from both art and science express understanding and respect for the epistemological opportunities afforded by one another's disciplines. For the remainder of this section I will briefly introduce some of this research.

In 2009, neuroscientists Martin Skov and Oshin Vartanian published an anthology, *Neuroaesthetics*, representing key neuroscientific research projects. The editors explicitly stated that their book was targeted to the "broader science community" in an effort to justify neuroaesthetics as a "basic part of the larger neuroscience program."[51] Skov acknowledged, however, that "neuroaesthetics needs to work in tandem with traditional aesthetics as a starting point."[52] In particular, the editors remarked that aesthetic functions were "phenomena that characterize our interactions with a wide array of objects..."[53] and that neuroaesthetic researchers needed to define what is meant by aesthetics. In one of the essays in the anthology, neuroscientist Steven Brown and independent scholar Ellen Dissanayake asserted that, "As presently conceived, neuroaesthetics has no way of distinguishing art from nonart."[54] Rather than simply forging ahead with empirical research into the neural anatomy of aesthetic experience, Skov, Brown and Dissanayake requested a disciplinary pause, and then stepped back to re-assess the foundational terms of the investigation. Brown, who is director of the

NeuroArts Lab in the Department of Psychology, Neuroscience and Behaviour at McMaster University, frequently engages in both formal and informal collaborations with artists, art historians and others in the humanities whose research may inform his work.[55] This kind of collegial approach on the part of neuroscientists will serve neuroaesthetics well.

Some art historians are also effectively taking up neuroaesthetics from non-defensive positions. Whitney Davis, for example, seriously engaged Zeki's theory of vision as an active process of configuring the world in an essay for the online journal *Nonsite* published out of Emory College of Arts and Sciences.[56] I will discuss Davis' essay in more detail presently, but for now I want to emphasise that he neither dismissed Zeki's claims nor appropriated them to validate his own claims. Rather, Davis undertook to think deeply through certain implications of Zeki's theory of the brain as an active, knowledge-seeking agent, to formulate his own speculative notion of visuality, or "socially constructed ways of seeing,"[57] informed by both art history and visual culture. In Zeki's research, Davis found support for his own extension of neuroaesthetics to engage with the contingency of cultural conditioning as fundamental to art experience.

As diverse researchers continue to join the neuroaesthetic discussion, the need for interdisciplinary context becomes more urgent. In the following sections of this chapter, I will examine how theories of embodied perception emerging in art history, science studies, and cognitive neuroscience and affect theory resonate

with and problematize neuroaesthetic dichotomies between conscious and nonconscious experience.

Art Historical Polemics of Presence and Representation

As the duality between conscious and non-conscious processing has been problematized by some neuroaesthetic researchers, art historians have begun to query similar and related dichotomies. Every researcher mentioned here has characterised the polemic differently, but the conundrums they've articulated are interconnected. Margaret Iversen and Stephen Melville recently troubled an art historical dichotomy between reading and seeing an image and in 2005 George Didi-Huberman drew on turn of the century art historian Aby Warburg to situate his own method of contending with the illegible aspects of artworks' materiality in direct opposition to Irwin Panofsky's rational method of iconology developed in the early 20th century. In 2008, Keith Moxey drew on Didi-Huberman, among others, to name an emerging polemic between art historical attention on artworks' representational capacities and their material presence. Rosalind Krauss positioned her 1993 work on the "optical unconscious"[58] – in which she configures vision as an irrational, embodied and psychologically inflected process – in opposition to what she understood as Clement Greenberg's reification of vision as autonomous, transcendent and timeless. Each of these art historical inquiries connects thematically to the neuroaesthetic dichotomy of conscious and nonconscious processes outlined above because each articulates a desire to

theoretically reconnect sensory perception with the intellect and culturally inflected modes of knowing.

This section begins with an outline of the art historical polemics of perception troubled by Iversen and Melville, Moxey, Didi-Huberman and Krauss. I will then proceed to make a case that Susan Buck-Morss' notion of the "synaesthetic system" offers a useful framework for considering embodied experience as an integrated dynamic between the perceptions of the senses and knowledges emerging through worldly, cultural engagements. I will conclude this section by applying this critical framework to two neuroaesthetic propositions: a collaboration between art historian David Freedberg and neuroscientist Vittorio Gallese who employed neuroscientific findings to propose that artworks communicate nonconsciously and without cultural mediation, and Whitney Davis' essay on neuro-visuality, mentioned above, in which he raised the important point that artworks, as distinct from many other objects of perception, have been "actively configured"[59] for audience perception, thus invoking a temporal process of recursion, or feedback, between conscious and nonconscious modes of engagement.

In their recent book *Writing Art History,* Margaret Iversen and Stephen Melville identified an art historical polemic between the senses and the intellect.

> Art-historical writing oscillates between two fundamentally different approaches to its objects. Some art historians and critics aim to "read," interpret or decipher the artistic "text." ... Others, however are critical of any approach to the work of art that diminishes our sensory-aesthetic experience of it. ... On the one hand, the work of art is more or less reducible to language, while

> on the other, it has nothing in common with it. As soon as one spells it out like this, it becomes obvious that either formulation is a travesty. Art and thought, seeing and reading, cannot be divided up in this way.[60]

In refusing to dichotomise seeing and reading, Iverson and Melville set up a premise of interconnectivity between sensory perception and conscious thought. The implication for art history is a return to aesthetic considerations that value embodied forms of knowledge without essentializing the body as a deterministic site distinct from cultural engagement.

Iversen and Melville's book informs neuroaesthetic theory, not only because they refused to polemicize the senses and the intellect, but also because they formulated sense perception as a culturally inflected mode of engagement. They elucidated this point by contrasting Irwin Panofsky's iconographic methodology with Martin Heidegger's ontological philosophy. "For Heidegger, they explained, "'de-distancing' is a dimension of what we are, whereas for Panofsky perspective is a tool we might or might not take up – a figure for method and not for existence."[61] Or, more simply, "....while Panofsky sees objects as available for interpretation, Heidegger sees them as given in interpretation, already caught up in interpretation simply in being the things they are."[62] Whereas Heidegger's formulation created a circular tautology in which observers could never fully detach themselves from the conditions of their observations, Panofsky set out "both to guarantee and, more importantly, to define 'objectivity.'"[63] In troubling art historical attachments to scientific objectivity Iversen and Melville made a valuable contribution that supports a critical reading of neuroaesthetic

literature and provides a warning for art historians, such as Onians, who might be tempted to appropriate scientifically derived empirical claims as validation for art historical analyses without considering the embodied and conditional subjectivities of scientific observers.

George Didi-Huberman has addressed the art historical conundrum of how to situate the material aesthetics of artworks in relation to cultural contexts. Like Iversen and Melville, he framed his argument explicitly as a form of resistance to Panofsky's rationalist iconological methodology. In his book *Confronting Images*, Didi-Huberman proposed an art historical epistemology to account for the material presence of images. Irwin Panofsky, he argued, championed a scientific system based on the legibility of signs and symbols in order to exorcise other, more chaotic kinds of understanding. Thus, according to Didi-Huberman, Panofsky was able to turn a blind eye to ways that images themselves could alter art historical epistemologies, and maintain a sense of methodological order.[64] Didi-Huberman chose instead to focus on illegible operations of images, drawing from both Aby Warburg and Sigmund Freud in his use of the term "symptom" to denote the way that images can manifest an "arborescence of associations or conflicted meanings."[65] Through his analysis of several canonical paintings – including Fra Angelico's *The Annunciation* in the Monastery of San Marco, and Jan Vermeer's *Girl with a Red Hat* – Didi-Huberman demonstrated how his notion of "symptom" emerges from the materiality of artworks, rather than from their signifying imagery.

Didi-Huberman lamented what he perceived as a shift in Panofsky's thinking away from the difficult questions posed by embodied perception toward a more legible methodology that foreclosed on the irrational dimensions of aesthetics. Before Panofsky left Germany for America, Didi-Huberman wrote, he posed a deeply critical question pertaining to aesthetic perception as a mode of knowing.

> How does "the relation of the soul to the world of the eye" express what becomes for each of us, "the relation of the eye to the world?" This is the basic question. It takes things in their nascent state, it already interrogates the phenomenology of perception from the following angle: *how does the perceived visible acquire meaning for us*?[66] [emphasis Didi-Huberman's]

Panofsky's early inquiry resonates with a contemporary neuroscientific question: how do the mechanisms of the brain produce consciousness? Specifically, for neuroaesthetics, how is it that perceptions take on meaning? For Didi-Huberman, the relationship of image to meaning necessarily involved the subjective domain of psychology, and he found a similar embrace of the unknowable in Panofsky's earlier writings. Didi-Huberman demonstrated, however, how Panofsky eventually abandoned the unknowable in the rationalist art historical methodology that he derived. Thus, Didi-Huberman argued, Panofsky developed a system in which art could only speak to consciousness and the unconscious must therefore be denied,[67] and this denial of the symptom in the image led to a methodology that was incomplete. "[Panofsky] forbade himself – and forbade the history of art – from seeing, or rather confronting the moment when images do violence."[68] Panofsky's drive to make art history an objective, scientific practice gave him

license to read only what he wanted to read into the images he studied. Thus, his methodology denied the subjective position of the art historian and, for Didi-Huberman, elided the unknowable and potentially disruptive effects of artworks' material presence. Nevertheless, Didi-Huberman did not renounce Panofsky's rationalist method outright.

> Thanks to Panofsky's warnings, we know better just how the historian of art engages, at every instant, his reason and his "scientific" desire for verification: we know better just how we need not be afraid of *knowledge*. But despite Panofsky's exorcisms – and thanks to the risks taken before him by Aby Warburg – we also know how we needn't be afraid of *not knowing*. We must, in this history, have the courage to confront both parties, both "pictures"....[69]

Just as Iversen and Melville refused to choose between seeing and reading, Didi-Huberman advocated an art historical methodology to simultaneously entertain both reasoned and irrational engagements with art.

In a 2008 essay surveying recent research in visual studies, art historian Keith Moxey posed the question, "Is it possible to conceive of the image as both a representation and a presentation at the same time?"[70] He identified a theoretical polemic between ontological and semiotic approaches – between those who consider art images as presences and those who consider them as representations. Drawing, in part, on Didi-Huberman, Moxey suggested that the art historical discipline was turning away from semiotic methodology in favour of a more sensorial approach.

> Bored with the "linguistic turn" and the idea that experience is filtered through the medium of language, many scholars are now convinced that we may sometimes have unmediated access to the

> world around us, that the subject/object distinction, so long a hallmark of the epistemological enterprise, is no longer valid.[71]

Here, Moxey made a valuable contribution in naming an axis of tension between postmodern analyses of cultural conditioning and a growing restiveness about the ways in which such linguistically derived analyses have been understood to invalidate, or render irrelevant, the sensed perceptions of the body. As I will argue in detail in Chapter Six, however, while claims for unmediated access to the world would seem to privilege the senses, they in fact deny the role of the senses as cognitive modes of knowing by stripping them of social and cultural inflection. In raising the polemic between presence and representation, Moxey, perhaps inadvertently, reinforced the dichotomy as he explicitly formulated an art historical return to presence as part of a reaction against social history.[72] At the same time, however, he also tentatively acknowledged that formulations of presence and representation may not be mutually exclusive, and that both "add power and complexity to our current understanding of the visual."[73] Thus, while Moxey maintained a more polemic stance than Iversen and Melville or Didi-Huberman, he did identify an heuristically useful dichotomy between ontological and semiotic modes of analysis and opened the possibility that it may not be necessary to resolve to one mode or the other.

Unfortunately, Moxey's polemics elided feminist art historical contentions with the body. While he acknowledged formulations of situated subjectivity invoked by feminist thinkers Irit Rogoff and Donna Haraway, he posited their standpoints in opposition to a list of largely male art historians who, he claimed,

addressed the materiality of objects rather than contextual cultural conditions. Moxey implied that the art historical attention to materiality he identified was a recent phenomenon arising in opposition to postmodern cultural analyses, and thus he neglected a long history of feminist contention with Cartesian polemics of body and mind. Feminist artists of the 1970s, for example, vigorously asserted the body as a site of subjectivity, while subsequent feminist, postcolonial, and queer theorists objected to essentialisms emerging from over-identification with the body as a fixed site of identity. For example, in her 1990 book *Gender Trouble*, feminist philosopher and queer theorist Judith Butler accounted for gender as "*a corporeal style*, an 'act,' as it were, which is both intentional and performative, where 'performative' suggested a dramatic and contingent construction of meaning."[74] Butler situated her view on materiality within an argument that pointed exclusively to discursive modes of being, and potentials for political change within those modes. Thus, she made an explicit refusal to discuss the body as an *a priori* material entity. For Butler, any statement about the body as matter was, inherently, in itself a normative social construction, and for her to make such a statement would be to undermine her own deconstructive efforts.[75] Thus, she charged any address to the materiality of the body with reductive essentialism, giving rise to misunderstandings that she therefore denied the existence of material reality.[76] In fact, one could argue the opposite; Butler's concerns about addressing material reality as such could be construed as a respect for the ontology of the body that she refused to obscure by making declarations that

could not, in fact, be ontological. In any case, Butler's complex and nuanced discourse represents one of the important feminist contributions to discussions of the body as a culturally inflected site that Moxey's polemic elides.

While Butler's discursive approach to the body has been (mis)read as a denial of corporeal experience, feminist art historian Rosalind Krauss explicitly entangled the senses and the intellect in her revisionist book on modernism, *The Optical Unconscious.* She challenged the self-referential logic of Greenbergian high modernism as it carved out zones of autonomy for the senses, treating vision itself as an "abstract condition with no before and no after."[77] Greenberg's materiality of media opened into a disembodied zone of optical transcendence, detached from not only the other senses of the body, but also from the cultural and historical conditions of the art experience. Krauss problematized the modernist paradigm that positioned each artistic discipline as "grounded in its unique and separate domain of experience,"[78] addressing vision explicitly as a fully embodied mode of perception. Resonating with Didi-Huberman's challenge to Panofsky, Krauss' version of modernism, written "against the grain" of Greenberg, was concerned with the unchartable "blind, irrational space of the labyrinth"[79] rather than the clean and tidy optics of the grid. As Didi-Huberman drew from Freud to describe how images can haunt us through "symptom," Krauss drew from Lacan to show how relationships of self to vision are always processual and cyclical.[80] She coined the term "optical unconscious" to describe the temporal, carnal and irrational aspects of vision that haunt the modernist paradigm.

If, as Krauss suggested, cognition is corporeal, then perceptual stimuli, including vision, can neither be disengaged from the infinitely heterogeneous conditions of culture, nor from the irrational processes of biology. Susan Buck-Morss, in her cautionary critique of modernity's splitting of subject, body and agency, posited a similar entanglement in her theorization of the "synaesthetic system."[81]

> The nervous system is not contained within the body's limits. The circuit from sense-perception to motor response begins and ends in the world. The brain is thus not an isolable anatomical body, but part of a system that passes through the person and her or his (culturally specific, historically transient) environment. As the source of stimuli and the arena for motor response, the external world must be included to complete the sensory circuit.[82]

Writing in the 1990s, Buck-Morss was responding to Walter Benjamin's proposal from 1936 that the aestheticization of politics was fascist, and the best form of resistance was the politicization of art. In her sensorial history of early modernism, she showed how aesthetics has come to mean a dulling of the senses, a splitting of the subject, the body and the environment that dangerously persists in the present day. The modern myth of autogenesis, whereby man creates himself, hinges on an Enlightenment construction of rationality that denies the uncontainable excesses of the senses and consequently the feminine and homoerotic aspects of corporeal experience.

In the political context of the 1970s, asserting female subjectivity meant contending with modern dualisms, and one prevailing strategy adopted by feminist artists such as Carolee Schneeman and Ana Mendieta was to celebrate

and valourize the elements that had been traditionally delimited and demeaned as feminine – nature and body. Whereas the body was challenged and revisioned in the celebration of its excesses by feminist theorists such as Carolyn Merchant, elisions between gender subjectivity and the material body carried a constricting form of essentialism. The challenge facing feminists such as Krauss and Buck-Morss was not to further essentialize the body as excessive, but to rethink dualism altogether – positing bodies as socially situated entities with cognitive capacities. I wish to bring such feminist constructs forward into neuroaesthetics, retaining Butler's lesson that identity categories are co-constituted by that which they exclude.[83] Thus, in this dissertation, I argue for a neuroaesthetic methodology that situates the physiological and cognitive capacities of brains/bodies within the contingencies of their cultural contexts. Buck-Morss' synaesthetic system is useful here, situating the biophysics of the sensing body as part of a larger system of engagement with the world that entails cultural and historic specificities.

Cartesian duality persists in contemporary art historical investigation as a dichotomy between social construction and sensorial perception in the analysis of artworks. Neuroaesthetics, for some art historians such as Onians, has provided resolution by seemingly obviating the need for consideration of cultural difference. Onians was not alone in embracing neuroscientific findings as epistemological alternatives to social construction for art history. In 2007, art historian David Freedberg and neuroscientist Vittorio Gallese teamed up to apply mirror neuron theory to aesthetic experience. I will discuss the shifting

neuroscientific discourse around mirror neuron theory in Chapter Six. For now, it is enough to understand that mirror neurons are small groups of brain cells that activate the same way when one is performing a particular action, or observing that same action performed by another. In suggesting that mirror neuron activation provided an "embodied simulation" of another's experience, Freedberg and Gallese explicitly argued against the "primacy of cognition in responses to art."[84] The authors situated their theory in direct opposition to the "new art history of the 1970s" which, in their words, insisted on "purely historical, cultural and social factors in responses to art."[85] Given the vehemence with which they dismissed social construction, Freedberg and Gallese's adaptation of neuroscience as providing direct access to materiality can be read, in part, as a backlash against the difficult questions posed by feminist and queer theory. Political standpoints, aside, however, their polemic framed the compelling proposition that viewers were able to experience the meanings of artworks physiologically, responding empathically to the poses represented in figurative works or to the movements indexed in gestural abstractions. This raises the question: is it really necessary to dismiss cultural conditioning in order to consider material response to artworks?

The polemic that Freedberg and Gallese invoke between embodied and socially conditioned responses to art relies on the assumption that the body and society operate as distinct spheres of influence on aesthetic experience. Art Historian Whitney Davis, who is versed in queer theory, has taken some steps towards problematizing such nature/culture dichotomies. As mentioned above, he

wrote an essay conjoining art historic and neuroscientific knowledges in his concept of neurovisuality. "By 'visuality,'" he explained, "art historians mean socially constructed ways of seeing, *Sehformen* as Heinrich Wölfflin called them, often shaped in interaction with styles of art, depiction, and built form (often called 'visual culture')." Neurovisuality, for Davis, referred to "the neural circuitry laid down in populations of people using just those artifacts visually in the ways in which they were culturally intended. "[86] Like both Stafford and Buck-Morss, Davis expressed an urgent contemporary need to assess the cultural contingency inherent to visuality as an embodied capacity because of the ways that techno-media may be conditioning their users' sense of vision in fundamental ways. For Davis, the discursive descriptions of art historians and neuroaesthetic "read-outs" of brain activity generated by laboratory experiments could be "fully translated into one another" because, "taken on their own terms, they are different representations of what we can see (or of what is seen by us) when apprehending the painting as an artwork."[87] Davis acknowledged, however, that neuroaesthetic experimental methodology was not yet developed to the extent that a direct parallel could be drawn between neuroscientific and art historical forms of knowledge. In assessing the problem, he suggested, as I do in this dissertation, that artworks present a particular kind of address that can not be replicated in neuroscientific imaging experiments.

> [W]hen we look at things that have been *actively configured for our seeing as actively configuring what is seen* we aestheticize *twice over* or in a feedback loop, redoubling the aesthetic momentum of seeing: we paint the painting painted for our

> painting of it–*re*paint it. This recursion or redoubling is a necessary condition for neurovisuality even though it may not be sufficient for it.[88]

Because the experience of artworks entails the conscious knowledge that they have been intentionally created in order to facilitate aesthetic response, art works make an address to conscious thought at the same time that they present affective stimuli to the biophysical sensorium. Thus, the audient is invited into a recursive awareness of their own processes of perception as they are taking place. While Davis did not state it explicitly, his insight implied that conscious processing is integral to aesthetic experience even at non-linguistic levels of apprehension. In Chapter Two I will discuss technical barriers that prevent fMRI imaging experimenters from producing "read-outs" that can account for this kind of meta-level processing. For now, my aim is to emphasize Davis' points that the particular address that artworks make to viewers is currently not quantifiable through neuroscientific imaging, and, furthermore, that artworks address the senses and intellect simultaneously, facilitating a neuroaesthetic awareness of perception as a cognitive mode of knowing.

Art historical investigations into embodied art experience inform and broaden neuroaesthetic inquiry by troubling traditional dichotomies between the senses and the intellect. Iversen and Melville delineated an art historical epistemology that conjoined seeing and reading. While Didi-Huberman likewise enacted an art historical methodology that embraced both the knowable and the unknowable as valid objects of research, Rosalind Krauss explicitly positioned

corporeal perception of art as a psychologically inflected mode of cognition. Addressing aesthetics as a philosopher of social and political thought, Susan Buck-Morss proposed her notion of the synaesthetic system, offering an effective model for how to conceive of the perceiving body as a cultural entity. While Moxey elided important feminist work on embodied art experience, he nevertheless made an important contribution by delineating axes of tension between representation and presentation, historically situating a contemporary turn toward material objects as a form of backlash against the discursive cultural constructions of postmodernism. This backlash is evident in the collaboration between Freedberg and Gallese, who enlisted neuroscience to formulate a neuroaesthetic theory that by-passes cultural contingency, positing embodied perception of artworks as an unmediated form of communication. Davis, on the other hand, retains cultural contingency in his neuroaesthetic formulation of neurovisuality as a recursive confluence of sensory perception and intellectual knowledge. In each case, these researchers have articulated the interconnected nature of body and mind, and their work thereby deepens and extends neuroaesthetic understandings of the relationship between conscious and nonconscious processing. In particular, Didi-Huberman, Krauss and Davis have demonstrated that art historical investigations can produce rigorous examinations of biophysical materiality without the need to bracket out social considerations. In this, their research resonates closely with theories that have been put forward by

philosophers of science who strive to collapse epistemological dichotomies between nature and culture.

Collapse of Nature/Culture Emerging from Science Studies

The prevailing emphasis on nonconscious processing in the neuroaesthetic literature stems from methodological constraints in neuroscientific experiment that privilege nonconscious processes as valid objects of study. In Chapter Two I shall explain these constraints in detail. Here, I wish to emphasise that many influential neuroaesthetic scholars, such as Ramachandran, Zeki and Onians, have positioned nonconscious brain function as a natural phenomenon – and thus a valid object of scientific inquiry – associating conscious processing with the realm of culture, a zone of influence about which neuroscientists can only speculate. Buck-Morss' synaesthetic system offers an alternative model that positions cultural influence as integral to the natural processes of perception, and the art historical research mentioned above also supports an interdisciplinary neuroaesthetic framework for considering nature and culture as co-constitutive aspects of the art experience. In this section I draw further support from three philosophers of science, Bruno Latour, Donna Haraway and Karen Barad, each of whom has explicitly set out to challenge the ways that traditional notions of the scientific method have reinforced a false dichotomy between nature and culture. Their investigations also problematize the polemic, invoked by Moxey, between discursive and perceptual modes of knowing.

Latour argued that the nature/culture polemic had been forcefully expressed in a modernist dichotomy between modes of knowing that was never valid in the first place. In his words, "we have never been modern."[89] Haraway, writing in conversation with Latour, advanced an heuristic model of "situated knowledges," a feminist framework designed specifically to account for the integration of material reality and cultural contingency. Karen Barad engaged with both Latour and Haraway, drawing from quantum physics to posit her theoretical formulations of "intra-action" and "agential materialism" which reconfigure matter itself as a temporal network of mutually inflective processes rather than a collection of fixed and predetermined objects.

In a curatorial essay written in 2002, Latour challenged theoretical dichotomies between discursive construction and empirical reality.

> If westerners had really believed they had to choose between construction and reality (if they had been consistently modern), they would never have had religion, art, science, and politics. Mediations are necessary everywhere. If you forbid them, you may become mad, fanatic, but there is no way to obey the command and choose between the two-polar opposites: either it is made or it is real. That is a structural impossibility, an impasse, a double bind, a frenzy. It is as impossible as to request a Bunraku player to have to choose, from now on, between showing his puppet or showing himself on the stage.[90]

The reason "we have never been modern," according to Latour, is that modernity enforced a false dichotomy between nature and culture. Social scientists may have debunked ordinary people for naive beliefs that power came from what he termed the "objective properties intrinsic to the nature of things" when in fact objects were empty surfaces upon which the normative values of society were inscribed.

Conversely, social scientists may have *also* debunked ordinary people for naive beliefs in volition and free will, when in fact the nature of things governed our behaviour. In either case humans came out as puppets, devoid of agency.[91] Continually deflecting agency, and thus responsibility, from nature to culture and back again, Western moderns have actually proliferated nature/culture hybrids, or "quasi-objects" such as the hole in the ozone layer, hybrid corn, digital machines, etc. Nature and culture, however, have never actually been separated – just as humans have always produced hybrids, so too the modern device of assigning nature and culture to different spheres has allowed the modern production of even more hybrids.

Latour, then, is not postmodern, rather he is amodern, meaning that he rejected the notion of modernity altogether. As he described it, postmodernism, like modernism, was a symptom of the modern culture/nature split. Postmodern theorists no longer believed in the guarantees of modernism, but they could not take action because postmodernism dismissed all empirical work as illusory, which left debunking and denouncing as the only remaining options. Latour called for theoretical deployment instead of unveiling, and interdisciplinary fraternizing instead of debunking.[92]

He explained that the disciplinary separation of facts (science), politics (sociology) and discourse (deconstruction) have brought modern Western culture to an impasse where agency (i.e., responsibility) has been consistently deflected.[93] Latour's motivations were in part ecological. Using the hole in the ozone layer as

an example of an empirical manifestation, politically determined and discursively potent, he pointed a finger at Jacques Derrida, expressing frustration at those who would "make fun of the belief in a reality."[94] He acknowledged that yes, the ozone layer could be figured as a discursive construction, but it also had material consequences and material origins. Thus, Latour asserted a human capacity to impact the material world and a human accountability to the material consequences of human actions, while at the same time asserting the influence of the material world as fundamental to the formulation of cultural constructs.

A further aspect of Latour's formulation, important for neuroaesthetics, is that he ascribed agency to non-human, and even inanimate, entities: "The reopening of the question of agency in terms of climate," he explains, "and more generally in terms of ecological crisis, is one of the things that makes my position, which seemed strange earlier on, completely common sense ... humans are not the only ones making agencies in the world.[95] Human and non-human actors including technological apparatus, contribute to knowledge in the science lab in an interconnected web that Latour terms an assemblage. Scientific facts, then, must be understood as both constructed and real. "When we say that a fact is constructed," says Latour, "we simply mean that we account for the solid objective reality by mobilizing various entities whose assemblage could fail; 'social constructivism' means, on the other hand, that we replace what this reality is made of with some other stuff, the social in which it is 'really' built."[96] While Latour rejected the hierarchical, deterministic role that social constructivism

ascribed to culture over nature, he did not reject the social. Rather, he extended the concept of social interaction to include the inputs of non-human entities and material objects. Thus, both culture and nature inhere as co-constitutive dimensions of the real world.

Like Latour, Donna Haraway placed equal weight on both matter and discourse, seeking to problematize dichotomies between the two. In her 1988 essay, "Situated Knowledges: The Science Question in Feminism and the Privilege of Partial Perspective," Haraway posed a challenging feminist question.

> So, I think my problem, and "our" problem, is how to have *simultaneously* an account of radical historical contingency for all knowledge claims and knowing subjects, a critical practice for recognising our own "semiotic technologies" for making meanings and a no-nonsense commitment to faithful accounts of a "real" world, one that can be partially shared and that is friendly to earthwide projects of finite freedom, adequate material abundance, modest meaning in suffering, and limited happiness.[97]

In refusing to let go of either pole of the dichotomy between "radical constructivism" – the discursive formulation of science as a text – and "feminist critical empiricism" – an allegiance to a form of objectivity based on acknowledging and accounting for the world we inhabit – Haraway suggested that it was time to "switch metaphors,"[98] by which she meant to propose an alternative way of thinking about knowledge of the world.

Haraway's theory of "situated knowledge," was a way of activating the particular subjectivities of people engaged in specific, real life situations. Instead of operating as a detached and omniscient understanding, this kind of knowledge could never be totalizing as it was always inflected by both material

circumstances and cultural conditions. Situated knowledge provides an alternative to both "totalizing versions of claims to scientific authority" and to relativism, both of which, in Haraway's words, "deny the stakes in location, embodiment and partial perspective," making it "impossible to see well."[99]

Haraway theorized situated knowledge as a shifting mode of subjectivity. "The knowing self is partial, in all its guises, never finished, whole, simply there and original; it is always constructed and stitched together imperfectly, and *therefore* able to join with another, to see together without claiming to be another."[100] Science, then, could be construed as a "positioned" rational practice that did not produce final closure, but rather provisionally explored the "contestable and contested."[101] While Latour, to some extent, adopted a comprehensive, bird's eye view on networked assemblages that produce knowledge, Haraway argued that only partial knowledge could be objective, and any transcendental claims were thereby false.

Haraway, like Latour, argued for an embodied agency of non-human actors, but she arrived at this position through her engagement with the sex/gender debates in feminism and queer theory. While she was alert to the dangers of biological determinism that inhere in constructions of sex as a biologically determined "object," she also refused constructivist implications of the body as a "blank page for social inscriptions."[102] Whereas humanist science assumed that "nature is only the raw material of culture,"[103] instead, she argued, "the world encountered in knowledge projects is an active entity."[104] Haraway's

feminist situated knowledges formulated material objects as agents in the co-construction of knowledge, as distinct from resources to be limitlessly manipulated to human ends.

Karen Barad, a feminist philosopher of science who studied with Haraway, also questioned nature/culture dichotomies emerging through the sex/gender debates. In particular she challenged Butler, who explicitly refused to discuss the body as an *a priori* material entity.[105] "How," asked Barad, "did language become more trustworthy than matter?"[106] Barad welcomed critiques of, what she terms, representationalism – "the idea that beings exist as individuals with inherent attributes, anterior to their representation"[107] – from "feminists, poststructuralists, postcolonial critics and queer theorists."[108] While she acknowledged Butler's theory of performativity as an alternative,[109] she remained unsatisfied with what she saw as Butler's inability to ascribe agency to matter. In Barad's reading Butler set up matter as a "passive product of discursive practice."[110] Barad may have been overstating her case against Butler, whose concerns about addressing matter as such could be construed as a respect for the ontology of the body that she will not compromise by making declarations that cannot, in fact, be ontological. Such discursive convolutions did not satisfy Barad, however, and she set about to propose a formulation that could account for the contingent relationship between matter and discourse, at the same time extending the discussion of matter beyond the sexed, human body debated in identity politics[111] to include the non-human entities that factor in scientific knowledge.[112]

Barad drew directly on the "philosophy-physics"[113] of early twentieth century physicist Niels Bohr to formulate her theories of intra-activity and agential realism. In this her work speaks in dialogue with feminist philosopher Luce Irigaray, who, frustrated that quantum physics studies particles that can not be perceived, complained that science was moving too far away from first-hand observation of material objects and events.

> The scientific enterprise has entered a "universe" where sensory perception has almost no currency, a situation which could lead to the cancellation of the object at stake in physics: the matter (whatever its attributes may be) of the universe and of the bodies that constitute that universe.[114]

For Irigaray, quantum physics operated too much in the realm of discursive theory, divorced from the lived experience of perception. Indeed, Bohr's quantum physics did reject "things" as "ontologically basic entities,"[115] but Barad celebrated the extent to which he construed the interrelationships between matter, the scientist's subjectivity, and the apparatus (technology) employed as a mutually constitutive "relational ontology."[116] For both Bohr and Barad, it was the phenomena that arose in specific, local intersections of activity between various agents – none of whom, Barad implied, need necessarily be human – that constituted reality.[117] Barad named this dynamic of activity "intra-action," distinct from interaction which "presumes the prior existence of independent entities..."[118] For her, Newtonian physics, with its "God's eye view of the universe..." was a story that was "written into our bones."[119] But the indeterminacy of quantum, sub-atomic physics decentred this point of view. "All this 'quantum weirdness',"

wrote Barad, "(the display of an increasing array of uncanny phenomena) is actually 'quantum *queerness,*' and I don't mean simply strange. Q is for queer - the un/doing of identity."[120] For Barad, then, matter was one of several agents in the production of phenomena, materialized locally and conveying meaning that was relevant to the specific context of the intra-action. In this sense, objectivity was preserved for the scientific method, construed, as she stated, as a "local resolution *within* the phenomenon of the inherent ontological indeterminacy"[121] [emphasis Barad's]. Breaking from traditional scientific distinctions between nature and culture, and further breaking from constructive suggestions that culture either inscribes meaning on pre-existing bodies or produces material bodies,[122] Barad proposed instead that matter was "not a thing, but a doing, a congealing of agency."[123] In formulating matter as a process, rather than an object, Barad built on Latour's notion of cultural/natural assemblages and Haraway's construction of material objects as agents in the co-production of knowledge to formulate a philosophical position situating indeterminacy itself as an agential capacity of the material world.

While both Haraway and Barad shared common ground with Latour in their collapse of nature/culture dichotomies, both broke from him as well, calling for more radical, feminist reconsiderations of scientific epistemology. In her 1996 essay "Modest_Witness@2nd_Millenium," Haraway specifically challenged Latour, suggesting that he did not ascribe enough importance to the myth-making systems of techno-science.[124] For Latour, the Western phase of belief in

modernity's dualisms was over and hybridity had arrived. Haraway was worried, however, that contemporary technoscience was proffering narratives of salvation through the restoration of essentialist concepts of human nature. Barad, likewise, worried that while Latour invited the agency of non-human entities, his system did nothing "to address the kinds of concerns that feminist, queer, postcolonial, (post-)-Marxist, and critical race theorists and activists have brought to the table."[125] Barad was more sympathetic to deconstruction than Latour, pinpointing the "constitutive effects" of the exclusions in intra-active systems as well as the inclusions.

While Barad came to her theory through a deep engagement with quantum physics, her focus on agential materialism has implications for neuroaesthetics as well.

> The entangled practices of knowing and being are material practices. The world is not merely an idea that exists in the human mind. To the contrary, "mind" is a specific material configuration of the world, not necessarily coincident with a brain. Brain cells are not the only ones that hold memories, respond to stimuli, or think thoughts (where "holding," "responding," and "thinking" are intra-active engagements with, and as parts of, specific configurations of the world).[126]

Barad's distinction between mind and brain could not be reduced to Cartesian dualism because both, in her construction, were comprised of the stuff of the material world. Her suggestion that mind could be partly located in other forms of matter besides brain cells resonates with theories of embodied cognition emerging in neuroscience and philosophy of consciousness.[127]

Drawing from Latour, Haraway, and Barad, I situate aesthetic experience, whether it takes place in the lab or the gallery, as a form of performative assemblage in which embodied knowledge emerges from the collaborative input of all participating entities, human and non-human, conscious and non-conscious. In the gallery, the institution itself can be considered as an actor, as well as the social networks of funding bodies, colleagues, critics and historians within which that institution functions. In turn, the artist, audience, and curator are all actors, moreover, the artwork itself is an actor as are the technological systems of display. The aesthetic experience of art is thereby multi-dimensional, situated, partial, temporal, un-repeatable and material. By taking as much of the assemblage into consideration as possible, human actors are able to test their own experience against the other actors in the network and thus situate aesthetics as a collective form of knowledge.

Likewise in the neuro-imaging lab, the institution in which the lab is housed is an actor, as is the social network of funding bodies, colleagues and critics who inform and help establish the conditions of the research. The scientists who designed the study are actors, the subjects whose brain's are examined are actors, the technicians who run the MRI scanner are actors, the scanner is an actor and the stimuli that activate neuronal firing are actors. The neurons that fire are also actors, as are the data produced by the neuronal activations, the statistical formula applied to the data and the graphs and other images eventually produced. As in the gallery, the individual art experience in the lab is multi-dimensional,

situated, partial, temporal, un-repeatable and material. Under the conditions of experiment, if all goes well, multiple sets of data coalesce into findings that constitute provisional facts.

In both circumstances of the gallery and the lab, the process of knowledge involves many agencies, inclusions and exclusions. In each discipline, the assemblage is comprised of such different agents that the knowledge produced can't simply be transferred from one situation to the other in order to underwrite, authorize or explain the knowledge produced. Yet, actors in either the lab or the gallery can bring with them, as part of the assemblage, knowledge from the other discipline. So that in the context of the art gallery, for example, an audience member may wonder "What are my neurons doing now?" and use the question derived from the lab to posit hypothetical agents – one's own neurons – operating in aesthetic intra-action with all of one's other cells, thoughts, memories, sense perceptions, and affects. Formulations by Latour, Haraway and Barad support a neuroaesthetic methodology that relinquishes dichotomies between nature and culture in the context of art experience, formulating the materiality of the body as a process and thus bringing conscious and nonconscious processing together in situated and temporal engagements with art.

Perception and Interaction through Feedback and Affect

In proposing a temporal, neuroaesthetic co-constitution of body, mind and culture, I draw further support from theories positing feedback between the body and the

environment that have emerged simultaneously in neuroscience and cultural studies. Neuroscientist Antonio Damasio levelled an important challenge to his discipline when he insisted, in 1994, that the brain cannot be considered in isolation from the ongoing interactions of the body with the world. Likewise, in 2007, neuroscientist Warren S. Brown and philosopher Nancey Murphy published a co-written account of cognition as an ongoing process of feedback and interaction with the environment. In 2002, cultural theorist Brian Massumi introduced his concept of affect as an incipient state of physical intensity resonating in feedback networks simultaneously activated within the body and between the body and its perceived external stimuli. Cultural theorist and curator Jennifer Fisher has taken up affect theory in the context of aesthetics, examining affects of curation and display culture as collective modes of embodied engagement.

Most, if not all, neuroscientists are materialists, in that they believe mind is a material phenomenon of the organic brain. In his influential 1994 book, *Descartes' Error*, Damasio suggested that the materialism of brain science can work against the discipline's anti-Cartesian agenda.

> There may be some Cartesian disembodiment [...] behind the thinking of neuroscientists who insist that the mind can be fully explained solely in terms of brain events, leaving by the wayside the rest of the organism and the surrounding physical and social environment – and also leaving out the fact that part of the environment is itself a product of the organism's preceding actions. I resist the restriction, not because the mind is not directly related to brain activity, since it obviously is, but rather because the restrictive formulation is unnecessarily incomplete, and humanly unsatisfactory.[128]

Damasio suggested that the crucial philosophical problem for neuroscience was not a mind/brain split, but a brain/body split. Damasio researched the mysterious case of a 19th century victim of brain damage, Phineas Gage, who seemed to have miraculously retained all of his neurological functions after a metal spike was driven through his brain in an industrial accident. As years went by, however, Gage's life changed dramatically, formerly popular and successful, over time he lost his marriage, his job and his friends, eventually becoming lonely, depressed and dissolute.[129] Correlating the neurological data on Gage's injury with patients of his own suffering similar pathologies, Damasio surmised that Gage's brain damage had hampered his emotional processing. Gage was able to perform well on neurological tests conducted within the confines of the lab, but in the complex and unstructured flow of life experience, his inability to draw on the information of emotional stimulus made it impossible for him to make wise decisions. Emotions, Damasio argued, function as important indicators of body states, constantly inflecting cognition through the body's ongoing interactions with the world. For him, neuroscientific accounts of the brain should not isolate its function from the complex dynamics of embodied life experience.

Murphy and Brown similarly addressed the neuroscientific importance of feedback between the brain and the environment. They took ten years to write their book, *Did My Neurons Make Me Do It?* (2007). As Brown explained in an interview with Ginger Campbell (The Brain Science Podcast), it took them that much time to arrive at a mutual language, one that would have traction in both

neuroscience and philosophy.[130] Questions of agency drove their investigation. If the mind and body were determined by autonomic, inherited micro-processes how could people be held accountable for their actions? To address this question, Murphy and Brown delineated their theoretical framework of reductive materialism. In reductive materialism, which describes traditional neuroscience, the parts are seen to determine the behaviours of the whole. Conversely, the authors explained, in non-reductive materialism the behaviours of the parts are determined by the structures of the system in which they function.[131] Murphy and Brown's formulation was very similar to Buck-Morss' synaesthetic system in that it situated the brain and body in ongoing feedback relations with the world. Conventional neuroscientific models described the brain as functioning much like a mechanical device; sensory input entered through the body, was registered in the "lower" levels of the brain, and then travelled "upward" synaptically to the cerebral cortex where it eventually transformed into a conscious perception. This linear model was in many ways an heuristic tool, because the synaptic activity was not uni-directional. During a perceptual event, there was constant feedback in the brain, with as many, if not more, signals simultaneously coming "downward" through the system. Nevertheless, the neuroscientific study of isolated neural processes tends to emphasise a bottom-up, linear chain of events. Murphy and Brown argued for a model of top-down causation, but by this they did not mean to invert the bottom up model – which would infer causation on conscious processes

and imply that human thoughts determine human behaviour. Rather, they argue for a different kind of model altogether.

> A word on terminology. While "top-down causation" and "downward causation" are the appropriate contrastive terms to "bottom-up causation," and while these are the terms currently used in the literature, they are, unfortunately, open to misinterpretation. This happens when one forgets that "higher" in this context refers to two systems, *S* and *S'*, where *S'* is said to be a higher order system because it incorporates *S* and relates *S* to its environment; in other words, because it includes *S* and the effect on *S* of boundary conditions not themselves constituent of *S*. The discussions of downward causation in philosophy of mind usually fail to take this into account. Mental properties are said to supervene on brain properties, diagrams are drawn with the mental properties *above* the brain properties, and then the question is posed as to how the mental property "up there" can influence the brain property "down here." ... our account of the mental in terms of a brain event *in context* is in fact that it precipitates in a broader, more complex causal or semantic system.[132]

The top-down causation they invoked was not a matter of one kind of neural process driving another, but instead the complex dynamics of an entire system, including the body, the environments the body engages and the knowledges the body and brain accrue over time. "All organisms," they explained, "all biology, are in continuous feedback relation with the environment."[133] All forms of cognition, Murphy and Brown implied, were extensive with embodied experience.

While Murphy and Brown mined the interdisciplinarity of their collaboration to advance their notion of neural feedback, Brian Massumi similarly formulated interdisciplinary connections with neuroscience to propose resonant feedback between the brain, body and world as the process giving rise to affect. He provided a benchmark definition of affect in his 2002 book *Parables for the*

Virtual. Like Haraway and Latour, Massumi was concerned with the extent to which postmodern theory had engendered considerations of nature as a purely discursive construct. He nevertheless eschewed a romantic return to human nature, and, similar to Haraway and Latour, proposed instead the theorization of a nature-culture continuum. His goal, however, was not to restructure the epistemological paradigms of science, but to encourage the humanities into a negotiation with science in order that the humanities may better articulate their own particular strengths.[134] Influenced by Gilles Deleuze, Massumi adopted a show-don't-tell writing style, meaning that his writing itself performed discursive experimentation at the interstices of cross-disciplinary boundaries. For Massumi, the as-yet-undefined sites of in-betweeness offered the most generative possibilities for theorizing perceptual experience. Affect, then, comprised an embodied state of in between, equated with physical states of intensity. Massumi distinguished affect from emotion, suggesting that the former was not subjective, but rather resided in "autonomic" and "nonconscious" processes.[135] Affect, for Massumi was a state of potential, a moment between incipient action and action in which all myriad potential expressions were present. For Massumi, then, the virtual realm of potential gave affect its autonomy, implying a possibility of escape from local conditions. In this way, he reformulated constructivist contingency as a material phenomenon. Nature, he proposed, need not be understood as a cultural construct nor as transcendent to culture, but simply *as*

nature. Rather than collapsing nature/culture dichotomies, Massumi argued for the autonomy of affect as a means of acknowledging nature on its own terms.

In arguing for the autonomy of affect as a nonconscious phenomenon, Massumi drew on the neuroscientific bottom-up model of mind, as proposed specifically by neuroscientist Benjamin Libet who suggested that the seemingly agential dimension of "higher-order" conscious processes, such as volition, was an illusion produced by the deterministic behaviour of automatic processes triggered in the brain.[136] Here, I find Massumi's invocation of neuroscience troubling because, while his approach was more nuanced and informed than Onians, he nevertheless similarly drew on neuroscience as a means of pitting natural processes and cultural discourse in opposition to one another; associating nature with mechanistic bodily functions as construed by science, as if science itself were not itself a discursive, cultural process.[137] Massumi invoked neuroscientific models as an alternative to social constructivism, conflating nature with science, and thus inadvertently reinforcing nature/culture dichotomies rather than radically troubling them as Latour, Haraway and Barad have done.

At the same time, however, Massumi's formulation of affect did posit perception as a reciprocal process, similar to Murphy and Brown's model of mind as a system of feedback relations with the world. He situated affect as a contingent, interstitial concept, drawing on from theories of consciousness that refuse the Cartesian dualism of the mind/body split.

> [V]olition, cognition, and presumably other "higher" functions usually presumed to be in the mind, figured as a mysterious

> container of mental entities that is somehow separate from body and brain, are present and active in that now not-so- "raw" domain. Resonation assumes feedback. [...] The body doesn't just absorb pulses or discrete stimulations; it infolds contexts, it infolds volitions and cognitions that are nothing if not situated. Intensity is asocial but not presocial...[138]

For Massumi, affect was of the body, but the body also entailed mind – thus he understood the entire organism to be entangled in ongoing relation with its natural/cultural contexts.

Furthermore, Massumi wrote in a different disciplinary context from Latour, Haraway, and Barad; it makes sense that the materialist aspects of experience would need to be asserted more emphatically in the field of cultural studies, where discourse prevails, than in the field of science studies where the normative materialism of science comes under critique. As Massumi asserted, "part of the idea is to put the humanities in a position of having continually to renegotiate their relations with the sciences – and, in the process, to rearticulate what is unique to their own capacities (what manner of affects *they* can transmit.)"[139] I would assert, however, that Massumi's emphasis on science as the authority on nature does both science and the humanities a disservice. Massumi suggested that "the humanities need the sciences...a lot more than the sciences need the humanities."[140] It is certainly true that art theorists pose questions to scientists more frequently than scientists approach art theorists for information, but this may indicate that people in the humanities are by and large well aware of their need for the sciences, while scientists tend to isolate themselves from other disciplines, thereby limiting the kinds of questions that science deems worthy of

investigation. Neuroaesthetics is an exceptional field because some neuroscientists, such as Zeki, have opened up their investigations to new challenges posed by artworks, even if they are not yet fully engaged in reciprocal conversation with art theorists. In any case, for a truly entangled understanding of natural/cultural processes, it should not be necessary to ascribe primacy to one side or the other. One approach I would like to assert is to consider the affects of artworks as part of a collective assemblage of communication.

While Massumi posited affect as a material dimension of the perceptual process, he did not directly address it in the context of aesthetics. Jennifer Fisher, however, has made a feminist argument for considering affect as an embodied dimension of aesthetic engagement. In her 2006 essay "Exhibitionary Affect," she asserted that affect is "distinct from individually felt emotion," in that it "consolidates collectively sensed singularities of feeling."[141] By emphasising the collective nature of affects, Fisher described embodied art experience as inherently relational, thus avoiding essentialist notions of nature. As she explained in an earlier essay on haptic aesthetics,

> The aesthetic can be understood, first, as a relational form, one which can account for the connections attendant in processes of identification, social affiliation and discursive practice; and second, as involving sensory mediation of social states and cultural formations.[142]

Fisher has refused dichotomies which would champion either culture or nature as the privileged zone of aesthetic experience; instead, she has emphasized how affect, in part, operates as a material manifestation of collectively experienced

intensities. Her work demonstrates that art, considered in art contexts, can facilitate viable forms of knowledge about embodied experience.

Affect operates as a contingent, interstitial concept, in part because the term is derived from theories of consciousness that refuse the Cartesian dualism of the mind/body split. Massumi's invocation of feedback suggested that while he considered affect to be of the body, that body also entailed mind. In resonance with Murphy and Brown, Massumi situated the entire organism in ongoing relation with its natural/cultural contexts.

If I repeat myself in over-stating the importance of resisting culture/nature dichotomies, I do so because such dualisms are tenacious, as Murphy and Brown have identified.

> We [the authors] constantly need to remind ourselves (as well as our readers) that mental phenomena pertain to the entire person, both brain and body, in social relations (at least, past social relations if not present ones), and active (at least at times) in the physical world. This is easier said than done – we are as much children of Descartes as are our readers.[143]

Cartesian dualism would isolate the body as a natural organism, from the mind's association with social and cultural spheres. In this dissertation, I draw support from Murphy and Brown in formulating a neuroaesthetic methodology that positions nature and culture as co-constitutive spheres of influence in art experience. Notions of feedback invoked by Murphy and Brown and Massumi resonate with Buck-Morss' synaesthetic system, situating the body in ongoing reciprocal relation with its environment. At times in this dissertation I will invoke findings from neuroscientific experiments, not to explain how the natural brain

gives rise to cultural constructs in the mind, but rather to demonstrate how cultural experiences can emerge, in part, as physiological processes enacted in the body. Thus, I aim to activate neuroaesthetics in the analysis of specific artworks to demonstrate that even cognitive processes derived from collective cultural interactions constitute material processes of engagement between body, brain and world.

Art and the Brain

As this chapter may have implied, both art and the brain are strangely elusive and ineffable objects of investigation. In order to consider either, researchers must contend with collapsing and oscillating distinctions between subject and object. By bringing art and the brain together, neuroaesthetics reveals deep theoretical questions about the co-constitution of body and mind inherent to both neuroscience and art history. The brief public clash between Ramachandran and Gombrich, for example, reveals a difference of opinion about perception that is not necessarily commensurate with disciplinary difference. For instance, art historian Onians might agree with Ramachandran that perception is essentially a predetermined, passive process, while neuroscientist Zeki might be more sympathetic with Gombrich's art historical understanding of perception as an active negotiation with the world. Neuroscience and art history have very different methodological obligations and epistemological conditions, but this does not mean that the two disciplines are necessarily in opposition, just that their

modes of knowing are differently constructed and constrained. As neuroscientists and art historians increasingly engage in the interdisciplinary field of neuroaesthetics, researchers are challenged to develop more comprehensive understandings of the histories and contingencies conditioning one another's disciplinary knowledge claims.

As I have shown in the first two sections of this chapter, the privileging of nonconscious over conscious neural processes driven by neuroscience in the neuroaesthetic literature resonates with an art historical polemic between discursive constructions and material investigations, formulated by Moxey as a contemporary scholarly turn away from representation and toward the presence of artworks. Both of these dichotomies are informed and troubled by the art historical investigations of Didi-Huberman and Krauss each of whom argued for embodied modes of knowing as constituent dimensions of reasoned analysis. Buck-Morss' synaesthetic system operates here as a conceptual hub, and I rely on her articulation of the nervous system as an active and socially inflected perceptual entity in my proposition that a robust neuroaesthetic methodology can insist on the mutual co-constitution of body, mind and collective culture without ascribing hierarchical causality to any one sphere.

I have situated neuroaesthetics in the context of interdisciplinary frameworks established by Latour, Haraway and Barad each of whom collapsed distinctions between nature and culture in his or her refusal to confer priority over either material experience or discourse. I find Barad's assertion that "[t]he

entangled practices of knowing and being are material practices"[144] particularly helpful for highlighting the interconnectedness of knowledge and existence while at the same time emphasising that both emerge as physical manifestation. Finally, notions of feedback between body, mind and world emerging from both neuroscience and affect theory flesh out the interdisciplinary breadth of research on embodied experience that informs neuroaesthetic inquiry.

While the interdisciplinary range of this dissertation is vast, I believe that projects of this scope are critically necessary for neuroaesthetics to flourish. Unless the field's own interdisciplinarity can be queried and addressed, neuroaesthetics may flounder as a hodgepodge collection of reductive attempts to explain how the brain causes and determines art experience. Art historical interest in neuroaesthetics may have been kick-started, to some extent, by a cultural pendulum swing away from postmodern linguistic theory. But material reality is not a back-lash, and culture itself is also manifest in the physical morphology of organisms. Interdisciplinary thinkers such as Barad, Haraway, and Buck-Morss are uncompromising in their insistence that an embrace of material reality does not constitute an escape from cultural contingency. Artworks and art audiences, as it happens, are also expert at performing material manifestations within indeterminate contexts of shifting and infinitely variable conditions.

In this chapter, I have convened a constellation of thinkers to establish the interdisciplinary standpoint from which I will conduct my neuroaesthetic case studies in Chapters Three to Six. In Chapter Two, which follows this one, I will

report on field research into neuroscientific experimental methodologies, laying groundwork for my theorization that artworks in art contexts can facilitate neuroaesthetic modes of knowing that augment and sometimes challenge neuroaesthetic knowledges produced by neuroscientific means. •

End Notes to Chapter One

[1] My goal is not to translate various disciplinary knowledge claims into a common set of terms. For example, as a practicing curator and art theorist, my disciplinary obligations, in Stengers' terms, are different from those of neuroscientists, and I would misrepresent each epistemology if I tried to suggest that we share identical research questions within a singular frame of reference. Rather, I propose that effective communication occurs when researchers acknowledge and respect disciplinary differences. By bringing together texts from disparate disciplines, I aim to reveal how diverse researchers on embodied knowledge can challenge and extend one another's inquiries without demanding strict adherence to any single paradigm.

In embracing disciplinary difference, I am influenced by philosopher of science Isabelle Stengers who advocates an "ecology of practices" in which "no practice be defined as 'like any other.'" (Stengers, 184) As Stengers explains, "... the 'ecology of practices' first implies that whatever its goodwill, its practitioners will not cross the border of the practice it addresses without a transformation of the intention and the aim of the address, what is often called a misunderstanding." (Stengers, 189) Writing partly in response to the Science Wars of the 1990s, she acknowledges that the postmodern claim that "physics is a social practice like any other" was insulting to physicists who understandably frame their discipline as a result of specific, local sets of "obligations" that other practices do not share. (Stengers, 190) Drawing from Stengers, I attempt, to the best of my abilities, to address the knowledges produced by neuro- and cognitive science within their own disciplinary frames of reference. See, Isabelle Stengers, "Introductory Notes on an Ecology of Practices," *Cultural Studies Review* 11, no. 1, (March 2005): 183-196.

[2] Neuroscientist Daniel Levitin has published a popular and accessible book on the neurology of music. See, Daniel Levitin, *This is your Brain on Music: The Science of a Human Obsession*, (New York : Plume, 2007).

Neuroscientist Steven Brown, McMaster Institute for Music & the Mind in Hamilton is a co-contributor, with Ellen Dissayanake, to the anthology *Neuroaesthetics*. See, Steven Brown and Ellen Dissanayake, "The Arts are More than Aesthetics: Neuroaesthetics as Narrow Aesthetics," in *Neuroaesthetics* (Amityville: Baywood Publishing Company, Inc., 2009).

[3] V.S. Ramachandran and William Hirstein, "The Science of Art: A Neurological Theory of Aesthetic Experience," *Journal of Consciousness Studies,* vol. 8, no. 6-7 (1999): 15.

[4] After receiving negative criticism for the paper he co-authored with Hirstein in 1999, Ramachandran published a follow-up interview in which he makes the following confession.

> "We mainly did it for fun. Also we hoped the essay would serve to generate a useful dialogue between artists, neuroscientists, perceptual psychologists and art historians — to bridge C.P. Snow's two cultures. The article was intended to be whimsical, provocative and slightly tongue-in-cheek, and to serve as a starting point — it certainly wasn't intended to be a complete theory of art (even assuming there *is* such a thing!)." See, V.S. Ramachandran, "Sharpening up The Science of Art: An Interview with Anthony Freeman," *Journal of Consciousness Studies,* vol. 8, no. 1, (2000): 9.

Ramachandran and Hirstein certainly succeeded in starting a debate, and their controversial paper introduced the concept of neuroaesthetics with a bang.

[5] Ramachandran and Hirstein, "The Science of Art: A Neurological Theory of Aesthetic Experience," Ibid., 24.

[6] Ibid., 18.

[7] Ibid., 18.

[8] E.H. Gombrich, "Concerning 'The Science of Art': Commentary on Ramachandran and Hirstein," *Journal of Consciousness Studies* 7, no. 8/9 (2000): 17.

[9] John Hyman, "*Art and Neuroscience,*" in *Beyond Mimesis and Convention*, Boston Studies in the Philosophy of Science 262 (Boston: Springer, 2010) [first published online at *Interdisciplines*, (2000) www.interdisciplines.org
(accessed July 2010)

[10] Ibid.

[11] Ramachandran and Hirstein, Ibid., 23, 30.

[12] E.H. Gombrich, *Art and Illusion*: *A Study in the Psychology of Pictorial Representation* (Princeton & Oxford: Princeton University Press, 2000), 50.

[13] Ramachandran wrote several pages in response to Gombrich's response, in which he suggests that "people specialising in the psychology of art or on art history alone have made very little progress in understanding the meaning of art. Even the distinguished professor Gombrich, who has speculated on these topics for almost fifty years, has had very little to say about the neural or evolutionary basis of art – especially abstract art." See, V.S. Ramachandran, "Response to Gombrich: Concerning 'The Science of Art': Commentary on Ramachandran and Hirstein," *Journal of Consciousness Studies* 7, no. 8/9 (2000): 19.

[14] V.S. Ramachandran, *The Tell-Tale Brain: A Neuroscientist's Quest for What Makes us Human*, (New York: W. W. Norton, 2011), 218.

[15] Exploiting the brain's plasticity, Ramachandran, was able to cure phantom limb syndrome in some people by having them do simple exercises while looking into a mirrored box, tricking parts of the brain into thinking that the missing limb is in place and thereby stopping the pain. See, V.S. Ramachandran, *Phantoms in the Brain: Probing the Mysteries of the Human Mind*, (New York: William Morrow, 1998).

[16] Semir Zeki, "Art and the Brain," *Journal of Consciousness Studies* 8, no. 6-7 (1999): 76-96.

[17] Semir Zeki, *Inner Visions: An Exploration of Art and the Brain,* (New York: Oxford University Press, 1999).

[18] Ibid., 4.

[19] Ibid., 1.

[20] Alva Noë, "Art and the Limits of Neuroscience," *New York Times: The Opinion Pages*, (December 4, 2011), http://opinionator.blogs.nytimes.com/author/alva-noe
(accessed June 29, 2012).

[21] Barbara Maria Stafford suggests that if researchers in the humanities are going to collaborate with neuroscientists, "We are going to have to admit that there are lawlike aspects to art." See, Barbara Maria Stafford, *Echo Objects: The Cognitive Work of Images* (Chicago & London: The University of Chicago Press, 2007), 209.

[22] Zeki, *Splendours and Miseries of the Brain*, Ibid., 65.

[23] I would like to take a moment here to note that when "the brain" is used as a generalization, the term operates within the disciplinary obligations of neuroscience. The only reason anyone might invoke "the brain" as opposed to "my brain," or "your brain," or "her brain," is because neuroscientists have done the experiments and run the statistical analyses that allow them to generalize about sets of unique individuals.

I do not mean to suggest that generalized scientific knowledge about the brain is irrelevant to the individual; each of us can learn a great deal from neuroscience about how our own brain operates. My mother has been diagnosed with Parkinson's disease, for example, and she and I are both confident in the science informing us that the tremor in her hand and her stumbling gait indicate that there is a degenerative deterioration of the substantia nigra cells located near the very centre of her brain. We also know what other symptoms may eventually develop as a result of the condition and the range of treatments available, but, because everyone's brain is different, the science cannot predict when, or even if, those symptoms will emerge for her. More importantly, perhaps, my mother is not her disease. When she goes to her medical appointments she is subjectified as a Parkinson's patient and the Parkinsonian aspects of her nervous system are quantified and scrutinised. In the context of her daily life, however, she is a writer, a teacher, a gardener, a musician (etc.), with a changing physiology. The shifts in her sensorium are sometimes debilitating, but they are just as often illuminating, opening up new ways for her to engage with the world and generating new creative projects. My mother's brain is not "the brain," it is her brain, but the generalized knowledge that scientists have accumulated about "the brain" is a tool that helps us navigate her personal experience of Parkinson's.

[24] Zeki, *Inner Visions: An Exploration of Art and the Brain,* Ibid., 4.

[25] John Onians, *Neuroarthistory: From Aristotle and Pliny to Baxandall and Zeki* (New Haven: Yale University Press, 2008) p.14

[26] Ibid., 57.

[27] Ibid., 57.

[28] Ibid., 78.

[29] Gombrich, *Art and Illusion*: *A Study in the Psychology of Pictorial Representation*, Ibid., 49.

[30] Ibid., 172.

[31] Ibid., 102.

[32] Ibid., 102.

[33] Onians, Ibid., 161.

[34] Ibid., 163.

[35] In a recent TED Talk, Sam Harris made the following comment about Muslim fathers, suggesting that neuroscientific technologies can aid in determining the morality of cultural value systems, "...at a certain point we're going to be able to scan the brains of everyone involved and actually interrogate them. Do people love their daughters just as much in these systems? And I think there are clearly right answers to that." See, Sam Harris, "Science can answer moral questions" TED Talk, (February 2010), http://www.ted.com/talks/sam_harris_science_can_show_what_s_right.html (accessed May 15, 2011)

[36] In his critical book on intelligence testing, *The Mismeasure of Man*, science historian Stephen Jay Gould identified that biological determinism has historically emerged as a tool for enforcing social hierarchy at times when the powers of the ruling elite are threatened. See, Stephen Jay Gould, *The Mismeasure of Man* (New York & London: W.W. Norton & Co., 1996), 28.

An argument could be made, in response to Onians, that the ruling powers of the Western world are facing such challenges now, and that the contemporary prevalence of stories about neuroscience in the popular press represents exactly the sort of hegemonic power play that Gould identified in 1996.

[37] Onians, Ibid., xi.

[38] Ibid., xi.

[39] Ibid., 2.

[40] Ibid., 2.

[41] Denis Dutton, *The Art Instinct: Beauty, Pleasure and Human Evolution* (New York, Berlin & London: Bloomsbury Press, 2009).

[42] Stafford, Ibid., 199.

[43] Ibid., 99.

[44] Ibid., 207.

[45] Ibid., 121.

[46] Ibid., 200.

[47] Ibid., 198.

[48] Ibid., 206.

[49] Onians, Ibid., 14.

[50] Stafford, Ibid., 212.

[51] Martin Skov and Oshin Vartanian, "Introduction" in *Neuroaesthetics,* Martin Skov and Oshin Vartanian, eds. (Amityville, New York: Baywood Publishing Company, Inc., 2009), 5.

[52] Martin Skov, "Neuroaesthetic Problems: A Framework for Neuroaesthetic Research," in *Neuroaesthetics,* eds. Martin Skov and Oshin Vartanian (Amityville, New York: Baywood Publishing Company, Inc., 2009), 11.
[53] Martin Skov and Oshin Vartanian, introduction to *Neuroaesthetics,* Martin Skov and Oshin Vartanian, eds. (Amityville, New York: Baywood Publishing Company, Inc., 2009), 1.

[54] Steven Brown and Ellen Dissanayake, "The Arts are More than Aesthetics: Neuroaesthetics as Narrow Aesthetics" in *Neuroaesthetics,* Martin Skov and Oshin Vartanian, eds. (Amityville, New York: Baywood Publishing Company, Inc., 2009), 44.

[55] In February of 2013, Steven Brown gave a talk on his research, at my invitation, to students and faculty in the School of The Arts at McMaster University. During both the formal presentation and the question and answer period he demonstrated professional respect for his audience, soliciting input and sharing information in a spirit of collaboration and mutual respect. Through personal discussion, I have become aware of several collaborations that he has undertaken with professional colleagues in McMaster's School of the Arts.

[56] Whitney Davis, "Neurovisuality," *Onsite*, no. 2 (June 12, 2011) http://nonsite.org/issue-2/neurovisuality
(accessed September 27, 2011).

[57] Ibid.

[58] Rosalind Krauss, *The Optical Unconscious* (Cambridge, MASS & London: The MIT Press, 1998, c.1993).

[59] Davis, Ibid.

[60] Margaret Iverson and Stephen Melville, *Writing Art History: Disciplinary Departures*, (Chicago: University of Chicago Press, 2010), 129.

[61] Ibid., 21.

[62] Ibid., 22.

[63] Ibid., 25.

[64] Georges Didi-Huberman, *Confronting Images: Questioning the Ends of a Certain History of Art*, trans. John Goodman (University Park, PA: The Pennsylvania State University Press, 2005), xxi.

[65] Ibid., 19.

[66] Ibid., 96.

[67] Ibid., 96-115.

[68] Ibid., 117.

[69] Ibid., xxvi.

[70] Keith Moxey, "Visual Studies and the Iconic Turn," *Journal of Visual Culture* 7, no. 2 (2008): 131.

[71] Ibid., 131-32.

[72] Ibid., 132 .

[73] Ibid., 133

[74] Judith Butler, *Gender Trouble* (New York: Routledge, 1999), 139.

[75] Judith Butler, *Bodies that Matter* (New York & London: Routledge, 1993), 10.

[76] Philosopher of science Karen Barad, for example, has accused Butler of configuring matter as a "passive product of discursive practice." See, Karen Barad, "Posthumanist Performativity: Toward an Understanding of How Matter Comes to Matter," in *Signs: Journal of Women in Culture and Society*, vol. 28, no. 3 (2003): 821.

[77] Krauss, Ibid., 7.

[78] Ibid., 7.

[79] Ibid., 21.

[80] Ibid., 21-27.

[81] Susan Buck-Morss, "Aesthetics and Anaesthetics: Walter Benjamin's Artwork Essay Reconsidered," *October*, no. 62 (Fall 1992):13.

[82] Ibid., 12.

[83] Butler, *Bodies that Matter*, Ibid., 191.

[84] David Freedberg and Vittorio Gallese, "Motion, emotion and empathy in esthetic experience," *Trends in Cognitive Sciences* 11, no. 5, (May 2007: 197-198.

[85] Ibid., 199.

[86] Davis, Ibid.

[87] Ibid.

[88] Ibid.

[89] Bruno Latour, *We Have Never Been Modern*, trans. Catherine Porter (Cambridge, Mass.: Harvard University Press, 1993).

[90] Bruno Latour, "What Is Iconoclash? Or Is There a World Beyond the Image Wars?" in *Iconoclash. Beyond the Image Wars in Science, Religion and Art*, eds. Bruno Latour and Peter Weibel (MIT Press and ZKM Karlsruhe, Germany, 2002).
http://www.bruno-latour.fr/livres/cat_icono_chap.html
(accessed January 3, 2010).

[91] Bruno Latour, *We Have Never Been Modern*, Ibid., 33.

[92] Ibid., 43.

[93] Ibid., 32-33.

[94] Ibid., 6.

[95] Bruno Latour interview with Paul Kennedy, CBC Radio's Ideas: How to Think About Science, Episode Five, Ulrich Beck & Bruno Latour, available online at http://www.cbc.ca/ideas/features/science/index.html#episode5.

[96] Bruno Latour, *Reassembling the Social : An Introduction to Actor-Network-Theory* (Oxford, UK: Oxford University Press, 2005), 91.

[97] Donna Haraway, "Situated Knowledges: The Science Question in Feminism and the Privilege of Partial Perspective," *Feminist Studies* 14, no.3 (Fall 1988): 579.

[98] Ibid., 577-580.

[99] Ibid., 584.

[100] Ibid., 586.

[101] Ibid., 590.

[102] Ibid., 591.

[103] Ibid., 591.

[104] Ibid., 593.

[105] Judith Butler, *Bodies that Matter*, Ibid., 10.

[106] Karen Barad, "Posthumanist Performativity: Toward an Understanding of How Matter Comes to Matter," *Signs: Journal of Women in Culture and Society* 28, no. 3 (2003): 801.

[107] Ibid., 804.

[108] Ibid., 804.

[109] Ibid., 807.

[110] Ibid., 821.

[111] Moira Gatens, "A Critique of the Sex/Gender Distinction," in *Imaginary Bodies: Power Ethics & Corporeality,* (London & New York: Routledge, 1996), 3-21.
and
Asia Freeman, "Unintended Consequences of the feminist sex/gender distinction," *Genders*, no.43 (2006), http://www.genders.org/g43/g43_friedman.html
(accessed April 29, 2012).

[112] Barad, Ibid., 818.

[113] Ibid., 813.

[114] Luce Irigaray, "Is the Subject of Science Sexed?" *Cultural Critique*, no. 1 (Autumn 1985): 82.

[115] Barad, Ibid., 813.

[116] Ibid., 814.

[117] Ibid., 815, 817.

[118] Ibid., 815.

[119] Karen Barad, "Quantum Entanglements and Hauntological Relations of Inheritance: Dis/continuities, SpaceTime Enfoldings, and Justice-to-Come," *Derrida Today* 3, no. 2 (2010): 249.

[120] Ibid., 247-8.

[121] Karen Barad, "Posthumanist Performativity: Toward an Understanding of How Matter Comes to Matter," *Signs: Journal of Women in Culture and Society* 28, no. 3 (2003): 815.

[122] Ibid., 285.

[123] Ibid., 822.

[124] Donna Haraway, "Modest_Witness@Second_Millenium" in *The Haraway Reader* (New York & London: Routledge, 2004), 233-37.

[125] Karen Barad, *Meeting the Universe Halfway: quantum physics and the entanlegment of matter and meaning*, (Durham and London: Duke University Press, 2007), 58.

[126] Ibid., 379.

[127] Cognitive scientist Lawrence Shapiro describes debates in cognitive science between computational theorists who treat the brain as a discrete, passive organism responding to external stimuli, and theorists of embodied cognition who position the brain as an active, agential organism embedded in ongoing interactions with the environment. See, Lawrence Shapiro, *Embodied Cognition*, (New York & Abingdon: Routledge, 2011).

[128] Antonio Damasio, *Descartes' Error* (International: Penguin Books, c. 1994, 2006), 250-251.

[129] Ibid.

[130] Warren S. Brown, interview with Ginger Campbell, Brain Science Podcast #62, posted October 9, 2009,
http://docartemis.com/brainsciencepodcast/2009/10/62-warrenbrown/
(accessed last October 12, 2011).

[132] Nancey Murphy and Warren S. Brown, *Did My Neurons Make Me Do It?* (Oxford & New York: Oxford University Press: 2007), 63.

[133] Brown, interview with Ginger Campbell, Ibid.

[134] Brian Massumi, *Parables for the Virtual: Movement, Affect, Sensation* (Durham & London: Duke University Press, 2002), 21.

[135] Ibid., 25.

[136] Ibid., 29.

[137] In Chapter Two I will examine in detail how neuro-imaging experiments both rely on and produce linear, temporal models of perception that support the hierarchical formulation in which nonconscious process are understood to drive and determine consciousness.

[138] Massumi, Ibid., 29-30.

[139] Ibid., 21.

[140] Ibid., 21.

[141] Jennifer Fisher, "Exhibitionary Affect," *n.paradoxa,* no. 18, (2006): 28.

[142] Jennifer Fisher, "Relational sense: towards a haptic aesthetics," *Parachute: Contemporary Art Magazine,* no. 87 (July-Sept 1997): 4-11.

[143] Murphy and Brown, Ibid., 40.

[144] Barad, *Meeting the Universe Halfway*, Ibid., 379.

Limitations and Possibilities for Art Research in the Neuro-Imaging Lab

In the previous chapter I situated key works from the neuroaesthetic literature within a larger interdisciplinary context of research on embodied knowledge, laying the groundwork for a neuroaesthetic methodology that considers how artworks in art contexts can facilitate neuroaesthetic knowledge. This chapter will focus on the methodological constraints of neuro-imaging experiment design and examine how the epistemological conditions of the neuroscience lab impact neuroaesthetic research.

I will begin by discussing a few of the most sensational fMRI (functional Magnetic Resonance Imaging) experiments reported in mass media, with the aim of unpacking some of the popular myths about brain scans. Next, I will describe the mechanics of the MRI scanner and neuro-imaging experiment design, drawing from my own first-hand experiences as a volunteer subject in an fMRI study at Sunnybrook Hospital in Toronto, information I learned while auditing a course on fMRI taught by Keith Schneider in the Department of Biology at York University, as well as my own independent research on the workings of MRI scanners and the methodologies of neuro-imaging experiment design. My goal here is to demystify the brain scan and provide readers with some working knowledge of neuro-imaging methods. During his course, Schneider explained that while some neuroscientists may leave the physics of neuro-imaging up to technicians, researchers need a basic understanding of how the MRI scanner works in order to design effective experiments. Since much of the neuroaesthetic research emerging from neuroscience labs involves MRI, it is my feeling that basic information about the technology may also benefit neuroaesthetic researchers in art and

art history who wish to engage their neuroscientific colleagues across disciplines. Once I have laid out some of the mechanical issues inherent to MRI, I will explore some of the critical practices that neuroscientists engage to hold one another accountable to the claims they make based on fMRI evidence. I will conclude with a critical analysis of a specific fMRI experiment in neuroaesthetics, conducted by neuroscientist Ulrich Kirk and a team of researchers. My goal in this chapter is not to debunk or belittle the neuroaesthetic findings of neuroscientists, but rather to explicate and unpack some of their methodologies in order to better understand how art works, considered in art contexts, can facilitate different modes of knowledge from those produced in the lab and thus contribute meaningfully to the growing collective body of interdisciplinary neuroaesthetic research.

Some Sensational fMRI Applications

As with microscopes and x-rays before them, MRI scanners are historically loaded symbols in society, culturally imbued with the seemingly clairvoyant power of medical science to look inside the human body. Neuroscientists, according to popular myth, can deploy their magical machines to divine people's inner thoughts and feelings. In truth, most neuroscientists who use MRI are engaged in an ongoing process of collective critical assessment of the limitations on the kinds of knowledge their experiments can actually produce. Unfortunately, this negotiated and contingent dimension of neuroscience remains largely unavailable to lay people, who are much more likely to encounter the sensational claims exaggerated by journalists than the nuanced and critical

debates that occur within the discipline.[1] As a friend of mine – a political activist and professor of sociology – put it recently, "It certainly seems like neuroscientists can look right in and read our minds." Her comment, made during a casual chat on a crowded city bus, reflects a cultural anxiety about the conflation of technoscience with surveillance, a fear that neuroscientists may become thought police who will exploit the private inner feelings of individual citizens in the service of capitalism and/or state control. This fear is by no means unfounded. News stories abound about the use of MRI scanners as lie detectors,[2] as a means of uncovering how consumers really feel about advertisements,[3] how voters really feel about political candidates[4] and as tools for recording people's dreams.[5] With these kinds of message about MRI circulating in the media, it is no wonder that cultural anxiety about the authoritative position neuroscience has been growing.

An American company called No Lie MRI claims to provide "unbiased methods for the detection of deception and other information stored in the brain."[6] Another company, FKF, deploys MRI to provide consumer research to fortune 500 companies. Their tagline reads, "Find out the difference between what consumers say and what they are really thinking."[7] This kind of application of MRI technology is not only ethically dubious, it is also regarded sceptically by the majority of the neuroscience community. As fMRI researcher and cognitive scientist Edward Vul told *Wired Magazine*, it is very easy for a subject to sabotage any kind of scan, including lie detection, just by "moving a little, holding your breath, or even thinking about a bunch of random stuff."[8] According to cognitive scientist Adam Anderson at the University of Toronto, FKF's claims are overstated because brain scans can only reveal which parts of the brain are engaged at

given moments in time. The emotional states associated with specific regions of the brain have been explored and hypothesized but they have not been reliably determined.[9] Usually in experimental design, the subject's state of mind is induced or self-reported, and the brain areas that activate during fMRI are then correlated with the presumed emotions. So for FKF to claim that they can tell what someone's inner state is by looking at what part of the brain is activated represents a classic error of mistaking correlation for causation. Anderson is not alone in his criticisms, and neuroscience blogs are rife with FKF detractors.[10] Nevertheless, the media hook that scientists might read people's minds proves irresistible to journalists, and so stories like these tend to make the headlines.

While certain sensational claims made by companies like No Lie MRI and FKF are easy to debunk because their methodologies are considered weak by other neuroscientists, fMRI is nevertheless a powerful and effective tool. For example, a sensational report[11] that spawned the Fox News headline "Mind-Reading Experiment Reconstructs Movies in Our Mind"[12] was the product of methodologically rigorous and accountable research. The headline was misleading, but only slightly. By showing movies to subjects and recording neural activity in the visual areas of their brains, the Gallant Lab at Berkeley compiled a large database of correlations between certain patterns of neural activations and certain formal elements of moving images. These neuroscientists also compiled an enormous database of moving images (using raw material from YouTube) with visual elements that strongly correlated with their database of neural activations. Experiments involved showing a subject a video, scanning their brain for visual activations, correlating the data with images in the YouTube database, then playing

back composite movies that bore significant resemblance to the movies that the subjects had originally been shown.[13] Thus, researchers were indeed able to reliably decode patterns of neural activation and translate them into moving images. Now that a robust database has been compiled, the research findings imply that future experiments may be able to decode subjects' dreams.

However, while the Fox News headline suggests that this process constitutes "mind reading" the researchers themselves make no such claim.

> While our computational models of some cortical visual areas perform well, they do not perform well when used to decode activity in other parts of the brain. A better understanding of the processing that occurs in parts of the brain beyond visual cortex (e.g. parietal cortex, frontal cortex) will be required before it will be possible to decode other aspects of human experience.[14]

Compared to other areas of the brain, the vision areas have been mapped in comprehensive detail. The visual activations recorded here – as compared with a complex neural process such as lying, for example – represent non-conscious neural processes that take place within well defined spatial locations in the brain. Visual processing is particularly suited to fMRI experiment.[15] The project has been designed to mechanistically record and mechanistically reproduce only the most mechanistic aspects of visual processing, not to read the subjects' minds.

Nevertheless, the implications of this research are enormous. Right now, the experimental validation lies in the fact that the movies produced through correlation match up with the movies that the subjects were shown as stimuli. If a subject's vision centres were to be scanned in the absence of a visual stimulus, and matched to the YouTube database, the resulting movie *might* represent the subject's internal

representations, but there would be no experimental proof except for self-report, which is generally considered unreliable. These are the conditions under which the Gallant Lab's databases and experimental methods could be taken up and applied as a mind-reading device, and like the work of No Lie MRI and FKF, this would begin to border on pseudo-science. While the Gallant Lab researchers are explicit about the limitations of their methodology, their project nevertheless taps into cultural desires and anxieties about the power of technoscience to see inside the human mind, and thus makes for top news headlines. Unfortunately, the popular conception of MRI as a mind-reading machine precedes the publication of neuroscientific reports – reports biased by mind-reading connotations in the media spin – depriving a general readership of the opportunity to engage in negotiations about the critical and ethical boundaries of fMRI research. The implication for neuroaesthetics is that researchers operating outside the discipline of neuroscience may be dazzled by such sensationalised news stories to the extent that they imbue neuroscience with an absolute authority to underwrite and explain the findings of their own disciplinary practice. A more nuanced understanding of neuro-imaging methodology can foster the criticality necessary for truly reciprocal interdisciplinary communication and research.

Getting Inside the Scanner: How it Works

In order to formulate my own epistemological standpoint of perception regarding neuroscience – based in sensorial, relational and aesthetic experience – I volunteered for an fMRI at Sunnybrook Hospital in Toronto (Fig.1). I wanted to explore first-hand how it

felt to be a neuroscientific test subject, and I wanted an embodied experience of the aesthetic environment inside the scanner itself. In addition, I somewhat narcissistically desired an image of my own brain, and this reward was prominently promised on the poster calling for volunteers. There were two types of brain scan conducted in the experiment and I signed up for both. The first was an MRI scan, which creates a static, high resolution anatomical image of the brain and takes a long time to record (Fig. 2). The second was an fMRI scan. An fMRI scan is a low resolution image of activities (the "f" stands for "functional") in the brain that take place over very short periods of time. fMRI scans often comprise a sequence of trials, in order to show changes in brain activity over a period of time, stimulated by the subject's performance of a specific task. The low resolution data from fMRI scans – represented in images as pixellated areas of bright colour – are usually mapped onto high resolution anatomical MRI scans prior to publication (Fig. 3).

Up until the 1970s, MRI (Magnetic Resonance Imaging) was called NMR (Nuclear Magnetic Resonance). MRI does not produce radiation, but the technology does use nuclear physics to manipulate the tissues of the brain at the subatomic level. Fig. 1 is a picture of me just prior to being inserted in the scanner. The big circular bore of the scanner contains a very powerful magnet (so powerful, in fact, that there is a very real danger of metal objects being sucked in, potentially damaging the machine or even injuring the person inside). The bore emits a constant, static magnetic field. When a person's head is inserted into the scanner, the magnet causes the protons in the hydrogen atoms in the tissues of her brain to spin together in alignment with the magnetic field.

Fig. 1 also shows the head coil, a cylindrical cage-like object just inside the bore of the scanner that produces radio frequency (RF) magnetic pulses, directed perpendicular to the constant magnetic field of the bore. The RF field can be turned on and off very quickly. Once the protons in the brain are synchronised by the static magnetic field, RF pulses flip them into different spins, or higher energy states. When the RF pulse is switched off, the protons gradually come back into alignment, a lower energy state. The process of realignment, called "precession," releases energy in the form of a photon. The scanner also has a set of RF detector coils that record the photons as they are released. The energy emitted is the same as the energy that was induced by the RF coil, and comprises the signal that is used to produce an image. This signal, captured by the scanner, consists of raw data which is sent to a computer running specialised software. Different protons in different tissues precess at different rates, and so the various areas of the brain can be differentiated from one another mathematically, and then translated into an image.

After the technician took my picture, she gave me earplugs and had me lie down flat on my back. Pads were jammed in tightly around my head to hold it in position. Once my body had been fixed in place, the table began to move slowly, sliding me into the scanner. My head slid inside the RF coil, part of which I could see about an inch and a half in front of my nose. As mentioned in the introduction, the audio environment inside the scanner was extremely jarring. The cooling system required to keep the main magnet conducting produced a slow rhythmic chugging sound, while the expansion and contraction of the RF coils produced a loud and penetrating grinding noise. At the time, I

had not yet done the research to understand where the sounds were coming from. The combination of close confinement and audio barrage made me feel helpless and disoriented. I was resolved to endure the full two hours required to record the anatomical MRI scan, so my only recourse was to try and calm my racing heart. I finally became acclimatised enough to relax. Eventually I managed to fall asleep while the powerful magnetic fields manipulated sub-atomic particles in my brain.

Oddly enough, when the scan was complete I felt strangely invigorated and refreshed. As I went to the change room to get dressed, however, I passed a pale and nervous-looking woman in a hospital gown waiting for her session in the scanner. I was suddenly struck with a sense of how lucky I was to be a volunteer test subject as opposed to a patient. Furthermore, compared to many people who volunteer for science, I was not motivated by money, but by my own research interests. Had I been undergoing a two-hour scan for medical reasons, I'm sure it would have been impossible for me to attain such a pleasant state of relaxation.

Days later, I returned to the lab at Sunnybrook Hospital for an fMRI scan. This experience transpired quite differently. An fMRI scan produces digital images representing three dimensional space. Just as a pixel comprises the smallest unit in a two-dimensional digital image, a voxel is the smallest three-dimensional unit in a digital fMRI scan – a small cube of space plotted in the subject's brain. In order to delineate a voxel, the scanner must be programmed to record frequencies within a specified area of length, width and height. As only one RF signal emits from the scanner, the process of determining these three axes requires a complicated methodology. The magnetic fields

produced by the scanner are gradient, meaning that the strength of the frequencies diminishes along a spatial continuum. When someone's brain is inserted into the field, the signal will be stronger at some locations in the brain, and progressively weaker in others. Thus, experimenters can correlate specific frequencies in the field with specific brain regions. In fMRI, experimenters isolate a "slice" of the brain by setting the head coil to only activate the specified range of frequencies that corresponds with desired spatial locations. This "excitation pulse" produces one of the three required dimensions. The other two dimensions are determined by processes called frequency and phase encoding. For frequency encoding, another gradient field is introduced, running perpendicular to the excitation pulse. This means that the differences in proton spin can be measured throughout the vertical dimension of the slice. The third dimension is established temporally. For pulse encoding, researchers apply yet another field in short bursts, or pulses, causing the protons to align. When the pulse is turned off the protons "precess" out of phase and transmit an RF frequency to the detector coils. The software then applies a mathematical process called the "Fourier Transform" to break the signal down into the relevant component frequencies. A three dimensional voxel has now been delineated.

Once the technicians had inserted me into the scanner for the fMRI scan, they placed two key pads with buttons into my hands, down by my thighs, so that I could perform a task that would stimulate activity in the right and left hemispheres of my brain. Again lying immobilised on my back, I looked upward through a periscope through which I could see a screen, set up at my feet, where the visual component of the task was

displayed. I couldn't close my eyes and drift off to sleep this time and the process became a surreal experience of disembodied interaction. I almost immediately began to feel as if the images on the screen were projected right inside my head. Targets, simple computer graphics that I was asked to focus on, appeared and disappeared on the right and left sides of the screen, and it came to seem as if the images were actual manifestations of the right and left hemispheres of my brain. Confined and immobilized, the task became strangely immersive, as if responding to visual targets was now, and had always been, my entire life's purpose. Eventually, however, my thoughts began to stray.

Initially my thoughts were gloomy, as I mentioned in the introduction, but eventually I was able to remind myself that I was inside the scanner by choice and free to leave. I decided to let my mind play over the situation. What kind of mental life would I have, I wondered, if I *was* a creature who had only ever been in this situation, always performing these actions, always seeing these images, hearing these sounds, and hardly ever moving at all. Would I begin to experience rich depth in the details of my environment? How would my brain networks change as a result of the constant left-right staring and clicking? Of course none of these musings had any bearing on the task-induced activity in my brain that was relevant to the researchers. I was told by the technician that the button pushing was designed to activate my motor areas, the staring was for my vision areas, and the thinking about what to push was for decision making. While I was aware that my brain was under surveillance, I was also aware that the thoughts and feelings that mattered to me most were in no danger of being logged and classified.

While anatomical MRI scans record different tissue structures in the brain, fMRI scans record changes in blood flow. In technical terms, fMRI measures the “blood-oxygen-level dependent” or BOLD effect. Neuronal activity requires energy, and blood provides the fuel, so blood will concentrate in areas of the brain that are busy and engaged. The network of veins and arteries is extremely fine and precise so the vasculature itself doesn't limit the resolution of the scan. The BOLD effect manifests as a signature shape in the RF frequency, detected through the process of Fourier Transform that breaks the signal down into useful components of information.

In fMRI experiment design, researchers must predetermine the resolution of the data they want to record, and in doing so, they must take careful account of the signal to noise ratio. The amount of useful signal they can receive from the scanner is limited by the time scale of the BOLD response (this temporal limit was one of the biggest challenges that the Gallant Lab had to overcome when recording visual activations caused by moving images). Also, blood pooling in nearby veins outside the area of interest can cause signal noise when it recedes. Thus, resolution is a balancing act. The smaller the voxels, the more precisely researchers can localise the effects, but the signal will be weaker because there is less blood to measure per unit. A strong signal is important because there can be a lot of noise, but a strong signal may also result from noise. Head movements cause noise, as well as inconsistencies in the magnetic field caused by the scanner itself, the morphology of the person's brain, and inconsistencies in the blood. It's very easy to get false positives. So the size of the voxels needs to be large enough that there is a strong signal, but small enough for the signal to be relevant. In

addition, different neural activities take varying amounts of time, so experimenters also need to consider how long the activation signal will be, based on what kind of activation they are trying to stimulate. Brain processes that unfold over long periods of time, such as certain kinds of memory, are difficult to record with fMRI.

Every human brain is unique in size and shape. Therefore, some noise also enters into the data when researchers combine information from different subjects together into one set, or image. As I mentioned earlier, because fMRI data must be captured quickly, it arrives at a much lower resolution than anatomical MRI data. If the final image represents one subject, the activations from fMRI will usually be mapped onto an anatomical scan from that individual. But most studies use multiple subjects. In this case, thresholds must be set for what counts as fMRI activation in order to correct for head movements and eliminate other noise. The little coloured areas representing neural activity in most fMRI scans represent an average of neural activity across a number of subjects. Because everyone's brain is a different shape, the points of neural activity need to be 'normalized' and mapped together to fit a standard model. One of the most common ways to create an fMRI image is to re-map the data onto a standardized brain space, collectively utilized by researchers in the field. Thus, the brightly coloured regions in fMRI brain scans commonly used as illustrations on websites and in magazines often represent data from a group of subjects, averaged, normalised and plotted onto an underlying image of a single brain.

Several days after I had completed my sessions in the scanner, a researcher from Sunnybrook emailed me a jpeg image of my brain (Fig.3). After the intensity of my

experiences in the scanner, was excited and eager to see the scan. Like many souvenirs, however, when it finally arrived it was somewhat disappointing – as an image it seemed disconnected from my experience, remote and uninteresting. I have tried to make artwork with the image, digitally animating it with some success, but no matter how much I manipulate my brain scan, I fail to feel a personal connection with it. I stare at it and think, "that's my brain," which triggers no emotional response at all. I don't love or hate it, and I do not find it fascinating. If the scan was diagnostic, I expect I would feel invested in it as a representation of my own anatomy with implications for my future. As it is, however, the notes that I took on my experiences have much more emotional resonance as vivid records of the events that transpired.

Neuroscientific Criticality and Accountability

fMRI images carry a great deal of authority when they are published in magazines and websites. To a lay person, they can read as direct, photographic documentation of neural activity. It is helpful for researchers who wish to engage critically with neuroscience to understand the extent to which those images have been constructed. At this point, I want to attach Latour's connotation on my use of the word "constructed," and make it clear that while an image may have been heavily mediated and painstakingly assembled, these steps in no way makes it an arbitrary or meaningless artifact. For all the manipulation that goes into the construction of brain scans, they do represent information about the workings of the human brain. An awareness of the constructed nature of fMRI scans does

not disqualify them as evidence of scientific facts, rather it enables one to engage more deeply by making critical distinctions between them.

As mentioned above, neuro-imaging researchers face many decisions when setting the parameters for measurement, and they must make even more decisions about what kinds of statistical filters to apply to the data after it has been collected. The signal to noise ratio is very tight (often there is more noise than signal), so without careful data analysis noise can easily register as signal, leading researchers to create compelling but misleading images suggesting neural activity where there is none. The noise/signal problem of fMRI was highlighted in a very amusing, and critical report by neuroscientist Craig Bennett in his first year of graduate work. As part of a routine calibration procedure, Bennett and his team used a dead salmon as a control subject in an fMRI experiment. He explained as follows.

> For our first attempt we scanned a pumpkin. During the next pilot testing session Abby brought in a Cornish game hen to be scanned. This really upped the ante, as we had now put a dead bird into the head coil. When pondering our next step the comment was made: "we should scan a whole fish."[16]

When the scan showed signs of brain activity in the dead salmon, the researchers decided to publish their results. They wrote up a report and presented it at the Human Brain Mapping conference in San Francisco. Bennett also wrote about the project on his blog and the story became an internet sensation. While some people, according to Bennett, took the report to mean that "the dead fish is actually still thinking or that we have observed evidence of the ethereal soul,"[17] the actual point of the report was to emphasize

that it is easy to get false positives from fMRI if statistical corrections are not properly applied to the data. As Bennett explained on his blog,

> The more I think about the affair the more I believe that the fish has the chance to impact the field of neuroimaging in a very positive way. Predefined significance thresholds with a specified cluster extent are a weak control to the problem of false positives in imaging data. Statisticians and methods researchers have argued about the need for multiple comparisons correction for some time. In just one figure the salmon data illustrates exactly why we need stronger controls for the false positive problem in fMRI. I hope it finds a good home in an open-minded journal.[18]

In the field of neuroscience, researchers examine one another's methodologies and experiment design very critically. The methodology sections of neuroscience papers are extremely technical, and it would be too much to ask that art theorists and historians develop the expertise to understand them thoroughly. However, for effective cross disciplinary dialogue, it is useful to understand the contingent nature of neuroscientific information.

Compared to physics or biology, neuroscience is a young field and neuroaesthetics is even younger. Neuroaesthetic researchers such as Zeki, Skov, Brown and Dissanayake and Ulrich Kirk, are still attempting to formulate parameters for what to study and how to study it.[19] One of the biggest challenges to experimental neuroaesthetic research is that it is much easier to study nonconscious process using fMRI than it is to study higher order cognition and consciousness. Vision, as mentioned above, lends itself well to fMRI because the vision areas are large and have been mapped out in detail, thus making it easy to target what is called a "region of interest."

While fMRI technology is better suited to nonconscious processes, there are many

neuro-imaging experiments, including some in neuroaesthetics, that focus on higher-order processing. As exciting as it is to see the science focus on conscious neural processing, these experiments sometimes stretch the credible limits of fMRI experiment design. Again, I want to assert that my goal is not to debunk neuroscientific claims. Neuroscience is an emergent field, and tackling the complex structures of consciousness requires explorative research. I do aim to examine how neuro-imaging methodologies are negotiated within the discipline, so that neuroaesthetic researchers in art and art history can begin to contextualize the findings of neuroscientific research as applied to art experience.

Experiments that address human personality tend to receive greater coverage in the press, because they make claims to reveal aspects of the human conscious condition. Alarmed by some of the claims being made by his peers, neuroscientist Edward Vul spearheaded a team of researchers that set out to challenge the methodologies applied in high-profile experiments on human consciousness. In 2009, Vul, et al, published a controversial and influential paper titled, "Puzzlingly High Correlations in fMRI Studies of Emotion, Personality, and Social Cognition." Vul and his team conducted a survey of 55 neuroscientific experiments on emotion, personality and social cognition.

> Functional magnetic resonance imaging (fMRI) studies of emotion, personality, and social cognition have drawn much attention in recent years, with high-profile studies frequently reporting extremely high (e.g., >.8) correlations between brain activation and personality measures. We show that these correlations are higher than should be expected given the (evidently limited) reliability of both fMRI and personality measures. The high correlations are all the more puzzling because method sections rarely contain much detail about how the correlations were obtained.[20]

Vul and his team became suspicious because, while the data seemed too good to be true, most of the papers did not explain properly how their data had been selected. The scientists sent a questionnaire to each of the researchers asking for information on their methodologies. Vul's primary question was how the specific voxels for study were chosen across the range of subjects tested. It turned out that in the majority of experiments, a kind of circular analysis had been applied. Rather than predetermining a region of interest in the brain and then selecting the voxels that were activated in that region, experimenters were choosing to analyse the data from activated brain regions that had been closely correlated with the kinds of behaviour that they proceeded to induce. In his paper, Vul exposed this common methodological weakness in the application of fMRI technology for experiments on higher-order cognitive processes. As he explained,

> A separate correlation across subjects was performed for each voxel within a specified brain region. Each correlation relates some measure of brain activity in that voxel (which might be a difference between responses in two tasks or in two conditions) with the behavioural measure for that individual. Thus, the number of correlations computed was equal to the number of voxels, meaning that thousands of correlations were computed in many cases. At the next stage, researchers selected the set of voxels for which this correlation exceeded a certain threshold, and reported the correlation within this set of voxels. What are the implications of selecting voxels in this fashion? Such an analysis will inflate observed across-subject correlations and can even produce significant measures out of pure noise.[21]

In layperson's terms, the experimenters made foregone conclusions about which data they would deem relevant, and used those conclusions to delineate which data they would use for analysis. According to Vul, that tautological methodology was not scientifically rigorous enough, and he was able to make a very compelling case for various ways in which these kinds of experiments could easily over-inflate their findings. His exposé was

not meant to suggest that the scientists under scrutiny were heinously and intentionally making unsupportable claims. Instead, his critique emerged as part of an ongoing process of negotiation in neuroscience, in which acknowledgment of the complex and contingent nature of fMRI studies leads to refinements in experimental methodology that increase the chances of producing accurate research. Vul, et al, identified a flaw in the system, not to put a stop to experiments on emotion, personality and social cognition, but rather to help make those experiments more effective. While Vul's findings have been publicly debated within the neuroscientific discipline, most of the researchers involved now seem to agree that circular analysis must be avoided in future fMRI studies.[22]

The experience of artworks entails complex cognitive processing, and thus the refinement of methodologies for studying such higher order processes bodes well for neuroaesthetic fMRI research. While Zeki's foundational work in neuroaesthetics has tended to focus on the nonconscious processes of the visual system, neuroscientists are now using fMRI to examine conscious dimensions of the art experience. In fact, in 2009, Zeki himself endorsed an fMRI study lead by Ulrich Kirk and Martin Skov on the importance of context to aesthetic judgment. The study asked two questions: 1) does contextual information influence aesthetic judgment of visual stimuli? and 2) where, in the network of brain areas previously established to be involved in the aesthetic experience, does the activity of dealing with context take place?[23]

Prior studies suggested that an extensive network of brain structures was involved in aesthetic response, including areas for the processing of reward, perception and decision making. Based on previous research which had found that a small section of the

brain near the eye – the medial orbitofrontal cortex or medial OFC – would become active when subjects were processing contextual information, Kirk, et al, hypothesized that the same region would be activated by shifting contextual information during aesthetic judgement of artworks. The scientists thereby chose the medial OFC as their region of interest, and isolated this region in the subjects' brains for observation in the scanner.

Fourteen subjects were chosen (graduate and undergraduate students) who had no formal art education. The visual stimuli were comprised of digital images of paintings, or sections of paintings, culled from the internet. Experimental subjects were told that some of the images were from the prestigious local art museum, while others had been created in Photoshop by the experimenters themselves. The images were randomly labelled "Gallery" or "Computer" despite the fact that all of them were actually canonical works of 20th century abstraction, including paintings by Mark Rothko, Jackson Pollock, Wassily Kandinsky and Juan Miro (all of which were cropped to a standardized square format). In the scanner, subjects were shown 200 images with "Gallery" and "Computer" labels for a duration of five seconds and they were asked to rate each image aesthetically on a scale from 1-5.

As the experimenters had predicted, subjects tended to show a preference for the images labelled "Gallery." In addition, the fMRI data showed activations in the medial OFC that correlated with aesthetic judgments for images labelled "Gallery" more than for images labelled "Computer" independently of whether the gallery image was preferred or not. Thus, the experimenters concluded that context affects aesthetic judgment and,

further, that the aesthetic response in the medial OFC region of the brain is modulated by context. They did raise some questions, however, which troubled the clarity of the concept of aesthetics as positioned in the experiment. First, the scientists suggested that the neural activation they found was due to a response to pleasure rather than to the act of judgment making itself. Yet, because of the random allocation of the terms "Gallery" and "Computer," the anticipation of pleasure was probably due to what the researchers described as the "subjects' conception of the image, rather than its sensory properties,"[24] meaning that while the subjects were experiencing pleasure, that response was triggered by their ideas about the image rather than by sensorial stimuli produced by the image itself. Second, researchers queried why the label "Gallery" gave rise to a higher expectation of pleasure, and suggested that this finding might be due to subjects' assumptions of prestige, money, or a combination of both. Kirk, et al, suggested that disassociating prestige from money would be the focus of further research.

While I am very excited to see context discussed in physiological terms, this study does raise some critical questions. In particular, from the perspective of an art theorist, I am troubled by the question of how, exactly, the experimenters were able to assume that their subjects were having an aesthetic experience. Nowhere in this paper was the term "aesthetic" actually defined, and it seems as if the experimenters were relying on a tautological premise; they were asking their subjects to judge images, and the images were artworks, therefore, in their estimation, the subjects were making aesthetic evaluations. And yet, in the art world, many participants – auction house evaluators, art critics, and art historians alike – frequently make value judgments on artworks that are

independent from their own aesthetic experience of the work. An auction appraiser may be aesthetically indifferent to a given work, but still deem it to have monetary, market value, and an art historian may personally dislike a given work while acknowledging its art historical importance. It seems to me that perhaps, by labelling the images "Gallery" or "Computer," the experimenters set up a system whereby their subjects actually by-passed aesthetic experience and skipped straight to judgement-making.

Based on my own experience as a subject in an MRI scanner, my larger question about this research is whether the necessarily passive role of the subject of neuro-imaging experiments – undressed, immobilized, confined, bombasted with aggravating audio and forced to look stare in one direction at a set of images predetermined by the experimenters – might actually preclude the possibility of full aesthetic engagement. While neuro-imaging subjects are given no choice about what to observe or how long to spend with each image, gallery-goers are invited to roam and select the artworks to they want to spend time with. Does the aesthetic experience require an element of choice? Certainly not everyone is going to be drawn to every artwork that they see, but even if, as a subject in a scanner, I happened to be presented with an image that captured my imagination, would I even be able to fully enter into an aesthetic state of engagement while subject to the extreme physiological conditions inside the scanner?

Kirk, et al, made a neuroaesthetic assumption that the anticipation of pleasure governed aesthetic choice. Yet, in contrast to the teleological notion of pleasure and reward, my hunch is that the act of open-ended, agential exploration plays a more central role in aesthetic experience. As visitors walk through a large gallery or museum, for

instance, they will often scan the space looking for something that catches their eye. Once engaged in an artwork, the viewer may decide to move on, or may decided to stay with the piece and look further. At this point a choice is made about whether to allow the artwork to exert further aesthetic influence. For some, the relationship with a single work of art may last a lifetime. The affective contingencies of aesthetics do not always entail pleasure, sometimes the artwork creates an annoying disturbance, posing niggling questions or inducing uncomfortable feelings that the viewer cannot immediately reconcile and explain. One neuroscientific theory that would support my hunch is Jaak Panskepp's suggestion that the most fundamental chemical reward system in the brain is attached to the act of active seeking, rather than hedonic pleasure.[25] Likewise, Zeki delves into this territory when he speculates that unfinished or broken works, such as Michelangelo's *Belvedere Torso*, engage the brain more intensely because it continues to seek for information rather than resolving the experience and moving on. I would like to see a neuroaesthetic fMRI study that specifically addresses these agential moments in the aesthetic experience. I feel strongly, however, that the context of the scanner should be taken into account as a factor in neuroaesthetic fMRI experiments.

What affects – such as confinement, disorientation, and resistance to loud sounds – might be produced by conditions of the scanner itself that significantly impact on aesthetic experience? Some groundwork has been done on the physiological effects of the scanner environment, though not, to my knowledge, in the context of neuroaesthetics. In a recent study by Markus Muehlhan, et al. (dated Sept. 2010), a group of German researchers examined the influence of stress induced by the conditions inside the MRI

scanner. They state that the "claustrophobic properties of the scanner, discomfort, loudness, a low sense of control and the novelty of the situation can act as stressful factors."[26] Subjects in the study were given a visual detection task designed to reveal effects of stress on the attention networks in the brain. Activity in the thalamus was observed using fMRI, and correlative hormonal measures were taken via saliva tests. Subjects were also given a Multidimensional Mood Questionnaire. The researchers determined that stress caused by the scanner may influence neuronal activations. I would suggest that for neuroaesthetics it would be useful to build on this research and examine whether or not the stressful conditions of the scanner environment can be mitigated by enhancing the subject's sense of agency. To borrow a phrase from science, more research needs to be done in this area.

The questions I have raised about Kirk's experiment on context and aesthetic judgement do not in any way invalidate the research. At this early stage, all neuroaesthetic inquiry is provisional and speculative, including my own. The field of neuroaesthetics can only grow more robust from increased interdisciplinary engagements. Furthermore, as an interdisciplinary researcher it is important to keep in mind that research goals of neuroscience and the research goals of art theory may not coincide. In this instance, for example, the study asked two questions: 1) does contextual information influence aesthetic judgment of visual stimuli? and 2) where, in the network of brain areas previously established to be involved in the aesthetic experience, does the activity of dealing with context take place?[27] While the first question about the role of context carries deep relevance to art theory, the second question about locating such processes in

the brain does not – I am not a neural anatomist and I have no professional inclination to map the various regions of the brain. Yet this is the question that Kirk, et al, were most successfully able to answer, achieving a significant goal within their own disciplinary paradigm. My role as an interdisciplinary colleague is not to dismiss their findings because they don't match my research goals, but rather to celebrate in a spirit of collegiality and wonder if there is additional research that my disciplinary practice can contribute to the conversation. In this regard, the first question posed by these researchers has also been asked by art theorists and art historians – does contextual information influence aesthetic judgment of visual stimuli? While an art theorist drawing on the a long history of aesthetic inquiry in the humanities might be tempted to simply answer "yes," the interdisciplinary challenge posed by neuroaesthetic inquiry is to ask the question "if so, how?" While I am not currently satisfied with the answers provided by Kirk, et al, I am grateful for their ambitious, exploratory forays into the synthesis of bio-physiology and cultural context. Again, there is more research to be done.

Conclusion

Unfortunately, it may ultimately be impossible to empirically analyse the contextual conditions of the MRI scanner in contrast to other kinds of contexts for embodied art experience, since brain scans cannot be performed without neuro-imaging machines. However, art theorists and art historians have compiled an extensive body of knowledge on aesthetic experience in the context of galleries and museums, archives, computer screens, movie theatres, etc. In fMRI experiments, specific constrained behaviours are

induced in subjects, and then the physiological neural activity that accompanies those behaviours is recorded and analysed. Subjects are typically stripped of agency and positioned as passive receivers of perceptual stimuli. While the subject may experience many thoughts and feelings in the scanner, only those neural processes under observation are considered meaningful to the experiment. The experience of artworks in a gallery provides an excellent corollary in that art audiences, in contrast to fMRI subjects, are free to pick and choose from a vast array of sensorial stimuli, including, but not limited to, the artworks on display. In the art context, an aesthetic engagement manifests as an active choice, a reciprocal engagement between the audience and the artwork. While the experience has bio-physical manifestations, there are no limits on the thoughts and feelings, past experiences, cultural knowledges and social networks that contribute to the embodied knowledges facilitated by the encounter.

Throughout this dissertation, I will aim to demonstrate that effective neuroaesthetic research can be produced by correlating and contrasting situated findings on embodied experience. This will be derived from the study of art in art contexts, with and against neuroaesthetic findings emerging from neuroscience labs. In the chapters that follow, I will activate a neuroaesthetic inquiry by conducting case studies of specific contemporary artworks, considered in gallery contexts, and examining how each of these works facilitates particular embodied knowledges about perceptual cognition. This will become evident in the next chapter where I will examine how a complex, multi-dimensional installation by the art collective FASTWÜRMS facilitates the awareness of cognitive processes of association. •

End Notes to Chapter Two

[1] Journalists often present neuroscience stories with more dramatic spins than the scientists do. In the studio seminar on neuroaesthetics that I taught to 4th year sculpture students at the University of Guelph, I asked them to choose a topic in neuroscience of particular interest to them personally and find an article on that topic in a mainstream publication (magazine or newspaper). Students then had to find the original neuroscientific report cited in the story and critically compare the two texts. Invariably, the journalistic stories made stronger claims, with broader implications, than the original reports. One humorous example I discovered was the Fox News story with the headline "Scientists Find God Spot in the Brain." Several lines down, in the body of the text, is a quote from the original reports which states,"....no single God Spot exists in the brain." See, Hsu, Jeremy. 2009. "Scientists Locate God Spot in Human Brain." FoxNews.com http://www.foxnews.com/story/0,2933,507605,00.html
(accessed June 2, 2012).

[2] Alexis Madrigal, "MRI Lie Detection to Get First Day in Court," *Wired Magazine* online (March 16, 2009), http://www.wired.com/wiredscience/2009/03/noliemri/
(accessed October 12, 2011).

[3] Marco Iacoboni, "WHO REALLY WON THE SUPER BOWL? The Story of an Instant-Science Experiment," on *Edge: The Third Culture* (2006)
http://www.edge.org/3rd_culture/iacoboni06/iacoboni06_index.html
(accessed July, 2011).

[4] Joshua Freedman, "This is Your Brain on Politics," *The New York Times* (January 18, 2005), http://www.nytimes.com/2005/01/18/opinion/18freedman.html
(accessed October 12, 2011).

[5] Associated Press, "Mind-Reading Experiment Reconstructs Movies in Our Mind," *Fox News* online (September 22, 2011), http://www.foxnews.com/scitech/2011/09/22/mind-reading-experiment-reconstructs-movies-in-our-mind/
(accessed October 12, 2011).

[6] No Lie MRI company website, http://noliemri.com/index.htm
(accessed October 12, 2011).

[7] FKF company website, http://fkfftp.com/FKF.html
(accessed July, 2011).

[8] Madrigal, Ibid.

[9] Adam K. Anderson, "The Hungry Eye: Neural and psychological mechanisms underlying emotional encoding" lecture delivered as part of president's symposium at The Canadian Society for Brain, Behaviour and Cognitive Science (CSBBCS) Conference, University of Western Ontario, June 19-21, 2008.

[10] The following excerpt represents criticism of FKF from the blog *Mind Hacks.*

> From a previous study done on political ads by the same marketing company, it looks as if they just average the activation of a certain brain area over the course of the ad. They then base their conclusions of the effect of the ads on the assumed functions of these brain areas.

> The difficulty is that the functions of these areas are still controversial. For example, with the Super Bowl ads, Iacoboni claims that activation in the 'mirror system' is a measure of empathy. This is still highly contentious and is presumably based on conclusions from an earlier study of his.
>
> Because of this uncertainty, it is difficult to know that any difference is not due to one advert having more movement in it than the other. Or perhaps more people. Or happier people. Or even something unrelated like a faster tempo in the music... despite the advert being otherwise rubbish.

Posted by Vaughan on the blog *Mind Hacks*, last viewed November 14, 2008, http://www.mindhacks.com/blog/2006/02/what_can_brain_scans.html (accessed October 12, 2011).

[11] Shinji Nishimoto, et al. "Reconstructing visual experiences from brain activity evoked by natural movies," *Current Biology* 21, no. 19 (22 September 2011): 1641-1646.

[12] Associated Press, ibid.

[13] The Gallant Lab at UC Berkeley website, https://sites.google.com/site/gallantlabucb/publications/nishimoto-et-al-2011, (accessed October 12, 2011).

[14] Ibid.

[15] Of course, the situation is somewhat tautological. Part of the reason vision is relatively easy to measure and observe using fMRI is because the visual coordinates in the brain have been defined using neural imaging technologies such as fMRI.

[16] Craig Bennett, "The Story Behind the Atlantic Salmon" from *Prefrontal.org: a weblog of developmental cognitive neuroscience* (September, 2009) http://prefrontal.org/blog/2009/09/the-story-behind-the-atlantic-salmon, (accessed October 12, 2011).

[17] Ibid.

[18] Ibid.

[19] Martin Skov and Oshin Vartanian, "Introduction" in *Neuroaesthetics,* eds. Martin Skov and Oshin Vartanian (Amityville, New York: Baywood Publishing Company, Inc., 2009), 1.

[20] Edward Vul, et al, "Puzzlingly High Correlations in fMRI Studies of Emotion, Personality, and Social Cognition," *Perspectives on Psychological Science* 4, no. 3 (2009): 274.

[21] Ibid., 278-9.

[22] Nikolaus Kriegeskorte, et al, "Everything you never wanted to know about circular analysis, but were afraid to ask," *Journal of Cerebral Blood Flow & Metabolism*, no. 20 (2010): 1551-7.

[23] Ulrich Kirk, et al, "Modulation of aesthetic value by semantic context: An fMRI study" *NeuroImage,* no. 44 (2009): 1125–1132.

[24] Ibid., 1130.

[25] Antonio Alcaro, Robert Huber, Jaak Panksepp, "Behavioral functions of the mesolimbic dopaminergic system: An affective neuroethological perspective," *Brain Research Reviews*, no.56 (2007): 283-321.

[26] Markus Muehlhan, et al, "The scanner as a stressor: Evidence from subjective and neuroendocrine stress parameters in the time course of a functional magnetic resonance imaging session," *International Journal of Psychophysiology*, (article in press): 1.

[27] Ulrich Kirk, et al, Ibid., 1125–1132.

FASTWÜRMS: Cognitive Association as a Neuroaesthetic Mode of Knowing

Entering FASTWÜRMS' impossibly intricate multi-media installation, *Donky@Ninja@Witch,* felt somewhat like navigating the overlapping networks of a living brain as it engages and interacts within multiple systems of sensory and intellectual stimulation. Viewers encountered witches and cats communicating telepathically; axes, scythes and dildos hung flat on the walls like hieroglyphs; a giant bat intricately woven out of coloured string; spider webs made of sexy bras and panties; a pirates' skull collection; ninjas skulking through the night; a witch's cauldron; incantations; cats, bats, bulls, crows, stars, moons, horseshoes, snakes, spiders, owls, wigs, hats, mirrors, potions, cloaks and a donkey; a hair salon for freaks; a denim-lined magic marker tattoo parlour; a playground for cats and humans – the list could go on and on, as the installation defied inventory and description. Potent objects, images and icons covered almost every inch of wall space from floor to ceiling – all of them cross-talking through complex visual and connotative networks that wove throughout the installation in a tumultuous, porous flow of nested feedback loops. Gallery goers were invited to navigate an intricate web of non-linear associations, both visual and conceptual, so densely woven as to resist any kind of cartographic stock-taking, or omniscient point of view. In order to engage with the work, one had to situate oneself within it.

In the previous two chapters I positioned neuroaesthetics within a broader discourse on embodied experience, and unpacked some of the methodological challenges that neuroscientists face when addressing neuroaesthetics. The remainder of the dissertation presents four case studies, each of which will theorize how certain artworks

invite self-reflexive awareness of particular cognitive processess. This chapter examines FASTWÜRMS' retrospective exhibition, *Donky@Ninja@Witch*, curated by Philip Monk at the Art Gallery of York University in 2007. In order to produce this ambitious installation, FASTWÜRMS physically inhabited the gallery for several weeks, sleeping in a tent on the floor at night and working to construct an impossibly intricate network of potent images and objects during the day. In early 2008, the artists re-installed the exhibition a second time at the Contemporary Art Gallery (CAG) in Vancouver.

FASTWÜRMS is a collective identity comprised of artist/witches Kim Kozzi and Dai Scuse.[1] The name functions not only as a professional designation for their collaborative endeavours, but as a singular artistic entity comprising their co-constitutive practice. As FASTWÜRMS join together in their practice, they also engage associations with other entities as collaborators. "In the Witch world," they have asserted, "Others are understood to include all peoples, animals, plants, the vast web of life, the universe."[2] Within the complex installation, notions of the web functioned as both a recurring visual theme and as a conceptual model for the structure of the exhibition as a whole. As Jenifer Papararo noted in the exhibition catalogue produced by CAG, "for [FASTWÜRMS] the web is used as a symbol to characterize a belief system grounded in connection, not disconnection."[3] Entangling beholders in webs that operated on several cognitive registers – from the visual to the social – *Donky@Ninja@Witch* emphasized perceptions as active performances emerging within an interspecies subjectivity. Audiences were invited to participate as agents in the network, and they had to make their own decisions

about how to enter and navigate FASTWÜRMS' matrix of campy role play, magic and aesthetic engagement.

I aim to demonstrate that *Donky@Ninja@Witch*, provided a neuroaesthetic model of consciousness by using the context of the gallery to facilitate embodied forms of knowledge about association as a cognitive mode of engagement. *Donky@Ninja@Witch* did not address beholders as detached observers, but rather as situated percipients participating within complex webs of non-hierarchical, associative interconnection. In contrast to the context of neuro-imaging experiments that configure subjects as passive responders to external stimuli, *Donky@Ninja@Witch* presented art as a process requiring active and self-reflexive engagement on the part of participants. I shall argue that, FASTWÜRMS' installation allowed for consideration of cognitive "association" (or "abduction" in cognitive terms) as a physiological process. Because abduction has proven extremely difficult, if not impossible, to model in neuro- and cognitive scientific contexts, *Donky@Ninja@Witch* offers a unique site of neuroaesthetic research. Furthermore, FASTWÜRMS activated their ongoing practice as witches to trouble culture/nature dichotomies, including non-human species as agents collaborating within their installation's myriad, interconnected networks. The exhibition suggests that humans may operate in embodied social networks with non-human animals as well as with one another. In this way, *Donky@Ninja@Witch* makes a neuroaesthetic contribution by situating cognitive processes of association within a performative assemblage that exceeds and extends humanist perspectives seeking to place nature and culture in hierarchical relation to one another.

I shall begin by briefly introducing post-humanist formulations by Bruno Latour and Donna Haraway that inform my neuroaesthetic analysis of *Donky@Ninja@Witch* by both troubling nature/culture dichotomies and by reconfiguring knowledge as a collaborative proccess of engagement between diverse and implicated entities, rather than a reified product delivered by detached observers. While Latour and Haraway write from the disciplines of science studies and philosophy to examine the formulation of scientific knowledge, I shall draw connections between the kinds of performative assemblage and situated knowledge that they propose, and the neuroaesthetic knowledges facilitated by *Donky@Ninja@Witch* operating within the gallery context. Next, I will situate the ways that *Donky@Ninja@Witch* troubles nature/culture dichotomies and activates audience participation within the context of their past work, and I will then go on to to provide a more detailed description of the exhibition itself. Once I have established these contextual parameters, I will make a detailed analysis of how the installation activated webs, both visually and structurally, to facilitate neuroaesthetic awareness of cognitive processes of association. As these webs entailed both human and non-human agents, I will proceed to explore how FASTWÜRMS' have approached inter-species communication, considering Amanda Boetzkes' writing on earth artists and Karen Barad's work on agential materialism to contextualize the art experiences offered by *Donky@Ninja@Witch* within contemporary configurations of human and non-human interaction. Finally, I will return to a brief consideration of how *Donky@Ninja@Witch* configured the gallery as a site of neuroaesthetic knowledge production, in contrast to the modes of knowing produced in the neuroscience lab.

Troubling Nature/Culture Dichotomies

In considering FASTWÜRMS' installation as a producer of neuroaesthetic knowledge, I am informed, in part by Zeki's assertion that both art and the brain seek to "gain knowledge about the world."[4] Zeki was not referring to knowledge as a packaged product for consumption in the form of a lab report or didactic treatise, but to knowing as an ongoing experiential process of sensorial engagement. I extend Zeki's formulation to consider how *Donky@Ninja@Witch* facilitates neuroaesthetic knowledge by producing embodied awareness of cognitive processes of association. In order to understand the process by which this particular mode of knowing takes place in the gallery installation, I draw from Bruno Latour and Donna Haraway, both of whom have brought science and the humanities together, writing in critical dialogue with one another, and converging on the notion that culture and nature are intertwined in collective, contingent knowledge-producing processes that entail human and non-human agents.

In Canada, where FASTWÜRMS have worked for their long career, traditional, colonial formulations of nature have drawn from the sublime – nature represented as an imposing, empty landscape. FASTWÜRMS, however, formulate nature differently. As Barbara Fischer explained, "They are not from a place where there is no language, where there are no meanings and representations..."[5] These artists, then, have formulated nature as a distinctly social, cultural space, abuzz with myriad, meaningful associations. Their installations have operated as assemblages that parallel science as a subjective, collective practice of knowledge formation.

Latour informs my neuroaesthetic analysis of FASTWÜRMS' artwork in two ways; first, he has insisted that modernity incurred a false dichotomy between nature and culture; second, he suggested that knowledge is not discovered by detached observers, but is rather conditionally produced by complex assemblages of participating agents – including human and non-human actors. The technological apparatus of an MRI scanner, then, using Latour's formulation, can be understood to contribute agentially to the knowledge that it helps produce, along with the subject in the scanner, the technicians who operate the machine, the scientists who collate and interpret the data, the journalists who report on the findings, and the publics who consume disseminated knowledge, and more. Latour's notion of a natural/cultural assemblage can illuminate the post-humanist operations of FASTWÜRMS' installation as it entails both non-human species and non-sentient objects as participants. Like the MRI lab, *Donky@Ninja@Witch* also comprises a collective of agents that entails the artists, the artworks and the audience in a collaborative formulation of localized, embodied knowledges. The forms of knowledge facilitated in the art installation are different from those produced in the neuroscience lab. While scientists seek to negotiate forms of knowledge that, however provisional, can be quantified and instrumentalized, embodied aesthetic knowledges can be non-linguistic, temporally extended and ephemeral. Nevertheless, for FASTWÜRMS, expressions of witchcraft-as-art and art-as-witchcraft are analogous to scientific practice. "A good word for 'magic'," they explained, "is 'gnosis.' The aspiration of witches is to become wise. Magic and knowledge are really interchangeable."[6] *Donky@Ninja@Witch* aspires to facilitate knowledge for its audiences through collaborative assemblage and association.

For Latour, nature, social structures, discourse and being are, and have always been, co-constitutive and entangled.[7] If social structures and discourse are taken as natural, and nature is taken as social and discursive, then an emphasis on the discursive dimension of knowledge as a social practice should not threaten its attachment to the natural world.[8] FASTWÜRMS have similarly entangled nature and culture, always emphasizing the agency of the various actors entailed in their artistic webs. By invoking magic in their work, FASTWÜRMS posited the possibility of material transformation, but at the same time, through humour and kitsch, left it up to each of their audience members to decide just how much magic they were willing to entertain.

Postmodernism, as Latour suggested, presented a "terrifying" image of the modern world by keeping nature, society and discourse distinct. The result, he claimed, was a "society made up solely of false consciousness, simulacra and illusions; a discourse consisting only in meaning effects detached from everything..." Latour suggested that the cause of these disconnections was that the postmoderns believed "they had forgotten Being."[9] In Latour's analysis, no one actually *had* forgotten Being; rather, the modern dichotomy of culture and nature produced a situation in which one could proceed as if one had. He invoked science as an example in which objects were "circulating simultaneously as subjects, objects and discourse."[10] Latour's formulation of scientific knowledge production can also be applied to aesthetic encounters. The myriad material elements in FASTWÜRM *Donky@Ninja@Witch*, for example, also operated simultaneously as subjects, objects and discourse, and they entailed audiences into their matrix as collaborative, cognitive agents of aesthetic engagement.

Haraway took up Latour and politicized his formulation that knowledge emerges through assemblages of agents by emphatically insisting that all points of view are always situated and partial. One can't adopt a bird's eye view that encompasses every aspect of a meaningful construction, and a network can never be fixed in its totality.[11] Furthermore, she placed more emphasis than Latour on social power structures. Haraway intended, in part, to reunite culture with nature by addressing the materiality of discourse, but she also aimed to establish accountability for one's own standpoint as it may enable the suffering of others. "Feminist accountability," she suggested, "requires a knowledge tuned to resonance, not to dichotomy."[12] Like Latour, she extended her notion of agency to objects, but in this case she formulated her theorization as an act of political resistance, resisting the reification of nature that results from power strategies of capitalist colonialism. As she explained, in the capitalist paradigm, "It – the world – must, in short, be objectified as a thing, not an agent; it must be matter for the self-formation of the only social being in the productions of knowledge, the human knower."[13] For example, she proposed, the "logic of domination built into the nature/culture opposition,"[14] has given rise to the objectification of the human body. As Haraway suggested, in the practice of science, an understanding of objects as agents would shift the dynamic of knowledge production away from a deterministic power relation of discovery to a more contingent mode of conversation.[15]

FASTWÜRMS' installation *Donky@Ninja@Witch* produced subjectivities commensurate with Haraway's formulation of situated knowledges by defying detached and comprehensive viewpoints. As I shall discuss, FASTWÜRMS also explicitly address

power dynamics between species and within social networks, inviting their audiences to join them in performatively inhabiting and engaging marginalized subjectivities. Percipients entering the installation were faced with a vast labyrinth of objects and images that resonated in multiple dimensions through visual and conceptual registers. In order to engage with the work, gallery goers were invited to forge their own connections within it, proceeding as embodied participants resonating with other entities in associative perceptual acts. In the self-reflexive context of the gallery, the epistemological conditions of the process and the material conditions of the work emerged as co-constitutive dimensions of neuroaesthetic engagement. Extending Zeki's notion of art and brain as seekers of knowledge, I suggest that *Donky@Ninja@Witch* expedited neuroaesthetic knowing as the embodied performance of a contingent assemblage, operating from the situated and partial perspective of participants within a network, rather than encapsulating a network as a fixed and packaged knowledge product. Furthermore, that network extended across species, creating a situation in which human modes of knowing were configured in relation to non-human modes, troubling humanist boundaries between nature and culture as well as self and other.

A Brief History

FASTWÜRMS installations have consistently been political, contingent, constructed, and far too complex to allow for any singular cartographic reading. In this respect, FASTWÜRMS are eminently postmodern, and yet, despite their lexical use of myriad iconic signs and signifiers, they have consistently refused to autonomize discourse,[16] in

Latour's sense, as distinct from the material world. The art experiences they've offered were embodied and manifest, real to the same extent as rocks and trees and cats, aesthetic epiphanies, political allegiances, and social cliques.

In the late 1980s, FASTWÜRMS –ironic, savvy to trending artworld tropes and the connotative powers of material media – were creating messy, sexy, gawky installations in which, as Fischer describes it, "both death and sexuality [were] celebrated as part of life."[17] The physiology of experience, what Latour might describe as Being, has always been an explicit aspect of their work. While other postmodern artists such as painter Andy Patton demythologized the expressive potential of the artist's hand by turning to a process free of gesture, FASTWÜRMS displayed logs that had been formed by chewing beavers. While the work of installation artists such as Ian Carr-Harris commented on the signifying qualities of man-made materials, FASTWÜRMS fashioned uncanny mounds of collected bark and mud. While painter Christian Eckart toyed with the hollow satisfaction of fetish, FASTWÜRMS created totems that invoked the resonant power of ritual. While Toronto painter Joanne Tod passed comment on the normative middle-class constructions of femininity, FASTWÜRMS created their own iconic goddess, Powerful Birch Girl, whose image still appears in their installations to this day. And yet, even at that time when an arch stance of detachment was apparently *de rigueur,* FASTWÜRMS' enthusiastic sincerity proved popular with audiences, and they exhibited in high profile institutions such as the Art Gallery of Ontario and the Ydessa Gallery. Always rife with campy kitsch and humour, their work was full of visual and linguistic puns indicating their thorough understanding of lexical connotation. They comprehended

the discursive operations of signifiers, and they were adept at their deployment. Nevertheless, they refused the notion that signifiers were somehow separate from life experience – as human animals FASTWÜRMS exercised their discursive talents through the manipulation and juxtaposition of material media.

In their more recent work, FASTWÜRMS have used a lot less mud and birch bark, but nature has remained as a central concept. The cats, of course, have performed as actors, in all senses of the word. FASTWÜRMS' inclusion of self-actualized beasts has indicated a conjoining of nature and culture, also evident in the relational processes of their audiences' engagements. While FASTWÜRMS have skillfully deployed technologies of cultural mediation, the material dimensions of nature have never been cast into doubt.

Given that FASTWÜRMS have been positioned among Canada's most established and celebrated artists, there has been a surprising lack of critical writing about their work. Fischer's catalogue essay of 1988 provided a notable exception, situating the collective within the historical context of Canadian colonialism, and making in-depth analyses about how their work at the time actively entailed audiences in changing attitudes about "history, ecology, the body and/or sexuality."[18] Almost 20 years later, in 2006, critic Robert Enright conducted a substantial interview with the collective, framing their practice of art and witchcraft as a form of political subversion.[19] Jennifer Fisher and Jim Drobnick also made an important critical contribution when they interviewed FASTWÜRMS, in 2008, for a catalogue published by the Contemporary Art Gallery in Vancouver when *Donky@Ninja@Witch* toured there after being installed at AGYU.[20]

Fisher and Drobnick emphasized the artists' collaborative DIY engagements with various counter cultures as a mode of art practice that made critical, ironic comment on the institutions of contemporary art. For the most part, however, critics have responded to the artists' humorous kitsch aesthetic. This may in part be due to the fact that FASTWÜRMS do not assume the attitude of art stars, but participate generously in the art community as peers and mentors, and essays such as Jon Davies' "Props to the Fairy People"[21] enthusiastically acknowledge their positive energy. While FASTWÜRMS' artwork has remained accessible through its playful irony and exuberance, it has also consistently transcended art world conventions of representation, troubling distinctions between art and audience by making a distinctly embodied address. For this reason, an in-depth neuroaesthetic analysis of their work was timely, and the large, ambitious retrospective *Donky@Ninja@Witch* offered a rich site for such research.

Introducing *Donky@Ninja@Witch*

FASTWÜRMS' installation *Donky@Ninja@Witch* was an ambitious project. Curator Philip Monk invited the artists to fill the Art Gallery of York University with a massive retrospective of five past installations and one new work. Not content to stage their previously interactive installation works as a collection of museum artifacts referencing past encounters, FASTWÜRMS' used several strategies to enliven the space. They decided to literally inhabit the gallery – setting up a tent on the floor and living there for several weeks during the installation/residency – in order to activate the large space to their satisfaction. Carefully considering sightlines from multiple points of view within the

gallery, the artists produced fluid transitions and cross-talk throughout the entire exhibition by allowing each installation to overlap visually with the others. Moving from the front to the back of the first gallery, visitors first encountered *House of Bangs* (1999) (Fig. 5), a DIY hair salon – initially staged as a collaboration at Andrew Harwood's tiny Toronto storefront gallery, Zsa Zsa – where performers offered haircuts on opening night. Then came *Blood and Swash* (2002) (Fig. 4), a felt pen tattoo parlour – initially created for Zsa Zsa in collaboration with artist Jill Henderson – where visitors could join the artists at tables to get tattoos and/or create their own icons on denim patches. *Gusset Nation* (2004) (Fig. 7) presented a utopian cat playground with balls of yarn, catnip toys, giant cobwebs made from bras and panties, and a monitor showing the videos *Pussy Necropolis* featuring Siegfried and Roy's sexy Royal White Tigers along with FASTWÜRMS' charismatic feline familiars.

The second gallery was darker. Passing through the glass doors that separate the two spaces, visitors first encountered *Pirate Head* (2003), a smoke-puffing cannon stocked with an uncanny pile of human skulls for projectiles. The next exhibit, *Blood Clock* (2005) (Fig.8) comprised a video installation decorated with axes, scythes, dildos, mirrors, busts of the Egyptian cat goddess Bast, and a projection with sublime and pensive footage of a white cow drinking from a golden pond at sunset. The final installation was a new work, *Pink Donky* (2007) (Figs. 9-10), in which Witch Nation icons such as a giant mock-Canadian flag with a pentagram in place of the maple leaf, cauldrons, and animal banners surrounded a small, prefabricated outbuilding, or Nissen hut, commemorating a donkey sanctuary. Inside the hut, a monitor displayed the video

Witch vs. Ninja, shot in eerie green night vision, in which the witches and a group of ninjas flit in and out of shadows on the spooky streets of Venice. Each re-staged installation was itself a major undertaking amassing a mind-boggling amount of artwork.

FASTWÜRMS couched their delivery of darkness in wicked dark humour. The pirate skulls were humorous. A fake cannon was shooting out of the darkness toward the glass doors that separated the two galleries. A decal that looked like shattered glass had been applied to one of the doors, making it seem as if a skull had been shot right through, forming a vaudevillian slapstick hole in the barrier between the light and dark. FASTWÜRMS' kitschy humour held a kind of promise: no matter how deeply one chooses to engage with their cosmology, the levity ensured one would always be able to find a way back out.

FASTWÜRMS' exhibition had many entry points: some people may have connected with stonewashed denim, others with pirates, others with hairdressing. Some might have found their eyes drawn to spots of saturated colour, others to black and white silhouettes. Some visitors would have made an historical investigation, tracing the recurrent images and icons from FASTWÜRMS' retrospective past, others would have been encountering the work for the first time. Some might have connected with images of owls, others with snakes, others cats, frogs, crows, daggers, moons, etc. Some would have wanted to look at pictures, others to watch video, some would have been motivated to participate in performative collaboration. Some people would have been drawn to take up political identifications with working class culture, some to take up troubled gender norms, or to engage with in animal rights issues. Some would have felt a pull to lose

themselves in the paranormal, others in kitsch, others in science fiction. Some would have felt playful, some frightened, or politically roused, or welcomed into a process of healing. Most importantly, these modes of identification overlapped with one another and extended beyond the gallery to implicate broader natural/cultural networks – audiences were invited to actively situate themselves within the matrix, becoming aware of their own cognitive associations in the process.

The Installation and the Brain: Interconnecting Webs of Association

FASTWÜRMS' retrospective exhibition, *Donky@Ninja@Witch* was structured as an intricate, open-ended web of overlapping installations that foregrounded cognitive processes of association. While FASTWÜRMS were not working specifically with the medium of networked computers, the prevalence of interconnecting webs throughout the exhibition recalls critical questions raised by new media theorists Geert Lovink and Anna Munster in 2005. Lovink and Munster queried a widespread aestheticization of connectivity by new media artists and designers that often took the form of two-dimensional webs, commonly referred to as maps, representing various complex networked relations.[22] Theorizing online culture as a manifestation of networked communities, Lovink and Munster argued that the proliferation of maps perpetuated a misunderstanding of the subjective experience from within networks. "The very notion of a network," they wrote, "is in conflict with the desire to gain an overview."[23] Networks, for Lovink and Munster, did not function as static graphic structures, but as non-hierarchical fluid societies, subject to both growth and decay. Furthermore, experience of

the network as a participant involved an active process of interaction that could never thoroughly account for all the influences and outcomes of one's actions. Lovink and Munster explained that legible maps, fixed and reduced to a finite set of connections, elided certain critical modes of knowing.

> Mapping information – the aesthetics of contemporary visualization – provides a sense of relief that the twisted and unstructured info-bits that roam around in our cognitive unconscious are finally laid-out to rest. A beast is tamed.[24]

Lovink and Munster advocated for a different network aesthetic, one which is "more akin to social aesthetics in which we engage in and with the collective experiences of being embroiled in networks and being actively part of their making."[25] FASTWÜRMS similarly confounded considerations of their networks from the position of a detached observer, rather, they invited their audiences to act as participants within embodied webs of association. While images of webs proliferated throughout the exhibition, they functioned, in part, as visual synecdoche's for an embodied, dimensional set of networked relations too fluid and complex to be represented in graphic form.

A giant bat hovered above the *Blood and Swash* installation (Fig. 4). It was made of string-art, woven with colourful yarns threaded between green-capped nails that had been physically pounded into a stretch of the gallery wall. The design was extremely intricate. From a distance the creature was rendered in flat planes of colour that, upon closer inspection, abstracted into finely detailed intersecting patterns. Other giant, spider-like webs – visible in the adjacent enclave housing *Gusset Nation* - sprawled in organic graphic patterns across corners and over the edges of walls. Upon moving closer it became instantly clear that one was made from bras and the other from panties – the

triangular gussets of the garments making up the repeating shapes of the larger web. The bat, loaded with associations from the mythical world of vampires to the scientific world of radar and echolocation, was legible as an image, revealing an abstract intricate formal structure in its details. The underpant gusset webs, conversely, were iconographically legible at the detailed level of components, their exuberant byzantine structure composed of real world commodities that resonated playfully with sexual innuendo, gratification, and desire.

While each of FASTWÜRMS' cobweb sculptures made a two-dimensional impact, they unfolded into three dimensions, and further into open-ended networks of association between pattern and reference. These webs operated as cues, referencing the web-like structure of the entire exhibition, while simultaneously affirming that the overall set of associations was far too motile, subjective and complex to be mapped and visually rendered. If Sapolsky was right that humans are good at holding onto two different realities at once, FASTWÜRMS made that concept manifest by inviting percipients to participate by weaving their own webs association between multiple standpoints. Furthermore, they extended the nexus of associative perception to engage non-human entities. The giant cobwebs of *Gusset Nation* resonated with the manifold compilations of objects and images that spread across every wall of the exhibition. In connotative harmony, spiders dotted the show hither and thither: dangling off a crescent moon, crawling across a denim patch, or holding court under a fringe of hair. While the webs themselves engaged cognitive association, the spiders served as totemic reminders that web-spinning is not an exclusively human phenomenon. Simultaneously, the networked

connectivity evident in *Donky@Ninja@Witch* suggested no subject position outside the exhibition from which to take cartographic stock of boundaries, connections and containments. Instead, audiences were invited to participate as collaborators in the formation of networks, forging perceptual connections within open-ended and overlapping webs of resonant association. As a multi-layered complex of interconnecting networks allowing for fluid leaps of association between any of its nodes, the installation mirrored, or perhaps more accurately, produced, the kind of networked activity that occurs in the human brain.

In fact, neuroscientists have been trying to map the networked components of the brain, in order to understand how they are connected, and thus begin to understand, or at least predict, how consciousness can emerge. In trying to chart nodes in an overwhelmingly complex network, however, they face the same problem identified by Lovink and Munster, which is that any map of the network fixes it as a reduced set of predetermined nodes intersecting at a frozen moment in time. Neural function entails so much complexity and parallel processing that no cartography could ever account for every aspect of the brain's network. Furthermore, some neuroscientists, such as Antonio Damasio, have shown that the networked processes in the brain are intimately co-constituted with the processes in the rest of the body and argue against consideration of the brain in isolation.[26] To make matters even more complex, when neuro- and cognitive scientists consider the brain/body in ongoing interaction with the environment, the viability of producing consciousness through detailed mapping of neural networks comes under serious question, even as a hypothetical proposition.

Computational neuroscientist Jerry Fodor has situated himself as a bit of a whistle-blower, despairing of the aspirations of his discipline.

> You might think that cognitive scientists would be worried a lot about the limitations of the Classical computational theory of mind. Speaking for myself, I'm worried half to death. In fact, it seems to me, much of the field is in deep denial... As usual, the characteristic mechanism of denial is suppression.[27]

Fodor challenged his colleagues to address head-on the structural impossibility of quantifying associative cognition, suggesting, specifically, that cognitive scientists had been avoiding discussion of "abductive inference."[28] In the vocabulary of cognitive science, abduction stands in contrast to induction. Whereas inductive reasoning is an incremental process of "inference from particular to general,"[29] abductive reasoning is a process of association by which one makes an instantaneous leap of "inference to the best explanation."[30] In order for neuroscientists (and/or robotics engineers) to construct a computational model for inductive reasoning, particulars could be programmed which the system would then analyze according to a set of semantic rules.[31] Designing a model for abduction, however, falls into a different order of task, not just technically difficult, but theoretically impossible. Because abduction operates as an unpredictable leap of association, a scientific model would require programming for what Fodor calls, "the whole background of epistemic commitments,"[32] meaning the entire spectrum of knowledge and past experience inherent to a conscious individual. Cognition emerges in a subjective network of both past experiences and temporal, perceptual influences that cannot be mechanically modeled because the potential associative connections are unpredictable and infinite. Thus, because empirical experimentation usually requires

plausible working models, neuro- and cognitive scientists, according to Fodor, face a methodological impasse in trying to determine how the brain gives rise to consciousness.

While cognitive or neuroscientific models of consciousness are limited in their ability to provide a context for studying abduction, *Donky@Ninja@Witch,* as an art exhibition, was in no way bound by the scientific requirement for defined and quantifiable variables. Rather, the installation could operate as a provisional model for examining abduction because its conditions of engagement called forth the very "background of epistemic commitments"[33] or breadth and depth of accrued life experience that scientists are unable to map and program for. Repeated representations of webs implied a networked structure, while a rich, unchartable labyrinth of images and objects provoked the opened-ended experience of association as a infinitely variable subjective experience. The abductions produced by the installation could not be predetermined, measured, nor quantified, but they could be observed. Neuroaesthetic knowledge about abduction emerged as embodied awareness of associations produced between engaged percipients and the objects and images they encountered. The associative webs in the installation largely operated non-linguistically, yet they were overt to the extent that audiences became self-reflexively aware of them, and thus they offered an embodied experience of cognition as a process of reciprocal engagement within a networked system.

In contrast to other neuroaesthetic theorists such as Onians and Ramachandran, the neuroaesthetic approach that I am advancing here does not situate the brain as an isolated organism. Considering the brain as part of an aesthetic assemblage –

encompassing artworks and their audiences as material agents operating in social contexts – is warranted in part by "top-down" models of consciousness, as critically reconfigured by Murphy and Brown. In their collaborative book, *Did My Neurons Make Me Do It?* the writers formulated a theory of consciousness that they called non-reductive materialism. In reductive materialism, the domain of traditional neuroscience, the parts are seen to determine the behaviours of the whole. While non-reductive materialism retains considerations of mind as a material manifestation of the brain, the behaviours of the parts are here understood to be determined by the structures of the system in which they function.[34] As Brown and Murphy explained, neural feedback systems are in a constant state of flux, shifting and adjusting in ongoing interactions with the world. Thus knowledge of the world is here construed again as a process rather than a product. Consciousness while material, operates co-extensively with the surrounding material environment.[35] This model refutes the scientific tradition of atomistic thinking, described by Murphy and Brown as follows,

> [A]toms" (in the philosophical sense of being the most basic components) are attributed "ontological priority" over the things they constitute. Thus, all causation is bottom-up – it is the atoms that do all of the causal work, and the supposed causal capacities of macroscopic entities are seen as epiphenomenal. When this picture is coupled with a further assumption about causation, a holdover from Aristotle, that nothing can be the cause of itself, the conclusion is that humans and other organisms cannot be the causes of their own behaviour or characters.[36]

Reversing the tradition of ascribing causal powers to the most basic components of matter, the authors argued instead for agency of the whole organism as a system that constrains the behaviours of its component parts. In challenging atomistic models of the brain, then, Murphy and Brown also challenge ideological hierarchies embedded in

evolutionary theory that ascribe ascendency to cognitive functions over non-conscious neural processes.

Neuroscientists, following in the atomistic tradition of science, have traditionally conceived of the brain according to bottom-up models, in which the smallest parts – neurons – drive the behaviour of the entire system. Furthermore, neuroscientists have made use of evolutionary analogies to describe the structure of the brain, correlating "lower" areas where nonconscious processes take place with "older" evolutionary forms (hence the phrase "reptile brain.") The "newer" areas of the brain are "higher" and more cognitively developed. The neuroscientific, "bottom-up" model of consciousness suggests that non-conscious processes exclusively drive the system.

Yet, as discussed in Chapter One, Murphy and Brown's definition of "top-down" is not a direct, spatial corollary to the standard notion of "bottom-up" and they hasten to head off any misinterpretation. "Top-down," in this sense does not refer to a hierarchical executive function of conscious thought determining experience and behaviour. Murphy and Brown formulate "top down" as an acknowledgement of the constraints of a "higher order system" rather than to the anatomical positioning of some brain parts above others in an upright body.[37] While the notion of a top-down system may resonates with deterministic conservativism, in this case, the authors mean to imply the contingency of relations between systems. The distinction is important, because while the authors reject the notion that the nonconscious activities of neurons at the cellular level determine human behaviour and experience, they are explicitly not arguing that conscious thought determines behaviour either. Rather, conscious and non-conscious processes work in

concert, co-constituted in the embodied systems of the organism as it is engaged in ongoing feedback relations with myriad systems in the world.

While Murphy and Brown used the written word to explicate the temporal reciprocity of cognitive engagement, *Donky@Ninja@Witch* in fact engaged similar cognitive processes through the embodied interactions of audiences. Similar to the human brain, the relational complexity of FASTWÜRMS' installation, and the importance of the situated subjectivity of the audience, meant that the exhibition's effects could not be mapped or plotted from the bottom-up. Rather than simply transmitting an experience of art from sender to receiver, *Donky@Ninja@Witch* fostered neuroaesthetic modes of knowing as a process co-evolving between many collaborators, including audience and artworks. The epistemological framework of witchcraft allowed for a kind of reflexive animism –animals were depicted as having agency and input into the forms of the works in the exhibition, while the works, many of them depictions of animals, registered on the level of icons, with an active agential force or presence in and of themselves. Gallery goers were thus invited into immersive and multi-dimensional engagements in which they could choose how deeply to suspend their disbelief in order to play a role in investing the objects with associative meanings. The resonant networked objects and images responded with an affirmation of art's associative capacity to produce engagement with the world. The networks of engagement in FASTWÜRMS' world included associations with myriad non-human entities, and thus the neuroaesthetic knowledges that they advance also imbricate nature and culture.

Telepathy, Mind Reading, and Inter-species Communication

One strategy for demonstrating the co-constitution of nature and culture is FASTWÜRMS' emphasis on interspecies communication. In a recent TED Lecture neurobiologist Robert Sapolsky suggested that the human quality that most distinguishes humans from other animals is the ability to believe two contradictory things at once.[38] Sapolsky, apparently, has not spent much time with cats. Cats are masters of contradiction, experts at suspension of disbelief.[39] Cats treat a good session of string chasing as much like a hunt as a game, and they conduct a good mouse hunt like a playful frolic as well as a deadly mission. FASTWÜRMS spend a lot of time with cats and their artworks posit a feline-esque agility between signifying modes.

FASTWÜRMS' video *Telepathacats* (2003) was screened on a monitor as part of the *Gusset Nation* installation in *Donky@Ninya@Witch*. It opened with found footage of a science lab. Two men in white coats maneuvered a large unidentifiable, techno-scientific piece of equipment. One of the scientists gestured slowly with a white-gloved hand, as the other man carefully moves the machine into place. The scene then cut to a blindingly white snowy landscape in which the artists – dressed as witches with pointy black hats, black capes, and gloves – made slow, hypnotic hand gestures as their cats cavorted around them. Set to a techno-dance groove, the edits cut back and forth between the witches and the scientists, as each used their hands to shape and direct the movements on screen. The cats seemed to be enjoying themselves a great deal, and the patterns of their movement synched up with the witches' gestural directives. As the cats and witches

played together, nobody could possibly believe that the interspecies companions were actually communicating telepathically ... or could they?

Why assume, for instance, that the witches were doing the directing? Perhaps the cats were setting the agenda and FASTWÜRMS were simply responding, adjusting their movements to reflect the imminent behaviours telegraphed by the cats they knew so well. Or perhaps the dynamic was a give and take in which all parties were teasing each other with intertwining moments of tension and release. During the climactic scene, one of the witches crouched in the foreground making an upwards gesture with his hand, his pointy witch hat perfectly composed in the frame, while one of the handsome orange cats, also perfectly composed (in both senses of the phrase), leapt dramatically up the side of a snow bank. It looked for all the world as if the witch and the cat were in cahoots, both playing to the camera, suggesting that we the audience were the ones being teased.

Of course there were others elements in this video besides the performing humans and cats – the pace of the edits, the dancey trance-like music, the contrast of the figures on the white snow, the juxtaposition between outdoor scenes and the science laboratory, all contributed to the dynamic tension. The scientists in the video were goofy in their solemnity, yet they exuded confidence. They had a methodological system for deploying their apparatus, and it worked. The witches adopted a similar demeanour. Nobody except FASTWÜRMS could wear those funny hats and pull it off. They seemed both convinced and convincing because, while they were certainly playing, they were not *just* playing. FASTWÜRMS really are witches, and they really do read cats' minds.

The word telepathy has a supernatural connotation, implying a mode of communication that happens by means that "cannot be understood by known scientific laws."[40] Yet, mind reading, on the other hand, functions as a perfectly ordinary term in the neuro- and cognitive sciences. As I will discuss further in Chapters Five and Six, people often make assumptions about the thoughts and feelings of others based on facial expressions and body language. While the assumptions drawn from non-verbal interaction may not always be correct, they are accurate enough to form the basis of much communication. Interspecies mind reading, then, need not come as much of a surprise, especially between animals who are as intimate and familiar as FASTWÜRMS and the cats with whom they live.

Models of mind and inter-species interaction are connected because the ways humans think of themselves as biological entities impacts on the way social power dynamics are established in self and other relations to culture. Theorists – from Aristotle, who proposed that humans have better memory than other animals, affording us the capacity for art and reason,[41] to philosopher of science Mary Midgley, who suggested that humans are unique in the degree to which they communicate with each other, a capacity that emerges in babies even before they develop motor skills – have found it useful to delineate essential differences between humans and other animals.[42] In cognitive science, the capacity for theory of mind – which means the understanding that others besides oneself have states of mind – ostensibly marks a boundary between humans and other species. As neurologist Adam Zeman explained it, "The ability to read our own states of mind and to recognize them in others is a central part of human self-

consciousness, involving what we called the 'awareness of awareness.'"[43] Zeman argued that the concept of theory of mind as formulated in cognitive science serves as a "corrective to [neuroscientific] ideas framed solely in the language of neuron and brain: society plays a powerful role in the creation of a fully fledged human consciousness."[44] The capacity for theory of mind allows people to form human collectives, but what of other species or nonsentient entities with no minds (or, at least, no brains) at all? FASTWÜRMS' aesthetic research methods are interesting in this regard because they recognize such entities as participants in their work. Through cohabiting, communicating, collaborating, crafting, and collecting, FASTWÜRMS' processes of embodied engagement have manifested in their exuberant exhibitions, where audiences were invited to actively join in. As Barbara Fischer has noted, FASTWÜRMS installations appeal to the visitor to "get involved, to act, to partake in the tasks that they propose. Their own intuitive communications as a collective are thus extended to a yet larger group: the artwork's audience."[45] Instead of producing sublime confrontations between humans and a humanist construction of nature-as-other, FASTWÜRMS have positioned humans as members of the animal kingdom, actively co-habiting the planet in ongoing interaction with other species.

Intelligibility as a Capacity of Humans and Non-Humans Alike

FASTWÜRMS' ecological stance is distinctive because they do not recognize nature/culture boundaries. Instead, they produce aesthetic experiences that emphasize perceptions that emerge within an interspecies subjectivity. By contrast, in her 2010

book, *The Ethics of Earth Art*, art historian Amanda Boetzkes analyzed ecological works by earth artists such as Robert Smithson, Andy Goldsworthy and Ana Mendieta and James Turrell,[46] arguing that these artists withdrew from representing nature, thereby acknowledging that nature is irreducible to human experience. Like Georges Didi-Huberman, Boetzkes engaged earth's materiality as an "otherness that escapes signification."[47] She explained that "... an ecological stance involves revealing the limits of an anthropocentric worldview and recognizing these limits as thresholds to the excess of the earth."[48] Boetzkes drew on Luce Irigaray's concept that difference from the other provokes wonder which prevents assumption of the other into oneself.[49] She insisted on the earth's alterity as a necessary condition for an ethical relationship between humans and nature.

In the context of contemporary ecological issues, I concur with Boetzkes' urgent call to recognize the material world *as such*, and I share her view that artworks' aesthetics can manifest as ethical relations between humans and other entities. I resist, however, her insistence on affirming an untraversable divide between humans and nature. Writing about Andy Goldsworthy's interventions, for example, she suggested that in "staging the body's separation from the earth's substance...artists identify a rupture between sensation and intelligibility."[50] But it could as easily be argued that Goldsworthy's aesthetic reconfigurations of natural elements do not reinforce distinctions between sensation and intelligibility, but rather situate sensation as a mode of intelligibility – the percipient's own awareness of their perceptions and constructions of form manifesting as a neuroaesthetic capacity for knowing and engaging with the world.

In examining how FASTWÜRMS entail natural elements as agents in the cultural webs they weave, I aim to demonstrate that sensation and intelligibility are in fact inextricably intertwined. In my neuroaesthetic formulation, the aesthetic, in encompassing the conditions of human perception, affirms the status of humans as natural creatures, while simultaneously revealing the role of sensation as a culturally contingent mode of knowing. In turn, contingent knowledge becomes a condition of sensation, in that no sensation can occur in isolation from the temporal and ongoing reciprocity of situated exploration of the world. Intelligibility, then, can be understood not just as a discursive reading of the world, but also as an embodied, contingent mode of navigating the world. It is important to recognize, as Haraway has, that knowledge is situated and partial. In this, I concur with Boetzkes' suggestion that the ethics of engaging the non-human world must entail acknowledgement of otherness. Nevertheless, drawing from Barad, it is also important to acknowledge that intelligibility itself is not exclusive to human modes of knowing. In considering intelligibility as a natural/cultural phenomenon, I draw from Karen Barad's idea of agential materialism.

> In traditional humanist accounts, intelligibility requires an intellective agent (that to which something is intelligible), and intellection is framed as a specifically human capacity. But in my agential realist account, intelligibility is an ontological performance of the world in its ongoing articulation. It is not a human-dependent characteristic but a feature of the world in its differential becoming.[51]

In Barad's radical formulation she did not hesitate to ascribe agency, or even modes of knowing, to non-human creatures and she extended her ontology to include non-living entities. Yet, she would most certainly agree with Boetzkes that the earth is irreducible to human experience – while non-humans entities share the capacity for intelligibility, that

does not mean that their modes of knowing are always open or accessible to human points of view. Barad assumed a situated subject, drawn from Haraway, whose knowledge is never omniscient and detached, but always partial, fluidly co-constituted in ongoing entanglements of difference in intra-actions with others.

If knowing and intelligibility are not the exclusive purview of humans, then other entities can also be understood as both natural and cultural, or as Barad would say, to be engaged in "naturalcultural practices."[52] While humans are not physiologically equipped to perceive the world as other species perceive it, they are nevertheless actively engaged as creatures of the world, where various forms of "naturalcultural practice" intersect and overlap. The artists that Boetzkes takes up, she argues, maintain a respectful distance from the other that is nature even as they make their marks in and on the earth. FASTWÜRMS, however, do not presume that other species are unintelligible. Rather, their address to alterity embraces nature, activated through heterogeneous webs of lexical, iconic, logocentric, atmospheric, affective, frightening, funny and audacious interconnections. The forms of knowledge associated with both witchcraft and with Barad's feminist scientific epistemology, derive from observations of nature and epistemological investment in the complex and contingent interactions of matter. FASTWÜRMS' artworks manifest matter as cultural and culture as material. Furthermore, they position other species, such as cats and spiders, as collaborators and colleagues who make active contributions to the socio-cultural networks that they invoke. Finally, in one section of *Donky@Ninja@Witch* they also used written language to invoke particular powers attributed to non-human species.

While interconnecting webs in the brightly-lit first sections of the gallery invited open-ended interaction through embodied interaction, the spells that FASTWÜRMS' cast in the second, darker space foregrounded associative cognition using written words. Here, some of the associations provoked were more directive, delivered through eerie incantation, and the atmosphere proved too frightening for some young audience members. On opening night I witnessed several students flee the back room for the more brightly lit sense of communal fun in the front galleries. I admit that I felt some trepidation myself, yet, as with all the best comedy-horror movies, FASTWÜRMS' camp presented fear as an optional indulgence, rather than an imposition.

A grid of banners were installed near two hanging cauldrons. Each banner bore a phrase of spell casting such as "coil of snake," "stab of heron," "dive of loon," and "fix of frog." The scenario was reminiscent of the three witches in *Macbeth* who incant around their cauldron, "Eye of newt and toe of frog, wool of bat and tongue of dog..."[53] Like the *Macbeth* witches, FASTWÜRMS' installation conveyed something half-way between slap-stick humour and awe. The artists' incantations, however, differed from Shakespeare's in a significant way. The animal attributes that FASTWÜRMS invoked didn't refer to bodily objects such as eyes, toes, and tongues that could be severed and boiled, but to actions – behaviours that could be emulated but never possessed. Nevertheless, FASTWÜRMS' methodology differed dramatically from the earth artists examined by Boetzkes in that the witches did not withdraw respectfully from the alterity of nature, but actively, audaciously, enlisted non-human entities into their sphere of influence.

Boetzkes' feminist rehabilitation of phenomenology is very helpful to situate sensory experience of the world as partial and provisional rather than deterministic. Irigaray, Boetzkes explained, objected to the solipsism of Merleau-Ponty's philosophy. While Irigaray was willing to accept Merleau-Ponty's argument that tactility informs sensations to create coherent perceptions, she argued that much of the world eludes perception altogether.[54] In this, then, Irigaray's influence can also be felt in Haraway and Barad, who argue that situated knowledges are always limited and all-encompassing points of view are impossible propositions. In Irigaray's 1985 essay, "Is the Subject of Science Sexed?" she referred to science as a " universe of fiction,"[55] and worried about who was not being heard and what as left unsaid by formalized, discipline-specific languages.

Boetzkes, in writing about the artist Hamish Fulton – who conducted walks in nature and documented them with terse and factual wall texts – claimed that the "...earth's excess registers in the textual document as an obstacle to meaning..."[56] For Boetzkes, the artist Fulton held back, adopting an ethical stance regarding the earth "...that for Irigaray is a retraction from the mistaken presumption that one knows the other, in order to let the other present itself in its own terms." [57] The ethics of making art about nature, for Boetzkes, lay in artists' decisions to present the natural world as something unknowable. By contrast, FASTWÜRMS, might have seemed to suggest that the non-human world *is* knowable by audaciously displaying banners bearing incantations of animal attributes in the English language. I aim to demonstrate, however that FASTWÜRMS' mode of knowing nature retains the ethical acknowledgment of

otherness so important to Boetzkes and Irigaray, while retaining a relational sense of shared community between species that they activate as human accountability for their behaviour towards non-human animals.

The texts on FASTWÜRMS' banners were reminiscent of wording in the *Orbis Sensualium Pictus*, a picture book for children, published in 1657, which announced itself as "A Picture and Nomenclature of all the chief things in the world, and of men's actions in their way of living."[58] An animal alphabet alliteratively lists certain natural entities and their behaviours, such as, "àà: the Crow crieth," "lu ulu: the Wolf howleth" and "fi fi fi: the Wind bloweth." [59] The book falls laughably short of living up to its claims of comprehensive classification, as many creatures, elements, and processes are left out. And yet, what is to be made of an inventory that includes both the wind and the wolf as agents? In *Orbis Sensualium Pictus* the poetics of the inclusions invoked the exclusions, a sphere of relations that was unknown but not unknowable. Similarly, the metaphoric nature of FASTWÜRMS' spells implied a larger, potent semantic system, pregnant with possibilities. As with any scientific system of classification, boundaries remain contestable and any acknowledgement of alterity can foster change.

While the black cauldrons in the installation dangled as if in reference to a fictional potion, the actual concocting happened in the moment, in the gallery, as viewers were invited to internalize a potent mixture of animal powers that just might linger and empower beyond the experience of the exhibition. Not only did the animal powers invoked by FASTWÜRMS emerge through verbal naming, but the installation also imparted knowledge of how to cast such a spell. The piece included no "logos of human"

banner, but one could hypothetically be added to the grid of incantations. FASTWÜRMS' address revealed an excessive dimension of logos itself; a capacity for meaning making that exceeds the limits of intelligibility. In this way, FASTWÜRMS didn't mistakenly assume to speak for others in Irigaray's sense, but rather hailed non-human confederate by naming their capacities – "coil of snake," " dive of loon" – as a way of performing interspecies affinities through identification of observed physical behaviours. "For Irigaray," wrote Boetzkes, "the ethical relation is negotiated through a mode of corporeal interaction. This relation caresses and embraces but never grasps or envelops, the other."[60] While FASTWÜRMS situate themselves as cultural/natural interspecies mediators, they never coerce their collaborators nor their audiences by imposing subjectivities on them, but rather pay them homage as participating entities, powerful in their own right. Speaking of their cats, FASTWÜRMS explained their interspecies relationship as a familial connection.

> The idea of a familiar is literally that they're your family, which means you break down any emotional or psychological barriers that should supposedly exist between self and Other. You think of them as part of you, an extension of you. Their sensory information reaches you. For example, with cats, they know the world differently. If you observe them long enough and you're that linked, then you can actually see through their eyes or hear the way that they hear.[61]

Magic, at least in this instance, may be a matter of paying attention at the edges of perception, of listening perceptively and calling out to others on their own terms, refusing to accept that there can be no possibility of communication across difference.

In their manifesto, published in the D*onky@Ninja@Witch* exhibition catalogue produced by Contemporary Art Gallery, FASTWÜRMS explained, "In Witch culture

personal freedom is a participation and positivity economy, enhance the liberty of Others and you prosper, constrain free will and you suffer."[62] In contrast to Shakespeare's witches, FASTWÜRMS would never cast a narrative spell that involved the dismemberment of animals. Their cats are not possessed as pets, but respected as family members, and the artists thoroughly reject the notion that one being could own another. At the very back of the second gallery, their Donky installation bore a poster with a quote from Alice Walker:

> The animals of the world exist for their own reasons. They were not made for humans any more than black people were made for white, or women created for men.

FASTWÜRMS have actively resisted instrumentalizations of non-human and human animals alike. By making their philosophies of mutual respect and free will explicit, FASTWÜRMS created a frame of reference that conferred as much importance on the knowledge and agency of the viewer (also, technically, an animal) as on the knowledge and agency of the artist (another animal).

FASTWÜRMS' installation *Pink Donky,* presented in a screening room shaped like a small barn, operated, in part, as an homage to the Donkey Sanctuary of Canada, where the animals are given space to wander and the freedom to conduct their lives according to their own volition. *Pink Donky* was a new work produced for the exhibition. One side of the hut bore a large colour photograph of a donkey at the sanctuary, on the other side hung the Alice Walker quote, cited above, linking human ownership of animals with slavery. FASTWÜRMS explained their use of Alice Walker's quotation, and their frustration with people who do not recognize animals' rights to self-determination.

> There is an impossibility of seeing beyond a construct that benefits you. People will say, "sure, your nature stuff is all very well but I am going to continue eating chickens because that's just the way it is." They don't stop to realize that years ago people would've said the same thing about keeping slaves.[63]

And, true to form, FASTWÜRMS used the technology of language to interrupt social constructs, jarring preconceptions by spelling Donky without an "e." In their glossary, they presented their own definitions for both terms:

> Donkey: to consider interspecies exchange as an aesthetic object in and of itself.
>
> Donky: to perversely celebrate the transcendent value of the lowest form of unrewarded labour.[64]

As with the animal banners, FASTWÜRMS again mobilized nouns as verbs. "In witchcraft," they asserted, "language is powerful enough that by speaking with intent you can manifest the symbolic order."[65] Here, the witches transformed the conventional symbolic construction of donkey, as an object for human use, into a process of aesthetic engagement and accountability. As FASTWÜRMS explained about their potent manipulations of English, "if you don't know the reference, it's a hidden language."[66] By sharing their terminology in a glossary, they let audiences in on the performative power of their words.

The artworks may have been magical in that they facilitated the power of transformation from one mode of being to another, but they were not supernatural because all of the processes that took place were apparent and embodied in the contexts and constructs of the physical world. By enacting knowledge of their witch's creeds FASTWÜRMS embodied magic without deceit. While the exhibition literally contained

both smoke and mirrors, it remained devoid of chicanery or coercion. As with scientific research conducted in a lab, the gallery installation made the knowledge produced and the means of its production openly available for communal public use and scrutiny. Percipients were invited to engage their critical faculties in choosing for themselves how deeply they wanted to enter FASTWÜRMS cosmology. By explicitly inviting experiences of agency, they created a safe environment for neuroaesthetic exploration. In contrast to the coercive conditions and constraints of the MRI scanner, FASTWÜRMS' installation empowered an "awareness of awareness" within embodied processes of cognitive association.

Donky@Ninja@Witch as a Neuroaesthetic Research Site

The gallery conditions of the neuroaesthetic experience of *Donky@Ninja@Witch* could never be comprehensively reproduced for quantification in a labratory-based neuro-imaging experiment. As discussed in the previous chapter, fMRI requires the identification and isolation of specific neural activity in predetermined regions of the brain. In contrast, FASTWÜRMS' retrospective gallery installation manifested as a different kind of model, one more aligned with developments in neuro- and cognitive science that focus on abduction, or association, and consider the brain as a organism co-constituted the world through ongoing feedback and engagement. Significantly, while an fMRI experiment can only account for linear relations of active stimulus and passive respsonse, FASTWÜRMS' formulation embraced multiple entities in the assemblage –

brains, bodies, cats, spiders, images and objects alike – as agents in collective co-constructions of embodied art experience.

In experiencing *Donky@Ninja@Witch,* the brains of multiple percipients performed physically in association with other socio-cultural agents in the web. Furthermore, the exhibition transparently staged these cognitive processes of association as aesthetic modes of engagement. FASTWÜRMS' installation differed from a scientific model in that the results it produced cannot be reliably repeated, and depend entirely on the subjective experience of participants. Nevertheless, *Donky@Ninja@Witch* did offer a material instantiation of associative cognition as a mode of interaction within extensive networks of, in Fodor's terms, "epistemic commitments."[67] Art in art contexts cannot quantify the open-ended variables and potentially infinite spheres of influence on consciousness, yet, when considered qualitatively as situated, neuroaesthetic engagements of audiences, FASTWÜRMS' installations did encourage embodied knowledge of cognitive association into awareness. Thus, while the installation did not scientifically model the networked nature of the brain, in fact it operated very much like a brain through its sheer complexity as it activated cognitive processes entailing social and material networks unbounded by the physical limits of the installation.

Conclusion

In a time of ecological disaster, humans ought not to underestimate their power. Humans are not the only ones acting, knowing and creating meanings, but they are accountable for the natural/cultural manifestations they help to bring about. In this chapter I have

demonstrated how, by activating the human capacity for embodied association through art and language, FASTWÜRMS revealed that nature and culture operate as co-constitutive spheres, entangling audience agencies with those of animals, images and objects. As Boetzkes insisted, nature cannot be fully expressed by human forms of knowledge. At the same time, Barad, Latour and Haraway have all suggested that human forms of knowledge are in themselves natural phenomena. Like these theorists, in their exhibition *Donky@Ninja@Witch*, FASTWÜRMS embraced accountability to other human and non-human entities by fully acting in and of the world. They did not feign objective detachment, instead they exercised their capacity for power, extending empowerment to others by welcoming them to collaborate in the production of aesthetic incantations that revealed multiple associations between various social and interspecies networks. In FASTWÜRMS' formulation, other humans (including their audiences) and non-human entities were enlisted, solicited and seduced to contribute their own knowledge-producing capacities to the witches' aesthetic nature/culture matrix. In this collaborative process, they exemplify Boetzkes call for artists who work with nature to respect the differences between humans and non human entities. FASTWÜRMS' interspecies collective included themselves, the animals they invoked, the objects and images they engaged and the audiences they addressed.

The key stakes of my neuroaesthetic analysis of *Donky@Ninja@Witch*, pertain to my analogy between the installation and a living brain. As percipients were invited to actively navigate the overlapping complexities of the exhibition, they were further welcomed to become aware of their own processes of cognitive association as embodied

modes of knowing. In the gallery, the intersecting webs of association across multi-dimensional networks could not be mapped nor charted, just as the complex parallel networks of consciousness evade inventory and defy models. Furthermore, like a cogitating brain, FASTWÜRMS' installation utilized associative cognition to entail subjective webs of knowledge derived from the situated life experiences of individual gallery goers. As these art engagements unfolded in the gallery, they offered non-linguistic, neuroaesthetic awareness of cognitive processes of abuction. Important for the neuroaesthetic proposition is that the experience of certain artworks emerges as a physiological form of social engagement. The gallery installation *Donky@Ninja@Witch* was itself a networked, natural/cultural environment providing context within which to consider the brain as a social organ.

I shall carry this notion of the social brain forward into the next chapter, where I examine works by Olafur Eliasson that operate within gallery contexts to activate audience awareness of vision as an embodied, culturally inflected and critical mode of knowing. •

End Notes to Chapter Three

[1] Although I have chosen in this dissertation to refer to FASTWÜRMS in the plural, it should be noted that the artists consider their collective as a singular entity.

[2] FASTWÜRMS, "Witch Nation, Directive from the Ministry of Information," in *AGYU Fall 2007 Newsletter*. (Toronto: Art Gallery of York University, 2007).

[3] Jenifer Papararo, "FASTWÜRMS: Webs and Icons," in *FASTWÜRMS: Donky@Ninja@Witch*, exhibition catalogue (Vancouver: Contemporary Art Gallery, 2008), 10.

[4] Semir Zeki, *Inner Visions: An Exploration of Art and the Brain,* (New York: Oxford University Press, 1999), 1.

[5] Barbara Fischer, P*erspective 88: FASTWÜRMS*, exhibition catalogue (Toronto: Art Gallery of Ontario, 1988), 6.

[6] FASTWÜRMS in conversation with author, 4 January 2010, Toronto.

[7] Bruno Latour, *We Have Never Been Modern*, trans. Catherine Porter (Cambridge: Harvard University Press, 1993), 90.

[8] Latour has no interest in debunking science. While arguing that scientific knowledge is constructed, he reclaims the notion of construction for physical reality.

> [I]n all domains, to say that something is constructed has always been associated with an appreciation of its robustness, quality, style, durability, worth, etc. So much so that no one would bother to say that a skyscraper, a nuclear plant, a sculpture, or an automobile is "constructed."

See, Bruno Latour, *Reassembling the Social: An Introduction to Actor-Network-Theor*y (Oxford: Oxford University Press, 2005), 89.

[9] Latour, Ibid., 64-65.

[10] Ibid., 66.

[11] Donna Haraway, "Situated Knowledges: The Science Question in Feminism and the Privilege of Partial Perspective," *Feminist Studies* 14, no. 3 (Fall 1988): 586.

[12] Ibid., 588.

[13] Ibid., 592.

[14] Ibid., 592

[15] Ibid., 592

[16] Latour laments that postmodern theories autonomize discourse as distinct from nature and society. See, Bruno Latour, *We Have Never Been Modern*, trans. Catherine Porter (Cambridge: Harvard University Press, 1993), 62-65.

[17] Fischer, Ibid., 21.

[18] Ibid., 27.

[19] Robert Enright, "Crafting Every Witch Way: An Interview With FASTWÜRMS," *BorderCrossings* 25, no.1 (March 2006): 40-51

[20] Jim Drobnick and Jennifer Fisher, interview with FASTWÜRMS, "HEXhibitionism," in *FASTWÜRMS: Donky@Ninja@Witch*, exhibition catalogue (Vancouver: Contemporary Art Gallery, 2008), 27-42.

[21] Jon Davies, "Props to the Fairy People" in *FASTWÜRMS Donky@Ninja@Witch,* exhibition catalogue (Toronto: Art Gallery of York University, 2010), 46-55.

[22] For example, FASTÜRMS' *Gusset Nation* bears a superficial resemblance to the lush images of webs created by Chris Harrison, a Ph.D. student in the Human-Computer Interaction Institute at Carnegie Mellon, who has graphically visualized a variety of networks including internet connections between cities, the most dugg stories on Digg.com, and user activity on Wikipedia. See, Chris Harrison, *Visualization Projects*, http://www.chrisharrison.net/index.php/Visualizations/Welcome,
(accessed April 29, 2012).

[23] Geert Lovink and Anna Munster, "Theses on Distributed Aesthetics. Or, What a Network is Not," *The Fibreculture Journal*, no.7 (2005), http://seven.fibreculturejournal.org/fcj-040-theses-on-distributed-aesthetics-or-what-a-network-is-not/
(accessed April 29, 2012).

[24] Ibid.

[25] Ibid.

[26] Antonio Damasio, *Descartes' Error*, (International: Penguin Books, c. 1994, 2006).

[27] Jerry Fodor, *The Mind Doesn't Work that Way* (Cambridge & London: The MIT Press, 2001), 39.

[28] Ibid., 39.

[29] *Oxford Companion to Philosophy*, ed. Ted Honderich (Oxford & New York: Oxford University Press, 1995), 405.

[30] Ibid., 1.

[31] Here, Fodor contests theories of mind proposed by Noam Chomsky and Steven Pinker which rely on the supposition that there are underlying neural structures for grammar.

[32] Fodor, Ibid., 37.

[33] Fodor, Ibid., 37.

[34] Nancy Murphey and Warren S. Brown, *Did My Neurons Make Me Do It?* (Oxford: Oxford University Press, 2007).

[35] Warren S. Brown, interview with Ginger Campbell, Brain Science Podcast #62, posted 9 October 2009. http://docartemis.com/brainsciencepodcast/2009/10/62-warrenbrown/
(accessed April 29, 2012).

[36] Murphy and Brown, Ibid., 42-43.

[37] Ibid., 63.

[38] Robert Sapolsky, "The Uniqueness of Humans," TED lecture, Standford University, filmed September 2009, posted online January 2010.
http://www.ted.com/talks/robert_sapolsky_the_uniqueness_of_humans.html
(accessed April 29, 2012).

[39] Jody Berland writes on cats and their capacity to pretend. See Jody Berland, "Cat and Mouse: Iconographics of Nature and Desire," *Cultural Studies* 2, no. 3-4 (May-July 2008): 440.

[40] *Collins English Dictionary*, 3d ed., s.v. "telepathy".

[41] Artistotle, "On 'Techne' and 'Episteme,'" in *Philosophy of Technology: The Technological Condition*, eds. Robert C. Scharff and Val Dusek, (Malden, MA; Oxford; Victoria, AUS: Blackwell Publishing, 2003), 22.

[42] Mary Midgley, *Science and Poetry* (London & New York: Routledge, 2006), 125.

[43] Adam Zeman, *Consciousness, a user's guide* (New Haven & London: Yale University Press, 2002), 299.

[44] Ibid., 300.

[45] Fischer, Ibid., 27.

[46] As mentioned in chapter two, Boetzkes also discusses works by Olafur Eliasson.

[47] Amanda Boetzkes, *The Ethics of Earth Art* (Minneapolis & London: University of Minnesota Press, 2010), 62.

[48] Ibid., 3.

[49] Ibid., 55

[50] Ibid., 48.

[51] Karen Barad, *Meeting the Universe Halfway: quantum physics and the entanlegment of matter and meaning* (Durham and London: Duke University Press, 2007), 379.

[52] Ibid., 88.

[53] William Shakespeare, "The Tragedy of Macbeth" in *William Shakespeare, The Complete Works*, eds. Stanley Wells and Gary Taylor (New York: Oxford University Press, 1988), 990.

[54] Ibid., 19-21.

[55] Luce Irigaray, "Is the Subject of Science Sexed?" *Cultural Critique*, no. 1 (Autumn 1985): 79.

[56] Boetzkes, Ibid., 62.

[57] Boetzkes, Ibid., 62.

[58] John Amos Comenius, *The Orbis Pictus,* (Syracuse: C.W. Barden, 1887) available online through Projext Gutenberg, http://www.gutenberg.org/files/28299/28299-h/28299-h.htm, last viewed April 29, 2012.

[59] Ibid.,

[60] Boetzkes, Ibid., 57.

[61] Drobnick and Fisher, Ibid., 38.

[62] FASTWÜRMS, "Witch Nation, Directive from the Ministry of Information," in *Donky@Ninja@Witch* exhibition catalogue (Vancouver: Contemporary Art Gallery, 2008), 25.

[63] FASTWÜRMS, in conversation with author, 4 January 2010, Toronto.

[64] FASTWÜRMS, "Creation Machines," in *Donky@Ninja@Witch* exhibition catalogue (Vancouver: Contemporary Art Gallery, 2008), 45.

[65] Drobnick and Fisher, Ibid., 40.

[66] Ibid., 40.

[67] Fodor, Ibid., 39.

Olafur Eliasson: Visual Cognition as a Critical Capacity

Imagine entering a room lit thoroughly with an even, lemon yellow light. The colour yellow saturates the space so thoroughly that every other colour in the spectrum has disappeared. Given the lack of colour differentiation, light and dark provide the only contrast, so that the objects in the room, including other people, become strangely monotone – like seeing in black and white, only in this case yellow replaces white. The human visual system has not evolved to comfortably contend with an environment like Olafur Eliasson's installation *Room for One Colour*. Eliasson's colour installations staged the human sense of vision as the object of the art work itself, bringing normally nonconscious dimensions of visual cognition into conscious awareness.

In the previous chapter I examined how FASTWÜRMS' installation *Donky@Ninja@Witch*, provided a model for neuroaesthetic knowledge by encouraging awareness of cognitive processes of association. In this chapter, I will explore how two of Eliasson's immersive installations – *Room for One Colour* (2003) and *360° room for all colours* (2002) – activate neuroaesthetic understandings of contemporary, techno-mediated environments by facilitating percipients' reflexive awareness of "seeing themselves seeing."[1]

Eliasson is a Danish artist working out of Berlin. His studio been mounting large-scale museum and gallery installations internationally since the mid 1990s. In 2003, Eliasson received wide spread media attention for his installation in Turbine Hall at the Tate Museum in London. For this piece, titled

*The Weather Projec*t, Eliasson installed a sun-like disc emitting a warm, orange light. Mists filled the space, creating a sense of atmosphere. The ceiling was mirrored, so that visitors could look up and see their own reflections in this otherworldly environment. The light-emitting disc in *The Weather Project* was comprised of mono-frequency lamps, which Eliasson had used previously in *Room for One Colour* - first installed at the Venice Biennale in 2003 - in which he saturated a room with yellow light. I have chosen to focus on *Room for One Colour*, because, in contrast to *The Weather Project*, it made no representational references. While *The Weather Project* presented an illusion of landscape, *Room for One Colour* more specifically focused attention on the physiology of colour perception itself. I will also consider another of Eliasson's colour installations, *360° room for all colours* (2002) which similarly cast visual cognition as the subject of the work. Both *Room for One Colour* and *360° room for all colours* were mounted, among other installations, in a North American survey of Eliassion's installations titled Take Your Time. The exhibition travelled between the San Francisco Museum of Modern Art (September - February 2008) and The Museum of Modern Art and P.S.1. Contemporary Art Centre in New York (April - June 2008).

Staged within the public context of the art museum Eliasson's colour installations used projected light to create immersive environments that had direct, physiological impact on the visual systems of percipients. By producing after-images, and other optical effects, these works revealed limits and

vulnerabilities in the human visual system.

In her book on neuroaesthetics, Stafford examined Eliasson (among many other artists), suggesting that his work "belongs to the ever-widening horizons of the eye in the age of physiologically expanded and technologically extended human faculties."[2] Stafford identified a "new conceptualism" emerging in contemporary art practice that "deterritorializes and reterritorializes the findings of the neurosciences into an artistic practice that is embodied both mentally and experientially."[3] While I would hesitate to separate the mental from the experiential, Stafford emphasized both explicitly in order to counteract the neuroaesthetic tendency to focus primarily on nonconscious processes. While *Room for One Colour* and *360° room for all colours* addressed nonconscious and involuntary aspects of colour perception, I shall extend Stafford's brief analysis of Eliassion to demonstrate in detail how, in the reflexive and collective context of the msuesum, these works produced different modes of neuroaesthetic knowledge from those that emerge in neuroscience labs. In particular, while subjects in fMRI scanners provide information about the brain to the scientists who observe them, Eliassion's installations provided embodied knowledge to the percipients who were subject to their effects. Furthermore, encouraging critical consideration of how the physiological engagements of vision unfolding within the context of the museum might inform the perceptual impacts of pervasive technoscientific conditions encountered in broader cultural contexts.

I will begin by considering the neuroaesthetics of embodied vision raised by *Room for One Colour* and *360° room for all colours* in light of feminist thinkers from science studies, affect theory and art history who reclaim vision from its modernist formulation as a detached, omniscient mode of knowing to resituate it within the sensorial matrices of situated, corporeal bodies. Within this feminist framework of embodied vision, I will proceed to describe the works, and consider how they addressed audiences in both physiological and social dimensions. I will then aim to demonstrate in detail how Eliasson's particular form of neuroaesthetic engagement formulated three interrelated subjectivities: affirmation, catharsis, and criticality. Turning specifically to the neuroaesthetics of color perception as an active and contingent process of engagement with the world, I will compare understandings of colour as a construct of the nervous system posited by Eliasson's art installations and by Zeki in his neuroaesthetic writings. Finally, I will assess how these analyses inform phenomenological readings of Eliasson's work. My objective here is to interrogate how vision and thought entangle within neuroaesthetics as capacities of situated bodies. *Room for One Colour* and *360° room for all colours* facilitated embodied awareness of vision as a critical capacity for knowing the world. The gallery context thereby stands with the scientific laboratory as a neuroaesthetic research site.

Embodied Vision

While Eliasson does not present himself or his work within an explicitly feminist

context, I aim to demonstrate that his installations *Room for One Colour* and *360° room for all colours* recall feminist theories of embodied vision. I will examine how these works reveal social dimensions within the physiology of visual cognition. Before discussing the installations in detail, however, I wish to address feminist theories of vision that inform my analysis.

Since the Enlightenment, seeing and thinking have been associated and celebrated as interrelated faculties of reason. Scientific imaging technologies – the microscope, the telescope, the x-ray, the MRI scanner – reinforce notions of vision as a linear beam, travelling between the observer and the observed to produce a detached, objective stance. As Haraway described it, "vision is the sensory system that has been used to signify a leap out of the marked body and into a conquering gaze from nowhere."[4] Meanwhile, modernist art history construed vision as transcendent and timeless – "an abstract condition," as Rosalind Krauss described the formulation, "with no before and no after."[5] If, as Susan Buck-Morss suggested, modernity has conflated vision with reason and separated both from the feminine excess of the body,[6] there is a feminist case to be made for reclaiming both vision and the intellect as embodied human capacities. Drawing from Haraway, Krauss and Buck-Morss, I will position the sense of sight as part of a synthesis of biological functions of specific living organisms. While seeing occurs, the pulse quickens and slows, lungs expand and contract, oxygen circulates and hormones ebb and flow. Furthermore, I propose that the intellect may also be reclaimed within a feminist formulation of embodied

experience. After all, even abstract concepts have material, biological dimensions as temporal, organic processes of embodied brains.

The neuroaesthetic analysis I am proposing here takes up third wave feminist reconsiderations of vision as a sense entangled with the other senses, as well as with conscious cognition. As Jennifer Fisher explained vision has traditionally been characterized as a distal sense, subjectively situated as external to the body.

> Where the visual sense permits a transcendent, distant and arguably disconnected, point-of-view, the haptic sense functions by contiguity, contact and resonance. The haptic sense renders the surfaces of the body porous, being perceived at once inside, on the skin's surface, and in external space.[7]

Fisher challenged the primacy of vision by devoting attention to haptics as an aesthetic mode, opening up a theoretical space for consideration of the ways that artists, artworks and audiences interact affectively through touch, proprioception and kinaesthetics. In doing so, however, she proposed that vision and haptics are not binary opposites, but are rather mutually implicated in aesthetic experience. "I am not concerned in posing a binary of touch and vision," she explained, "but in examining how art works pose interminglings of these sense modalities."[8] I take up Fisher's notion of haptics as it intersects with and challenges neuroaesthetic considerations of vision as an organic process performed by the cells, tissues and fibres of the body. In this sense, I will explore the haptic implications of Eliasson's immersive colour installations, examining how they provoke perceptual effects that reveal the material limitations of vision as an evolved,

biological capacity, developed through active engagement with the environment.

While the visual sense has been overly privileged and reified, it remains important to theories of embodied perception. Writing in 1991, Haraway made a call for a feminist reconstitution of vision.

> I want a feminist writing of the body that metaphorically emphasizes vision again, because we need to reclaim that sense to find our way through all the visualizing tricks and powers of modern sciences and technologies that have transformed the objectivity debates. We need to learn in our bodies, endowed with primate color and stereoscopic vision, how to attach the objective to our theoretical and political scanners in order to name where we are and are not, in dimensions of mental and physical space we hardly know how to name.[9]

It was not enough for feminists to celebrate the body; Haraway demanded a hybrid conception of embodiment in which all the senses, including vision, emerge in co-constitution with shifting cultural conditions. Feminists, she put forward, should be able to access "the objective" as scientists do. But Haraway's objectivity (even as she extended it to science) by no means implied a detached, omniscient stance; rather, she advocated a situated, partial point of view, located in the contingent flux of life experience. This formulation endowed vision itself with limiting biological properties and conditions. Haraway's feminist vision offered clarity, not through transcendent all-encompassing views, but through an acknowledgement of the limits on seeing, an awareness of the not-seen. I aim to advance Haraway's formulation by theoretically sustaining the collective dimension of cultural engagement as an active aspect of vision that entails the acknowledgement of other possible visual standpoints besides one's own.

Eliasson's works, I propose, inhabit this zone of contingent visuality. As distinct from neuro-imaging experiments, where visual neural processes are isolated, triggered, traced and quantified by detached observers, artworks by Eliasson simultaneously invoke and confound vision as an embodied and culturally entangled object of neuroaesthetic inquiry conducted by situated participants.

Situating Subjectivities

Eliasson's bringing into conscious awareness aspects of vision that usually occur nonconsciously in everyday life, has contributed to neuroaesthetics by providing explicit embodied knowledge about physiological conditions of visual cognition. In many of his installations, the artworks themselves actually manifested only in the nervous systems of their viewers. One example is the installation *Room For One Colour,* which has been installed in various locations including the Danish Pavilion at the Venice Biennale (2003), the Malmö Konsthall in Sweden (2005) and the Museum of Modern Art in New York (2008). The piece contains no objects nor images, consisting only of an empty room saturated with yellow light. At the MoMA in New York, the piece was installed in the hallway outside the galleries on the second floor. Museum visitors ascended the escalator, emerging into a thoroughly yellow environment. (Fig.11) The light was produced with mono-frequency bulbs emitting a narrow frequency of light only in the yellow spectrum, so that no other colours were visible within the environment. This unusual light created several optical effects. Afterimage images appeared to

audiences because the yellow-perceiving receptors in their eyes got worn out; eventually, the white walls outside of the yellow room appeared purple.[10] In addition, because the pervasive yellow light excluded other colours everything appeared in monotone. For some people, the dampening of colour processing meant that other visual processes, such as the perception of edges, became more acute. As Eliasson explained, the monochrome environment produced "the feeling of having a particularly sharp detection of the space and people around us."[11] The unusual visual effects themselves became the focus of attention because there were no objects nor images on display, only an empty hallway with museum visitors passing through. In Eliasson's terms, there was nothing to see except seeing itself.[12] While the piece has been installed in various contexts, in New York it served as an entry point, or introduction to Eliasson's survey exhibition Take Your Time.

Within the galleries there were many installations of Eliasson's works. One in particular, *360° room for all colours,* also presented an empty space filled with saturated colour that stimulated visual after images. (Fig. 12) While *Room For One Colour* was installed as a transitional space filled with ambient light, *360° room for all colours* had a more sculptural presence. Museum visitors approached and entered a circular chamber, 10.5 feet high and almost 27 feet in diameter, standing in the middle of a room. Apart from the gap for the entrance, the inside of the chamber presented a continuous panoramic wall comprised of a blank projection foil. Behind the foil, banks of flourescent lights projected a

sequence of bright colours that saturated the circular space with a rich glow. Over time, the projected light shifted through a series of colour frequencies, timed perfectly so that an after image for each could get established in eyes of beholders before the colour would fade into the next. As Eliasson described it,

> With the blue space you have the orange afterimage and, after fifteen or twenty seconds, the orange afterimage is so strong that this idea of the blue starts to fade to pastel, then slowly working its way toward white. After another ten seconds, the blue doesn't really seem blue to us, it is a mixture of both our afterimage and what we know about what we are looking at. But then, the piece starts to fade into another color, so we are then with "orange eyes" so to speak, and then the piece decides to fade from blue to yellow.[13]

Within the installation, staged within the context of the museum, the nervous systems of percipients underwent physiological shifts, producing vivid colours that manifested only in their perception. By manipulating the physiology of beholders' visual systems, these works conditioned audiences to see colours and images that did not exist outside their own perceptual experience.

While MoMA visitors had freedom of choice about whether or not to enter Eliasson's exhibition, they had to pass through *Room For One Colour* in order to access the other installations in the show. Thus, it was difficult to avoid the physiological manipulations that the piece imposed, and if one found the experience discomforting one could only try to pass through it as quickly as possible. People reacted to these conditions in various ways. One online reviewer, Laura Mott, reported that at Eliasson's SFMOMA (San Francisco Museum of Art) exhibition, people walked through *Room For One Colour* quickly in order to

"escape its severity."[14] Another reviewer, Katherine Whitney, described her experience in the same piece,

> The light was pure yellow – monochromatic – and it distorted our color perception. We looked at our hands – they look weird and dirty. My dad's face was all blotchy. My daughter's blue shirt looked grey. I looked at a total stranger. He looked back at me. It was our first clue that this will be a different kind of museum experience.[15]

Indeed Eliasson provided an unusual art experience. There were no objects to look at except other people, no artworks to consider except the aesthetics of one's own vision as one's nervous system struggled to contend with odd environments for which it had not evolved. The installation situated the individual bodies/brains of subjects as the material sites where the artwork unfolded. Thus, somewhat like an fMRI experiment in which areas of subjects's brains are activated by external stimuli, *Room for One Colour* physically triggered the visual systems of beholders in ways that were beyond their control.[16] In contrast to the neuroscience lab, however, the subject under observation in Eliasson's installations simultaneously performed as the observer conducting the investigation. Furthermore, this subject did not operate in isolation, but in the company of others, as audiences came into simultaneous contact with the artwork and with one another in a public sphere.

Claire Bishop proposed that installation art makes a specific form of subjective address. "Rather than imagining the viewer as a pair of disembodied eyes that survey the work from a distance," she suggested, "installation art presupposes an *embodied* viewer whose senses of touch, smell and sound are as heightened as their sense of vision."[17] The conditions of installation art, as Bishop

explained, formulate a hypothetical, ideal viewer, alert to their own perceptual processes. This percipient must be physically present to experience the work, and thus for installation art the ideal viewer is also "a literal viewer," in Bishop's terminology. Indeed, *Room For One Colour* and *360° room for all colours* would not function as artworks without the presence of the viewer because the intended visual objects were afterimages produced in the viewers' own bodies. Each installation was engineered to trigger viewers' bodies to produce specific visual effects. Of course, the same may be said of any work of visual art – when a sighted person stands before Barnett Newman's *Voice of Fire*, for example, his or her brain will assess relationships between the varying wavelengths of light to produce a perception of colour. The difference I want to pinpoint here is that rather than externalizing vision as a set of attributes in the artwork, *Room For One Colour* and *360° room for all colours* internalized vision as a capacity of the body. Furthermore, viewers standing in front of two dimensional artworks are free to turn their heads and look at something else; the body has been visually engaged but its functionality has not been tampered with. By contrast, Eliasson's three dimensional installations encompassed the percipient in an ambient environment. Furthermore, even if museum visitors chose not to linger in these spaces, once the after images had been triggered in their perceptual systems they had no choice but to see them until the exhausted cones in their retina recovered enough to resume their regular activity. For this reason, Eliasson's colour installations could be considered physical in the same sense that a hockey game is physical, meaning

that they made contact that left lasting, material effects on the bodies involved. Thus, *Room For One Colour* and *360° room for all colours* made their address to a literal viewer, physically present to experience the work. Yet, at the same time, the works directed attention toward visual processes, *as such*, reinforcing Bishop's notion that installation art presupposes a hypothetical viewer who maintains a heightened state of awareness of their own perceptions.

For Eliasson, his focus of attention on viewer experience had political potential. "I find it crucial," he said, "that museums focus on the visitor experience, rather than only on the artworks, to unfold their socializing potential and create an important relation between museums and the society in which they take part."[18] As a strategy for priming audiences to take agency, many of his titles have included the second person possessive pronoun. Titles like *Your utopia* and *Your uncertainty of colour* implied that audiences owned the aesthetic experience, rather than the artist or the institution. But of course this kind of directive gift has not always been accepted. In response to Eliasson's exhibition title *Take your time*, art critic Peter Schejldahl playfully quipped, "I will do as I please with my time, thanks."[19] Also, as noted above, some viewers resisted immersion. Perhaps finding themselves uncomfortable with being so physically manipulated in a museum context, some hurried through *Room for One Colour* in order to evade the haptics of its insistent visual address. Eliasson's works made the broadly empowering statement that art transpires in audience experience, yet at the same time, the mechanisms of his installations directly manipulated the visual systems

of viewers. The outcome, however, was that the optical effects of afterimages revealed limitations to the visual system, inherently offering a reflexive neuroaesthetic awareness of biological constraints on human perceptual capabilities. Eliasson's installations thus revealed that vision operates both more automatically and less reliably than one might have previously thought. The "most obvious impact of the yellow light," said Eliasson of *Room For One Colour*, "[was] the realization that perception is acquired: the representational filter, or the sudden feeling that our vision simply is not objective, [was] brought to our awareness and with that our ability to see ourselves in a different light."[20] But how exactly does the process of seeing oneself seeing extend into forms of political, ethical or critical engagement?

Some writers, such as Bishop, and art historians Jonathan Crary and Pamela Lee, found it important to locate Eliasson's work within an ethical framework. Crary suggested that for Eliasson "the disruption of habit is one of the conditions of individual and collective freedom."[21] Eliasson's audiences, then, were not simply passive subjects, nor raw material for producing artworks, because their aesthetic experiences had potentially liberating effects. Bishop took up Eliasson's insistence that his work made institutional critique, suggesting that, "by returning to the subjective moment of perception, Eliasson aims less to activate viewers than to produce in them a critical attitude."[22] In Bishop's formulation, Eliasson's works formulate an ideal subject, a hypothetical viewer who both experiences the work and reflects on its implications within the context

of the institution. For Lee Eliasson's institutional critique extended beyond to the museum to implicate broader social constructs. She contextualized his installations within an "ethos of immersion"[23] that she identified as a "military-industrial impetus" also giving rise to VR and computer games. "Perhaps," she suggested, "his work illustrates the terms by which we perceive and accept everyday reality – whether nature or the museum or the amusement park – as so much techno-mediation."[24] Each of these writers was able to locate audience agency in works that determined audience experience to an unusual degree.

Bishop drew attention to the fact that art critics often conflate particular audience experiences with the subject implied in the artwork's address. "Installation art," she wrote, "plays on an ambiguity between two types of subject: the literal viewer who steps into the work, and an abstract philosophical model of the subject that is postulated by the way in which the work structures this encounter."[25] Thus, in Bishop's formulation, installation art posits subjectivities available for consideration even by those who have not directly encountered the work. As public projects unfolding in the collective space of the museum, *Room For One Colour* and *360° room for all colours* invited subjects to consider their own experiences of vision in relation to various subject positions invoked by the work, whether or not, as literal viewers, they identified with, or physically inhabited, those subjectivities themselves. Eliasson explained this self-reflexive dimension when he suggested that his audiences were invited to adopt a third-person point of view.

> What I look at is ... not only the experiencing of the artwork itself, or the artwork and institution as one, but also – and even more importantly – the ways in which the visitors may experience themselves experiencing the artwork. The audience should, in other words, be encouraged to see themselves both from a third-person perspective, that is, from the outside, and from a first-person perspective.[26]

The ideal subject posited by Eliasson's installation leverages embodied awareness of one's own perceptual capacities into a critical stance from which to consider the cultural and biological limitations of vision – an awareness of the not-seen emerging through self-reflexive, aesthetic examination of the process of seeing. Not every viewer would engage with the work in this way during their experience of the installation, but it is enough, for neuroaesthetic theorization, that the material conditions of the artworks situated the individual experience of vision as a collective, human capacity operating in a social sphere.

For the purposes of detailed neuroaesthetic analysis, I will now break down the subjective address of Eliasson's installations into three interrelated categories: affirmation, catharsis and criticality. The artworks facilitated each of these modes of aesthetic engagement as both first-hand performativities and third-hand intellectual considerations. I will discuss each subjective proposition in turn: affirmation as an experience of self as a material entity; catharsis of anxieties that emerge from living as consumers of technoscience; criticality derived from contextualizing one's individual sense of vision within larger social structures.

Affirmation of Self as a Material Entity

The neuroaesthetic awareness of vision induced by Eliasson's installations affirmed sensorial engagement with reality specifically by throwing direct connections between human vision and the world into question. This might be considered as a Cartesian problem; Descartes mistrusted information from his senses, because he knew from his experience of dreaming that such information could be wrong.[27] Descartes' scepticism about sensorial information is in some ways confirmed by feminist constructs of embodied vision, traditional neuroscience of vision and Eliasson's colour installations, each of which asserts that vision does not operate as a transparent medium, providing direct access to external objects in the world, but as an evolutionary, species-specific negotiation *with* the world, resulting in provisional information. At the same time, however, the Cartesian polemic between an immaterial consciousness and a material world breaks down when vision itself manifests as an embodied process. The border between internal and external melts away, as does the distinction between subject and object. In Eliasson's installations, the object under observation was the corporeal and subjective act of observing itself.

Vision is unique among the senses in that many of the components of its sensory organ, the eye, are actually comprised of brain cells. As neural anatomist David Bainbridge explains,

> [W]hen you are staring lovingly into somebody's eyes, you are actually staring at the perforated frontmost extension of his or her brain, which I admit does not seem quite so romantic. Yes, the iris is brain – the window on the soul after all. Admittedly the iris is an

> unusual part of the brain. Beautiful pigmentation led to its name, which means "rainbow." Also, it forms its own intrinsic muscles to open and close the pupil, and so it is the only part of the brain that can move itself.[28]

Not to overly press the point, but the eyes and the brain are physically connected organs – what touches the eye, such as a wavelength of light, also touches the brain, in a very literal sense. Furthermore, the process of perception is itself a physical process, as neurons fire in various sections of the visual cortex, feeding information forward and back through neural networks, formulating decisions about what that information means. Just as perceptions of smell, taste and touch have effects on and in the body, colour also manifests as a physiological process.

Eliasson's *Room For One Colour* tired out the cones in the eyes that signal to the brain to produce the colour yellow. These cones contain pigments that, like all pigments, absorb certain wavelengths of light, but they then do something more. As neuroscientist David H. Hubel explained, the physiology of vision also entails morphological and chemical changes at the cellular level.

> [A] visual pigment has the special property that when it absorbs a photon of light, it changes its molecular shape and at the same time releases energy. The release sets off a chain of chemical events in the cell ... leading ultimately to an electrical signal and secretion of chemical transmitter at the synapse.[29]

As the human stomach has evolved to turn food into nutrients, parts of the human brain have evolved to turn light into colour. Vision, like digestion, is a biological process in which the body makes a series of material transformations. It is critical to keep in mind, however, that while the capacity for vision is shared by most people, vision manifests as highly subjective and individual experience. Colour

for example, is not a quality as much as it is a qualia, meaning that it is a sensation (or, more accurately, a relative set of sensations) negotiated and produced by the eyes and brain rather than a fixed feature of the object perceived. By pushing components of this physical human system past its usual capabilities, Eliasson induced colourful afterimages in the nervous systems of the viewers, thus drawing attention to the biological limitations of vision and affirming the reality of human perception itself as a material engagement with the world.

Calling for a feminist formulation of vision as embodied, situated and partial, Haraway described the human body as "endowed with primate colour." What did she mean to invoke by that phrase? In her essay *Situated Knowledges* she suggested that "the eyes of any ordinary primate like us can be endlessly enhanced by sonography systems, magnetic resonance imaging..." and continues to cite an impressive list of optical devices that serve to "distance the knowing subject from everybody and everything in the interests of unfettered power."[30] Haraway situated the human animal, in this instance, as an ordinary primate, a biological creature with limited vision, especially when stripped of the prosthetic imaging systems of technoscience.

The ordinary primates visiting Eliasson's installations were not equipped with special goggles or VR helmets to enhance or mitigate optical effects; the spectacles produced were pure "primate colour," as viewers' nervous systems adapted to novel environmental conditions. Haraway's "primate colour," however, classified humans within the biological order of primate, rather than the

species of human, emphasizing human affinity with other animals. All creatures have evolved their own particular sensorial modes. Most primates have better colour vision than other mammals,[31] but many birds have the capacity to see more colours than primates.[32] Of course there are animals, such bats, who don't use vision at all, or dogs, who do see, but smell much better. One of the neuroaesthetic finding posited by Eliasson's art, then, may be an awareness of self as an animal with a particular kind of nervous system, evolved to navigate well under certain environmental conditions, but not others (such as a rooms filled with only yellow light).

The evolution of human vision is not a progressive achievement by which humans have gained control over their environment, but an ongoing, fluid process of interaction and adaptation to specific sets of environmental conditions. *Room For One Colour* and *360° room for all colours* revealed the limits of the human visual system by immersing beholders in a visual environment for which they were not evolutionarily adapted. Within the explicitly human context of the art museum, these works did not celebrate human powers of vision through dazzling spectacle, but rather created a contemplative space that drew attention to imperfections in the human visual system. Evolution has never been a teleological process with the goal of producing humans, but an unmotivated engine of diversity in which humans have emerged as just one of many diverse species, each configured to interact with particular environmental conditions through specific sensorial systems. This post-humanist standpoint can be

humbling because it highlights human vulnerability, not only as mortal individuals, but as an entire species constrained by the physical conditions of biological life on this planet. At the same time, an embodied understanding of vision's limitations can be critically empowering because it problematizes humanist ideologies that privilege human vision by conflating it with Western norms, including technological determinism. Eliasson's colour installations invoke post-humanist criticality by "touching" percipients' visual systems, bringing the physiological limits of vision to the fore while simultaneously encouraging reflexive awareness of the process as it unfolds within the technologically and socially mediated environment of the museum installation. In order to collectively access the knowledge derived from "seeing oneself seeing," the subjective experience of audiences must be valued and taken into account, even (or especially) as it evades empirical measure and determination.

While Haraway used the term "primate" to invoke the notion of humans as a species of animal, biologically conditioned like any other, she also raised the fraught power relations between humans and other primates in experimental science. Post-humanist affirmation of self as animal entails a socio-political power structure in which the techno-science of observation calls for subjective accountability between species. Neuroscience, in particular, has a complex dependence on non-human primate subjects. Most major universities have a monkey lab for performing neuroscience experiments. These labs generally keep a low profile, in order to stay under the radar of animal rights activists, but

monkey testing plays an essential role in neuroscience. As John Capitanio and Marina Emborg of the US National Primate Research Centre explained,

> This animal model is especially valuable because of the many similarities between human and non-human primates that derive from their common ancestry, such as complex cognitive capabilities, great social complexity, details of reproductive biology, and intricacy of brain organisation.[33]

While monkeys are useful test subjects because of their close kinship with humans, differences in ethical protocol between the two species mean that, as test subjects, non-human primates undergo much more invasive procedures than humans do. Electrode implants can be placed directly into monkey's brains. This technology can produce very high resolution data, right down to the level of a single neuron, thus, neuroscientists surmise much of their knowledge about the workings of the human brain through a process of correlation between high resolution data on monkeys (implants) and lower resolution data on humans (MRI and fMRI).

Zeki has spent the bulk of his career in neuroscience studying vision in humans and non-human primates. In 1973 he published a paper describing his experimental procedure for establishing which areas within the visual cortex of rhesus monkeys respond to certain colour stimuli.

> The animals were anaesthetized with sodium pentobarbital and paralyzed with gallamine triethiodide (5 mg/kg/h). A hole was drilled in the skull over the appropriate region and an agar filled chamber was placed over the defect, thus providing a closed, transparent system through which microelectrode penetrations could be made. The animals' eyes were dilated with atropine (0.5 7oo) and covered with neutral contact lenses; supplementary lenses were employed to bring images on a screen 114 cm away, to a

> focus on the retina, the stimuli originating from a projector equipped with a variable rectangular diaphragm, thereby allowing the presentation of different shapes.[34]

This research, representing an early stage in the cartographic knowledge about the vision areas of the brain, also serves as a distressing reminder of the kind of suffering that non-human primates endure as a matter of course when they are put to human use as subjects of science.

Haraway, well aware of ways that non-human primates have been objectified by scientific practice, invoke the phrase "primate color" in part to acknowledge a relation of complicity between a human individual's situated experience of colour perception, the science of colour perception and power structures of dominance and submission woven into social assemblages of knowledge formation. Eliasson's installations similarly raise awareness of the extent to which technoscientific environments condition Western colour perception. Within the reflexive context of the art installation percipients took notice of the ways that *Room For One Colour* and *360° room for all colours* manipulated the workings of the visual system, this subjective address could then be extended to the technologically constructed visual environments of daily life. On the one hand, Eliasson's installations gave viewers a raw experience of their own embodied vision without screens or lenses, affirming vision as a biologically evolved human capacity, developed to help the animal human body contend with particular environmental conditions and not others. At the same time, the environments that he engineered were highly technical, and the embodied

knowledge about vision that they manifested derived, in large part, from science. Furthermore, like Haraway, Eliasson resisted romantic constructions of vision as a pure, biological experience centred in the individual. Rather, the subjective forms of knowledge about vision that his works provoked entailed an awareness of technoscientific cultural conditions as they impact aesthetic experience. In this way, his works made an affirmation of self as a material entity, while simultaneously situating that material self as a vulnerable, yet accountable, participant in the material word.

Catharsis of Technoscientific Anxieties

Room For One Colour and *360° room for all colours* offered audiences insight into their own material existence by staging technoscientifically engineered environments with different light conditions from those to which humans have become habituated. Within the context of the museum, these installations offered an exotic and playful space to process anxieties about how culturally ubiquitous techno-mediated environments such as the medical system, mobile computing and pervasive surveillance condition embodied experience. Lee addressed Eliasson's use of technology, tracing his historical relationship to the Light and Space movement, in which artists such as Robert Irwin and James Turrell studied the science of perception through the lens of experimental psychology. She suggested that Eliasson, in a similar fashion, also adopted a "highly mediated and thoroughly technical approach to problems of human perception specific to its

era's technological desideratum."[35] Eliasson, in Lee's formulation positioned his audiences as creatures whose aesthetic desires were in part determined by the aesthetic conditions of life in techno-scientific environments. Art historians John Crary and Caroline A. Jones also supported the notion that Eliasson's works have invoked a subject mediated through technological systems particular to the conditions of contemporary Western culture.

Lee's term desideratum means "something lacked and wanted,"[36] raising the question of what might comprise the collective lack that could potentially be satisfied for some audiences in *Room For One Colour*? As proposed above, Eliasson's installations fulfilled a Western desire for affirmation of one's capacities as a biological animal. In doing so, I suggest, they also provided a catharsis of anxiety about how the contemporary biological human animal has been conditioned and constrained by technoscientific constructs.

As humans acquire and interact with commodities of technomedia, they also produce and consume the technoscientific services of Western medicine. The social convergence of scientific authority with potentially life-saving medical procedures produces a state of cultural anxiety in which collective knowledge about bodies has been societally ascribed to a set of technologically enhanced scientific practices rather than to the embodied subjects themselves. Neuroscience, in particular, situates the corporeal body as an object of study and technological manipulation rather than a subjective, knowledge-producing entity. As discussed in Chapter Two, fMRI scanners in the lab have been cast as mind-

reading machines in the popular media, and lay persons may come to feel as if their own brains are mysterious alien organisms about which they, as non-scientists, can produce no valid forms of knowledge.[37] By contrast Eliasson's museum installations allowed viewers to experience some of the strangeness of their own neurological functions first-hand. Here, the kinds of information that scientists produce about how vision operates could be manifested by lay persons as embodied forms of knowledge. In the various art institutions where *Room For One Colour* and *360° room for all colours* have been installed, Eliasson created safe environments for exploring one's own body as an organism potentially vulnerable to scientific manipulation without the personal stakes of illness and treatment that attend drug trials, diagnostic testing or surgery. As he suggested, "...the viewer becomes the experiment itself and also experiences being the experiment. It is like being operated on without anaesthesia."[38] While a patient anaesthetized on an operating table is denied experiential knowledge of the process, Eliasson's manipulations of the body unfolded in a state of perceptual awareness. Eliasson did not hide the technical apparatus that produced his visual effects; rather, he made his use of technology transparent, inviting viewers to engage with the technoscience as willing participants in full knowledge of what was being done to them. While popular media provides plenty of opportunity to look at very powerful optical illusions that demonstrate neurological principles in the comfort of one's own home, Eliasson's museum installations offered something more than just information; an extra power dynamic comes into play.

Percipients entered the institutional, social space of the museum and submitted themselves to physiological processes that unfolded in three-dimensional, immersive environments, opting to make themselves vulnerable to optical effects that the artworks imposed. These experiences played out in a public, institutional context, as a collective, social process. Eliasson manipulated the institutional context of the museum so that, in contrast to the neuroscience lab, the subjects undergoing procedures were the intended recipients of the knowledge produced by the process.

The optical effects of after images triggered by Eliasson's works usually occur automatically and nonconsciously in daily life. While there are sure to be nuanced differences between people, the basic neural architecture of vision adheres to standard patterns whether they take place while looking at art, looking at a sunset, or looking at a screen in an fMRI scanner. Eliasson's work made a collective address within the public space of the museum, triggering visual phenomena that would be shared by most sighted people. The colour installations at SFMoMA and MoMA in New York thus provided collective, social experiences of lack of control. It can be thrilling to cast one's body into an unknown process, and, like the massive slides presented by Carsten Höller, Eliasson's installations have been compared with mid-way rides at a fair. But Eliasson has contextualized his installations within the hybrid realm of art and science. Museum visitors were given the active choice to consensually and playfully perform the usually passive role of scientific subjects. In this way,

similar to Höller's slides, Eliasson's installations leveraged the thrill of submission to lack of control. In contrast to Höller, however, the aesthetic experiences offered by *Room For One Colour* and *360° room for all colours* teased at collective cultural anxiety about the subjective alienation of the body as a universalised and abstracted object of scientific investigation.

Art Producing Critical Awareness of Social Conditions of Vision

Eliasson's viewers, in seeing themselves seeing, were invited to consider the subjectivity of humans as biological creatures conditioned by technoscientific environments. By offering aesthetic experiences of vision as a physiological capacity vulnerable to environmental conditions, his installations invited critical reflection on the social power structures that confer technoscience with authority over the human body. Celebrations of human materiality cannot exclude human reason, culture and responsibility. In her book *Modest−Witness@Second−Millennium. FemaleMan©−Meets−OncoMouse*™, Haraway claimed kinship with lab mice who have been biologically engineered to carry the gene for breast cancer. "OncoMouse™ is my sibling," she asserted, "and more properly, male or female, s/he is my sister."[39] Haraway implied that humans and lab animals share some hybrid traits as biological creatures of technoscience, but in doing so, she foregrounded human power relations with other species. OncoMouse™ exists as a commodified technology, and yet, as Haraway made clear, it also comprises particular living entities.[40] Haraway refused to turn a blind eye to the human

objectification of other animals, but neither has she stormed any laboratories to rescue lab mice. Her postulations offered neither comfort nor resolution, rather, Haraway invoked inter-species accountability to highlight the ethically conflicted and impure position of humans-as-animals emerging in technoscientific culture.

Deploying the technology of mono-frequency lamps to manipulate human vision, Eliasson situated humans as biological organisms vulnerable to technoscientific conditions. At the same time, by staging his works in the reflexive context of museum installations, he encouraged percipients to adopt a third-person perspective, thus raising questions of human accountability for the ubiquitous cultural conditions of technoscience that they both inhabit and produce on an ongoing basis. In this sense, Eliasson's relationship to science is similar to Haraway's, in that he acknowledges collective accountability for science as a cultural practice. His strategy for raising awareness has been to recontextualize the science of colour perception within the institution of the museum.

Eliasson's critical relationship to colour perception has been analysed by Crary, who has written extensively about historical relationships between developments in imaging technology and cultural shifts in the understanding of vision. Crary was one of the first people Eliasson solicited to write about his work in 1997.[41] Writing in 2004 for an exhibition catalogue produced by the Aarhus Kunstmuseum in Denmark, Crary reminded his readers that, "up to the 1800s, color was inseparable from a direct embeddedness in the natural world."[42] Humans did not create colours, but found them in the environment, and even

pigments used for dyes remained culturally connected with their "sources in shellfish, insects, roots and shrubs."[43] It wasn't until the introduction of chemically produced colours in the nineteenth century Crary explained, that colour became "standardized, fully quantifiable and controllable."[44] Crary did not mean to suggest that Eliasson embraced any kind of primitivist yearning for natural colour. As Crary clarified, Eliasson has dismissed Romantic notions of culturally uninflected colour perception; rather, "[a]ll his work begins with the neutral[45] assumption of a biosphere that is irreducibly consolidated with technological objects and processes."[46] With *Room For One Colour* and *360° room for all colours* Eliasson deployed technoscience to create installations in which mechanistic processes of vision manifested for audiences, suggesting that the human subject is a culturally situated animal implicated in contemporary technoscientific power dynamics. Eliasson has even spoken of his audiences in technological terms, referring to them as either "users" in discussion with Robert Irwin,[47] or as "projectors" in a public talk about his after image works.[48] In referring to percipients as "projectors, he cast them as components in the technical apparatus of the installation, while the term "users" implies that visitors to the museum were already culturally complicit as consumers of technoscientific media.

Caroline A. Jones has similarly situated Eliasson within a technoscientific, networked environment of servers and users, inflected, at the same time by a 20th century history of the artist's studio (and the science lab) as factories for

knowledge production. She characterised knowledge as integral to perception, notably citing ratiocination as a knowledge form along with speech, vision, proprioception, memory, and "the multiple flows on which the body surfs to constitute a constantly morphing subjectivity."[49] For Jones, the subjective experience of perceptual knowledge that Eliasson afforded his audiences had to be considered in the context of his corporate mode of production. "His increasingly adamant insistence on the studio is one clue," she suggested, "that his physical work needs to be seen in the context of research and other relations. The works' fabrication, the embodied experience they require, and Eliasson's efforts to shape his own discourse are all part of production."[50] The critical subjective mode that Eliasson has posited, according to Jones, extends beyond the direct, first-hand experience of his work to encompass his practice as a contemporary cultural phenomenon.

In Jones' formulation, Eliasson managed to both embroil his studio in the art market and remain at a safe distance from commodification. "Eliasson's evocation of the laboratory is aimed at the art world – an attempt to buffer the machinic phylum's association with commerce and trickery."[51] If I understand Jones correctly, she was suggesting that Eliasson performed his practice as science rather than, for example, architecture or design, in order to cast his mechanistic inductions of aesthetic experience as objects of research rather than commodities. But the works do have monetary value for Eliasson and for the art institutions that host him. The invitation to see from a third person perspective,

then, might be considered as yet another coercive form of technomedia marketed as art. And yet, when positioned as scientific research sites, Eliasson's installations were not exploitive because of their circular structure, facilitating neuroaesthetic knowledge produced by and for the very subjects under observation. For example, as *Room For One Colour* manipulated the visual systems of percipients to perceive the world in shades of grey and yellow, it made an address that merged the perspectives of observed and observer into an entangled point of view. Encouraging both first and third-person perspectives, the work positioned its beholders as both subjects of vision research and researchers gaining knowledge about how vision works. While Eliasson's practice may be complicit with hegemonic art world hierarchies (indeed, it would be disingenuous for a such an institutionally successful artist to claim otherwise), *Room For One Colour* did not lull subjects into the role of complacent consumers but rather destabilized subjectivity at the very level of visual cognition.

Eliasson transposed the science of vision out of the lab and into the museum, allowing participating audiences to gain first-hand, embodied knowledge about their own visual processes by immersing themselves in visually manipulative environments. Jones cast the ongoing Eliasson project as a strategic corporate effort with an affinity of both relational aesthetics and the social flows of networked media. Indeed, visitors to the MoMa exhibition Take Your Time were offered the opportunity to see themselves seeing in the company of other human bodies, each of whom had opted to take a trip to the museum on that

particular day, at that particular time. As Haraway insisted, "situated knowledges are about communities not about isolated individuals. The only way to find a larger vision is to be somewhere in particular."[52] The audiences who experienced Eliasson's installations experienced them as part of a particular social body: the museum-going public. As, Raphael Tiffany noted in a *Rhizome* review of the 2003 exhibition of *Take your Time* in New York, "the perceptive bodies present in the same confined spaces make the show largely about an imposed togetherness."[53] Not only were audiences offered the opportunity to reflexively see themselves seeing from a third-person perspective, but also to see others seeing, and to compare experiences. Foregrounding vision as a limited biological capacity for whole groups of people together at the same time, Eliasson's colour installations didn't just affirm the biology of self on an individual level, but also the physiological presence of others in community. Thus the pervasive yellow light of *Room For One Colour* and the shifting after images of colour produced *360° room for all colours* afforded the opportunity for a critical awareness about the ways that visually mediated environments can condition the perceptual experience of entire populations. Importantly, for neuroaesthetics, is that the embodied knowledge of one's own perception presented by Eliasson's works manifested simultaneously as an awareness of both individual physiology and social relations.

Thus far, I have delineated three possible neuroaesthetic subjectivities addressed by Eliasson's colour installations. First, I suggested that reflexive

awareness about the biological limits of vision could lead to an affirmation of self as a material entity engaged with the world. Next, I proposed such experience might also operate as a performative catharsis of collective anxieties about the ways that technoscience physiologically impacts culturally situated bodies. Third, I suggest that a third-person awareness of how Eliasson's technologically transparent art installations revealed the limits and vulnerabilities of human vision might, for some, lead to a reflective criticality regarding the social structures producing the pervasive technomediated environments encountered outside the context of the museum. The art installations *Room For One Colour* and *360° room for all colours* did not empirically trigger specific modes of knowledge beyond inducing visual afterimages for the literal viewer, in Bishop's sense of the term. Nevertheless, the works' address postulated an ideal viewer, capable of reflecting critically on their own subjectivity in relation to collective embodied experience. Thus, by entangling physiological experience of vision with social conditions of vision, *Room For One Colour* and *360° room for all colours* made an neuroaesthetic contribution to embodied knowledge about the physiology of human visual system as a cultural phenonmenon. In the next section, I shall further examine detailed neuroaesthetic propositions about colour raised by Eliasson's writings and gallery installations in comparison with claims about colour perception raised by Zeki's neuroaesthetic research in the lab.

Neuroaesthetics of Colour

In this section, I aim to bring Eliasson's work and Zeki's research into conversation with one another.[54] While Eliasson has invited physicists to write about his art,[55] invited a neuroscientist to present research in his studio,[56] and delivered an artist talk on the contingency of colour perception at a neuroaesthetics conference,[57] to my knowledge his work has not been explicitly addressed by a neuroscientist to date. In particular, I find it notable that Zeki – as a neuroscientific vision expert who has analyzed the optical effects of paintings by Bridget Riley for an exhibition catalogue produced by the Museum of Modern Art in Paris[58] – has not, to date, written about Eliasson's work. Perhaps this lack is understandable. Zeki's neuroscientific methodology is more relevant to analysis of two-dimensional works, while Eliasson creates three-dimensional installations. Furthermore, if Eliasson wanted at least some of his viewers to critically consider their subjective experience in context of dominant cultural conditions, it would be counter-productive for him to allow the effects of his work to be reduced to neuroscientific principles. Likewise, within this neuroaesthetic analysis, I have no desire to deterministically deploy neuroscience to underwrite art exhibitions, nor to position Eliasson's artworks as illustrations of neuroscientific theory. Thus, I proceed with caution in considering Eliasson's and Zeki's colour research projects in relation to one another, and remind the reader that the neuroscientist and the artist are producing different, yet equally viable, forms of knowledge about

perception. In this section, I will compare how Zeki's neuroscience and Eliasson's artworks formulate colour perception within neuroaesthetic terms.

While the visual afterimages in *Room For One Colour* and *360° room for all colours* resulted from the exhaustion of cones in the eyes responsible for absorbing certain wavelengths, colour perception exceeds the calculation and translation of light frequencies. In his writing about colour, Eliasson has suggested that complexity of colour becomes evident in the neurological principle of colour constancy. Likewise, Zeki explained colour constancy as the cognitive faculty by which a green leaf continues to appear green even under dramatically different lighting conditions. Green remains green to the observer even when the frequency of the wavelength is closer to red than green, because the brain always assesses each colour in relation to the other colours around it.[59] Colour perception is always relative in this way, so that the same mathematical frequency that produces a perception of red under certain conditions will produce a perception of green under others, always depending on the ratio of reflecting pigments to one another, rather than on one-one translations of each frequency.[60] Thus, Zeki asserted that colour itself is "a construction of the brain," rather than "a property of the physical world."[61] Eliasson has made a similar observation.

> Color has in its abstraction an enormous psychological and associative potential, and even though it has been cultivated to the extreme, the amount of individuality in experiencing colors is equally extreme. This points to the fact that color doesn't exist in itself but only when looked at.[62]

Both, in this instance, affirm the subjective dimension of colour perception as an

process of neuroaesthetic engagement, located in the active engagement of the viewer with the world, rather than in the passive reception of external stimuli.

Nevertheless, while the brain constructs colours in relative association to one another, it does not do so randomly but as a response to the relative reflectance of objects. Both *Room For One Colour* and *360° room for all colours* use projected light to produce after-image colours that manifested only in the brains of percipients, but the human capacity for seeing colour has evolved as a perceptual strategy for engaging with objects in the environment. As Zeki explained, "A red surface will always reflect red light more efficiently than green or blue light, compared to its surrounds."[63] The physical world, then, does have properties that play a role in colour perception. Furthermore, at the risk of overstating the obvious, brains are physical organs, and therefore even the relational dimension of colour constancy itself can be considered a property of the physical world. Given these conditions, colour perception produces liminal states where knowledge and visual stimuli manifest as material sensation. The fact that the brain produces colour reveals its own embedded entanglement with other objects in the physical world. Furthermore, colour constancy depends on active forms of knowledge, meaning that the brain does not passively receive signals from the material world "outside" but rather generates percepts actively in ongoing interaction with other objects, entities and events.

Zeki's neuroaesthetic research has taken him into speculative, philosophical territory. In his book, *Splendours and Miseries of the Brain*, he

proposed a relationship between inherited and acquired concepts. Inherited concepts, he explained, are genetically programmed, fixed for a lifetime, while acquired concepts develop through experience and are subject to change. Two features of inherited concepts, as Zeki defined them, are that the neural systems responsible for them are fairly autonomous, and that their activation occurs nonconsciously. Zeki positioned the relative nature of colour as an example of an inherited concept. As Zeki explains, neuroscientists studying vision have located the ratio-taking capacity for generating colour in the V4 section of the visual cortex,[64] thus pinning this capacity for relative assessment to a specified region in the brain.

Whereas Zeki construed colour constancy as an inherited – and therefore, in his paradigm, fixed and universal – neural capacity, for Eliasson colour constancy revealed the perception of colour as a "construction, dependent on the individual."[65] Indeed, the universal aspect of automatic, nonconscious aspects of colour perception has enabled Eliasson to reliably trigger after images of certain colours in the visual systems of visitors to his installation *360° room for all colours*. In a written statement, however, Eliasson has construed colour constancy as an indication of indeterminacy, stating "...objects always shift or mutate over time, and, if we become aware of this constant movement, we may be able to understand the world as a much more open, negotiable space than we usually think it is."[66] Thus, for Eliasson, the contingent, relative nature of colour

perception was more important than its universal applicability, opening up possibilities, rather than closing them down.

Zeki also noted an aspect of indeterminacy in colour perception, but, in contrast to Eliasson, he did not locate it in colour constancy. Zeki explained colour constancy – the capacity of the brain to consistently identify colours despite their changing frequencies – as an inherited concept, fixed and predetermined through biological evolution. In Zeki's formulation, the capacity to see the colour red, for example would be inherited, but the idea of "red" itself would be a different kind of concept – an acquired concept - that changes throughout one's lifetime. Each new perceptual experience of the colour red would add to, challenge, extend and otherwise inform the ever evolving accquired concept of red. Zeki used the idea of a house as an example, suggesting that over time the brain generates an acquired concept of house so that it does not have to go through the process of determining what a house is every time it encounters one.

> The brain does not know in advance what kind of experience it will have, but merely modifies its concepts in the light of new experience, which is why the acquired concept has to be modifiable throughout life.[67]

Cultural contingency then becomes an inherent aspect of visual perception, even within the comparatively deterministic paradigm of neuroscientific knowledge. In this regard, that Eliasson's proposal that, "relation to color is closely derived from our cultural habitat,"[68] derives from his material investigations as an artist provoking embodied forms of neuroaesthetic knowledge. His findings support

Zeki's neurological principle that acquired concepts are contingent on individual life experience.

Colour perception has functioned as a site of neuroaesthetic research for both Zeki and Eliasson in that it reveals the active nature of visual cognition as a process for understanding the world. Zeki has asserted that, in colour perception, "the brain creates, according to its own rules, the knowledge that we have."[69] Whereas, in Eliasson's construction, "[t]he unique fact that color only materializes when light bounces off a surface onto our retinas shows us that the analysis of colors is, in fact, about the ability to analyze ourselves."[70] Eliasson's installations are steeped in neuroscientific colour theory. In his research, he has drawn on neuroscientific principles, not to fix art experience to a scientific paradigm, but to demonstrate the relational character of colour perception as an active process of engagement. By stimulating colours that exist only in the perceptual systems of beholders *360° room for all colours* produced neuroaesthetic knowledge about the brain's active role in making colour through an embodied address. Likewise by immersing museum goers in pure yellow light that made the world seem both grayer and more sharply distinct, the installation *Room For One Colour* conducted a non-linguistic, neuroaesthetic demonstration of the relative properties of vision. These embodied, neuroaesthetic revelations unfolded in the shared public space of the museum, contextualizing the physiology of vision within a social sphere.

Social Dimensions of Phenomenology

Writers such as Bishop,[71] Lee,[72] Daniel Birnbaum[73] and Amanda Boetzkes[74] have positioned Eliasson's work in relation to phenomenology because he has explicitly staged direct, perceptual experience as a mode of knowing. While I have speculated that Eliasson may have been hesitant to conflate his work with neuroscience, he has explicitly articulated his discomfort with phenomenological readings of his work, outlining this reluctance as a concern that his work might be " justified as an isolated event, not having anything to do with anything else."[75] It has clearly been important to Eliasson that his aesthetics extend beyond the individual to entail a collective, social dimension, while phenomenology has traditionally been associated with positioning individual experience as the primary source of knowledge. Lee acknowledged such concerns in her essay for the *Take Your Time* exhibition catalogue and explained the postmodern turn against phenomenological thought.

> Indeed, critiques of phenomenology hold that its putative subject is timeless and universal, unmarked by any number of influences that shape one's experience of the world, whether economic, social, ethnic, national or gendered.[76]

In the same catalogue, Birnbaum similarly suggested that Eliasson's work surpassed phenomenology. In his estimation, Eliasson's installations surpassed phenomenology's first-person perspective because they conflated subject and object, positioning the observer as, simultaneously, that which was being observed.[77] Others, such as Bishop and Boetzkes, have theorized phenomenological aspects of Eliasson's work as part of a contemporary

rehabilitation of phenomenology itself. Bishop, for example, situated Eliasson among a group of "phenomenological" artists emerging in 1990s, whose works, she suggested, called for new readings of Merleau-Ponty. In recent years, thinkers, including Boetzkes and philosopher Eric Matthews, have revisited Maurice Merleau-Ponty's phenomenology to entail the collective, cultural dimensions of embodied subjective experience.

Boetzkes made a complex phenomenological reading of Eliasson's work in her book on earth artists. She revisited Maurice Merleau-Ponty through Luce Irigaray's feminist critique of his work, suggesting that traditional phenomenology "denies the importance of striving to communicate with the other and simply assimilates all phenomena into a solipsistic legibility..."[78] As mentioned in the previous chapter, Boetzkes construed the natural world as "other" in relation to human subjects. Eliasson, she suggested, "acknowledge[d] this attentiveness to the external boundaries of experience by propelling attention to the periphery of the perceptual field."[79] In my formulation, rather than approaching the boundaries of vision to emphasise human separateness from nature, Eliasson emphasised human experience, culture included, as a physiological and thereby natural phenomenon. At the same time, however, Boetzkes re-reading of phenomenology is helpful, because she pointed to the fact that humans are not equipped with omniscient perceptual capacities, and phenomenological experiences entail as much not-knowing as knowing.

While Eliasson expressed wariness about phenomenological readings of

his work, his own phenomenological analysis allows for the possibility that perceptual experience might entail collective, cultural contingency and the critical potential for change.

> I'm sometimes afraid when someone comes up with a "phenomenological solution" to my work, because it's a contradiction that phenomenology would actually come up with a *solution*. Quite the contrary, I think the potential of phenomenology is that it introduces a kind of relativity to our experience. There's a social aspect to actually allowing you to change your own surroundings by means of your actions.[80]

Here, Eliasson expressed a contemporary reconfiguration of phenomenology that parallels contemporary shifts in neuroscience away from bottom-up models toward considerations of the brain as an embodied organ, socially networked and reciprocally engaged with others. New readings of Merleau-Ponty have suggested that phenomenologists need not bracket out cultural contingency in order to validate the knowledge of embodied subjectivity. As philosopher Eric Matthews explained Merleau-Ponty was himself invested in the social dimensions of perception.

> [A]lthough [Merleau-Ponty] stressed the importance of the subject, he was not a defender of the Enlightenment conception of a human subjectivity that is independent of the physical, social and historical situation of the human being concerned.[81]

As mentioned above, Bishop also took up Merleau-Ponty, contextualising Eliasson's installations within a contemporary trend to reconfigure phenomenology. She noted how Merleau-Ponty himself situated the subject as a historically inflected entity rather than a neutral observer.

> As Merleau-Ponty observed, the self is not simply an embodied presence in the present tense, but a psychological entity that extists "through confusion, narcissism…a self, therefore, that is caught up in things, that has a front and a back, a past and a future."[82]

Such contemporary formulations of phenomenology as a mode of theorizing both the physiological and social dimensions of perception resonate with Haraway's call for subjectivities that are situated, partial and embodied. In Matthews' reading of Merleau-Ponty, he explained,

> ...we are not isolated from other subjects in the way that Cartesian dualism seems inevitably to imply; our being-in-the-world is being in the social and cultural world as well as in the world of physical nature. (Indeed, being the kinds of creatures we are, we cannot ultimately separate our inherence in nature from our inherence in society.) [...] Social and political involvement is in this way for Merleau-Ponty not an optional addition to individual life, but a necessary part of our being-in-the-world...[83]

Like Haraway, and like Eliasson, Merleau-Ponty refused to settle for a material reality without cultural conditions. Humans are social animals, after all. Nature and culture entwine, so that in considering oneself as an animal subject, one also considers oneself as a cultural being. The cognitive constructions that produce meanings may be relative, contingent and indeterminate, but they are not random and indiscriminate. Rather, they emerge from ongoing, collective interactions, allowing humans to live in groups, communicate across difference and activate social change.

Situated in the context of large museum installations, *Room For One Colour* and *360° room for all colours* have likewise had an empowering influence in that they encouraged neuroaesthetic connections between individual and

collective subjecvities. Eliasson has been rightly reluctant to explain his works according to the philosophical principles of phenomenology, or the biological laws of neuroscience, because art comprises a different sort of knowledge system, one in which perceptual processes that are normally non-conscious can emerge in conscious awareness – seeing oneself seeing – thus shifting subjectivity from the first person to the third person and back again, threading one's experience into the collective fabric.

Eliasson's museum installations were contextualized within the larger culture of technoscience in which myriad imaging systems, from computer screens to fMRI scanners have fostered the fiction that vision itself operates as a transparent and virtual process. The human primates who have experienced Eliasson's installations, for the most part, belong to a social demographic who share their lives with computers, game consoles and mobile phones. Western art audiences are largely comprised of human animals who wield a great deal of power in relation to other animals, and to others within their species. Technologized notions of collective experience, such as the network and the hive mind, depend on disassociations of mind and body – vision takes on the character of a wireless signal, linking disembodied entities through the interface of screens. But such constructs of disembodied cyberspace belong strictly in the realm of science fiction. Vision is not a neutral carrier, but a cognitive, corporeal process and Eliasson's installations have functioned as reminders that even the most

dazzling, spectacular visions comprise active processes of negotiation between perceiving bodies and the things that they perceive.

Even taken intellectually as conceptual propositions, Eliasson's installations have aesthetic impact at the level of perceptual experience. As I write about colour perception, I spend daylight hours at a desk bathed in the fleeting, weak grey light of the winter solstice. Nevertheless, the soft colours around me, reflecting off book jackets, empty plates and coffee cups present themselves vividly as manifestations of my own material existence. Then I turn back to the screen on my laptop, my eyes flooded with its flat white light, and I am reminded that this, too, is a perception generated in my body, that my brain and the brains of my colleagues are physiologically adapting in daily interaction with the screen. Eliasson produces installation contexts that heighten awareness of visual cognition. The meta-level consciousness of these neuroaesthetic artworks in the museum can make audiences alert to the aesthetic conditions of nonconscious perceptual processes as they also play out in daily life.

Conclusion

In this chapter, I have argued that the installations *Room For One Colour* and *360° room for all colours* in the travelling museum exhibition *Take Your Time* positioned vision as an embodied, social process, facilitating capacities for cultural critique. In order to frame this neuroaesthetic analysis, I drew from feminist theories of vision that have challenged notions of vision as an objective

and reified view on the world by sustaining the collective dimension of cultural engagement as integral to situated points of view. I then delineated three neuroaesthetic subject positions emerging from the awareness of "seeing oneself seeing" facilitated by Eliasson's colour installations. Each comprised an embodied mode of knowledge that entailed the sense of vision in the gallery as an active process of engagement with the world at large. First, I drew from Haraway's notion of primate colour vision, or the specific biological capacities for colour perception with which humans have evolved, to explore how the awareness of seeing oneself seeing in Eliasson's installations could affirm a sense of self as a material entity engaged in interaction with others. Next, I considered how these works have offered audiences a cathartic opportunity to playfully perform in the museum as subjects of technoscience in a lab, with the important distinction that the knowledge produced in this gallery context belongs not to the designers of the experiment, but to the subjects under observation. I then examined how Eliasson's installations, produced and presented by corporate art institutions, fostered a reflective criticality about culturally ubiquitous technoscientific superstructures that condition embodied perception. Eliasson's immersive, three dimensional installations emphasised the active, participatory role of audiences in the co-construction of the work. His installations have foregrounded the dimensionality of colour, not as an two-dimensional surface covering an external world, but as an active creation produced by the nervous systems of his audiences. In his writing, Eliasson has invoked the neuroscientific

concept of colour constancy, situating this human capacity as a site of contingent knowledge production. In comparing Eliasson's propositions about colour with those of neuroscientist Semir Zeki, I have shown how each thinker located indeterminacy within different aspects of colour perception. Yet in the end, both positioned colour as an active process of cognitive engagement, inflected by knowledge accrued from life experience. Finally, because Eliasson's works place so much emphasis on vision as a site of cultural knowledge, I examined how his insistence on the social dimension of vision has provoked contemporary phenomenological analyses of his work. I have argued that the emphasis on embodied vision in Eliasson's colour installations fostered empowered relations to the world and its social structures by simultaneously facilitating personal and collective knowledges about the material conditions of life in technoscientific environments.

While this chapter explored how Eliasson's *Room For One Colour* and *360° room for all colours* facilitated neuroaesthetic research on the perception of colour in culturally specific visual cognition, in the next chapter I will examine the material dimensions of conceptual thought by analysing how a conceptual art performance by Kristin Lucas can serve as neuroaesthetic research beyond the lab to produce embodied, effects despite the fact that audiences largely encountered the work through written description and word of mouth. •

End Notes to Chapter Four

[1] Olafur Eliasson in an interview with Angela Rosenberg, "Olafur Eliasson — Beyond Nordic Romanticism," *Flash Art* (May-June 2003): 110

[2] Barbara Maria, Stafford, *Echo Objects: The Cognitive Work of Images* (Chicago & London: The University of Chicago Press, 2007), 132.

[3] Ibid., 101.

[4] Donna Haraway, "Situated Knowledges: The Science Question in Feminism and the Privilege of Partial Perspective," *Feminist Studies* 14, no. 3 (Fall 1988): 581.

[5] Rosalind Krauss, *The Optical Unconscious* (Cambridge, MASS & London: The MIT Press, 1998, c.1993), 7.

[6] Susan Buck-Morss traces the ways in which scientific authority has historically relied on a refusal of the body, and, concomitantly, a denial of the feminine since the Enlightenment. She explains autogenetic Enlightenment formulations of man as independent of (and superior to) nature, celebrating the warrior who, impervious to danger, is also impervious to his senses. See, Susan Buck-Morss, "Aesthetics and Anaesthetics: Walter Benjamin's Artwork Essay Reconsidered," *October*, no. 62 (Fall 1992): 8-9.

Similarly, in the introduction to her book, *Modest_Witness@Second_Millennium*, Donna Haraway describes the way in which authority in science has been historically achieved by men who adopt a "modest" persona. "As men whose only visible trait was their limpid modesty, [scientists] inhabited the culture of no culture." Integral to the story woven by techno-scientific culture is the fiction that men, who are deemed cerebral, must be modest about their brains, while women, who are deemed sensual, must be modest about their bodies. See, Donna Haraway, "Modest_Witness@Second_Millenium" in *The Haraway Reader* (London & New York: Routledge, 2004), 225.

This story is so deeply embedded in Western culture that it often appears invisible, and girls and boys alike internalize the narrative at very early ages. Part of Haraway's agenda, which I share, is to rework this equation so that all genders may be identified as both sensual and rational.

[7] Jennifer Fisher, "Relational sense: towards a haptic aesthetics," *Parachute: Contemporary Art Magazine.* 87 (July-Sept 1997): 4-11.

[8] Ibid., 4-11.

[9] Haraway, "Situated Knowledges," Ibid., 582.

[10] Madeleine Grynsztejn, "(Y)our Entanglements," in *Take Your Time: Olafur Eliasson* (San Francisco, Calif. : San Francisco Museum of Modern Art ; New York, N.Y. : Thames & Hudson, 2007), 15.

[11] Olafur Eliasson, "Some Ideas about Colour," in *Olafur Eliasson: Your Colour Memory*, eds. Ismail Soyugenc and Richard Torchia, exhibition catalogue (Glenside: Arcadia University Art Gallery, 2006), 75.

[12] "[M]ost institutions forget to let the spectator see themselves seeing."

Olafur Eliasson, as quoted by Claire Bishop, in *Installation Art* (London: Tate Publishing, 2010, c.2005), 77.

[13] Olafur Eliasson, "Similarity and Coloration," artist's talk presented during the first Neuro-Aesthetics conference organized at Goldsmiths University, London UK, (May 2005). http://www.artbrain.org/similarity-and-coloration/ ca
(accessed November 15, 2011).

[14] Laura Mott, *Shotgun Review*,
http://webcache.googleusercontent.com/search?q=cache:z-QrFB1lFHAJ:www.shotgun-review.com/archives/sf_moma/olafur_eliasson_take_your_time.html+olafur+eliasson+take+your+time+review&cd=8&hl=en&ct=clnk&gl=ca,
(accessed November 15, 2011).

[15] Katherine Whitney, "Take Your Time, Olafur Eliasson" online review at *ExhibitFiles*, (March 7, 2008), http://www.exhibitfiles.org/take_your_time_olafur_eliasson ca
(accessed November 15, 2011).

[16] Another of Eliasson's works raised the question of external manipulation even more emphatically. *Your utopia* was shown at the Venice Biennale in 2003 but was not included in the Take Your Time survey exhibition. For this piece, Eliasson set up a flash bulb with a red button that had the word "press" on it. When people pressed the button, the word "utopia" was flashed into their eyes, and it would then remain in their vision, as an after image, for several minutes.

[17] Claire Bishop, *Installation Art* (London: Tate Publishing, 2010, c.2005), 6.

[18] Eliasson, "Some Ideas about Colour," Ibid., 75-83.

[19] Peter Schjeldahl, "Uncluttered, an Olafur Eliasson Retrospective," *The New Yorker*, (April 28, 2008), http://www.newyorker.com/arts/critics/artworld/2008/04/28/080428craw_artworld_schjeldahl?currentPage=all
(accessed December 8, 2011).

[20] Eliasson, Ibid., 75.

[21] Jonathan Crary, "Your Colour Memory: Illuminations of the Unforeseen," in *Olafur Eliasson: Minding the world*, eds. Olafur Eliasson and Gitte Ørskou, exhibition catalogue (Aarhus: ARoS Aarhus Kunstmuseum, 2004), 209-225.

[22] Bishop, Ibid., 80.

[23] Pamela Lee, "Your Light and Space," in *Take Your Time: Olafur Eliasson*, (San Francisco, Calif. : San Francisco Museum of Modern Art ; New York, N.Y. : Thames & Hudson, 2007), 44.

[24] Ibid., 45.

[25] Bishop, Ibid., 130.

[26] Eliasson, Ibid., 75-83.

[27] René Descartes, *Meditations on First Philosophy*, trans. John Cottingham (Cambridge, New York, Port Chester, Melbourne, Sydney: Cambridge University Press, 1986), 19.

[28] David Bainbridge, *Beyond the Zonules of Zinn, A Fantastic Journey Through Your Brain* (Cambridge, MA & London: Harvard University Press, 2008), 147.

[29] David H. Hubel, *Eye, Brain and Vision* (New York: Scientific American Library, 1988), 162.

[30] "[A]rtificial intelligence-linked graphic manipulation systems, scanning electron microscopes, computed tomography scanners, color-enhancement techniques, satellite surveillance systems, home and office video display terminals, cameras for every purpose from filming the mucous membrane lining the gut cavity of a marine worm living in the vent gases on a fault between continental plates to mapping a planetary hemsiphere elsewhere in the solar system." See, Donna Haraway, "Situated Knowledges: The Science Question in Feminism and the Privilege of Partial Perspective," *Feminist Studies* 14, no. 3 (Fall 1988): 581.

[31] Hubel, Ibid., 159-60.

[32] David Bainbridge, Ibid., 150.

[33] John P Capitanio and Marina E. Emborg, "Contributions of non-human primates to neuroscience research," *Lancet* 371 (2008): 1126.

[34] Semir Zeki, "Colour coding in rhesus monkey prestriate cortex," *Brain Research* 53 (1973): 422-24.

[35] Lee, Ibid., 44.

[36] Collins English Dictionary, 3d ed, s.v. "desideratum".

[37] As a personal anecdote, I must admit that when I signed up as a volunteer for fMRI experiments, part of my motivation was that I would be given images of my own brain when the sessions were complete. This narcississtic desire to see inside my own head was about wanting to get close to the power of techno-imaging, in part a kind of hypochondriac desire to make sure all the gross anatomy was in place, and in part a desire for a more embodied sense of self. Despite the high quality of the brain scans I received, this last desire remained unsatisfied. The scans did not introduce me to my brain in any intimate sense, rather they created more distance, because I could not find meaningful information in them, nor connect them in any way to my experiences inside the scanner. Artworks like Eliasson's are designed to produce subjective neuroaesthetic experiences in ways that MRI labs have a hard time replicating.

[38] Eliasson, Ibid., 75-83.

[39] Donna Haraway, *Modest−Witness@Second−Millennium.FemaleMan©−Meets−OncoMouse™*, (New York and London: Routledge, 1996), 79.

[40] Ibid., 82.

[41] Luca Cerizza, "Mediating Experience: A conversation between Olafur Eliasson and Luca Cerizza, Berlin, 6 July 2009," in *TYT (Take Your Time), Vol. 2: Printed Matter*. (Berlin: Studio Olafur Eliasson; Cologne: Verlag der Buchhandlung Walther König, Köln, 2009), 50-53.

[42] Crary, Ibid., 209-225.

[43] Ibid., 209-225.

[44] Ibid., 209-225.

[45] I question Crary's use of the term "neutral." It seems that he may be naturalizing a specific philosophical formulation about technology.

[46] Crary, Ibid., 209-225.

[47] Olafur Eliasson and Robert Irwin, "Take your time: A Conversation. Olafur Eliasson and Robert Irwin," in *Take Your Time: Olafur Eliasson* (San Francisco: San Francisco Museum of Modern Art; London: Thames & Hudson, 2007), 59.

[48] Eliasson, "Similarity and Coloration," Ibid.

[49] Carolyn Jones, "The Server/User Mode: Carolyn Jones on Elafur Oliasson," *Artforum*, (October 2007): 318.

[50] Ibid., 319.

[51] Ibid., 323.

[52] Haraway, "Situated Knowledges," Ibid., 590.

[53] Rafael Tiffany, "Review of Olafur Eliasson's 'Take Your Time' at the Museum of Modern Art and P.S.1," *Rhizome* (June 11, 2003), http://rhizome.org/editorial/2008/jun/11/review-of-olafur-eliassons-quottake-your-timequot-/,
(accessed November 15, 2011).

[54] I remain alert to the fact that while Eliasson has drawn on the neuroscience of vision to create his immersive colour environments, he did not in any way stage his colour installations as illustrations of neuroscientific principles. Rather, as Crary asserted, Eliasson aimed to create critical interventions to trouble collective perceptual habits. As Crary explained,

> Although it may be stating the obvious, it is important to emphasize that Eliasson has no interest in some demonstration piece that informs us about the fascinating peculiarities of color vision. If after-images preoccupy him, it is in part as a strategy of challenging and displacing perceptual habits imposed by dominant features of contemporary technological culture.

See, Jonathan Crary, "Your Colour Memory: Illuminations of the Unforeseen," in *Olafur Eliasson: Minding the world*, eds. Olafur Eliasson and Gitte Ørskou, exhibition catalogue (Aarhus: ARoS Aarhus Kunstmuseum, 2004): 209-225.

[55] The 2001 MIT publication on Eliasson titled *Surroundings Surrounded: Essays on Space and Science* includes contributions by chemists, geologists and physicists.

[56] Brain researcher and sensory physiologist Ernst Pöppel participated in the Life and Space symposium hosted by Eliasson's studio in 2008, but he did not directly address Eliasson's work.

[57] Eliasson, "Similarity and Coloration," Ibid.

[58] Semir Zeki, "Bridget Riley and the Art of the Brain," in *Bridget Riley rétrospective : Musée d'art moderne de la ville de Paris, 12 juin-14 septembre 2008*, exhibition catalogue, (London and Santa Monica, CA: Ridinghouse, 2008): 114-125.

[59] Semir Zeki, *Splendours and Miseries of the Brain* (Chichester, UK: Wiley-Blackwell, 2009), 29.

[60] Ibid., 29.

[61] Ibid., 30.

[62] Olafur Eliasson, "Some Ideas about Colour," Ibid., 75-83.

[63] Zeki, Ibid., 30.

[64] Ibid., 31.

[65] Eliasson, Ibid., 75-83.

[66] Ibid., 75-83.

[67] Zeki, Ibid., 24.

[68] Eliasson, Ibid., 75-83.

[69] Zeki, Ibid., 27.

[70] Eliasson, Ibid., 75-83.

[71] Bishop, Ibid., 76.

[72] Lee, Ibid., 35.

[73] Daniel Birnbaum, "Heliotrope," in *Take Your Time: Olafur Eliasson* (San Francisco, Calif. : San Francisco Museum of Modern Art ; New York, N.Y. : Thames & Hudson, 2007), 140-141.

[74] Amanda Boetzkes, *The Ethics of Earth Art* (Minneapolis & London: University of Minnesota Press, 2010), 140.

[75] Olafur Eliasson quoted in Tim Griffin, "In Conversation: Daniel Buren & Olafur Eliasson" *Artforum International* 43, no. 9 (May 2005): 213.

[76] Lee, Ibid., 35.

[77] Birnbaum, Ibid., 140-141.

[78] Boetzkes, Ibid., 140.

[79] Ibid., 140.

[80] Eliasson, Ibid., 213.

[81] Eric Matthews, *The Philosophy of Merleau-Ponty* (Montréal: McGill-Queen's University Press, 2002), 1.

[82] Bishop, Ibid., 76.

[83] Matthews, Ibid., 9.

Kristin Lucas: Embodied Neuroaesthetics in Conceptual Modes of Address

Kristin Lucas' performance *Refresh* has been disseminated to her art audiences as a story of an event that took place over a two-week period in the fall of 2007. The story was conveyed through performance documentation in the form of written texts, digital images, and re-enactments. The event itself took place as follows: a few months after her 39th birthday, Lucas, who was living in Oakland at the time, put in a formal request to have her name legally changed at the Superior Court of California in Alameda County. This name change was unusual, however, because there was, in fact, no change - her legal name was Kristin Sue Lucas, and she wanted it legally changed to Kristin Sue Lucas. The process unfolded in stages. First, Lucas was legally required to take out an advertisement in a local newspaper giving public notice of her request.[1] Then she was required to present the reason for her request at a court hearing. The court proceedings were documented in an official transcript, made available for download on the artist's website. The transcript shows that at the first court hearing, on September 21, 2007, Lucas verbally provided the presiding judge with the following explanation for her request.

> Your honor I am hear for a refresh.
> A renewal of self.
> I consider this act to be a poetic gesture and a birthday gift.
> I am ready for an update.
> An intervention into my life.
> I am here to be born again as myself, or at the very least, the
> most current version of myself.
> I am prepared to let go.
> To empty my cache.
> To refill the screen with the same information.
> To reboot knowing that the new Kristin Lucas may experience a

tremendous sense of loss, detachment, or disappointment, or joy.
Kristin Lucas is ready for change.
And Kristin Lucas awaits her replacement.[2]

The judge declared a two-week recess to consider Lucas' petition. When she returned to court on October 5, 2007, he granted her request. In a 2010 interview with Marisa Jahn, Lucas described her experience of renewal at this moment in her second court appearance, "[My refresh] instantaneous with the judge's ruling. There was an immediate change. Blood rushed through my body, and I experienced a sense of detachment from everything that had happened before – it was fun, I loved it. I felt different."[3] While Lucas' description vividly conveys her embodied experience in the courtroom, these words were published three years after the original event. During that time, *Refresh* documentation and follow-up performances – which I shall describe in detail later – had been widely disseminated through a variety of international exhibitions and artist residency projects, as well as the artist's website. The primary source of information about the courtroom proceedings was the transcript itself, in which the artist expressed her hopes for the refresh, but did not describe the outcomes, leaving it to audiences to imagine the embodied implications of the event.

Lucas' original petition to the judge, excerpted from the court transcript above (and maintaining the original formatting of that document), conveys three key concepts that call for neuroaesthetic analysis. First, in Lucas' formulation, this socially enacted legal procedure would have direct impact on her own embodied experience – a "renewal of self" – raising neuroaesthetic questions about how social conditions can manifest through physiological processes. Second, by using computer terminology such as

"refresh," "screen," "cache," and "reboot," the artist reinforced a metaphorical analogy between her own embodied experience and that of a digital file. In order to renew a web page, one must write over the html file on the server by replacing it with a new file of the same name. Once this has been done, one navigates to the file's url in the browser. If the browser has cached the page – which means it has stored the old version of the file to memory – the web page will appear unchanged. In order to bring up the new file in place of the old one, one must push a specific button on the browser. In the Internet Explorer and Safari browsers the button is called "refresh," hence the title of the performance. Thus, the embodied processes of renewal invoked by *Refresh* took place in a collective social context of digital technology, raising a neuroaesthetic question of how mediated environments inflect embodied experience. Finally, Lucas' renewal would take place through a process of duplication, a mimetic shift in which the artist would become a "version" or "replacement" of her former self. By making the proposition that one could simulate oneself, *Refresh* invoked inquiries arising in cognitive science about how imaginative acts of simulation may manifest as physiological experiences. While the piece – disseminated through documents such as the transcript excerpted above – made a primarily conceptual address, I aim to demonstrate that *Refresh* encouraged embodied experiences on behalf of audiences through active processes of internal simulation.

In the previous chapter I investigated how Eliasson's colour installations have facilitated thinking toward a critical neuroaesthetics by staging an embodied awareness of seeing oneself seeing. In this chapter, I turn to consideration of the Lucas' performance *Refresh*, enlisting research from neuro- and cognitive science to examine how a concept

can come to manifest aesthetically as an embodied experience. I will begin by situating the *Refresh* performance and documentation within the context of some of Lucas' other significant works, showing how the artist has consistently examined first-hand physiological impacts of life in technological environments. I will then introduce neuroaesthetic concepts of mimesis to show her distinctly embodied mode of blurring fact/fiction boundaries, producing performances that reiterate, rather than imitate, pre-existing states. Finally, I will situate the mimetic dimensions of *Refresh* in context of neuroscientific investigations into the ways that imagined, or simulated mimetic experiences can be considered as physiological actions in their own right with the potential to produce neuroaesthetic effects.

Refresh in Context of Lucas' Oeuvre

I first heard about Lucas' *Refresh* in 2007 through word of mouth, and soon after downloaded a digital copy of the court transcript from her website. This document consisted of four 8.5 x 11" pages, in 12 point Typewriter font, displaying the conversations between Lucas and judge at both of the 2007 court hearings. At this time, I also downloaded a jpeg, a scan of a court sketch, drawn in pencil, of the artist as she stood before the judge (Fig. 13). While Lucas has created subsequent art objects as part of the ongoing *Refresh* project, these two documents were sufficient to convey all the key aspects of the performance and spark my present neuroaesthetic inquiry. In 2011, Lucas gave me a small artist' book – a material souvenir of the performance – organized in a simple layout. The booklet was 4" wide by 5.25" tall, black and white, and consisted of

14 pages bound with staples along the spine. It included a simple layout of the transcript, an image of the court sketch, and image of the public notice in the newspaper (Fig. 14). The centre spread of the booklet comprised a photographic diptych with nearly identical images of Lucas from before and after the refresh took place (Fig. 15). The photographs were staged like mug shots. The artist faced the camera with a blank expression and, as in a mug shot, there was a measuring tape running up the wall beside her. In each image she held a small chalkboard in front of her chest with the works "Kristin Lucas" written on it. The chalk letters were clearly written by the same hand, but they are not identical, indicating that they had been written at different times. Other very subtle differences such as the angle of the head, the way the hair falls, and small shifts in hand position indicate that the two images are not duplicates but two separate images. There is no indication of the order in which they were taken, other than the implication that the convention of displaying temporal progression from left to right. The image on the cover of the book was a circular arrow, the icon used for the refresh button on most web browsers. (Fig. 16).

These three artifacts, the digital transcript, the jpeg of the court sketch, and the booklet, served as documents of the performance, not as artworks in and of themselves. There has been a great deal written on performance art documentation and ephemera and it is neither my intention to add to that literature, nor to delve into it here. Rather, I want to consider audience experience of the performance as a cognitive event. While the little booklet certainly had an aesthetic presence, more significantly, the work challenged audiences to engage on another level, to imagine the performance itself. *Refresh* informs

neuroaesthetic inquiry because, as I aim to demonstrate, the artwork's most significant material manifestation comprised the cognitive activity that took place as embodied experience within the nervous systems of audiences.

Lucas' *Refresh* adhered to the conventions of conceptual art, as described by Sol LeWitt in 1967, in two ways: first, "the idea or concept is the most important aspect of the work,"[4] and second, "all of the planning and decisions are made beforehand and the execution is a perfunctory affair."[5] With regard to the latter, Lucas initially established a plan – to request a legal name change in which her name would not, in fact, change – and then carried the plan through to its conclusion. The resulting artwork continued to reach audiences after the fact, in the form of a concept or idea, rather than as a real-time performance in which the audience was present to perceive sensorial effects. Conceptual art has been art historically positioned as an anti-aesthetic movement by thinkers such as artist Joseph Kosuth and critic Lucy Lippard, both of whom situated conceptual art in opposition to Greenbergian formalism in the late 1960s. Kosuth, for example, suggested that " a purely aesthetic object is a decorative object," and that this lead "directly to 'formalist' art and criticism."[6] While Lippard similarly situated conceptual art as "post-aesthetic" in relation to Greenbergian analysis, she nevertheless indicated that "[d]ematerialized art is post-aesthetic only in its increasingly non-visual emphases,"[7] suggesting that aesthetics apply to conceptual principles of order as well as to sensorial qualities. More recently, in 2009, philosopher of aesthetics Diarmuid Costello suggested that, while conceptual art was "routinely supposed to reveal the shortcomings of aesthetic theory in general," in fact it revealed the "limits of formalist aesthetics, as mediated by

Greenberg, in coming to terms with the cognitive aspects of art after modernism."[8] In the context of neuroaesthetics, the ideas presented in conceptual artworks can be considered to have material manifestations, similar to sensory perceptions, in that concepts are understood as physiological processes in the brain. While the performance artifacts for *Refresh* made an explicitly conceptual address through their dry and deadpan delivery of information the idea of the performance itself strongly evoked an embodied experience of renewal. Lucas' name change was an act of imitation, in which the artist used the court system to manufacture a process by which she, like a digital file, could become a mimetic version of herself. Here, I aim to demonstrate that *Refresh* also entailed audiences in reciprocal acts of mimetic exchange. I will conduct a neuroaesthetic inquiry into how this particular conceptual artwork, with very few material qualities, situated conceptualization itself as an embodied mode of knowing.

Since the initial event of the name change, Lucas has exhibited her *Refresh* documentation internationally. In 2007, the year of the refresh, she put together a two-part exhibition that originated at Postmasters Gallery in New York (2007) and toured to And/Or Gallery in Dallas (2008) and the Shift Electronic Arts Festival in Basel (2008). In the part of the show titled *Refresh*, Lucas displayed a clipping of the newspaper announcement of the hearing along with a copy of the court transcript and the court sketch. For the other part of the exhibition, titled *Before and After*, Lucas invited 25 artists to create portraits of her from before and after the transformation. Works in this section included the black and white diptych by Laura Parnes that Lucas subsequently used in her booklet along with digital images by the artist collective eteam, a conceptual

work by Perry Hoberman, and a mixed media sculpture and sound work by Jake Borndal and Kate Scherer. Rather than limiting interpretations of her own embodied experience of the refresh by explaining her experience, Lucas extended the project to entail aesthetic response by other artists.

Lucas has continued to extend the *Refresh* project through a variety of iterations. She held a one-year anniversary party during her artist residency at CentralTrak in Dallas (2008). Lucas' original birthday is in July, but as her refresh occurred in October she could now adopt a second astrological sign, Libra, for the new version of herself. Thus she invited other Libra's to attend the party at CentralTak and had her photograph taken with them resulting in images which she displayed on her website as part of her ongoing and digitally disseminated *Refresh* archive. Her second anniversary celebration took place during a residency at Edith-Russ-Haus for Media Art in Oldenburg, Germany. For this event, titled *Versionhood Party*, Lucas expanded on the theme of embodied mimesis by inviting an Elvis impersonator to perform and hosting a karaoke party for guests. Further spreading the project to entail others' experiences, she has also staged re-enactments of the court proceedings as a live performance at the New Museum in New York (2010), a skype performance at Living Space Internet Cafe, London, UK (2012),. For this series, titled *Refresh Cold Reads*, Lucas invited people to adopt the roles of herself and judge, reading aloud from the court transcripts as a public performance. In 2010, at the New Museum in New York, she invited a man named Cesar James Alvarez to play the part of herself. She chose this individual because he was named after two men, Cesar Cauce and Dr. James Waller, who were murdered during a massacre by Klu Klux

Klan in 1979. In Lucas' words, "[Cesar James Alvarez] has lived, together with the others, in remembrance of those who died. His name has always signified the loss of a close family friend along with the hope for rebirth, healing, and courage to stand up for justice." [9] In this way, her choice of performer broadens the relevance of the *Refresh* performance beyond her own embodied experience to entail those of others. She similarly extended the role of the judge, by choosing Bob Edgar to read his part. Edgar was Vice President of Donor Relations for a New York community foundation, not a judge, but someone in another position of social responsibility. For each iteration of *Refresh Cold Reads* Lucas chose people to adopt the roles based on associations of embodied practice and experience extending beyond her own personal transformation.

While Lucas exhibits in gallery and museum contexts, she also works with the capacities of digital environments disseminating various iterations of her projects simultaneously through online media, word of mouth, and community events organized through artist residencies. As with her extension of *Refresh* beyond its original instantiation, her works are rarely contained as objects, but operate more as ever-evolving concepts that extend rhizomatically through multiple manifestations. The disparate structure of her practice reflects the content of her works, which, as in *Refresh*, have often addressed the dissolution of a singular identity. Importantly, *Refresh* is consistent with Lucas' past works, in that it posits an embodied reciprocity between humans and technology.

As a performer, Lucas has been inhabiting technological environments since the late 1990s. In two early video works, *Watch Out For Invisible Ghosts* (1996) and *Host*

(1997); and a web project, *Involuntary Reception* (2000), she performed as ephemeral characters who's very bodies were blended with digital networks and transmissions. In *Watch Out For Invisible Ghosts*, which was structured like a video game, the artist, garbed in goggles and helmet, battled a range of foes – kick-punching and joy-stick maneuvering with Riot Grrrl-esque vitality – yet at the same time the character inhabited the medium of the video itself as a broadcast entity, vulnerable to glitches, infections and interference from invasive energy fields. *Host*, a split-channel video, resembled the multiple views of a security camera. The artist seemed to be trying to locate her lost sense of self, engaged in a poignant therapy-session with a machine that did not deliver answers. *Involuntary Reception* consisted of a website with audio, video and text components through which the character of the artist communicated as a kind of technological poltergeist, an ephemeral creature with an enormous electromagnetic field, able to "self-broadcast via satellite." Here, Lucas presented the body itself as a technological entity, capable of transmitting itself through digital means. At the time, however, she presented this digital dispersal as a precarious mode of embodiment, akin to a mental illness that enhances certain capacities while threatening the stability of its host.

> You know, things happen, like computers crashing, screens freezing. I can erase chips pretty easily, I mean you can re-record. You can rewrite the chip, but that doesn't mean it's going to be protected.[10]

When logging onto the *Involuntary Reception* website, it appeared as if one's internet connection had been involuntarily infiltrated by a fragmented, frightened entity, herself receiving and broadcasting embodied signals that she could not control.

In all three works, Lucas expressed an entanglement between the material conditions of broadcast technologies and her own physiological processes. Ghosts haunted the video signal and human hosts became involuntary carriers for electronic interference, their very material existence glitching as a form of dissolution and disease. While the characters that Lucas embodied had fictional qualities, they also implied a real-world, human vulnerability to invisible yet material conditions of life in a technoscientific culture such as electrical fields, wireless signals and surveillance.

Lucas' early, multi-layered web and digital video works demonstrated a high level of technical proficiency in the mid 1990s when it was still relatively unusual for young women to adopt such media. She was embraced as a cyberfeminist pioneer by theorists such as Yvonne Volkart[11] and her work was curated into international cyberfeminist exhibitions. Lucas encouraged other young women to adopt new media tools as a way to "influence the direction of our use of technology"[12] and while her projects were technically sophisticated, she consciously strove to make the technology itself transparent and accessible. At the same time, however, Lucas remained ambivalent to the techno-utopianism of cyberfeminism. Her works often portrayed life in a dystopic culture – disease and physical dissimulation permeated her early approach to technological embodiment.

From 1998 to 2002, Lucas conducted series of *Simulcast* performances at Windows, Brussels (1998), The Wexner Center for the Arts, in Columbus, Ohio (2000), Postmaster's Gallery in New York (2001) and the Pacific Film Archive in Berkeley (2002). Through her *Simulcast* projects, Lucas mitigated the heroic aspects of

cyberfeminism by contextualizing high tech, fragmenting her own role as author by inviting other artists to perform with her at these events, often within a conference-style framework. Furthermore, at a time when simulcast video conferencing with satellite technology was popular for art panels, Lucas, who was by then known for her use of cutting edge technology, eschewed such high-tech systems in favour of cardboard, tinfoil, and a small, model satellite dish which she wore strapped to her back. Inventing a role for herself as a "simulcaster," Lucas performed in character as a specialist, akin to a cable installer or interior designer, hired by these institutions to provide a service. For her performance, she would "simulcast" the space, re-arranging the energies that flowed through the room.

The *Simulcast* performances exposed what had then become an art-world trope of deploying high-tech equipment for its own sake. Lucas replaced remote video and satellite links with household materials. In doing so, she also the challenged art-world fascination with media networks, so prevalent at the time, by focusing attention instead on the interconnected energies among the people in the room. Announcing that her job as a simulcaster was to channel frequencies in the air waves, she worked her way slowly through the audience and around the room, concentrating intently with a deadpan, professional intensity, as she installed cardboard and tinfoil objects here and there, taping some to the backs of chairs, putting some in corners, adorning various fixtures. She enlisted the audience and other participants by asking them to hold onto cardboard and tinfoil antenna, or affixing her strange props to people's clothing. I attended Lucas' simulcast conferences at Postmasters Gallery and the Wexner Centre. During both events,

the audience sat spellbound as she solemnly directed and re-directed the focus of their attention. As Lucas worked her version of *feng shui* – an ancient Chinese practice of arranging space to produce positive energy – with tinfoil and cardboard, audience members began to join her in perceiving, or pretending to perceive, the multivalent forces of energy at play in what became a communal moment of heightened physical awareness. Asking audiences to suspend their disbelief and embrace her performative assertion so that she could channel invisible frequencies, Lucas shifted awareness of electrical connectivity away from the high-tech effects of modern machinery, such as satellite connections and remote video links. Instead, she emphasized the affective dynamics emerging through the collective experience of a group of people sharing a physical space for a particular period of time.

Many of Lucas' ongoing projects and exhibitions continue to tease fact/fiction dichotomies. As in the *Simulcast* performances, Lucas asked audiences to set aside their incredulity for *Refresh*. While all iterations of the *Refresh* project are worthy of critical analysis, in my interrogation of neuroaesthetic embodiment I have chosen to focus on the original performance as a stand-alone artwork. Lucas asked audiences to accept her proposition that in legally changing her name to the same name, she could activate a personal rebirth akin to the digital renewal of a file online. As the court transcript from *Refresh* indicated, Lucas presented herself to a bemused judge who accepted that she was acting on good faith, took time to seriously consider the legal ramifications of a name change with no actual change, and eventually granted her request. According to the premise of the project, the artist "became the most current version of herself"[13] on the

occasion of her name change. In a neuroaesthetic sense *Refresh* operated on a number of cognitive registers. It transpired as a performance referencing processes of self-simulation, while at the same time it also emphatically posited simulation as material manifestation of imitation in the body of the artist. By conflating fact and fiction, Lucas situated herself as both the subject and object of the performance. Paradoxically, the new Kristin Sue Lucas was not actually a copy but a replacement – not a representation, nor a simulation, but a new iteration of the artist as a subjective and objective entity. Like a web page that has been refreshed, the new phsycial manifestation may or may not have been identical to the old one, but in either case the old data comprising the subjective sense of self has been seamlessly replaced by the new data, positing the possibility of physical as well as conceptual transformation.

The mechanism by which Lucas' renewal ostensibly took place was not a rebirthing ritual, nor a course of psychotherapy, but a legal procedure – a process that can change the status of the subject in the social sphere. In addition, the ramifications of legal transformations may have material impacts in the lives of those transformed. People have many reasons to go to courts for a name change: divorce, ease of pronunciation in a new language, transgendering. Sometimes people opt for a new name because they feel it will better reflect the identity they wish to convey. Lucas, however, may be the only person who has ever requested a legal name change while keeping all to the words or spelling of her name exactly the same. While Lucas was clearly sincere in her desire for embodied renewal, the essence of the project manifested as an elegant conceptual paradox: a change that is not a change. Recalling LeWitt's explanation of conceptual art practice that "[t]o

work with a plan that is preset is one way of avoiding subjectivity,"[14] Lucas deployed the legal system as a formal device, a widely recognized, externally imposed process operating independently from the artist's subjective manipulations. The court ruling provided a binary structure – like pressing a button or flipping a switch, the judge could only accept or deny Lucas' request – and this way she submitted herself to a procedure that reified her own position. If one accepted the premise of the project, once the judge agreed to grant the name change the "refresh" occurred instantaneously, triggered by a state sanctioned procedure that, once initiated by the artist, unfolded as a process beyond the artist's control.

While Lucas' name was legally changed, it nevertheless also remained the same. The conceptual premise of the performance suggested that, like a digital file that had been over-written, the legal procedure produced a new, subjective instantiation of Kristin Sue Lucas did not imitate the previous version, but replaced it completely. At the conceptual level, this subjective transformation also had material implications; suggesting that the physical experience of the artist would be impacted by her renewal without necessarily producing any evidence of change that could be externally observed. In the artist's formulation, the concept of the "refresh" manifested as a physiological experience. Furthermore, in her choice of wording for her petition, Lucas used terms that directly referenced contemporary technology. Thus, as in her past works, she performed an embodied affinity with digital entities such as the files that comprise online media. Lucas extended *Refresh* into myriad iterations involving other artists and community members as performers and participants in the project of embodied renewal. Every

instantiation, however, revolved around the premise that one could create a new version of oneself, like a copy of a digital file. Lucas performed and disseminated her mimetic proposition as a conceptual artwork; not a representational illusion to be consumed by passive spectators, but a neuroaesthetic invitation to cognitively simulate similar processes of embodied renewal.

Mimetic Blurring of Fact and Fiction

The fact/fiction ambiguity of the performance in *Refresh* was typical of Lucas' practice. In an interview with Lucas for the Austrian O.K. Center for Contemporary Art, curator Beatrix Ruf proposed, "Your work ... dramatizes the ambiguity of acting as the operator of technologies and at the same time being operated by those technologies"[15] Lucas responded,

> I would like to remain ambivalent to that question. I choose not to define the relationship between Kristin the artist and Kristin the actor. This is what keeps me coming back to this method of production. This ambiguity leaves the work open for multiple readings by an audience. I intentionally play with the relationship between producer and actor and I keep in sight the connections and ambiguities that surface. As a result my work is full of contradictions.[16]

Lucas' performances demand a high level of suspension of disbelief from her audiences and a tolerance for fact/fiction paradox. Some people have chosen to reject the artist's premise outright. Internet-based art critic Tom Moody dismissed *Refresh* as a "stunt," feeling sorry for the judge and suggesting, "not everyone has the time or inclination to get art."[17] This criticism, however, contrasts with the judge's point of view. The court

transcript indicates that the judge, intellectually intrigued, accepted that Lucas was acting on good faith, and took time to seriously consider her request. At one point he mused,

> Can I give you an order that doesn't change your name at all? That keeps your name the same? Is that the same as granting a name change? [...] I'll just try to puzzle out in my mind whether I ought to do it. ... I know that the law permits me to say "no," but does the law permit me to say "yes," is the second question.

The judge openly acknowledged that he did not think Lucas was abusing the system, and, unlike Moody, he opted to participate, willfully and thoughtfully suspending his disbelief.[18] In the end, the judge decided to grant the artist's request, condoning the premise of her project and thereby using the legal authority conferred on him by the state to effectively push the refresh button on her embodied browser.

Just as the judge, as a representative of the law, had to consciously decide whether to accept or reject the sincerity of Lucas's request, so did her art audiences – had the original Kristin Sue Lucas, in some sense, been replaced, or was the artist's performance merely a shallow pretence? While in 2010 Lucas did tell Jahn that she had experienced a change in the courtroom, for three years prior she had left that question unanswered. Furthermore, consistent with most of her public statements, Lucas conducted the interview in character,[19] so that the fact/fiction ambiguity of her mimesis remained unresolved.

While Plato denigrated mimesis as the production of shallow imitation of ideal forms,[20] more recent mimetic theory has suggested that every copy also manifests as an original invention. Art historian E.H. Gombrich, for example, identified the two-sided nature of mimesis in his 1960 book *Art and Illusion.* Gombrich revisited Plato to suggest

that a painter depicting a couch doesn't just match, as Plato claimed, but also makes – not just imitating the features of an object, but bringing a whole new object into existence.[21] Similarly, the new Kristin Sue Lucas did not manifest as a depiction, image, nor imitation of the old Kristin Sue Lucas, but as a subjective and objective instantiation of the artist herself, continuing to develop in her practice and occasionally celebrating her renewal. Thus, the mimetic moment of re-naming during her performance produced both a copy and an original at once.

Such oscillating duality between copy and original in the performance of mimesis has been indentified by Michael Taussig. For him, mimesis operated as an interstitial mode between copy and contact.[22] He applied this paradigm to a description of the physiology of optics, explaining, "A ray of light makes contact with the retina and, by way of the nervous system, forms a copy of the world."[23]

Taussig conjoined physical contact of light with the eye, and the representation, or copy, of the world produced in the brain, as if they were simply "different moments in the one process of seeing."[24] For Taussig, the complexity of the mimetic moment, co-constituted by both image and the body of the perceiver of the image, was something theorists "too easily elide as nonmysterious, with our facile use of terms such as identification, representation, expression, and so forth..."[25] Mimesis, in his formulation, became an interstitial zone, pregnant with possibility for new ways of understanding intersubjectivity if one could only forestall resolution and take time to inhabit the paradox. This willingness to remain suspended in the mimetic process was what Lucas

requested from audiences of *Refresh*: she didn't ask them to decide that she had indeed duplicated herself, but only to entertain the idea as a possibility.

Internal Simulations as Embodied Actions

The fact/fiction dichotomy of Lucas' performance remained ambiguous for the percipient. The conceptual nature of *Refresh* meant that, in this instance, mimetic contact was not the result of light rays hitting retina, but of ideas sparking neural activity in the brain. My neuroaesthetic assertion that the ideas presented by *Refresh* have material manifestation is supported by several cognitive and neuroscientific theories that entail the neuro-physiology of mimetic exchange. In the next chapter I shall discuss mirror neuron theory in detail, which emerged from the discovery that certain neurons in the brain activate the same way when one is performing an action, or when one is observing another perform the action. Of particular relevance to *Refresh*, neuroscientific research has suggested that mirror neurons can activate even in the absence of visual cues. Vittorio Gallese, Giacomo Rizzolatti and Leonardo Fogassi explain the experiment,

> [W]e theorized that if mirror neurons are truly involved in understanding an action, they should also discharge when the monkey does not actually see the action but has sufficient clues to create a mental representation of it. Thus, we first showed a monkey an experimenter reaching for and grasping a piece of food. Next, a screen was positioned in front of the monkey so that it could not see the experimenter's hand grasping the food but could only guess the action's conclusion. Nevertheless, more than half the F5 mirror neurons also discharged when the monkey could just imagine what was happening behind the screen.[26]

This research suggested that a mere suggestion of an action may be enough to trigger mirror neuron activity, as long as that action was understood by, and familiar to, the

person who contemplated it. It follows, then, that while *Refresh* was not primarily a visual artwork, audiences who had a prior familiarity with the action of clicking the refresh button on their internet browsers would not need visual cues in order to internally simulate the neural activity associated with finger movement in their own motor systems. Thus, intentional, internal simulations on the part of *Refresh* audiences could be considered as actions in their own right, manifest physiological experiences with embodied aesthetic effects.

The neuroscientific assertions about mirror neurons – suggesting that mimetic simulation manifests physiologically in the brain – have supported certain theories from cognitive science that also examined the physiology of intersubjective communication. In neuro- and cognitive science, the process of assessing another's mental state is called "mindreading." Two competing theories have emerged to explain what this cognitive capacity entails. The traditional approach to mindreading, amusingly called theory-theory, supposed, according to philosopher of consciousness Emma Borg, that "grasping the mental states of others is a matter of applying one's theory of common-sense, belief-desire psychology to that other person."[27] In other words, in order to understand someone else's frame of mind, one had to cognitively and computationally reason how they must be feeling. The other formulation, simulation theory, both challenged and complemented theory-theory by suggesting that in order to understand another person's feelings one could also form an embodied simulation of the other person's state. Cognitive scientist Alvin Goldman explained:

> People often say that they understand others by empathizing with them, by putting themselves in others' shoes: "I feel your pain." Is there any truth to

> this expression? Contemporary neuroscience has determined that there is much truth to it. When people observe others in pain, part (though not all) of their own pain system is activated. This provides an initial piece of scientific support for the intuitive idea that understanding others is mediated by putting ourselves in their (mental) shoes. In its bare essentials, this is what the simulation theory holds.[28]

In proposing that people may understand one another's mental states through observation, Goldman's simulation theory intersects with mimetic theories put forward by Merlin Donald who suggested that "mimesis happens when a mental model is expressed in action,"[29] meaning that humans share information about their internal states through physical behaviour. Simulation theory also recalls the work of affect theorists. Anna Gibbs, for example, has put forward the notion that facial expressions are contagious between people, and that in assuming another's expression, one also, to some degree, assumes the emotional state that expression conveys.[30] In the next chapter I will discuss Donald and Gibbs in more detail. Here, I want to emphasis that similar notions about embodied simulation have arisen in several disciplines.

According to Goldman, some processes of simulation happen automatically – mirror neuron activity occurs involuntarily, as does the neural response to witnessing another's pain – while other processes of simulation can be conducted intentionally. For example, Goldman described his theory of enactment imagination, explaining, "[t]o enactively imagine seeing something, you must 'try' to *undergo* the seeing – or some aspects of the seeing – despite the fact that no appropriate visual stimulus is present."[31] Neuro-imaging experiments have shown that the neural activity of imaginatively visualizing images significantly overlaps with the activity of actually seeing.[32] According to Goldman, enactment imagination was by no means restricted to vision; for example,

when one imagines performing a motor act, such as clenching a certain muscle group, the same neural regions may be activated as when one is actually clenching those muscles.[33] Donald made a similar claim, suggesting that mimetic communication can happen in any part of the body, ranging "across all the perceptual and motor domains given to the actor's awareness."[34] Goldman's theory of enactment simulation is further affirmed by Donald, who put forward a similar notion of "mimetic imagination," claiming that humans have the capacity to both understand and reenact events that have not happened directly to them.[35] In Goldman's enactment simulation, even emotional states can be internally induced, "When I imagine feeling elated," wrote Goldman, "I do not merely suppose *that* I am elated; rather I *enact* or *try* to enact, elation itself."[36] The capacity for simulation, then, supported the theory that mindreading the mental states of others occurs, in part, as a physiological process of imitation. Furthermore, as Goldman suggested, intentional acts of simulation could also be applied to describe embodied engagements with fiction.[37]

In *Refresh*, Lucas staged a mimetic simulation of herself, but at the same time she also invited audiences into a reciprocal mimetic relationship with the piece. Like readers of a novel, people who chose to engage the concepts put forward by *Refresh* were offered an option of whether or not they would further choose to imagine themselves into the embodied scenario that Lucas proposed. I suggest, however, that because *Refresh* operated ambiguously as a fact/fiction hybrid, it made a more explicit call for voluntary simulation than most works of fiction. Audiences engaged with fictional narratives could, as Goldman suggested, simulate states experienced by the protagonist and/or they could

simulate states experienced by a hypothetical observer of the fictional events as if those events were real.[38] In both cases, the consumer engaged physiologically with the fiction, and thus the aesthetics of the work manifested as embodied forms of experience. The difference between engaging with *Refresh* and most forms of fiction was that the process of voluntary simulation was here brought into awareness; audiences had to consciously decide whether or not to play along with the artists' deadpan proposition that her refresh was real.

Lucas not only asked her audience to internally simulate a sense of renewal, but to embody that process as if it was aesthetically akin to the rewriting of a digital file. If one could, as Goldman suggested, "try" to simulate a state of being elated; then one could at least *try* to simulate a state of being digitally refreshed on Lucas' terms. Anyone who has spent many hours a day interacting intimately with their computer's online processes would be familiar with the action of clicking the refresh button in the browser, and may have already experienced a sense of satisfaction and release when, in a single action, old data was wiped away and new data appeared before their eyes. But could this simulation be taken one conceptual step further? Would it be possible to imagine an embodied identification with data in a digital file?

While a digital file can be seamlessly copied, transmitted and replaced over an electronic network, it nevertheless has a physical presence as a configuration of code that is inscribed (and re-inscribed) into a piece of hardware. As a material entity, a digital file is comprised of discrete components, particulate in its definition, light, crisp and inert – an electronic compilation of binary code that stands in contrast to the moisture-laden,

hormone-steeped and biodegradable human persons who have given rise to the technology. And yet, as people engage more and more with digital technologies, are they not increasingly inflected by digital aesthetics? As Gibbs suggested, "[Mimetic communication] might ... be conceived as a contagious process that takes place transversally across a topology connecting heterogeneous networks of media and conversation, statements and images, and bodies and things."[39] Mimesis, as a collective, cultural capacity, entangles people with one another, and with the various material agents in their environment, including computers and the internet. Lucas, in her plea before the judge, made the following implication that technology could deeply impact embodied experience.

> I feel that the technology that we have available can make ... change for us. It's like, replacing information. The computer, the technology, the system has a way of erasing you, and ...I feel that ...this is a change I have seen in my lifetime. And I, I just, I'm really interested, in....just reestablishing, uhm...I felt I had laid that out for you but its difficult to describe.[40]

Lucas situated her refresh as a reclamation, a form of rebirth for a technologically inflected entity. The processes took place in the linguistic and formal context of the legal system, disseminated through the linguistic medium of the transcript, but the artist explicitly sought an embodied experience that could not be easily translated into words. Staging her own experience as a performance, Lucas implicitly invited audiences to try and feel for themselves what such a form of refresh might be like. Whether the simulation was accurate or not, is beside the point. As Stafford explained in her chapter on mimesis, "In affective ingestion we do not just repeat another's actions, we grapple with them."[41] Mimesis, and simulation never produce identical copies, but always new instantiations.

Thus, Lucas presented her refresh as a critical intervention into an evolving aesthetics of everyday interaction with computer technology, an action that can be made by anyone. Digitized modes of embodiment can resonate as positive renewal, dystopic threat, or a mixture of both. In any case, the action of Lucas' performance grappled with nonlinguistic forms of knowledge that were felt in the body within techno-scientific environments.

Lucas disseminated *Refresh* through several different collective contexts. She did not publicize the project as an art performance prior to the original event. Instead, she activated the context of the legal system to confer legitimacy on her strange name change that was not a change. In adherence with the legal requirements of the process, she took out an ad in the local newspaper, duly notifying the general public of her intention to change her name. Next she presented her case in court without making any reference to the fact that she was an artist. Those who witnessed her refresh in the courtroom, including the judge, were situated as participants in a legal procedure, rather than as spectators at an art performance. In this way, Lucas made full use of the authority of the legal system to accept or reject the sincerity of her proposal that a name change without a change would provide her with a form of renewal. It was only after the refresh had been enacted that Lucas presented the project as an artwork.

Lucas' presentation of *Refresh* as an art project also unfolded through several different contexts. She mounted an exhibition at Postmaster's Gallery in New York in which she displayed artifacts documenting the completed performance: the court transcript, the newspaper clipping and the courtroom sketch. By presenting the piece in a

high profile Chelsea gallery, she situated it within the art world conventions of conceptual art and performance. At the same time, however, she also disseminated the same three artifacts online through her website. In the context of the internet, the digital references inherent in the piece folded seamlessly into the process by which the piece was consumed. Within the art world, the piece was also disseminated by word of mouth, as people who had initially encountered the work in the gallery or online told one another the story of Lucas' *Refresh*. Each context – the legal system, the art gallery, the internet and the community networks of the art world – invoked a shared mode of engagement within collective histories and environmental conditions. Once it had been contextualized as a conceptual artwork, *Refresh* infolded all of its contexts as part of the piece. Just as Duchamp's urinal utilized the gallery context for reflection on the cultural implications of mass production, *Refresh* proffered both the authority of the legal system and the conditions of digital technology for aesthetic consideration. In this way, Lucas enacted an embodied transformation at the intersection of several social contexts.

Simulation theory supports the premise of *Refresh* that imagined fictional states could manifest physiologically. In enacting an imitation of herself, the artist suggested that others might undertake a similar mimetic performance. The work was generative, in the sense that Gombrich suggested, because mimetic imitation always operates as an act of invention. *Refresh* was typical of Lucas' larger practice to the extent that it demanded indulgence and acts of imagination on the part of the audience. The piece did not automatically trigger mimetic response, rather it made a neuroaesthetic address by inviting audiences to simulate their own embodied refresh, if they so chose.

Conclusion

In this chapter, I proposed that Lucas' *Refresh* made a neuroaesthetic contribution by raising the notion that concepts themselves manifest as material processes in the nervous system. I enlisted theories of simulation emerging in neuro- and cognitive science to suggest that some of Lucas' audiences, those who willingly chose to entertain her premise, could generate embodied experience of the performance by trying to internally simulate similar transformations for themselves. For some audiences, I suggested, a familiarity with computer processes might allow them to simulate a transformation imbued with the aesthetic characteristics of digital media. Furthermore, Lucas utilized the court as the mechanism to trigger her refresh, and thus the collective context of the legal system also inhered in the work's conceptual address. Thus the neuroaesthetics of *Refresh* entailed not only the embodiment of ideas, but the collective contexts conditioning them. In this way, *Refresh* made another important neuroaesthetic contribution, demonstrating a synthesis between physiological and social experience.

While *Refresh* operated neuroaesthetically within the self-reflexive context of the art world, the processes by which its conceptual dimensions emerged physiologically would be very difficult to observe in the laboratory context of a neuro-imaging experiment. In order to gather sufficient data across a range of subjects, the stimuli in neuro-imaging experiments have to reliably trigger predictable effects in the brains of subjects that will occur at a similarly predictable point in time. While the concept of Refresh could be conveyed to subjects in a scanner, the neural activations that it might stimulate would vary widely among percipients. Furthermore, it would be impossible to

predetermine when the physiological effects of *Refresh* might emerge in order to measure and observe the associated neurological activity. In addition, the neuroaesthetic impact of the piece, as I have suggested, solicited the agential capacity engagement. First, percipients were asked to willingly suspend their disbelief, and second to intentionally imagine themselves enacting a personal refresh in the context of their own physiological engagements with technology. The piece invited people to choose whether or not to accept the fact/fiction challenges that it proposed and thus there would be no guarantee that it would trigger any effect at all in subjects gathered for a neuro-imaging experiment. Finally, because neuro-imaging methodology depends on the isolation of specific neural processes, the wide ranging social contexts implicated in the piece would be beyond the scope of neuroscientific measurement. For these reasons, the full neuroaesthetic implications of *Refresh* only become available for analysis in the epistemological context of the art world. For *Refresh* audiences and theorists, the reward for opting to simulate its enactments as embodied experiences was a reflexive neuroaesthetic awareness of the deep impact of technological environments on embodied experience.

In the next chapter, I will examine the concept of mimesis in more detail, as it emerged in a video work by artist Omer Fast, further demonstrating the capacity of neuroaesthetic concepts to relate embodied modes of engagement. •

End Notes to Chapter Five

[1] The *Oakland Tribute* called to notify Lucas of what they thought was a typo in her ad because the first name and the second name were identical. See, Kristin Lucas and Marisa Jahn, "'Refresh': Kristin Lucas on The Multiplicity of the Self : Conversation with Kristin Lucas and Marisa Jahn" .*dpi*, no. 17 (February 2010) http://dpi.studioxx.org/demo/?q=en/no/17/refresh-The-Multiplicity-of-the-Self-Conversation-Kristin-Lucas-Marisa-ahn,
(accessed July 2012).

[2] Superior Court of California, County of Alameda, Kristin Sue Lucas, petitioner, Case No. RG07336497, (September 21, 2007), http://www169.pair.com/klucas/before_after
(accessed July 2012).

[3] Lucas and Jahn, Ibid.

[4] Sol LeWitt*, "Paragraphs* on Conceptual Art," *Artforum,* vol. 5, no. 10 (June 1967): 1.

[5] Ibid., 1.

[6] Joseph Kosuth, "Art after Philosophy," *Studio International*, vol. 178, no. 915 (October 1969):134-137

[7] Lucy Lippard and John Chandler, "The Dematerialization of Art," *Art International*, vol 12, no. 2 (February 1968): 32

[8] Diarmuid Costello, "Retreiving Kant's Aesthetic for Art Theory after Greenberg," in *Rediscovering Aesthetics*, Francis Halsall, Julia Jansen, Tony O'Connor, eds. (Standford: Stanford University Press, 2009), 132.

[9] Kristin Lucas, artist's statement for *Refresh Cold Reads*, www.kristinlucas.com/refresh_coldreads.html (accessed, December 2012).

[10] Kristin Lucas, *Involuntary Reception*, online artwork hosted by Electronic Arts Intermix (2000), http://www.eai.org/involuntary
(accessed March 20, 2009).

[11] Yvonne Volkart, "Infobiobodies: art and esthetic strategies in the new world order," in *Next Cyberfeminist International*, eds. Cornelia Sollfrank and Old Boys Network (Hamburg: obn, 1999), 66.

[12] Kristin Lucas interviewed by Kathy High for *Reel New York* (May, 1997), http://www.thirteen.org/reelny/previous_seasons/reelnewyork2/i-lucas.html
(accessed March 20, 2009).

[13] Kristin Lucas, *Refresh*, artist's book (Chicago: Soberscove Press, 2011).

[14] LeWitt*,* Ibid., 2.

[15] Kristin Lucas and Beatrix Ruf, "Interview with Kristin Lucas," *Temporary Housing for the Despondent Virtual Citizen*, exhibition catalogue (Linz: O.K. Center for Contemporary Arts, 2000), 20-21.

[16] Ibid., 20-21.

[17] Moody, Tom, comment thread at *Art Fag City*, http://www.artfagcity.com/2009/02/16/wikipedia-art-lasts-all-day/comment-page-1/#comment-134802, (accessed June 15 2011).

[18] Superior Court of California, Ibid.

[19] In the interest of clarity, I state here that Lucas stayed "in character" for the interview with Jahn. It should be mentioned, however, that the fact/fiction ambiguity of her performative stance has been so thoroughly maintained throughout her career that her characters really cannot be verifiably distinguished from her real-life persona.

[20] Matthew Potolsky, *Mimesis* (New York and London: Routledge, 2006), 22-24.

[21] E.H. Gombrich, *Art and Illusion*: *A Study in the Psychology of Pictorial Representation* (Princeton & Oxford: Princeton University Press, 2000), 98.

[22] Michael Taussig is an anthropologist who book *Mimesis and Alterity* is situated in a moment of postmodernism (1993), using mimesis as a tool to achieve two ends: 1) to reconcile the turbulence of knowing that reality is constructed, yet needing to live and function in that reality as if it were "natural" (Taussig, p.xviii), and, 2) to write a "post-colonial, culturally sensitive, anthropology of signification" (Taussig, p.x). He articulates the sad and frustrating postmodern paradox as "Yearning for the true real" yet knowing it is "not for me." (Taussig, p.xv). From a contemporary standpoint, Taussig's embrace of the real as a linguistic construction feels somewhat dated. Did anyone swallow that model so completely? Even Judith Butler, who refused to discuss the sexed body as real, indicated that she did not deny the existence of the real body, but rather paid respect to the real by acknowledging that any statement she could make about it would itself be a fresh construction imposed upon it. And yet, this discursive impossibility of addressing the real was pervasive in theory until very recently. For myself and many of my cohort in art school during the 1980s and early 90s, the struggle to articulate meaningfulness seemed both an imperative and a doomed project. Taussig explores mimesis as a touchstone concept that brings impossibilities in conjunction with one another, allowing for a kind of ontology to emerge that is culturally conditional, yet also grounded in physiological experience.

While Taussig's use of the term "contact" references the "real" as opposed to the copy, he also uses it to intentionally recall the notion of "first contact" between Western colonizers and the indigenous peoples they invaded. In these colonial encounters, he argues, it is impossible to answer the question of which culture is imitating which. The implication, for post-colonial discourse, is that histories of cross-cultural mimetic exchange problematize Western notions of the Other. Artist Jimmie Durham elaborates in his *artforum* review of Taussig's *Mimesis and Alterity*.

> "Europe, or the Western World, or Civilization, has been going around watching everyone for some time now. The good part of this is a kind of self-observation, so that we have complicated novels to read, and art that attempts self-exploration and intervention in the given narrative and, at the same time, a little distance. The bad part is that the Western World has not observed itself observing. It has not seen how active, how transforming, its watching has been for itself. The West (I can't keep writing the 'Western World,' though 'the West' is even more ambiguous) has not imagined itself as defined by its colonial enterprises and engagements. Instead, it has continuously imagined barriers and borders between itself and constantly reinforced Others."

See, Michael Taussig, *Mimesis and Alterity: A Particular History of the Senses* (New York & London: Routledge, 1993), 21.
And
Jimmie Durham, "Mimesis and Alterity" *ArtForum*, (December 1993), http://www.thefreelibrary.com/Mimesis+and+Alterity.-a014890843

(accessed July 15, 2011).

[23] Michael Taussig, *Mimesis and Alterity: A Particular History of the Senses* (New York & London: Routledge, 1993), 21.

[24] Ibid., 21.

[25] Ibid., 21.

[26] Giacomo Rizzolatti, et al, "Mirrors in The Mind," *Scientific American* 295 (2006): 56-8.

[27] Emma Borg, "If mirror neurons are the answer what was the question?," *Journal of Consciousness Studies*14, no. 8 (August 2007): 6.

[28] Alvin I. Goldman, *Simulating Minds: The Philosophy, Psychology and Neuroscience of Mindreading* (New York: Oxford University Press, 2006), vii.

[29] Merlin Donald, "Imitation and Mimesis," in *Perspectives on Imitation, From Neuroscience to Social Science,* Vol 2, Hurley, Susan and Chater, Nick eds. (Cambridge: MIT Press, 2005), 288.

[30] Anna Gibbs, "After Affect: Sympathy, Synchrony, and Mimetic Communication," in *The Affect Theory Reader*, eds. Melissa Gregg and Gregory J. Seigworth, (Durham & London: Duke University Press, 2010), 191.

[31] Goldman, Ibid., 151.

[32] Ibid., 154.

[33] Ibid., 160.

[34] Merlin Donald, "Art and Cognitive Evolution" in *The Artful Mind: Cognitive Science and the Riddle of Human Creativity,* Turner, Mark, ed. (Oxford: Oxford University Press, 2006), 17.

[35] Merlin Donald, "Imitation and Mimesis," Ibid., 204.

[36] Goldman, Ibid., 47.

[37] Ibid., 282-287.

[38] Ibid., 286-287.

[39] Gibbs, Ibid., 187.

[40] Kristin Lucas, *Refresh*, artist's book, Ibid., 5.

[41] Barbara Maria Stafford, *Echo Objects: The Cognitive Work of Images* (Chicago & London: The University of Chicago Press, 2007), 89.

Omer Fast: Performative Mimesis and Mirror Neurons

In the previous case studies I explored how FASTWÜRMS' installation facilitated neuroaesthetic awareness of associative processes of cognition. Olafur Eliasson's colour installations, I argued, revealed the neuroaesthetics of vision as a culturally implicated process, while Kristin Lucas' ephemeral performance made the neuroaesthetic proposition that concepts themselves inhabit a physiological dimension. In this chapter, drawing on mimetic theory as implicated by the evolving neuroscience of mirror-neurons, I will explore how Omer Fast's 2009 video, *Talk Show,* encouraged a self-reflexive, neuroaesthetic awareness of mimetic exchange. Furthermore, I will suggest that this awareness emerged through an entanglement of physiological and social interaction. In the context of the gallery, *Talk Show* unfolds temporally over a span of 45-minutes, producing a range of sensorial intensities derived, in part, through cultural implications that would be very difficult, if not impossible, to reproduce in the context of a neuroscience lab.

Omer Fast's *Talk Show* first manifested as a series of three live performances programmed by Performa in New York City, 2009. Each performance was recorded, and Fast chose one of them to produce as a three-channel video installation exhibited at Arratia, Beer gallery in Berlin from April 29 - June 2, 2010. The events referenced the genre of day-time television talk shows. A stage was arranged to simulate a television set with false walls, floral arrangements and muted ambient lighting designed to invoke a corporate media environment. Two white leather chairs were placed on the set. A studio audience of approximately 100 people sat facing the stage on a stand of bleachers. As

Fast explained in an interview with RoseLee Goldberg (who founded Performa), the presence of cameras, lighting cues for the performers, and the signifiers of a television studio, mentioned above, made it clear that the event was staged as a "media creation" rather than a work of theatre.[1] Nevertheless, the performances were recorded in real time, with no cuts nor re-takes. The resulting video felt like a hybrid between a television production and a video document of a live event. While there were no frontal pans of the studio audience – as there would be in a day time talk show such as Oprah – audience members were partially visible in some shots, and their sounds of throat-clearing, and nervous laughter could be heard on the audio track, establishing the tensions and intensities of a live, public event. Both the studio audience for the performance and the gallery audience for the video were offered clear indications that the work was not meant to pass as an actual television talk show, but was transparently staged as such in order to situate the performance within a collective context of mass media extending beyond the conventions of video art and gallery display.

While the piece referenced the highly controlled and precisely manipulated products of television programming, the formal structure of the performance itself produced a heady, unsettling sense that anything might happen. For each of the three Performa events, Fast invited a different guest to tell a real-life story of personal trauma and loss. The first evening featured Bill Ayers, a member of the activist collective weathermen underground, whose girlfriend, Diana Oughton, had been killed during an accidental explosion while they were preparing bombs for civil disobedience. Lisa Ramaci spoke at the second event about the loss of her husband, an American journalist

brutally murdered in Iraq, and the fate of the Iraqi translator who had helped him. The third guest was David Kaczynski, who had been through the harrowing experience of betraying his own brother – the infamous Unabomber, Ted Kaczynski – to the FBI. Fast enlisted six professional actors – Rosi Perez, Jill Clayburgh, Tom Noonan, Dave Hill, Lili Taylor and David Margulies – to re-tell the guests' stories. At the beginning of each performance, the guest and one actor entered the set and sat themselves in the leather chairs. The guest told his or her story and then left the stage. The actor, in turn, relayed the story to the next actor, and the process continued until the guest returned to the set to receive the final version in front of the audience. Like a game of broken telephone, the original stories mutated as the actors struggled to remember details while at the same time embellishing with details of their own. Fast has explained that in his opinion the first and third performances were the least successful because the actors were previously familiar with the high profile stories and the evolving narratives did not stray as far from the originals as he'd hoped.[2] Ramaci's story, by contrast, had not received the same amount of media attention and so the actors were not aided, nor constrained, by their foreknowledge of the events. Fast chose this performance, of the three, to present in his three-channel video.

The *Talk Show* video began with Lisa Ramaci telling her gripping, true-life story to actor Rosi Perez. As Ramaci related, her husband, Steven, had been investigating the American war in Iraq with the help of a beautiful young Iraqi translator named Nour. The work placed Nour's life in danger, so Ramaci and her husband hatched a plan – Steven would convert to Islam, marry Nour and bring her safely out of Iraq. But then Nour and

Steven were kidnapped. Both were beaten and shot – Steven died and Nour survived. After this tragedy, Ramaci worked diligently to get Nour out of Iraq and eventually the young woman came to stay with her in New York. When Ramaci finished describing these experiences she left the stage, and another actor entered. Now Jill Clayburgh played the "host" and Perez assumed the role of the "guest" who attempted to re-tell Ramaci's story from memory, embodying the narrative as if it were her own. After Perez, it was Clayburgh's turn to tell the story, and the process continued with all six actors switching roles in sequence, until Ramaci returned to listen as "host" for the final act.

I aim to demonstrate that *Talk Show* produced an awareness of mimetic processes operating on manifold neuroaesthetic registers. First, the mimetic illusion of a televised talk show served to frame the piece within the collective, social sphere of mass media. More importantly, while the narrative evolved in the form of spoken word, the intensities of engagement between Perez and Ramaci, and between each subsequent pairing of actors, emerged non-linguistically through the reciprocal exchange of physical gesture and affective behaviour. In his interview with Greenberg, Fast emphasized the physiological dimension of the work, explaining that "the original story would begin to mutate and would be passed along from body to body, almost in the way that – we're in swine flu season now – a virus would pass from body to body."[3] Each re-telling of the story launched a fresh instantiation of mimetic exchange as the two bodies occupying the chairs on stage absorbed one another's non-verbal performances. Thus, while the ongoing narrative was relayed linguistically, each iteration became tangible through the embodied performances of the actors.

The physical transference of the mutating narrative was not only available to the performers, but was also offered to audiences. As I shall demonstrate, the emerging neuroscience of mirror-neuron theory supports the notion that a beholder may, to some degree, undergo physiological experiences of enacted behaviours that they observe in others. While most mediated narratives – such as cinema and video games - entail embodied mimetic exchange, three additional dimensions of *Talk Show* functioned to produce a neuroaesthetic awareness of the mimetic process itself. First, while a film may invite embodied response to the actions of the characters it portrays, the transparent structure of *Talk Show* asked beholders to respond to the actors' performances *as such*. Through meta-level engagement with actors performances, suspension of disbelief in the stories they were telling was revealed as an active choice, rather than a passive*, a priori* state of reception. By asking beholders to become actively engaged, *Talk Show* produced a context conducive to conscious reflection on processes of mimetic experiences as they took place. Next, for those who saw the video, the audible presence of the studio audience offered an additional mimetic register, inviting gallery beholders to respond to the expressions of the recorded, live beholders as well as to those of the performers. In this way, just as the actors were presented *as actors,* the video also presented the performance of audience *as audience*. Finally, Fast raised the stakes of self-awareness by intentionally choosing guests who would present stories loaded with personal trauma. He explained that this dynamic created an ethical dilemma for him personally, as he worried he might be responsible for forcing his guests to re-experience their trauma in public.[4] Furthermore, both the live event and the video presented, in Fast's words, "real stories,

and real bodies, and the person who experienced the original stories seeing what's happening to their stories – how they're getting beaten up, and changed, appropriated by these actors and whacked out of shape."[5] It was Fast's hope that the transformation of the story would have a beneficial impact on his guests, and Ramaci reported, after the fact, that she enjoyed the process.[6] Nevertheless, as the performance unfolded her story diverged farther and farther from its original form, entailing beholders in a complicit relation with the work's ambiguous ethical stance. The intensity of this tension facilitated heightened states of awareness as every new iteration of the story was charged with fresh anxiety.

I will begin the sections that follow by briefly introducing the concepts of mimesis and mirror neurons in their neuroaesthetic significance. Each of these interconnected theories emphasizes the physiological nature of intersubjective communication in part by troubling distinctions between imitation and invention. I shall then situate *Talk Show* within Fast's larger body of artwork as he has consistently activated stories of trauma to problematize dichotomies between fact and fiction, copies and originals. A description of *Talk Show's* affective dimensions follows, with a detailed examination of the processes by which the artwork produced neuroaesthetic awareness. I aim to demonstrate that my neuroaesthetic analysis of *Talk Show* challenges the reductive tendencies evident in some neuroaesthetic literature. In particular, I suggest that *Talk Show* problematizes hierarchical distinctions between conscious and nonconscious neural processes and I will draw on theories emerging in neuro- and cognitive science that support such challenges to reductive determinism. Within this discursive context,

literature on the neuroscientific discovery of mirror neurons has been particularly fraught. While mirror neuron theory tends to support my claims for the physiological dimension of *Talk Show's* mimetic mode of address, early neuroaesthetic applications of mirror neuron theory would seem to refute my emphasis on the concurrent role of conscious awareness. Again, however, challenges to such determinism have emerged from within the fields of neuro- and cognitive science. I will explore how this recently refigured mirror neuron theory informs my neuroaesthetic proposal that *Talk Show* facilitates awareness of embodied, mimetic exchange.

Introducing Mimesis and Mirror Neurons

While *Talk Show* used the medium of verbal language to convey its contents, it also made an emphatic, non-linguistic address through mimesis, or what affect theorist Anna Gibbs would call "mimetic communication," meaning, "corporeally based forms of imitation, both voluntary and involuntary."[7] Mimesis has been thoroughly examined in the humanities as a mode of representation, but, as mentioned in the previous chapter, the concept has recently re-emerged in cognitive science,[8] affect theory,[9] and neuroaesthetics[10] as a mode of embodied communication. I adopt a definition of mimesis advanced by cognitive scientist Merlin Donald, who suggested:

> A mimetic act is basically a motor performance that reflects the perceived structure of the world, and its motoric aspect makes its content a public, that is, a potentially cultural, expression.[11]

Donald formulated mimesis as a form of aesthetic performance that entangles nonlinguistic embodied actions with collective cultural knowledges. Donald

distinguished "mimesis" from "imitation" or "mimicry," suggesting that mimesis is intentionally communicative and must take audience experience into account.[12] Mimesis, as he defined it, does not operate as a linear process whereby a message is sent and passively received, but as a collaborative dynamic in which participants actively engage in mutual exchange. Furthermore, in mimetic exchange the participants do not simply duplicate one another's actions, but each performance manifests as an original, unique iteration. As Gibbs indicated, the differences between performances are as important to the communicative aspect of mimesis as their similarities.[13] Mimesis, then, informs neuroaesthetic analysis of embodied experience because, in the context of art, it formulates beholders as participants who physiologically perform communicative acts as they actively engage with artworks.

Current mimetic theory has been informed by developments in neuro- and cognitive science. As I shall explain in detail later in the chapter, mirror neuron theory emerged from the neuroscientific discovery of small groups of neurons that fire the same way when a subject performs an action as when the subject observes another performing the action. Simulation theory, from cognitive science, also intersects with mimesis because it suggested that people internally simulate the physiological states of others in order to understand those others' states of mind.[14] These internal simulations have been understood to take place both consciously and nonconsciously. As discussed in the previous chapter, Alvin Goldman's simulation theory posits that some forms of internal simulation happen automatically, such as the neural response to witnessing another's pain, while in others, such as "enactment imagination" percipients interacting with fiction

may actively choose to physiologically simulate, to some degree, embodied states that the fiction portrays. The most significant neuroaesthetic implications of simulation theory are, first, that concepts can manifest physiologically in the bodies of conceivers, and second, that such simulations may, in some cases, be triggered by active choice. In *Talk Show*, the option to engage in fictions was an integral step in the production of neuroaesthetic awareness.

The discovery of mirror neurons supported simulation theory by demonstrating that physiological processes of imitation are triggered in the brains of observers. Early mirror neuron research was delivered with strong causal claims for mirror neurons as the determining agents of inter-subjective communication, reinforcing the automatic and non-conscious dimensions of mimetic exchange. Thus, mirror neuron theory initially left no room for discussion of the kinds of self-reflexive neuroaesthetic awareness posited by artworks such as *Talk Show*. As I shall explain later in the chapter, however, interdisciplinary developments in mirror neuron theory have shifted away from such models of linear causation, positing mirror neurons increasingly as elements integrated into broader, nonhierarchical neural networks that entail all aspects of cognition. Thus, I aim to demonstrate that current mirror-neuron theory supports an analysis of *Talk Show's* embodied mimetic exchange as a physiological phenomenon, while retaining the element of conscious choice that leverages neuroaesthetic engagement with the work.

The mimetic synthesis of physiological response and active performance emerges through inventive behaviour, and *Talk Show* explicitly staged each of the actor's

performances as a unique enactment. Mirror-neuron theory suggests that a given behaviour can be effectively passed from body to body, but in each percipient the action must be embodied anew. My neuroaesthetic analysis of performative mimesis suggests that imitations manifest as original acts, and Gombrich's work on mimesis also supports this claim. For example, in *Art and Illusion* he discussed the inventive dimension of mimesis, describing a child at play who uses an upturned table for a spaceship and a basin for a crash helmet: "The basin does not represent a crash helmet, it *is* a kind of improvised helmet, and it might even prove useful."[15] One doesn't assume that Gombrich's child was deluded – he or she knew that the helmet was still a basin – and the human nervous system seems perfectly capable of allowing the real basin and the fictional helmet to comfortably co-exist. Fast's *Talk Show* also brought this kind of tolerance for fact/fiction paradox to the fore, but in this case the situation was far from comfortable. There is little at stake in pretending that a basin is a helmet, whereas in the case of *Talk Show,* the actors were pretending to be a specific person – a person in intimate proximity, performing on the same stage. Because of the loaded content of Ramaci's story, the actors' struggles to duplicate it created emotional tension. Yet, even as their stories diverged from the original, they generated compelling new ones. The potent physiological dimension of the performances, which I shall presently describe in more detail, conferred a form of credibility on each actor's invention, revealing the synthesis of fact and fiction inherent to mimetic exchange.

Copies as Originals in the Work of Omer Fast

Fast is not strictly speaking a digital artist, yet his works suggest a contemporary digital art discourse in which questions about imitation, copies and originals prevail. Art theorist Boris Groys recognized that in the context of curated gallery exhibitions, where site-specific decisions are made about how to present digital images, "each presentation of a digitalized image becomes a recreation of that image."[16] Different display conditions, different monitors, lighting, sound equipment all contribute to specific aesthetic experiences. As Groys further explained, "there is no such thing as a copy. In the world of digitalized images, we are dealing only with originals – only with original presentation of the absent, invisible digital original."[17] Turning his attention to the situated, temporal and material presence of the digital image itself, Groys reassessed the ontology of the copy in a contemporary context. While digital images can be easily reproduced, someone must initiate each instantiation, and people experience these copies as a unique events. Groys was specifically assessing curatorial practice, but in the digital culture of sampling and remix, artists and audiences also operate in the interstitial zone between imitation and invention.

Indeed, Fast has addressed the originality of the copy as a central theme in many of his works, deploying loaded, political content as a catalyst for charged fact/fiction ambiguities. In his video installations he has located the material presence of copies in the temporal, lived experiences of his actors and audiences. Working with collectively charged content such as the American war in Iraq, the Holocaust, a suicide bombing in Israel, and drone warfare, Fast has constructed video and performance re-enactments of

first hand accounts of traumatic events. While Fast's videos have made critical commentary on broadcast media tropes, critic Gideon Lewis-Krauss has suggested that reading "banalizes" his work[18] and Fast himself has expressed a disinterest in this line of inquiry suggesting that gallery goers are already very well versed in the ways that media frame narratives.[19] He stated that rather than passing ironic critique on contemporary media, he wanted his works to have an "emotional or perceptual" effect.[20] In his video installation *The Casting*, for example, actors staged tableaux of scenes from the war in Iraq, based on a narrative told by an American soldier. As the shots sustained, and the actors tried to hold their poses, they made tiny involuntary movements. Tension mounted as the physical strain on the actors became apparent and the tableaux became volatile with unexpressed kinetic energy. While there are multiple levels of content that can be read into the work, it is the physicality of the actors' performances that Fast seems to value most highly. As he indicated, he had originally wanted the tableaux to be perfectly still, but he couldn't control the slight movements of the actors' bodies or the blowing of the wind. "These minute tics and signs of life, the body's gestures of rebellion really, drove me crazy during the shooting," Fast explained, "The beauty in all these miniature movements is something I only discovered while looking at the footage much later, alone in the studio. I really think it's what makes the work worth looking at."[21] In *Casting*, the tension between the soldier's story and the strange performances of the actors – poised and fixed in creative re-enactments of traumatic events – staged a mimetic engagement similar to that of *Talk Show* in that beholders were invited to simulate for themselves the embodied states of the actors as actors, thus re-enacting their own version of the original

story and further troubling the fact/fiction dichotomy.

While Fast has often used actors to re-enact stories generated by traumatic life events, *Talk Show* stands out in his oeuvre in that its first manifestation was a live performance. In his interview with Greenberg, Fast shared his anxiety about letting go of the directorial and editorial control that he usually has over his productions.

> The hardest thing for me was standing alongside and thinking "Oh no, the story! Someone is taking a wrong turn with this, what's going to happen?" At the same time it's a structure that could guarantee regeneration. Someone could come along ... and kind of upend the material and breathe some new life into it.[22]

Just as the actors' small involuntary movements in *Casting* turned out to be key aspects of the piece, in *Talk Show*, the element of the unexpected produced tensions that gave life to the stories that were being told. In this work, the fact/fiction paradox unfolded in real-time, and the anxiety that Fast expressed about his lack of control was also palpable as an inherent aspect of the work's mimetic processes of invention.

***Talk Show*'s Affective Address**

Perez was the first actor to re-tell Ramaci's story. As she spoke, halting occasionally, sometimes letting her words flow, the tension oscillated dramatically. As she struggled for words, it became clear that part of her apparent distress was a means of buying time while she reconstructed the narrative she was tasked to relate. And yet, for two reasons, her reconstruction did not feel false. Firstly, the emotions that she now tried to evoke were some of the emotions that the audience had just experienced through Ramaci. Secondly, Perez is an excellent actor. As Ramaci previously commanded audience

attention with her dignified presence, now Perez captured the gaze as she attempted to embody key aspects of what had suddenly become her story. The emotional nuance did not lessen in intensity, but Perez weighted her version differently. While Ramaci conveyed calm composure, dignified grief and a sense of accomplishment in her success in bringing her late husband's translator to America, Perez inhabited elements of anger, jealously and guilt evoked by the story. While Ramaci was calm, Perez was fierce; moving around a lot, waving her hands, raising and lowering her voice with inflection. It was as if she was fully portraying certain emotions that Ramaci had been trying hard to suppress. Perez created a fiction, but her body language, tone of voice and facial expressions manifested that fiction as a very present, sensorial reality.

Later in the sequence, when comedian Dave Hill took on the narrative, he radically shifted the tone from sincerity to humour by performing exaggerated, mawkish gestures and gratuitously throwing anachronistic, humorous details into the plot. His glib approach bordered on offensive as he seemed more interested in getting laughs than in staying true to the story. The moment was telling as it became apparent that a kind of ethical code of conduct had been emerging all along. None of the actors had stayed true to Ramaci's story, but by at least appearing to try to faithfully internalize and replicate what they had heard, they had shown Ramaci a form of respect. As Hill made fun of the story, he came across as rude, and created an atmosphere of panic, as even more elements of Ramaci's version slipped away. When Lili Taylor retold Hill's version, however, she rejected his comedic mode and, in doing so, she delivered the most affectively convincing performance of the entire show. She faced "host" David Margulies with a

clear-eyed expression of emotional pain. Head in one hand, she spoke candidly, “I don’t know anymore. I don’t know anything. I know that I loved this woman, and she’s gone.” (When the first male actor in the sequence, Tom Noonan, had taken the stage, he’d changed gender of the spouse in the story to female. In Taylor’s version, she presented her own character and that of the now female spouse as a same-sex couple.) Taylor continued, “It’s like an MIA and I don’t have any closure...” – her voice became husky, and the rims of her eyes reddened in a seeming effort to hold back tears – “...no resolve. And I’m...” – she paused, shaking her head slightly, and heaved a pained sigh, looked at Margulies with stark vulnerability, sighed again – “... so I’m just trying to figure it out.” Taylor’s words were ambiguous. While she was improvising a character, she was simultaneously describing her present predicament as an actor; trying to tell a believable story about which she knew almost nothing. In her raw, emotional performance, fact and fiction completely collapsed into one another.

At the end of the performance chain, Ramaci returned to the stage to assume the role of “host” and David Margulies related to her a final version of her by now unrecognizable story. The scene was uncomfortable to witness because the audience knew that the story had lost elements of nobility and generosity that had earlier seemed to give Ramaci strength and comfort. The political details had been dropped, the selfless dignity had evapourated, and the sense of closure had completely disappeared. The story had changed from one in which a loving, politically engaged couple conspire to save a young Iraqi woman, to a sordid tale of adultery and shame. Story elements had been lost and new ones added; even the genders of the protagonists had been switched around.

Ramaci settled into her chair, with a somewhat terrified smile, and bravely asked, “So, tell me about the first time you saw her.”

Margulies was warm and chivalrous. He leaned forward in his chair and looked directly into Ramaci’s eyes, rarely glancing at the audience. He began sardonically, emphasizing the gender-bending absurdity of the situation. “Well,” he said, picking up the narrative handed to him by Lili Taylor, “I’ve always been attracted to straight women, and I’ve always tried to convert them.” Ramaci laughed, providing a much needed release for everyone. Margulies continued with gentle confidence, but the affective tension mounted again. Ramaci began to show physical signs of discomfort as it seemed to dawn on her that her story had been effectively erased. If she had entertained any narcissistic hopes of hearing her heroic story magnified, those hopes were now dashed. In the previous segments, it was the speaker who commanded the viewer’s attention, but in these final minutes, Ramaci’s listening face, the affective focus of the “reaction shot,” became the focal point. She relaxed her posture more now than she did when she was performing, but her expression slowly becomes sad, and she plucked at her hands. Here and there familiar details emerged. “She was a journalist,” said Margulies, “and she was used to going to dangerous parts of the world, dangerous theatres of war.” At this Ramaci sighed and placed her chin in her hand, and it was as if some ephemeral, half-grasped presence of her husband wafted momentarily in the air between them, despite the fact that his gender had been changed. Next, however, the story turned to adultery and betrayal, punctuated with a host of comedic details that raised nervous laughs from the audience. Ramaci laughed along, but she seemed to draw back from the procedure. She leaned

away from Margulies, and her face took on a polite, unchanging smile. Once he had finished, Margulies reached for her hand and apologized. “I’m sorry if I have violated your story in any way.” The final words of the performance were Ramaci’s enigmatic, laughing reply, “You don’t even know my story ...you did a terrible job.” With that the video ended, Ramaci seeing nothing of her noble story in the final sordid version and effectively laughing off the process as a pointless exercise.

Throughout, the audience rode an affective roller coaster, oscillating between the states of appreciation for the actor’s performative abilities and states of empathetic anxiety for Ramaci as those performative fictions called her personal story into question. Many of the actors’ performances, for example, were delivered with more affective exaggeration than Ramaci’s version, generating emotional intensities that felt genuine even when the words did not. Furthermore, the collapse of fact and fiction raised a question: how rehearsed was Ramaci’s performance? How many times had she told her story and how much narrative spin had she put on it? Just as a fictional mimetic performance manifests as a new invention, so Ramaci’s non-fictional performance now existed as a narrative interpretation of past events.

Talk Show presented a perceptual paradox inviting audiences to respond simultaneously to the actors’ own real time processes of improvisation, as well as to the invented narratives that the actors inhabited. The dual address repeatedly demanded an active choice between indulging in the affective veracity of the actors’ fictions or maintaining an allegiance to some sense of the original story. By repeatedly raising the option of whether or not to embrace each new story, *Talk Show* positioned the audience

as potentially complicit in the dubious ethics of transforming a story of trauma. Thus, just as the actors were presented as actors, the performance of the audience *as such* was similarly revealed. The intensity of the address to the audience would have been higher during the live event, where, in Fast's words, "people [were] sort of captive in a way. … They [couldn't] really leave…it's too small a theatre, the seats [were] too tight."[23] For viewers of the video, however, sounds from the studio audience raised the stakes of self-reflexive awareness, as the tension of the live event became palpable not only through the actors' gestures but through the sounds of the audience shifting, clearing their throats, individuals breaking out into occasional bursts of isolated nervous laughter. The studio audience did not sound relaxed and this atmosphere of tension translated through the video as well. The tension escalated each time the story diverged from the original and the question of whether or not to suspend disbelief was raised anew. As the piece consistently refused to resolve into either a factual or a fictive mode of address it sustained awareness of the paradoxical relation between the two.

By addressing the beholder as an active, complicit participant, *Talk Show* produced a context for self-reflexive awareness of embodied mimetic response. Mimesis, as formulated here, entails mutual exchange of physical states. Gibbs has explained that facial expressions, for example, can be especially contagious between subjects.

> Of particular interest is facial expression's activation of mimetic impulse in response to the facial expression of observers, tending then to elicit the same affect in them. It is very difficult not to respond to a spontaneous smile with a spontaneous smile of one's own, and one's own smile provides sufficient feedback to our own bodies to activate the physiological and neurological aspects of joy.[24]

Taylor's facial expressions of distress, confusion and pain; Ramaci's full-bodied expression of controlled calm; Perez's look of intent concentration, simultaneously invoking empathy for Ramaci and the cognitive effort of committing Ramaci's story to memory; were all potentially contagious affects heightened, even in the video, by the palpable tension of the live studio audience. To some degree, and in some circumstances, the actors' strongly moving performances of confusion, frustration, grief and resignation might have compelled reciprocal, empathetic responses in the nervous systems of beholders.

Problems of Privileging the Nonconscious

The neuroscientific discovery of mirror neurons, which activate involuntarily and nonconsciously, strongly reinforces my claim that *Talk Show's* mimetic exchange invovled physiological activity on the part of both performers and beholders. I shall explore the neuroaesthetic implications of mirror neuron theory in the section that follows this one. Before I embark on that analysis, however, I want to insert a note of caution. As I discussed in Chapter One, a neuroaesthetic emphasis on nonconscious processing may run the risk of activating deterministic ideologies that seek to position human experience as empirically driven by nonconscious neural activity, thus eliding the importance of conscious awareness in the art experience. Indeed, mimesis has surfaced in neuroaesthetic discourse, in part because the discovery of mirror neurons has cast mimesis as a mechanical, nonconscious process supporting deterministic, bottom-up models of mind. Some neuroaesthetic scholars, such as art historian John Onians, have

positioned the physiology of neuroscience in opposition to the supposedly non-physiological realm of culture.

As mentioned in Chapter One, Onians suggested that "[m]ore habitual terms [than 'brain'], such as 'mind' and 'intelligence,' with their lofty, even godlike, associations, distort our view of the people to whom they are credited ... by overemphasizing the active character of their relation to the world."[25] In other words, for Onians, human hubris had mistakenly privileged conscious thought processes over nonconscious neural activations and neuroscience could provide a corrective theory by reconfiguring the hierarchy in reverse. As Onians embraced the brain, he implicitly reinforced a nature/culture dichotomy, drawing from an ideological position that human behaviour was driven by nonconscious, and therefore natural, impulses. While my analysis of *Talk Show* demands an account of the role of nonconscious neural processing, I consider how such processes are infused with conscious awareness, and thus my formulation is distinct from that of Onians who positions the nonconscious and the conscious in opposition to one another. In this section, I will examine theories of mimesis and physiological engagement that trouble such determinisitc dichotomies.

The experimental practice of neuroscience has been traditionally based on a bottom-up model of the brain, which assumes that small components of brain anatomy – localized networks of neurons assigned with particular tasks – transfer signals upward through the complex system, from the nonconscious zones of perception low in the network toward the higher cognitive areas where conscious thought occurs. A common interpretation of the bottom-up model is that nonconscious processes are spatio-

temporally situated early in the chain and therefore they drive and determine conscious thought and behaviour. In 1985, for example, neuroscientist Benjamin Libet famously questioned the existence of free will in his deterministic essay "Unconscious Cerebral Initiative and the Role of Conscious Will in Voluntary Action."[26] Massumi took up Libet in 2002 in his formulation of affect as an autonomous process, suggesting that "... what we think of as 'free,' 'higher' functions, such as volition are apparently being performed by autonomic, bodily reactions occurring in the brain but outside consciousness..."[27] Conscious agency came into question because such bottom-up models of the brain rely on a temporal hierarchy that positions nonconscious processes prior to conscious processes. I challenge this linear temporal formulation because it only inheres under the staged conditions of laboratory experiment where specific processes of perception are intentionally triggered in passive subjects and observed in isolation from other concurrent neural processes. Instead, within everyday contexts, I suggest that neural processes are ongoing throughout the entire, networked matrix of the brain, they are not isolated from one another, nor do they have temporally discrete beginnings.

Recent research in cognitive neuroscience has tried to provide empirical formulations of mind that could account for the co-evolution of the brain with the body as they interact in feedback relations with the natural/cultural environment. Jerry Fodor, for example, worried about the limitations of anatomical neuroscience to account for the infinite variability of inputs that constitute consciousness,[28] while the collaborative duo of Nancey Murphy and Warren S. Brown, emphasized the non-hierarchical structure of the brain as a dynamic system in ongoing feedback with the environment.[29] These

formulations of mind, which posited the brain as a dynamic system embedded in larger dynamic systems, lacked for experimental models because the shifting and complex conditions that give rise to consciousness are difficult, if not impossible, to quantify and replicate in a lab. *Talk Show*, however, succeeds in situating the embodied cognitive processes of audiences within a collective, social context that unfolds over an extended period of time. Thus, while the artwork does not by any means operate as a science experiment, it can provide material instantiations of embodied mind as a social, integrated system.

I do not intend to argue for the primacy of conscious thought processes over nonconscious neural activations, but to position the two as mutually entangled. I disagree for example, with Gombrich, whose mimetic paradigm privileged making over matching. He rightly argued against the idea that an artist could ever produce a direct, unmediated representation of his or her sense impressions. As soon as pencil touches paper, he explained, decisions must be made about what to depict and how. Thus, invention, for Gombrich always preceded imitation and, like many who explore the physiological processes of perception, he assumed a temporal hierarchy of importance in the system. Yet, in order to assert that one mode precedes another, the measurement of time has to begin at some determined moment. Imagine the artist sitting down to draw. The paper is blank, and common sense might dictate that the art making begins with the first mark. But the artist is not blank, nor empty. He or she is a digesting, respirating, remembering, cogitating, culturally embedded, temporally situated, living, breathing person who comes to the blank paper with a nervous system that is processing the content of his or her world

on an ongoing basis. As Murphy and Brown have argued, the nervous system operates as an impossibly complex and continuous network of feedback loops between the individual and the environment. In their neurological exploration of agency they explain,

> The picture we are prone to have in mind is an organism whose 'default position' is inactivity. When it acts, the question arises as to what caused it to act and whether the action was 'up to it' or not 'up to it" [...] A more accurate picture is of an organism that is constantly active (to some degree or another). Thus, the question is not what initiated any part of the behavior, but rather, what the factors are that modify ongoing behaviour.[30]

In this way, they rejected the deterministic temporal hierarchy assumed by many neuroscientists, such as Libet, and instead positioned the nervous system as an interactive co-constitution of conscious and nonconscious processing. Drawing from Murphy and Brown, I wish to trouble hard formulations of precognitive states for neuroaesthetic theory, because, in art contexts, there is no way to ascertain a discrete beginning. In relative terms it is certainly possible to consider the temporal duration of art experiences, particularly in the case of time-based work, such as *Talk Show*. Nevertheless, it is also important to remember that a viewer who comes to an artwork is never a *tabula rasa*, but always an active, agential participant whose cumulated history of lived experiences inflects and informs their perceptions in the present. Likewise, an artist who comes to create an artwork is already actively engaged in imitative and inventive relation to the world before the physical act of art making begins. In both instances, the oscillating mimetic processes of imitation and invention are always and ever ongoing.

Another problem with Gombrich's assertion that invention precedes imitation is that such a formulation is born out of a romantic and teleological attitude toward time. Even if, as in a science experiment, a provisional beginning point were to be established

for the art process, and even if it were to be shown that, within the framework of this model, invention comes before imitation, there is no reason to thereby assume that invention is *more important* to the process. To privilege earlier states as more important betrays a kind of teleological primitivism, by which I mean a progressivist attitude toward human evolution as the development of civilizations, with the attendant corollary that conditions in the present can be explained and naturalized according to the perceived conditions of earlier times. The Western tendency to apply goal-oriented progress to the passage of time is a central problem for art history, as well as for neuroscience. The danger for neuroaesthetics of ascribing primacy – in the sense of "having chief importance" – to neurological processes which are considered primary – in the sense of "coming first" – is that it inscribes an essentialist, evolutionary[31] paradigm on human experience, implying that human physiology prefigured human cultural interaction, and thus eliding the fact that humans have always been social animals.

My argument with Gombrich is not that I would privilege matching over making, but that privileging either masks the co-constitutive relation of the two. As previously discussed, *Talk Show* explicitly refused to privilege invention over imitation and *vice versa*; rather, the piece stands as a neuroaesthetic model that makes transparent the very circular entwinement of these mimetic dimensions.

Donald's formulation of mimetic performance as a communicative, cultural motor act is useful for thinking through the implications of *Talk Show* because, like Taussig, he emphasized the entangled nature of imitation and invention rather than taking the ideological step of demonstrating allegiance for one process over the other. Donald

reminded his readers that much of the experimentation on consciousness takes place in laboratory conditions, on very small time scales, and focuses on isolated areas of the brain, whereas the consciousness that humans commonly experience involves many areas of the brain and takes place over much longer stretches of time.[32] Instead of opting to privilege invention or imitation, voluntary or involuntary behaviour, conscious or nonconscious neural processes, Donald's mimetic theory insists on entangling such dichotomies. In this way, both Donald's mimetic theory and neuroaesthetic operations in Fast's *Talk Show* answer Taussig's urgent call that theorists of mimesis "be a little more malleable, ready to entertain unexpected moves of mimesis and alterity across quivering terrain, even if they lead to the outermost horizon to an all-consuming nothingness."[33] For Taussig, the interstitial zone of mimesis could be destabilizing, but also afforded an entry point to embodied knowledge about the paradoxical and reciprocal nature by which participants engaged in intersubjective interaction may simultaneously simulate one another's embodied states. In *Talk Show*, one actor speaks while the other listens, but at the same time the fact and fiction synthesize as they affectively absorb one another's non-linguistic gestures and expressions.

While I have criticized Gombrich for implying a temporal hierarchy of invention over imitation, his larger aim was to blur the philosophical boundaries that Plato drew between the two.[34] In this – as in other sections of *Art and Illusion*[35] – Gombrich formulated human perceptual interaction with the world as an active and relational process. Onians, by contrast, directly appropriated the findings of science as authoritative evidence to validate or invalidate art historical claims. He relied heavily on the normative

authority of neuroscience without delving critically into the disciplinary conditions and constraints on how neuroscientific knowledge is negotiated. For Onians, an investigation of human nature was needed as a corrective to postmodern relativity. But he fell into the Romantic trap of essentializing and universalizing human nature as an innate and deterministic alternative to cultural contingency.

Onians complains about a humanist "uncertainty"[36] in Gombrich, his former teacher, but Gombrich's reluctance to assign absolute authority to science reveals that he had a deeper understanding than Onians about how scientific knowledge evolves critically as an ongoing process of negotiation. By showing respect for the differences between art history and science, Gombrich established an unfixed and provisional space between them, a dialectic in which synthesis was forestalled in favour of heterogeneous potential. In this way, Gombrich's work foreshadowed contemporary neuroaesthetic debates because his epistemological approach was born out in his refusal to deterministically reduce human experience to either nature or culture.

> The dignity of man [*sic*] ... lies precisely in his Protean capacity for change. We are not simple slot machines which begin to tick when coins are dropped into us, for ... we have what psychoanalysts call an "ego" which tests reality and shapes the impulses from the id. And so we can remain in control while we half-surrender to counterfeit coins, to symbols and substitutes. Our twin nature, poised between animality and rationality, finds expression in the twin world of symbolism with its willing suspension of disbelief.[37]

Gombrich cast mimesis as a process that collapsed the distinction between a representation and its referent because the mimetic imitation is always also an invention. A mark on a paper or a physical gesture can be both symbol and material at the same time. In this way, "The world of man [*sic*]," said Gombrich, "is not only a world of

things, it is a world of symbols where the distinction between reality and make-believe is itself unreal."[38] While Gombrich's take on mimesis may strike some readers as overly humanist, it is useful to remember that his ardent advocacy on behalf of human agency may have been influenced in part by his experiences of the Nazi reification of humans in World War II. As discussed in Chapter One, Onians dismissed Gombrich's suspicion of biological determinism yet, by taking on science without ascribing it absolute authority, Gombrich was able to make deeper insights into embodied perception than Onians, who uncritically appropriated neuroscientific findings as a means of validating art historical propositions.

In contrast to Onians, Stafford retained an allegiance to the entanglement of conscious and nonconscious processing in her neuroaesthetic investigations. Examining connections between mimesis and mirror neurons, Stafford challenged neuroaesthetic researchers to consider conscious agential acts as integral aspects of art experience.

> The venerable problem of mimesis – that is, the fabrication of faithful representations – can be restated as just this tension between first-person experience or individual witnessing and coming to know another through a double process of internalization: by intuitive copying and willed repetition.[39]

For Stafford, mimetic oscillation occurred not just between imitation and invention, but also between conscious and nonconscious performances of simulation. Like Onians, she celebrated that postmodernism's logo-centric hold on art analysis has loosened to the extent that the material affects of artworks could once again be seriously considered. Nevertheless, Stafford was wary of neuroaesthetic theories – specifically those of Ramachandran and Zeki – that privileged nonconscious processes of perception in the art

experience. It was particularly important to her that neuroaesthetic scholars begin to value volitional attention alongside automatic neural processes, because the contemporary, Western, technological environment tends toward the mechanization of intelligence and the fragmentation of subjects into component parts. A particular function of art, she argued, is to "snap us to attention,"[40] making viewers aware of their sense perceptions and also aware of themselves as agents directing attention to the cognitive task of combining diverse elements into meaningful synthesis.

Stafford's concept of mimesis as a combination of "intuitive copying" as observers automatically simulate another's performance and "willed repetition" as observers consciously reproduce behaviour as a self-reflexive process informs my claim that *Talk Show*'s mode of address entangled conscious and nonconscious processing. The point when Clayburgh exchanged places with and Perez took over Ramaci's story was the first of a series of moments that served, in Stafford's terms, to snap the beholder to attention as the narrative shifted instantaneously from a factual to a fictive mode. As the event continued, mimetic behaviours such Perez's agitation or Taylor's sincere expressions of emotion, returned the narrative to the factual dimension through the compelling veracity of the performance. In this way, the fact/fiction dynamic fluctuated throughout, each mode imbued with the other so that the narrative could not resolve to either dimension. Neither did the piece resolve into linguistic legibility, but remained a paradoxical experience in which the audience was asked to actively participate in conscious acknowledgement of their own physiological responses. Mimetic processes that might normally happen nonconsciously, such as empathic responses to facial

expressions, here came into cognitive consciousness because they would not settle as either real effects or fictitious representations. Fast thus deployed the fact/fiction duality inherent in mimetic performance as a catalyst to activate awareness of the physiology mimetic engagement that so often unfolds as a nonconscious process.

Interdisciplinarity and the Changing Discourse of Mirror Neuron Theory

Mirror neuron theory has been activated to support the notion of physiological engagement between artworks and their audiences in the gallery context, but can it also support my assertion that the neuroaesthetic properties of *Talk Show* emerge through awareness of such embodied processes? In this section, I will outline some of the shifts that have taken place in the discourse around mirror neurons and mimesis that bear relevance on *Talk Show*'s neuroaesthetic mode of address.

Mirror neurons are small groups of brain cells that fire the same way when a subject performs an action as when the subject observes another performing the action. They were discovered by neuroscientist Giacomo Rizzolatti and his team when they were recording the synapses in a monkey's brain while it performed a simple grasping action.[41] By inserting electrodes directly into the animal's brain, the scientists observed neuronal activity when the monkey picked up a piece of food. During the experiment, one of the humans happened to pick up the food while the monkey was watching. To everyone's surprise, the monkey's neurons fired in exactly the same way as they had when it was grasping the food itself.[42] Working in collaboration with an fMRI lab, Rizzolatti and his team concluded that humans also have a mirror neuron system.[43] The discovery of mirror

neurons provided empirical, neuroscientific evidence of a physiological dimension to inter-subjective communication. Furthermore, this physiological process seemed to be automatically triggered by external stimulus. As cognitive scientist Alvin Goldman explained, "Mirroring activity is an involuntary response to perceptual stimuli, whereas motor imagination is subject to voluntary control and not normally driven by any distinctive class of perceptual stimuli."[44] Mirror neuron theory suggests that *Talk Show* audiences, to some degree, may not have been able to avoid experiencing aspects of the actors' actions in their own bodies. Does this mean, then that such audiences are simply passive subjects, whose nervous systems are mechanistically triggered by the artworks they observe? I have suggested that, in *Talk Show*, conscious choice about suspension of disbelief activated a neuroaesthetic awareness of mimetic response. It would seem, initially, that mirror neuron theory works against this claim.

Early work on mirror neurons was delivered with strong claims suggesting that the nonconscious activity in the motor neural nets was the driving force underlying human communication and empathy. In a 2004 research paper, mirror neuron scientists Giacomo Rizzolatti and Laila Craighero made the following assertion.

> Mirror neurons represent the neural basis of a mechanism that creates a direct link between the sender of a message and its receiver. Thanks to this mechanism, actions done by other individuals become messages that are understood by an observer without any cognitive mediation.[45]

For some, neuroscience seemed to hold out the promise of unmediated communication as a kind of Holy Grail, an empirical proof of nature over nurture that would release Western culture from the seemingly miasmic cultural relativism of postmodern theory. If senders could reach receivers without passing through cognition then, by extension,

culture and history would not need to be taken into account as factors in the construction of collective knowledge. Rizzolatti and Craighero implied here that nature wins out over culture, positioning physiological mechanisms as if they were independent of cognitive mediation, and by extension, independent of cultural conditions. By suggesting that communication can occur in the absence of cognitive mediation, they portray a world in which social contingencies are rendered superfluous to intersubjective engagement.

In 2007, art historian David Freedberg and neuroscientist Vittorio Gallese teamed up to apply mirror neuron theory to aesthetic experience, making similar claims to those of Rizzolatti and Craighero. In suggesting that mirror neuron activation provided an "embodied simulation" of another's experience, they explicitly argued against the "primacy of cognition in responses to art."[46] Freedberg and Gallese situated their theory in opposition to the "new art history of the 1970s" which, in their words, insisted on "purely historical, cultural and social factors in responses to art."[47] Framing a polemic dichotomy between biological and cultural response, they proposed that viewers were able to grasp the meaning of artworks as their mirror neurons responded physiologically to the poses represented in figurative works (such as Michelangelo's *Atlas*) or to the movements indexed in gestural abstractions (like Jackson Pollock's *Lavender Mist*). Freedberg and Gallese suggested that mirror neuron response occurs "precognitively," by which they interpret the fact that visual stimuli trigger mirror neurons automatically and nonconsciously to imply a deterministic, temporal distinction between perception and cognition.[48]

Thus far, mirror neuron theory supports my claim that aspects of the performances in *Talk Show* could have manifest as physiological processes in the bodies of beholders. As Rizzolatti and Sinigaglia have claimed, mirror neuron activations, or "internal action representations" can be considered as "actions in their own right."[49] While mirror neurons usually activate offline – inhibited in the motor system so that observers don't automatically perform the actions they see in others – the neural activity nevertheless registers in the body as a form of activity. Because *Talk Show* presented mimetic performances that conveyed affective states through gesture and facial expression, it had the potential to draw beholders (those who were paying attention and were themselves already familiar with the gestures they observed) into physiological alignment with the embodied fictive states that the actors portrayed. And yet, while mirror neurons do trigger automatic neural response, does it necessarily follow that the audiences for *Talk Show* were therefore passive subjects whose aesthetic experiences were driven by *purely* nonconscious processes? How would this impact on my assertion that *Talk Show*'s mode of address was to facilitate conscious awareness of embodied mimesis? The early rhetoric around mirror neurons as involuntary, nonconscious causal mechanisms would seem to preclude discussion of conscious involvement. The discourse has been changing, however, and in the next few pages I shall trace some recent shifts in mirror neuron discourse as it has moved away from strident assertions that mirror neurons have a deterministic, causal role in communication, toward formulations that position them as co-constitutive agents working in synthesis with other cognitive processes.

Changes in mirror neuron theory have come about, in part, as a response to critiques from within the fields of neuro- and cognitive science. Donald for example, suggested that the causal claims for mirror neurons had become too overblown to deploy in a critical neuroaesthetic analysis of mimetic communication.

> Mirror neuron circuits are found in large numbers in species, such as monkeys, that are very poor at imitation and gesture. It follows that the mere presence of a mirror neuron system in the brain is not sufficient for the emergence of mimetic skills or even of imitation. Mirror neuron systems, taken alone, lack some of the key cognitive components required for high-level mimetic action.[50]

For him the atomistic examination of cellular activity could not provide an adequate explanation of mimetic behaviour. Donald was invested in the notion that mimesis entails a meta-level awareness of audience as well as a self-reflexive "third-person perspective on the actor's own behaviour."[51] Mirror neuron theory, in his estimation, could only tell part of the story, because it could not account for these conscious dimensions of mimetic exchange.

In 2007, philosopher Emma Borg also queried the strong causal claims made for mirror neurons in an essay in the *Journal of Consciousness Studies* titled, "If mirror neurons are the answer what was the question?" Doubting that mirror neurons could provide any meaningful understanding of the intentions implicated by others' actions, Borg suggested, "I want to be able to work out that you grasped the cup because you were thirsty, not merely that you grasped the cup because you intended to grasp the cup."[52] She raised an alarm that deterministic accounts of the role of mirror neurons were bordering on behaviourism.

The following year, philosopher of science Corrado Sinigaglia published a

response to Borg in the same journal, arguing that she had failed to understand the full range of implications suggested by mirror neuron research.

> Far from constituting a 'lure of behaviorism', which cognitive science should resist, MNs [mirror neurons] would enable us to go beyond the dichotomy of behaviour- and mind-reading, avoiding both the over-simplification of relegating action understanding to a mere identification of motor sequences and the abstraction of reducing action understanding to pure mentalizing.[53]

Sinigaglia's clarification was welcome, as he insisted that mirror neuron theory could problematize mind/body duality rather than privilege body over mind. Here, mirror neuron theory was coming more in line with neuroaesthetic theories of mimesis put forward by Donald and Stafford. Given the extent to which mirror neuron scientists had previously relied on a linear, causal formulation of nonconscious processing and inter-subjective communication, both Borg's concerns and Sinigaglia's response have made vital contributions to the discourse.

In recent years, mirror neuron research has tended to become less polemic and more interdisciplinary. Michael Arbib, a computational cognitive neuroscientist who was part of the team with Rizzolatti that originally discovered mirror neurons, situated his own interdisciplinarity, explaining that computational neuroscientists generally model the brain as if it were a computer and look at isolated systems, such as mirror neurons, with the aim of compiling a functional network out of discrete component parts. By contrast, he continued, the cognitive neuroscientists tend to focus on more global questions such as "how do we know the world?"[54] In his interdisciplinary field of computational cognitive neuroscience, Arbib worked with scientists from a range of disciplines in order to understand neural micro-systems, such as mirror neurons, not as the primary agents of

conscious processes, but as integrated elements of larger complex systems. In a paper he co-authored with Erhan Oztop and Mitsuo Kawato, Arbib suggested that far too little was understood about the myriad neural networks at play in acts of communication to justify causal claims for the role of mirror neurons in acts of communication.[55]

In an apparent response to Arbib, neuroscientist Rizzolatti teamed up with Sinigaglia[56] to reframe the mirror neuron discourse in terms that were less reductive and deterministic.

> Of course, claiming that mirror neurons are critical for understanding the motor acts done by others does not imply that these neurons magically bear such an understanding *per se*; rather, this means that their output triggers a complex network of neurons, some of which are involved in the execution of those motor acts.[57]

While Rizzolatti had originally asserted that mirror neurons provided material evidence of precognitive – and thus, in his formulation, unmediated –communication, he now construed them as elements in multi-dimensional systems of interaction. Significantly, Rizzolatti and Sinigaglia implied that the firing of mirror neurons, while a physiological process, revealed human communication as a co-constitutive mode of social interaction. They explained:

> Mirror mechanisms tell us is that the self and the other are so strictly intertwined that, even at the most basic level, self- and other-attribution processes are mutually related to each other, being both intimately rooted in a common motor ground.[58]

This claim was significant because, while mirror neurons were originally cast as the instigators in a linear chain of neural events, Rizzolatti and Sinigaglia now situated them as participating elements in a vastly complex network of interrelated and ongoing neural processes of dynamic social interaction.

Presently, mirror neuron discourse acknowledges that the isolation and observation of nonconscious neural processes in the lab, such as mirror neurons, does not mean that those processes *in themselves* are sufficient to determine human behaviour and experience. The neuroaesthetic implication, for my analysis of *Talk Show* is that one can embrace the physiological impacts of mirror neuron activation without having to sacrifice or elide the role of conscious awareness as a concurrent mode of engagement. At no point, for example, did *Talk Show* ask audiences to feel as if they had fully become the actors they observed. In Stafford's neuroaesthetic formulation of mimesis, which draws on mirror neuron theory, she identified just such a combination of intentional action and automatic response.

> Mimesis recognizes the contagious effects of mimicry, and the fact that empathy begins with reciprocal seeing and involuntary duplicating of another person's behavior. But it also requires emotional control, the executive decision to resist drowning in another person's pain so as to formulate an appropriate course of action.[59]

The neuroaesthetic implication is that percipients have the capacity to operate on several cognitive registers at once, entangling conscious and nonconscious modes of response. *Talk Show* audiences were invited to empathize with the actors *as such*, rather than seamlessly eliding their roles into illusionary, fictional characters, and to consider their own roles in performing as audience. This mode of active, self-reflexive engagement was reinforced by the problematic ethics of manipulating a real-life story of trauma, raising the stakes so that beholders would have to be convinced, rather than lulled into suspension of disbelief, as that story changed. The most convincing aspects of the work, however, were not the verbal stories, but the embodied gestures of the actors. This

veracity that so troubled distinctions between fact and fiction, imitation and invention, came about, in part, through mirror neuron activations in the nervous systems of the beholders. In daily life, people commonly form embodied engagements through mimetic performance but usually without self-reflexive, conscious awareness of the process. *Talk Show*'s neuroaesthetic operations brought that human capacity for mimetic communication into awareness and held it in suspension so that its manifold dimensions could be explored.

Conclusion

The *Talk Show* video stands as a site of neuroaesthetic research offering alternative forms of knowledge to those that can be produced in a neuroscience lab. While neuro-imaging experiments typically isolate and reify nonconscious processes, as an artwork *Talk Show* facilitated conscious awareness of normally nonconscious processes. In my neuroaesthetic analysis of this artwork, I drew on interconnected theories of mimesis and mirror neurons as each draws attention to the physiology of intersubjective communication. *Talk Show* addressed percipients through mimetic engagements enacted between performers, and between performers and audience. By stimulating mirror neuron activations through embodied gestures, the piece invited beholders to simulate in their own bodies the affective states that were being performed by the actors they observed.

In contrast to other forms of media that stimulate embodied response nonconsciously, *Talk Show* brought the process of mimetic exchange into awareness through several mechanisms that encouraged self-reflexivity. First, the structure of the

piece was transparent in that it framed each performance as an embodiement of the process of acting, rather than as an illusion of character portrayal. At the same time, however, the actors physically inhabited their fictive roles with compelling veracity. By drawing attention to the mimetic synthesis of invention and imitation, the piece foregrounded suspension of disbelief itself as an optional, performative mode of engagement.

Fast has often produced works that draw attention to blurry boundaries between fact and fiction. However, because *Talk Show* was orginially performed live, its dynamics of invention and imitation unfolded in a context of heightened intensity. The story that was being manipulated was heavily charged with personal loss and trauma, and the story teller was present at the event, raising the stakes on suspension of disbelief by posing each shift away from the original narrative as a fresh ethical threshold that beholders were invited to cross. Through its audio track, the video conveyed the tension of the studio audience at the live event, offering another mimetic register that, in the context of the gallery, positioned the role of audience itself as one of the key components referenced in the work. Thus, while *Talk Show* impacted on a physiological register, it activated meta-level states of awareness to contextualize the nonlinguistic dimensions of its address within a collective social sphere. Finally, Fast's decision to create the (transparent) illusion of a public television talk show enhanced all the tensions around suspension of disbelief by connecting the role of audience to the public sphere of mass media. *Talk Show* mobilized the collective contexts of television (through its set) and global politics (through Ramaci's story) to fully charge and activate its embodied

engagements. All of these mechanisms combined to foreground physiological processes of mimetic exchange as the primary subject of the work. While *Talk Show* was indeed full of talk, it made a neuroaesthetic address by raising awareness of social interaction on a non-linguistic register, demonstrating, through embodied means, the co-constitutive entanglement of conscious awareness with nonconscious neural processes. •

End Notes to Chapter Six

[1] Omer Fast and RoseLee Goldberg, "Performa 2009: Omer Fast," *ARTonAIR.org* (November 22, 2009), http://www.thebac.ca/
(accessed June 2013).

[2] Ibid.

[3] Ibid.

[4] Ibid.

[5] Ibid.

[6] Ibid.

[7] Anna Gibbs, "After Affect: Sympathy, Synchrony, and Mimetic Communication," in *The Affect Theory Reader*, eds. Melissa Gregg and Gregory J. Seigworth, (Durham & London: Duke University Press, 2010), 186.

[8] Merlin Donald, "Imitation and Mimesis," in *Perspectives on Imitation, From Neuroscience to Social Science, Vol 2*, eds. Susan Hurley and Nick Chater (Cambridge, MA: MIT Press, 2005), 283-300.

[9] Gibbs, Ibid., 186-205.

[10] Barbara Maria Stafford, *Echo Objects: The Cognitive Work of Images* (Chicago & London: The University of Chicago Press, 2007), 75-104.

[11] Donald, Ibid., 283.

[12] Ibid., 286.

[13] Gibbs, Ibid., 195.

[14] Alvin I. Goldman, *Simulating Minds: The Philosophy, Psychology and Neuroscience of Mindreading* (New York: Oxford University Press, 2006), vii-viii.

[15] E.H. Gombrich, *Art and Illusion*: *A Study in the Psychology of Pictorial Representation* (Princeton & Oxford: Princeton University Press, 2000), 99.

[16] Boris Groys, *Art Power* (Cambridge & London: MIT Press, 2008), 91.

[17] Ibid., 91.

[18] Gideon Lewis-Kraus, "Infinite Jetzt," *In Memory: Omer Fast*, ed. Sabine Schaschl (Berlin: The Green Box, Kunst Editionen, 2009), 45.

[19] Ibid., 45.

[20] Ibid., 77.

[21] Note by Omer Fast in Tom Holert, "Attention Span," *In Memory: Omer Fast*, ed. Sabine Schaschl (Berlin: The Green Box, Kunst Editionen, 2009), 139.

[22] Fast and Goldberg, Ibid.

[23] Fast and Goldberg, Ibid.

[24] Gibbs, Ibid., 191.

[25] John Onians, *Neuroarthistory: From Aristotle and Pliny to Baxandall and Zeki* (New Haven: Yale University Press, 2008), 14.

[26] Benjamin Libet, "Unconscious Cerebral Initiative and the Role of Conscious Will in Voluntary Action," *Behavioral and Brain Sciences* 8, no. 44 (1985): 529-566.

[27] Brian Massumi, *Parables for the Virtual: Movement, Affect, Sensation* (Durham & London: Duke University Press, 2002), 29.

[28] Jerry Fodor, *The Mind Doesn't Work that Way* (Cambridge & London: The MIT Press, 2001), 39.

[29] Warren S. Brown and Nancey Murphy, *Did My Neurons Make Me Do It?* (Oxford & New York: Oxford University Press: 2007).

[30] Ibid., 275.

[31] Darwinian evolution itself is not an inherently teleological concept. Despite Richard Dawkins' compelling metaphor of the "selfish gene," genes themselves do not have goals. Even at the level of the organism, biological mutation for the betterment of the species is not part of any animal's life plan. Change is afforded by the heterogeneity and chance of biological mutation. The complex of pressures and opportunities that environmental conditions exert on situated organisms conditions genetic change. Evolution is a temporal process, but it is not a sign of progress. When Gombrich dismisses evolution, however, it is not because of the teleological framework that Western culture has imposed on it, but for the simple fact that human genetic evolution is simply too slow to have had a meaningful impact on our species.

> There are few historians today, and even fewer anthropologists, who believe that mankind has undergone any marked biological change within historical periods. But even those who might admit the possibility of some slight oscillation in the genetic make-up of mankind would never accept the idea that man has changed as much within the last three thousand years, a mere hundred generations, as have his art and his style.
> See, E.H. Gombrich, *Art and Illusion*: *A Study in the Psychology of Pictorial Representation* (Princeton & Oxford: Princeton University Press, 2000), 22.

[32] Merlin Donald, *A Mind So Rare* (New York, London: W.W. Norton & Company, 2001), 46-57.

[33] Michael Taussig, *Mimesis and Alterity: A Particular History of the Senses* (New York & London: Routledge, 1993), 237.

[34] Gombrich, Ibid., 98.

[35] In Chapter One I discussed how Gombrich looks at a study of perception in chickens and draws the conclusion that the perception of colour is a relational, dynamic process that relies on imagination.

[36] Onians, Ibid., 160.

[37] Gombrich, Ibid., 102-3.

[38] Ibid., 99.

[39] Ibid., 76.

[40] Ibid., 207.

[41] Giacomo Rizzolatti and Laila Craighero, "The mirror-neuron system," *Annual Review of Neuroscience,* no. 27 (2004): 69.

[42] Vittorio Gallese, "From Grasping to Language: Mirror Neurons and the Origin of Social Communication," in *Toward A Science of Consciousness III*, eds. S.R. Hameroff, et al (Cambridge, MA & London: The MIT Press, 1999), 168-9.

[43] Giamcomo Rizzolatti, "Mirrors in The Mind," *Scientific American* 295, (2006): 54-61.

[44] Goldman, Ibid., 168.

[45] Rizzolatti and Craighero, Ibid., 138.

[46] David Freedberg and Vittorio Gallese, "Motion, emotion and empathy in esthetic experience," *Trends in Cognitive Sciences* 11, no. 5, (May 2007): 197-198.

[47] Ibid., 199.

[48] Ibid., 201.

[49] Ibid., 69.

[50] Merlin Donald, "Imitation and Mimesis," in *Perspectives on Imitation, From Neuroscience to Social Science, Vol 2*, eds. Susan Hurley and Nick Chater (Cambridge, MA: MIT Press, 2005), 289.

[51] Ibid., 286.

[52] Emma Borg, "If mirror neurons are the answer what was the question?," *Journal of Consciousness Studies*14, no. 8 (August 2007): 8.

As mentioned in Chapter Five, Barbara Maria Stafford made a similar complaint about the limitations of mirror neuron theory, when she suggests that the real problem is that of "determining the very nature of intention itself – not just its where and when. In affective ingestion we do no just repeat another's actions, we grapple with them." See, Barbara Maria Stafford, *Echo Objects: The Cognitive Work of Images* (Chicago & London: The University of Chicago Press, 2007), 89.

[53] Corrado Sinigaglia, "Mirror Neurons: This is the Question," *Journal of Consciousness Studies* 15, no. 10-11 (2008): 73.

[54] Ginger Campbell interview with Michael Arbib for *The Brain Science Podcast,* no. 39 (2008), http://brainsciencepodcast.squarespace.com/episode-transcripts,
(accessed June 14, 2011).

[55] Erhan Oztop, Mitsuo Kawato, Michael Arbib, "Mirror neurons and imitation: A computationally guided review," *Neural Networks*, no. 19 (2006).

[56] At the time of writing, an essay co-authored by Corrado Sinigaglia and Vittorio Gallese, "How the Body (in Action) shapes the Self," is pending publication in the *Journal of Consciousness Studies*. I am delighted to see that mirror neuron scientists Rizzolatti and Gallese are extending the scope of their inquiry by working across disciplines with a philosopher of science. Sinigaglia brings a great deal of valuable insight to the discourse.

[57] Giacomo Rizzolatti and Corrado Sinigaglia, "Through the looking glass: Self and others" in *Consciousness and Cognition,* no. 20 (2011): 66.

[58] Ibid., 69.

[59] Stafford, Ibid., 211.

Conclusion: Moving Forward with an Interdisciplinary Neuroaesthetic Paradigm

The dissertation emphasizes the co-constitution of the senses and conscious cognition in contemporary art experience. I have conducted a series of neuroaesthetic inquiries to theorize how certain artworks have facilitated embodied awareness of perceptual cognition. In placing the neuroaesthetic operations of artworks in gallery contexts on an equal footing with neuroaesthetic research conducted in the neuroscience lab, my aim has been to reposition neuroaesthetics as a thoroughly interdisciplinary field of inquiry, calling on the research contributions of art historians and art theorists who operate from their own epistemological standpoints rather than privileging neuroscientific knowledge with authority over other modes of knowing.

Drawing connections to ongoing investigations into embodied experience emerging in other disciplines, Chapter One raised the stakes of neuroaesthetic interdisciplinarity by situating neuroaesthetics within a broader discourse. While neuroscientific considerations of the brain as a biological organ support the notion that engagement with art is a physiological process, a range of scholars have suggested that an exclusive focus on physiology cannot sufficiently explain the workings of the body. Thinkers such as Barbara Maria Stafford, Susan Buck-Morss, Donna Haraway and Karen Barad have each invested in material experience, yet simultaneously refused to isolate physiology from discourse. Nancey Murphy and Warren Brown have similarly formulated the body as a contingent process of interaction with the environment. I suggest that, moving forward, neuroaesthetic researchers will produce more robust theorizations about art when they refrain from bracketing out environmental and cultural

conditions as zones of inquiry separated from examinations of the brain. The neuroaesthetic paradigm that I have advanced provides a starting point for consideration of how the physiological dimensions of social engagements with art constitute embodied perceptual processes in and of themselves.

Adopting a standpoint of critical embodiment within neuroscientific technology, Chapter Two introduced a critical assessment of fMRI as both a mode of knowing and an object of knowledge. Considering neuroeasthetics from my embodied standpoint as a test subject in neuro-imaging studies, I demonstrated how the disciplinary constraints of fMRI experiments on art experience are such that they rightly produce passive subjects, isolate nonconscious neural processes and eliminate variables. By contrast, the research context of the gallery positions active subjects, self-reflexive and aware, operating in open-ended networks of social and physiological engagement. At stake in an interdisciplinary neuroaesthetics is the inclusion of embodied forms of knowledge arising in the gallery context that are typically occluded by neuroscientific methodologies.

In extending the neuroaesthetic discourse to consider research conducted in non-neuroscientific contexts, the first two chapters established a theoretical framework within which to challenge a deterministic tendency in the existing neuroaesthetic literature to ascribe nonconscious neural processes with causal priority in art experience. My aim has not been to privilege conscious over nonconcious processing, but rather to reconfigure the neuroaesthetic paradigm so that both can be examined as entangled components of art experience. The remaining subsequent case studies detailed how certain artworks contribute to neuroaesthetic knowledge production by facilitating conscious awareness of

normally non-conscious processes of perceptual cognition. FASTWÜRMS' installation, for example, brought cognitive processes of abduction, or association, to the fore, while Olafur Eliasson made visual cognition the subject of his colour installations. Artworks by Kristin Lucas and Omer Fast revealed physiological dimensions of conceptual art. Lucas' performance raised awareness of a cognitive process of internal simulation by inviting the imaginative enactment of a conceptual proposition. Fast's video revealed intersections between art and mirror neuron theory in consideration of mimetic performance as an embodied mode of intersubjective communication.

Together, the case studies have provided new perspectives on the issues of abduction, vision, simulation and mirror neuron activation raised in neuro- and cognitive science. In each instance, however, the research context of the gallery allowed for considerations of how the neurological experience of art impacts within subjective modes of social engagement that would be epistemologically inaccessible in the context of a neuroscience lab. The processes of abduction revealed by FASTWÜRMS emerged through associations within a vast network of agents, including nonhuman participants, that raised questions of human accountability to nonhuman species. Eliasson invited audiences into an awareness of how technologically mediated environments impact and condition human visual capacities. Likewise, Lucas' performance invoked the context of digital and online media, offering sensorial appreciation for how the conditions of computerized society can affect embodied subjectivities. Fast's processes of mimetic exchange were framed and intensified through the production of politically loaded narratives about the American war in Iraq. These social dimensions were not illustrated

representationally by the artworks, but rather embodied neuroaesthetically within the gallery context, in that they emphasize the co-constitution of the social and the physiological in the art experience.

This dissertation has only scratched the surface of potential for how art experience may be formulated within an interdisciplinary neuroaesthetic paradigm. Myriad possible avenues of research remain unexplored. The case studies demonstrated, to some extent, how the embodied forms of knowledge produced by certain artworks could be taken as critical interventions into the aesthetic hegemony of techno-scientific culture. These efforts represent the beginnings of a neuroaesthetic analysis of technoscientific culture that have yet to be fully developed. As younger generations evolve collectively in the highly social spheres of mobile technology and internet-based media, the need for critical exploration of the embodied affects of online aesthetics becomes more and more urgent. There is a need to expand critical discussion problematizing the mind/body dualities that new media tends to reinforce. As the case studies demonstrated, the self-reflexive context of the art gallery offers an ideal space for activating neuroaesthetic awareness of the embodied impacts of technological environments. Neuroaesthetic knowledges produced in art contexts may provide a useful theoretical tool for problematizing the Cartesian notion that the products of digital media somehow operate in a non-physical, disembodied dimension when, in fact, they make deep, physiological impacts on the perceptual and cognitive capacities of those who engage with them.

While I have argued in this dissertation for research in art world contexts to be considered as a viable alternative to the neuroscience lab, I have by no means dismissed

the valuable contributions of neuroscientific experimental research. Within the field of neuroaesthetics, there is more collaborative work to be done in experiment design. In particular, as I suggested in Chapter Two, the aesthetic properties of the environment inside the MRI scanner itself remain largely unexplored. Furthermore, the character of the aesthetic stimuli could also be improved through collaborative research. For example, in their experiment on the importance of context to aesthetic judgment, Kirk, et al, showed their subjects a series of jpegs of canonical paintings from art history, all of them cropped to fit within the same square format. Any art history student knows that there is a fundamental difference between looking at digital documentation and engaging with artworks themselves, and cropping the images removes them one step even further away from being able to convey the aesthetic effects intended by the artists. Ideally, for a fully embodied aesthetic experience, one would be in the actual presence of the works.

As a curator who has spent a fair amount of time inside MRI scanners, I would like to commission artists to produce art works designed specifically to be experienced in that environment. Throughout this dissertation I have contrasted the context of the gallery with the context of the neuro-imaging lab in order to show how the the self-reflexivity of the gallery context promotes reflexive neuroaesthetic awareness. Certain artists like FASTWÜRMS, Eliasson, Lucas and Fast have produced artworks that welcome visitors as participants in the co-construction of embodied experience. Furthermore, artworks such as *Donky@Ninja@Witch, Room for One Colour, Refresh* and *Talk Show* also leveraged the reflexive character of art world contexts to extend an invitation to reflect on embodied experience as a social phenomenon. In contrast, a neuro-imaging lab positions

subjects as passive entities whose brains are activated by external stimuli. In the lab, non-conscious neural processes are recorded and measured, but the self-reflexive awareness of participants rarely comes under observation. What if, rather than showing neuro-imaging subjects documentation of artworks, subjects were instead invited to experience an actual art exhibition inside the scanner? A context such as this would provide first-hand embodied engagement with artworks rather than with jpegs of artworks. My future research will include commissioning multi-media artists working with sound and video to create several site-specific installations designed to be experienced by subjects inside the scanner. The project will contextualize the scanner as the frame for an art exhibition to explore the potential for the kinds of meta-level self-reflection that gallery viewing provides. Each piece could be designed to produce a different neuroaesthetic effect. If such a project were to function as a valid scientific experiment, clear goals would need to be negotiated, controls established, and variables quantified. Artists would work in close collaboration with scientists to design neuroaesthetic stimulations that could address pertinent neuroscientific questions. Whether or not I secure the funding and collaborators needed to realise this project, I intend to continue to conduct field research in both the gallery and the neuroscience lab to frame projects which engage critically in open-ended discussion across disciplines, and explore avenues for possible future collaboration between art and science.

I have faced, along with my art and art history colleagues, a contemporary, widespread challenge that the humanities justify their value to the post-secondary educational institutions that house them. In a political climate of fiscal cutbacks for

education, university faculties are being pitted in competition against one another. Yet, the material engagements of artists, curators and art historians can critically inform scientific conversations about embodied art experience and conversely, neuroaesthetic research can empower artists and art historians to consider the physiological dimensions of their practice from new perspectives.[1] A neuroaesthetics paradigm that acknowledges the value of placing art and art history students on equal footing with students in the sciences affords both groups with access to interdisciplinary discourses that they might not otherwise entertain.

While artists, curators, art historians and art theorists may rarely access the full critical complexity of neuroscientific debates, the problem is not that the negotiations that comprise neuroscientific collective knowledge are incomprehensible, but rather that they are rarely articulated in forums intended for interdisciplinary readership. As neuroaesthetic research moves forward, the onus is on the humanities to refrain from over-simplifying and sensationalizing neuroscientific findings. Of course, contemporary art discourse can be as rarefied as neuroscience. It is not that the discourse of contemporary art can only be comprehended by certain people, but that it is seldom articulated in broadly public forums. Each of the artworks discussed in the case studies opened up art discourse to entail neuroscience, suggesting neuroaesthetic curatorial frameworks to provide additional new entry points for gallery goers to undertake active exploration of embodied engagements with contemporary art.

Because artworks produce perceptual cognition, it is fitting that some neuroscientists have placed art at the centre of their inquiries into the workings of human

consciousness. While the field of neuroaesthetics is only about fifteen years old, art historians have been investigating art and consciousness for centuries and their contributions are vital to neuroaesthetic research. Neuroscientists can access neuro-imaging tools in the lab to study neural anatomy in fine detail. Yet art historians and theorists are praticed in the self-reflexive, meta-level awareness of perception in art contexts. But the lab and gallery are by no means mutually exclusive. One challenge for neuroaesthetic researchers is to initiate an open acknowledgement that different epistemological frameworks will produce different modes of knowing and that one form of knowledge need not be reduced to claims made by the other.

Perhaps the most important neuroaesthetic challenge that this dissertation has tried to address is the ongoing need to overcome Cartesian dualisms separating body and mind. Yes, neuroaesthetics address the sensorial capacities of artworks, but it can also reveal that humans interact within their environments as social bodies steeped in thought. •

End Notes to Conclusion

[1] In my seminars in neuroaesthetics for senior undergraduate classes in both studio and art history, students felt empowered by their capacities to critically engage with the findings of science from their standpoint of arts practitioners. In a written evaluation one art history student stated, "I was able to better understand how I experience an art work, and became more involved in my research," [Course Evaluations, ART_HIST 4AA3 (McMaster University, Term 2, 2012)] while a studio student reported, "The topic of neuroaesthetics is not only fascinating as an artist but opens many new areas of study and gives artists a completely new way of looking at their work." [Course Evaluations, SART 4870 01 (University of Guelph, Winter, 2011)]

Figures

Fig. 1) The author, just prior to a 2-hour volunteer session inside an MRI scanner at Sunnybrook Hospital, Toronto, ON (2008).

Fig. 2) Anatomical MRI scan of my brain, taken during class assignment for audited course: BIOL 5148: Introduction to functional magnetic resonance imaging, York University (2010).

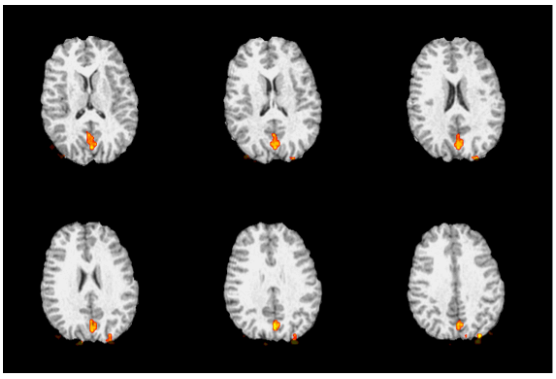


Fig. 3) Functional MRI (fMRI) images that I generated using the software package FSL from a pre-recorded data set provided for a class assignment in the course: BIOL 5148: Introduction to functional magnetic resonance imaging, York University (2010).

Fig 4) FASTWÜRMS, *Blood and Swash*, part of the multi-media intallation *Donky@Ninja@Witch*, 2007. Courtesy of Art Gallery of York University. Photo: Cheryl O'Brien

Fig 5) FASTWÜRMS, *House of Bangs*, part of the multi-media intallation *Donky@Ninja@Witch*, 2007. Courtesy of Art Gallery of York University. Photo: Cheryl O'Brien

Fig 6) FASTWÜRMS, part of the multi-media intallation *Donky@Ninja@Witch*, 2007. Courtesy of Art Gallery of York University. Photo: Cheryl O'Brien

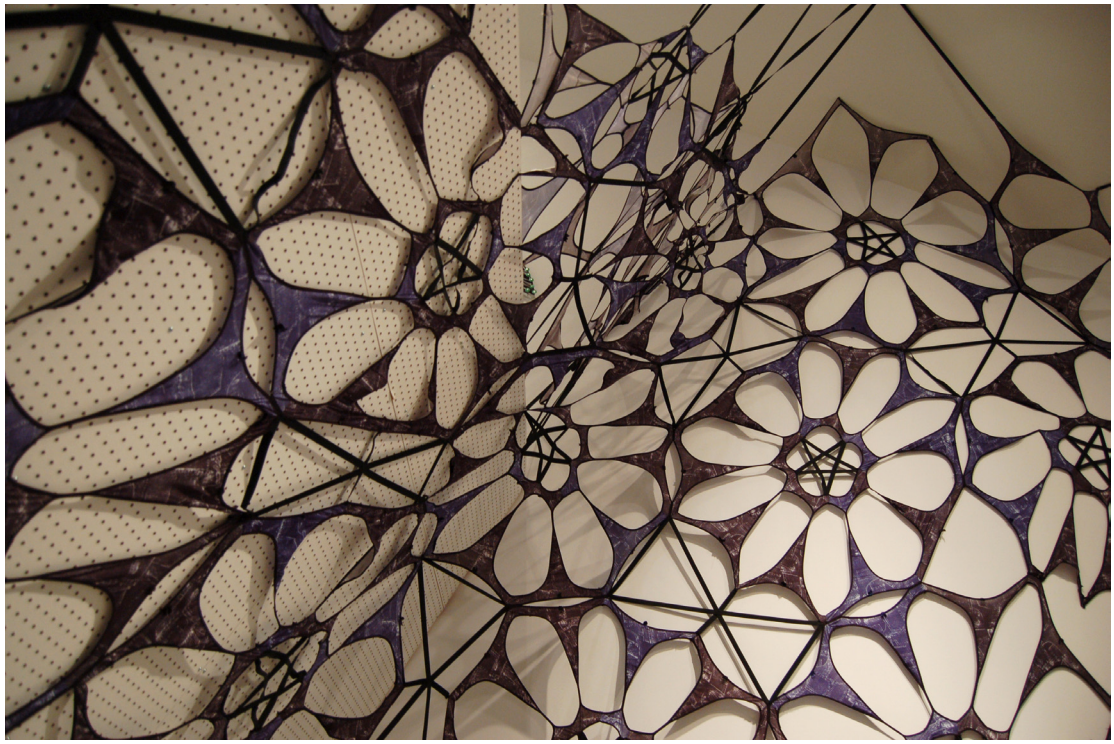


Fig 7) FASTWÜRMS, *Gusset Nation*, part of the multi-media intallation *Donky@Ninja@ Witch*, 2007. Details and installation view. Courtesy of Art Gallery of York University. Photos: Cheryl O'Brien

Fig 8) FASTWÜRMS, *Blood Clock*, part of the multi-media intallation *Donky@Ninja@Witch*, 2007. Courtesy of Art Gallery of York University. Photo: Cheryl O'Brien

Fig 9) FASTWÜRMS, *Pink Donky*, part of the multi-media intallation *Donky@Ninja@Witch*, 2007. Courtesy of Art Gallery of York University. Photo: Cheryl O'Brien

Fig 10) FASTWÜRMS, *Pink Donky*, part of the multi-media intallation *Donky@Ninja@Witch*, 2007. Courtesy of Art Gallery of York University. Photo: Cheryl O'Brien

Fig. 11) Olafur Eliasson, *Room For One Colour*, 1997. Courtesy of Studio Olafur Eliasson.

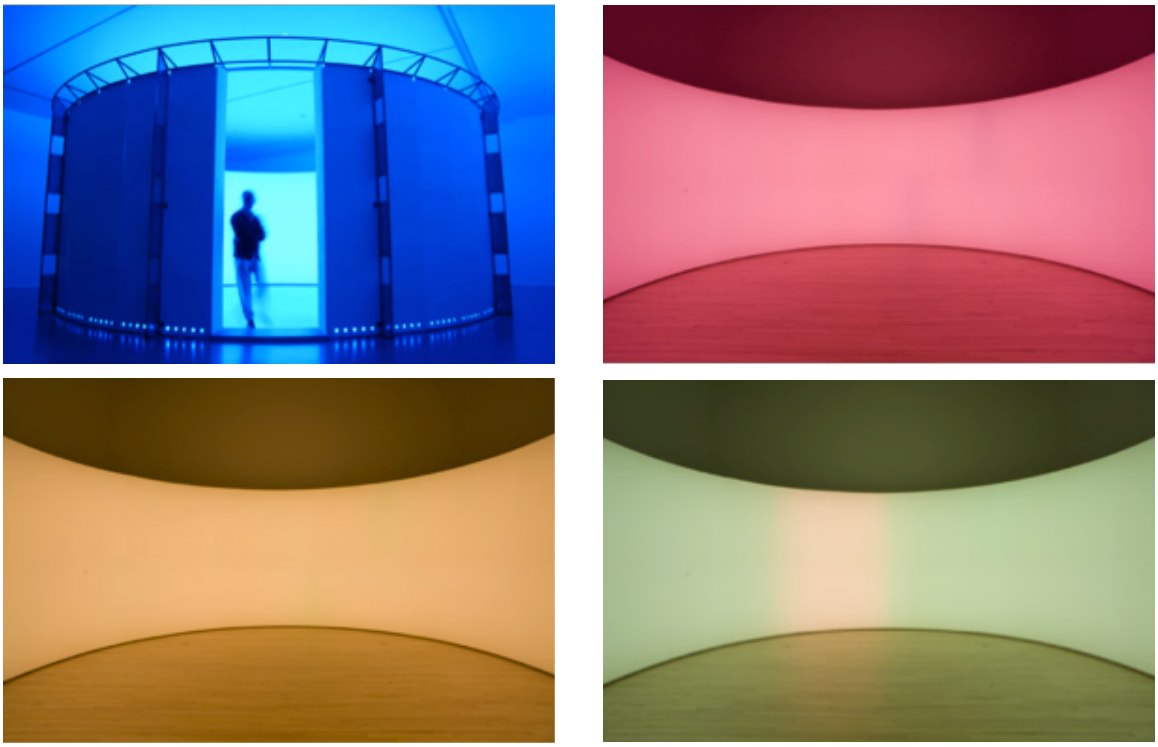
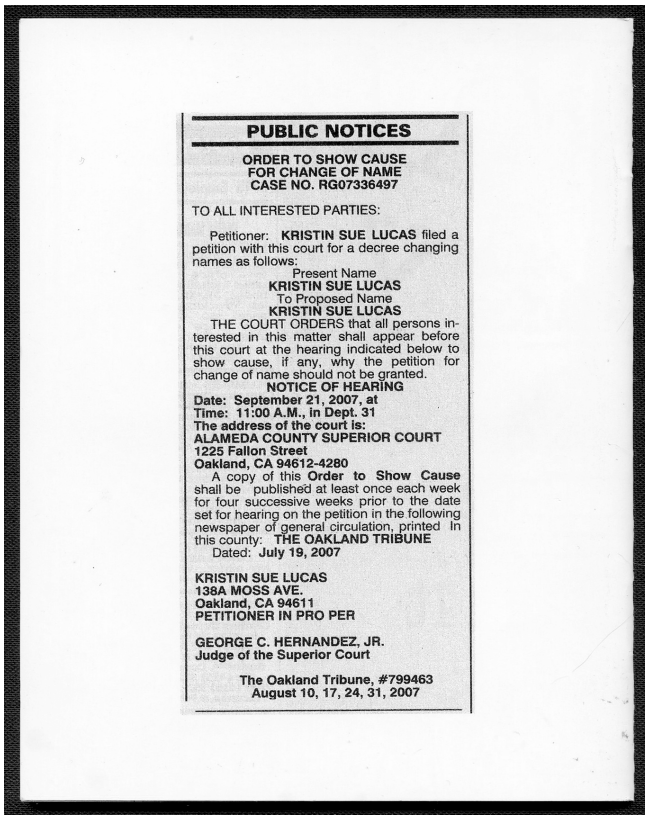


Fig. 12) Olafur Eliasson, 360° room for all colours, 2002. Courtesy of Studio Olafur Eliasson.

Fig. 13) Kristin Lucas, Courtroom Drawing for *Refresh* (2007). Courtesy of the artist.



PUBLIC NOTICES

ORDER TO SHOW CAUSE
FOR CHANGE OF NAME
CASE NO. RG07336497

TO ALL INTERESTED PARTIES:

Petitioner: **KRISTIN SUE LUCAS** filed a petition with this court for a decree changing names as follows:

Present Name
KRISTIN SUE LUCAS
To Proposed Name
KRISTIN SUE LUCAS

THE COURT ORDERS that all persons interested in this matter shall appear before this court at the hearing indicated below to show cause, if any, why the petition for change of name should not be granted.

NOTICE OF HEARING
Date: September 21, 2007, at
Time: 11:00 A.M., in Dept. 31
The address of the court is:
ALAMEDA COUNTY SUPERIOR COURT
1225 Fallon Street
Oakland, CA 94612-4280

A copy of this **Order to Show Cause** shall be published at least once each week for four successive weeks prior to the date set for hearing on the petition in the following newspaper of general circulation, printed In this county: **THE OAKLAND TRIBUNE**

Dated: **July 19, 2007**

KRISTIN SUE LUCAS
138A MOSS AVE.
Oakland, CA 94611
PETITIONER IN PRO PER

GEORGE C. HERNANDEZ, JR.
Judge of the Superior Court

The Oakland Tribune, #799463
August 10, 17, 24, 31, 2007

Fig. 14) Kristin Lucas, *Refresh* booklet, outside back cover, 2011. Courtesy of the artist.

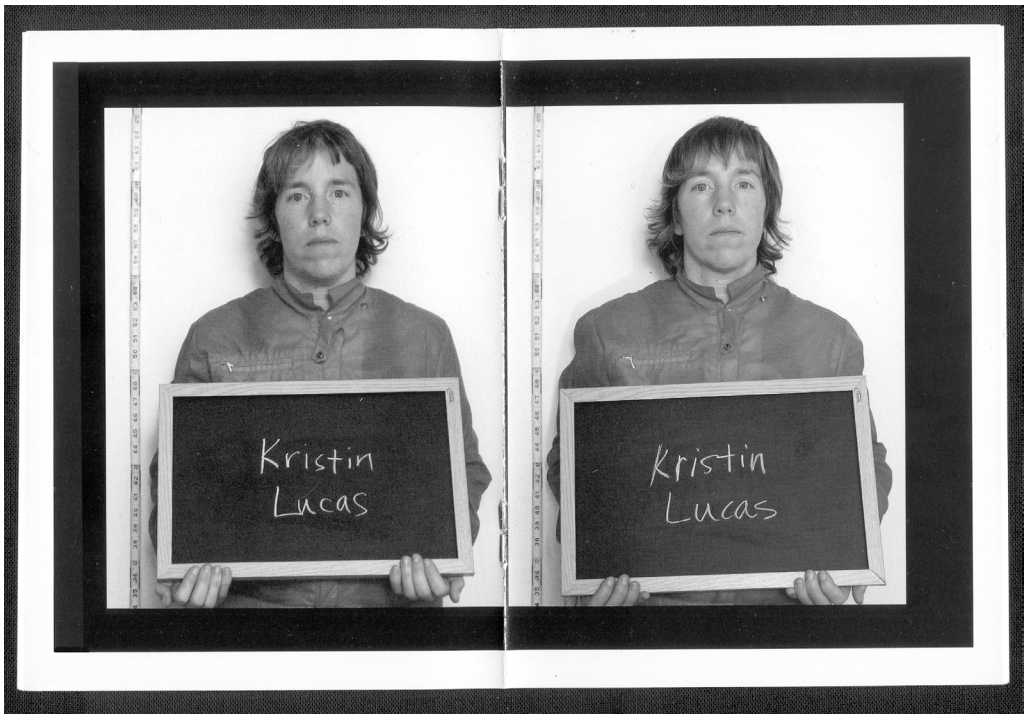


Fig. 14) Kristin Lucas, *Refresh* booklet, centre spread, 2011. Courtesy of the artist.

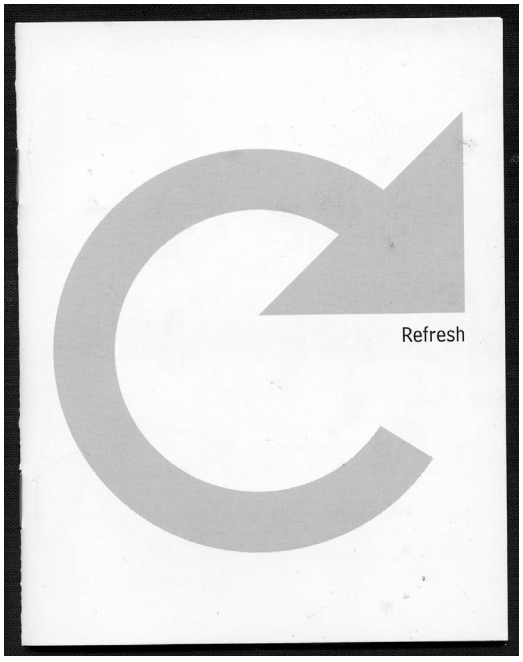


Fig. 15) Kristin Lucas, *Refresh* booklet,
front cover, 2011. Courtesy of the artist.

Fig. 16) Omer Fast, *Talk Show*, 2009. Video installation with three synchronized screens (detail). Courtesy of Postmasters Gallery, New York

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