MINDSCAPES AND LANDSCAPES: EXPLORING THE EDUCATIONAL INTERSECTIONS OF NEUROSCIENCE, ECOLOGY AND MEDITATION

by

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Abstract

The causes of the most pressing environmental problems today can be traced in part to the prevailing assumptions that inform the design and function of our social institutions, schools included. Collective efforts to address ecological decline must include the reform of formal schooling, both its goals and its practices. This thesis explores how meditative practice might be used to address anthropocentric and egocentric patterns of thought that some theorists understand to underlie the collective actions that result in ecological deterioration. Working within the framework of embodied cognition, I propose using neuroscience as a way to gain larger insights into human consciousness, and consider the import of neuroscientific data for educators concerned with a more ecological way of living and thinking. If we proceed from the methodological assumption of the embodied mind, then alterations to consciousness should also be manifested in the brain in the form of neurological activity and neuroplasticity. Questions addressed include: "Can meditation facilitate changes in our consciousness that might make us less anthropocentric and less ego-centric? Is there neuroscientific evidence supporting the efficacy of meditation in promoting a less anthropocentric way of thinking? How is the neuroscientific knowledge of meditation relevant to education? This thesis brings together ideas from deep ecology, the phenomenology of embodiment, neuroscience and meditation to inform the larger discussion on how schools can effectively address the ecological challenges of the 21st century.

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List of Abbreviations

NCC — Neurological correlates of consciousness

PET — Positron emissions tomography

PhR — Phenomenological reduction

DNS — Dynamic neural signature

EEG — Electronecephalography

PhC — Phenomenological clusters

EOG — Electrooculogram

SR — Steady Readiness

FR — Fragmented Readiness

SU— Spontaneous Unreadiness

SIU — Self-Induced Unreadiness

MRC — Mutual Reciprocal Constraints

PFC — Prefrontal Cortex

NGF — Nerve growth factors

BDNF — Brain-derived neurotrophic factor

mRNA — Messager Ribonucleic Acid

MBSR — Mindfulness based stress reduction

FA — Focused Attention

OM — Open Monitoring

OAA — Orientation Association Area

AUB — Absolute Unity Being

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Dedication

Dedicated to my patient and loving wife, Pam, who shows me everyday how to be a better person.

Chapter 1 — Introduction

The students spring toward the precipice with uncharacteristic exuberance. An innocent levity takes hold of our collective spirits, educing a primal joy as we hike under the ceiling of foliage, shuffling stones with our feet by the river, running our fingers in the silvery waters, leaning into the cool dark silence of the canyon, gazing expectantly at the crepuscular rays streaming past lines of swaying alder. In the embrace of the white light of the sun, we sit by the creek, listening to the rushing of waters, observing the dance of foam against boulders carved smooth by the ageless currents. Scarcely a cell phone in sight, we are absorbed and cradled in the lush susurrus of the land, children of a strange, but familiar mother.

A year after that beautiful trip to Lynn Valley, my students are complaining to me about the unrelenting tedium I now inflict upon them. Exhausted after wrestling with Shakespeare, they fix me with an accusing glare – the environmentalist teacher has betrayed his calling and replaced the earth with essays. I realize through their protest that a moment of earthly connection has become a salient episode in the lives of my students and that, despite my laborious efforts to motivate their learning, an unmediated experience in nature has decidedly shaped their young minds and left an indelible mark on their memories. Lessons about our relationships to the earth are lamentably absent in schools; my own classroom practice tends to promote a knowledge far removed from the intelligence that serves a pervasive land ethic. Schooled in a system that does not know the love of the land, we remain under the spell of a cruel ignorance, the consequence of which is not only psychological privation but ultimately, ecological ruin.

1.1 — Education and Ecology

For many decades, scientists have been gathering evidence of decline across many eco-systems on the planet. The picture of the earth's ecological vitality grows grimmer by the day as reports of pending ecological disaster increasingly take on a tone of grave severity. A recent warning predicts that we will reach an ecological tipping point within the current century beyond which the cumulative damage to the ecosystem becomes irreparable (The Raw Story, 2012). The ecological crisis, and the impending social/economic collapse it portends, constitutes the single greatest challenge to human survival – yet, in the face of such doom, human institutions have been appallingly inapt at dealing with the crisis, in part because capitalist systems of economic production across much of the globe have been thus far unable to reform their *modus operandi* to alleviate the pressures imposed upon the earth.

Schools stand among the many institutions that have failed to address the problem of ecological decline. If an observer should spend a day in a school, he would hardly gather that an ecological crisis is raging, and the biosphere under systematic attack. Schools today, by and large, prioritize economic objectives of the status quo over environmental protection and thus perpetuate the material impulses that aim to extend human domination over the earth. Both in its goals and designs, the educational establishment sees students as potential economic units of production and consumption (Orr, 2004). Through wholesale transmission of reductionist knowledge and the promotion of materialist ideals, achieved through the ideology of economic growth, schools have become part of a pervasive endeavor predicated upon competition. Prevailing educational values take for granted a sphere of human activity

that is entirely separate from, if not outright antithetical to, ecological principles; schooling not only primes the young for the work force, it also instills an economic rationality whose logic does not figure in the relevance of the natural world into its calculations. The result is a pervasive belief in a stable human existence, poised for endless economic growth unconstrained by any ecological boundaries or natural limits. Schooling has become, for the most part, a means to an end, a tedious and stressful formality along the path to success defined by pecuniary abundance and sybaritic indulgences. Under this system of tuition, a formal education attempts to maximize a person's employability, but does not guarantee a person's decency, wisdom, or commitment to ecological citizenship (Orr, 2004). Ironically, the most prodigious contributors to the economy, often the most educated among us, are also those who are foremost in pushing the world to ruin.

A technocratic education that fashions skilled workers for the consumer economy institutes a fragmented world in which knowledge is severed from the contexts of use. Advanced training in specialized spheres of knowledge and skill for the purposes of employment negates the need for a wider, interdisciplinary knowledge base. Under a system of economic specialization, an engineer can devise powerful contraptions capable of catching more fish, or drawing more oil from the earth; a graduate of business school can possess the acumen to reap winsome profits without regard to the social and environmental impact of his enterprise. While both may be exemplary figures in their respective fields, their contributions to the larger social and ecological landscape are more dubious. These examples illustrate how successful participation in the modern economy often requires scholastic specializations that

draw attention away from a thorough understanding of how the world weaves together. It comes as no surprise that, while the measures through which students are evaluated may help ensure at least a minimal degree of fitness for the modern economy, these measures do not promote – and in many cases prevent – any meaningful sense of ecological citizenship.

The contradiction found in the fact that educational institutions are helping to accelerate the destruction of the planet springs from the premise of the industrial/consumer economy, which places human desires above all others. This anthropocentric drive is antithetical to the organizing principle of ecology as iterated by Thomas Berry (2006), who holds the earth to be primary, and human beings secondary. Neither the design nor the curriculum of schools under the sway of economic imperatives will acknowledge the biological context of the earth. In fact, the ethos of domination over the natural world, perpetuated through the preoccupation with human betterment at all costs, define the tenor of most scholastic enterprises.

The foregoing strongly suggests that the shift toward a more sustainable mode of human civilization that restructures the human economy to operate under ecological limits must include, among other efforts, educational reform. At the very least, we must begin to examine the gap that education has wrought between mindscapes and landscapes, students and nature, the economy and the earth. One chief deficiency in the formation of pedagogy has been our tendency to privilege disembodied and abstract theory over direct experience, and a calculative rationality that employs a cost-benefit analysis to justify our destructive behaviour within the larger ecological world. Such a rationality is aligned with anthropocentric assumptions about the order of the world, a

view that entitles the human species to unbridled expansion and exploitation as we transform biological abundance into human capital; thus are mountains viewed as ores, forests as timber, and animals as commodities. Compelled by this narrow rationality, many nations around the world are further developing their economies by accelerating the extraction and consumption of natural resources, thus inversely enacting Thomas Berry's (2006) iteration of cosmic relationships, having cast the human race as the preeminent force that subdues and transforms the terrestrial biome for the betterment of the human species. In so far as schools function according to, and reproduce, the cultural, social and economic imperatives of the status quo, assumptions about education, and its anthropocentric underpinnings, must also be revised as we face challenging ecological realities.

1.2 — Deep Ecology, Neuroscience and the Movement towards Sustainability

The path toward a more sustainable mode of human civilization requires a shift in the beliefs that shape our values and concerns. This shift implies a different understanding of human relationship with the earth and all its inhabitants; collective human consciousness must embrace the totality of the earth as a living community. This shift in consciousness is described by Berry (2006) as "a transformation from an anthropocentric norm of reality and value to a biocentric or geocentric norm" (p.43). Anthropocentrism negates the central fact of ecology: that the human species survives and thrives on the largess of the living earth. In contrast, a more geocentric world-view recognizes the intrinsic value of the biotic community and the ecological order from which life arises. Arne Naess (2008), for example, has argued that "there is no way of

making the developer eager to save a forest as long as he or she retains the conception of it as a set of trees" (p.11), a view that contrasts that of the conservationist who sees and experiences the forest as a unified reality (Naess, 2008). Without any claim to intrinsic value, the earth is unlikely to enjoy any legal status that is recognized under prevailing systems of governance. Thus, the work involved in moving toward a more sustainable world extends beyond technological innovation and the preservation of wilderness. A thorough and effective systemic reform must include a re-imagination of the ongoing processes of human development and the cultivation of a set of values that will compel more sensible action in an inter-connected ecological world. Foundational assumptions about the globalizing human project – that human beings preside over biological systems – must be replaced with a more eco-centric model that acknowledges and respects the intrinsic value to the ecological community.

Accordingly, I intend to investigate whether we can cultivate a perception of, or even *realize* from within, the intrinsic worth of the earth by *seeing* and *experiencing* the natural world as a living, dynamic and integrated community. More specifically, I raise the question of whether there might be specific ways of seeing and experiencing the natural world that will facilitate a change in our relationship with the planet, ways of living which run counter to anthropocentric patterns of thought.

1.3 — Physicality and a Material Science

To begin, I point to a fundamental feature of human experience that ties us inextricably to the tapestry of biological florescence: physicality. The earth is a rich and complex network of material exchanges whose ordered operations compose systems of

ecological function. The material basis of life is shared among every member of the ecosystem, from the smallest bacterium, to the grandest of cedar trees – indeed, our own physical existence commits us to the larger ecological world full of physical beings. Thus, the experience of physicality is the most basic connection we have to the earth. To go further, the *experience* of physicality is possible because, as human beings, our subjective states are intrinsically woven into objective processes in the body. Physical operations feature subjective valences that compose a *lived experience* that cannot be fully explicated through third-person empirical observation alone. Objectivity and subjectivity are, as it were, two parts of one inseparable phenomenon. Therefore, consciousness presupposes a physical matrix, and a full accounting of material events in the body cannot be completed without consideration of the interplay between subjective experience and physiological occurrences (Abram, 1988; Merleau-Ponty, 1964, 2007). The embodiment of consciousness indicates that all shifts in subjectivity must also be accompanied by physiological alterations; as the mind changes, so does the body (via the brain, our organ of thought) and vice versa. Shifts in consciousness, including shifts away from anthropocentric norms, should therefore have an accompanying physical manifestation.

Given the concatenation of consciousness and physicality, I will be looking to neuroscience to provide helpful insights into the physical manifestations of consciousness. By examining the more recent developments in neuroscientific research, I will consider the ways in which changes in the brain are both the effects and the causes of changes in consciousness, and conversely, the ways that the mind can be used to change the structure of the brain. Scientists have begun to uncover the myriad ways

in which brains change over time. Neuroplasticity denotes the physiological alterations in the nervous system, and thus our consciousness, as a result of changes in behaviour, environment, neural processes, or the body (Pascual-Leone et al., 2011). In cases of injury, scientists continue to study the ways in which neurological structures compensate for the loss of function due to damage in certain regions of the brain. Besides injury, the brain also changes as a result of continuous engagement in certain activities – the alteration of neurological circuitry that accompanies the acquisition of skills is the basis of all learning. It is this type of *use-dependent* neuroplasticity that is so germane to educational theory because neuroscience provides useful insights into the physiological aspects of learning that may otherwise be overlooked by educators.

Nevertheless, short of a theory that resolves the mind/brain duality (discussed later in chapter 3) and identifies the causal forces at work in the relationship between objective events and subjective experience, the import of neuroscientific data may not be immediately obvious to educators, who may dismiss neurological events as the physiological correlates of cognition, the mapping of which does not have any direct implication on educational practice. Granted, much depends on the nature of the various neuroscientific studies at hand; efforts to map out the cerebral activities *associated* with certain cognitive events (such as the functional imaging of cerebral metabolism during a certain state of mental concentration) can be understood as *descriptive* accounts of neurological function. On the other hand, neuroscientific studies that piece together *explanatory* accounts of brain function (such as the identification of the bio-chemical processes that underlie neurogenesis and the observation of alteration in cerebral structure as a result of prolonged and repeated engagement in a specific

activity) can be used to predict neurological and cognitive development. In so far as descriptive accounts show us *what the brain is doing,* explanatory accounts show us *how the brain is working.* In offering descriptive and explanatory insights into brain function, as well as providing physiological evidence of learning through neuroplasticity, neuroscience has direct relevance to educators studying how best to promote cerebral/cognitive development over time.

If learning has physiological correlates in the brain that can be objectively observed, then what kind of learning is necessary if we want to move toward a more eco-centric view of the world? Can we learn to relinquish our anthropocentric habits and embrace a more holistic and ecologically inclusive vision of human life? If such a way of thinking and experiencing can indeed be learned, how might such a revision in our consciousness be reflected in the brain? Furthermore, while an embodied approach to the study of consciousness might provide insights into how certain practices promote specific changes in the structure of the brain, how these practices may be adapted in an educational context is an entirely different question altogether. The contemplative practice of meditation, after all, is not merely a set of techniques that focus attention, but also a philosophy of mind that includes a set of views that requires the integration of intellectual, emotional and sensory faculties in the development of a healthy mind. If neuroscience can provide data supporting the efficacy of meditative practice in support of certain kinds of mental transformation, educators must nevertheless discern the ways in which meditative practice fit into existing models of education. My work attempts to lay the groundwork by unpacking neurological data and evaluating their relevance to models of contemporary education.

1.4 — Mindfulness

An established tradition of introspection and integral education can be found within Buddhism, whereby practitioners methodically examine their experience in large part by investigating the nature of awareness and the thoughts of self that arise within it. Meditative training, according to Buddhists, promotes compassion and wisdom by softening one's attachment to the sense of a distinct self, or the sense that I exist apart from the world around me. At its most basic level, meditation is an act of embodied consciousness requiring a specific application of attention and awareness, an act that invariably involve neurological mechanisms and events within the brain. Much research has been conducted on the effects of mindfulness meditation[1] in stress reduction, pain management (Kabat-Zinn, 1982), and the regulation of emotions (Davidson, 1995); the last decade has seen a growing interest in the application of mindfulness-based methods in clinical settings. Scientists have also taken an interest in mindfulness as a way of cultivating empathy. Yet, for all the attention given to mindfulness-based methods of clinical and educational practice, there remains a paucity of literature that integrates neuroscientific data with philosophical theories on

[1] Varieties of meditative practices abound in the Buddhist tradition, and different sects are likely to propone distinct techniques, each with its unique approach to training the mind. The use of the words *meditation* or *mindfulness* as generic terms would be therefore problematic. Although all meditative practices work with aspects of awareness, some techniques may aim to sharpen the acuity concentration while others may attempt to deepen equanimous, open awareness. Because meditation and mindfulness cannot be taken for granted as a monolithic activity – I use the categories devised by Antoine Lutz and Richard Davidson (2008) to typify the meditative practices discussed in my work, namely, *focused attention* (FA) and *Open Monitoring* (OM). A more complete discussion will be provided in chapter 4.

how meditative practice alters a subject's sense of self in relation to the larger ecological world.

Because meditative practice aims to illuminate habitual tendencies related to the experience of self, neurological research into its effects on the brain may provide clues into how self-centered thinking is affected by meditative training. Whereas Berry (2007) implicates anthropocentrism as the root cause of ecological devastation, Buddhism attributes much human suffering to rigid adherence to a *self*, or self-centered thinking. Admittedly, anthropocentrism and ego-centrism are not interchangeable terms – in my work, however, I will argue that the two forms of "centrism" can be placed next to each other on a continuum, and that the inadvertent effects of both patterns of thought wreak disaster on the ecological world. The thesis will explore ways in which neuroscience can provide biological accounts of anthropocentric/ego-centric patterns of thought.

1.5 — Research Questions

With mindfulness at the center of my topic, my thesis will draw from three foundational fields of knowledge: Neuroscience, Deep Ecology and Education. Synthesizing the research undertaken within these three fields, the project will attempt to address the following primary question:

- Under what conditions can mindfulness play a significant role in an eco-centric curriculum that will foster respect among participants for the earth community as the context of all human endeavours?

My work is further guided by questions more directly related to the distinct disciplinary fields I draw from.

Deep Ecology:

- How do deep ecologists define the ecological crisis?
- To what causes do they attribute such pervasive environmental problems?

Neuroscience:

- What are the physiological underpinnings of meditative experience?
- How does mindfulness practice affect the brain?
- What inferences can we make, based on existing neuro-scientific evidence, on the link between mindfulness and ecological awareness?

Education:

- What does an ecologically sound curriculum look like?
- What role, if any, should mindfulness practice play in such a curriculum?

1.6 — Methodology: Towards an Integral Theory of Consciousness

My work attempts to connect concepts from different disciplinary domains. The path from neuroscience to ecology is indeed an unusual one; however, I believe that our evolving understanding of human consciousness requires greater integration of insights from disparate fields and a willingness on our part to employ a diverse range of methodological and theoretical tools. By drawing on data and theories from different disciplines, I hope to bring a more complete and nuanced picture of human consciousness to the discussion of ecological sustainability.

In the wake of the strides made by neuroscience in the past two decades, a momentous shift in our concepts and models of consciousness now looms on the horizon. Yet, the advancement of the scientific knowledge of brain function enjoins the development of a larger theory of mind that moderates competing claims about the nature of consciousness. An entirely material/physiological account of the mind neglects the sociological realms in which collective and individual consciousness takes shape; on the other hand, exclusively psychological concepts of consciousness, gathered through introspection, cannot be verified through direct observation, because psychological accounts of conscious experience are inherently ideational and speculative (Campbell, 2012). Since none of these methodologies are entirely sufficient in and of themselves, an inter-theoretical model of consciousness that joins, if not abolishes, the object/subject, physical/spiritual dualities is needed in order for a comprehensive understanding of mind can emerge.

Ken Wilber (1997) has argued that epistemological lines of demarcation that have relegated researchers to disciplinary silos can no longer adequately provide satisfactory insights into the nature of consciousness. Wilber believes that because "the universe hangs together. . . an equally legitimate endeavor is to investigate, both theoretically and methodologically, the ways that these various elements are *intrinsically* hooked together as aspects of an unbroken Kosmos" (p. 92). Using a four quadrant model as a descriptive schema, Wilber (1997) positions the physical sphere (brain) in relation to the intentional, social and cultural spheres that share the construction of human consciousness, underscoring the non-physical realms that exert an influence on the formation of consciousness, both collective and individual.

If we heed Wilber's (1997) appeal to work towards an integral theory of consciousness, then considerations of Berry's (2007) vision of an eco-centric consciousness cannot be confined within the bounds of socio-cultural discourse, but must be explored and considered in conjunction with other spheres of knowledge, neuroscience among them. On the educational front, we might surmise that, if all cognition has a physical basis, then something must be happening in our brains when we adopt a more eco-centric order of thinking. Similarly, there may be ways to identify the brain activity that underlie the behavioral tendencies that wreak ecological havoc. If so, what are the implications for educators? In direct response to Wilber's (1997) call, my work is an attempt to bring disparate fields of knowledge into one arena of scrutiny, to situate them within close proximity so as to channel their respective resonances into an ordered harmony.

1.7 — Overview

Chapter 2: Deep Ecology

My work begins with a discussion of the three theoretical frameworks: the philosophy of deep ecology, the neuroscience of meditation, and the philosophy of integral education. As a starting point, I look to the concept of anthropocentrism, as defined by Berry (2007), Leopold (1989) and Naess (2008). In this chapter, I elaborate upon the concept of anthropocentrism as a fundamentally distorted understanding of our place within the ecological provisions offered by the earth. For Berry (2007), anthropocentrism inflicts a wound upon the human psyche, and eviscerates the more ecologically sensitive ethical systems held by ancient and indigenous societies.

Anthropocentric assumptions of human preeminence within the natural order, magnified through advancements in technological prowess, have radically transformed human consciousness so as to make ecological destruction an inevitable consequence of human development, if not an inalienable feature of modern human existence. The eco-centric vision of the human project advocated by Berry and Leopold essentially removes human beings as the conquerors of the earth and reinserts us back into the ecological community as members who contribute to a precarious biological balance.

Bringing the concept into sharper focus, Anthropocentricism is at once a system of values and a psychological orientation. For Berry (2007), anthropocentrism is a psycho-spiritual condition, a state of mental privation whereby human beings are unable to recognize their attachment to and dependency on the earth. Thus, I use anthropocentrism to typify a problematic kind of consciousness, a pattern of thinking and experiencing that pervasively imbue much of our economic, social and political projects. I also consider the critiques leveled against deep ecology by Val Plumwood, who is perturbed by the liberties that deep ecologists have taken in extending mysticism into ecological discourse. For Plumwood (1991), the ambiguity of the *self*, the confusion between dualism and atomism, the desire to unify with nature — and by extension the need to obliterate all distinction — renders deep ecology defunct. I will respond to Plumwood's arguments by providing an alternative reading of the deep ecological theories in question.

Chapter 3: Neurophenomenology

By drawing neuroscience into discussions on education and sustainability, I bring an empirical science to an otherwise socio-cultural discourse. A materialist account of the brain, with its complex network of neural assemblages, raises questions about the nature of the mind and the elemental constituents of human experience. By studying and analyzing physiological processes in the brain, neuroscience advances a version of human experience through a biological perspective. However, many critics outside of neuroscientific circles may worry about a reductionist model of the mind and a mechanistic treatment of human consciousness. Reductionism insinuates a biomechanical mind that simplifies the human person to machines, as it were, the instauration of which can only be accomplished through bio-chemical interventions. Furthermore, reductionist models of mind/brain tend to privilege the natural sciences over the humanities and social sciences in ways that overlook the subtle complexities of human nature and the myriad of influences wrought by our surroundings.

In this chapter, I will argue that neuroscience need not proceed strictly from materialist assumptions. The mind/brain duality, and the tendency for some scientists to attribute mental valences to material events, can be circumscribed and, in some cases circumvented, through the model of embodied cognition advanced by Francisco Varela (Thompson & Varela, 2001; Thompson, 2004; Varela, 1991, 1996). In this chapter, I present the case for a physicality of consciousness, where subjectivity (the experience of mind) is inseparably intertwined with objective, neurological processes – an objective science of the brain, therefore, does not supersede subjective investigations of experience; neither should physiological events be ascribed as the

causal origins of mental phenomena. In laying the foundations for a non-reductionist neuroscience, I will then proceed to discuss some salient research into the neurological effects of meditation.

Chapter 4: Neuroscience and Meditation

In this chapter, I explore the possibility of identifying the neurological events associated with specific profiles of consciousness. I will also mention a few notable neuroscientific studies on meditation and explore their implications on discussions related to sustainability. I explore the ways in which the anthropocentric systems of thought undergirding projects of human development may manifest themselves on an individual level through egocentrism, a pattern of thought through which we fortify a dissociated sense of self while fomenting the perception of an ecological *other*. Exploring neuroscientific notions of a self based on physical processes while surveying some salient studies on mindfulness-related neuroplasticity, I consider the effects of mindfulness practice in shaping the eco-centric vision put forward by Thomas Berry. Reaching beyond the tentative connection between neuroscience and ecology, I believe that the wealth of evidence supporting *use-dependent* neuroplasticity, provides clues into how the mind changes over time. If neuroscience can identify the neural assemblages that compose one aspect of *a sense of self* and determine how those circuits change through time as a result of certain mental activities, we may then speculate on how to intentionally alter that experience of self by designing mental practices that facilitate specific structural changes in the brain. In other words, in response to Berry's (2006, 2007) plea for a different way of being in the world for the

sake of ecological sustainability, we may enlist the help of neuroscience in learning how best to reshape our modes of self-perception and experience. Because neuroplasticity is the physiological evidence of learning, the neuroscientific understanding of how the brain can be deliberately changed over time may offer insights for educators who are designing and revising pedagogical tools to help students better meet educational goals. In this light, the incorporation of mindfulness practice in developing students' executive function (Oberle et al., 2012) and social-emotional learning (MindUP Program, 2013) represents the beginnings of an educational appropriation of mindfulness practice.

Chapter 5: Conclusion

Having traversed through the diverse philosophical landscapes, from deep ecology to neuroscience, I conclude my work by reflecting on the current state of the educational establishment, resounding and responding to Orr's (2004) incisive critiques of the educational system. If the vitality of the earth community matters indeed, then education, compulsory and higher, ought to reflect an ecological sensibility in all aspects of its design and operation. Currently, educational institutions have not fully roused themselves out of their inertia to fully confront the realities of environmental damage – so steeped are they in the vaunted creed of the industrial/consumer economy. Under a system where merit is tied to an intelligence abstracted from ecological experience, any programmatic attempt to instill ecological values without complete revision of the express ideals of education must inevitably fall short. Thus, despite mounting neuroscientific evidence supporting the efficacy of meditative practice in cultivating certain aspects of consciousness, we cannot succeed

in shaping a more eco-centric future if mindfulness practice, and other well-intentioned programs of environmental education, remain an addendum to the primary agenda of priming students for an economic life. Therefore, the exploration offered here merely serves to highlight the much larger and immeasurably daunting task of reimagining schools rather than presumes to offer comprehensive pedagogical and political solutions to the systemic problems of modern education.

Chapter 2 — Deep Ecology

Sitting on the patio, enfolded by the cool shadow of the house, watching the thick covers of the spruces and firs, I sense in a moment of tactile acuity the day's subtle shift from the heat of the afternoon to the gentle ease of the evening. The wind that rounds the streets, having ruffled through the banks of pine and maple, lifts the fragrant, dank aroma of the soil, and soothes the baking bricks that pave the yard. The air is a shade cooler than just a moment ago, and the vault of greenery previously awash in the blazing sunlight now sink deeper into cavernous shadows that sway with the zephyr. The shift in mood, evinced by the play of light and foliage around me, ushers me into another state, a space of deeper reflection and nestled contentment as the land itself resolves to retire from the day's labour. Yet, had I not been paying attention, had I not tuned in to the sensual chorus around me, I may have missed the encroachment of night and the minute alterations in the earth's many moods. The bristle of the breeze draws me into a natural presence; suddenly, the path of time is given to the measure of a sensate body, and one falls into synchrony with the moving earth. The mind, attuned to the pulse of the landscape, riveted by the immediacy of the present, finds a spacious dimension of endless resonance – awareness itself sways amidst the branches, loping through the rents and crevasses of the forest cover, staggering and drifting with the lilt of the birds, bathing joyously in the lavish warmth of the resplendent sun.

Our physical dependency on the planet is hard to deny; however, there seems to be an ever-growing gap between our consciousness and the physical earth, with its natural limits. Might the ecological crisis be traced in part to the fact that, although we physically

inhabit the earth, our minds dwell elsewhere, operating in a realm far from the exigencies of a fragile planet?

2.1 — Crisis

Among the many explanations of the roots of the ecological crisis, one philosophical movement attributes systematic environmental damage to a festering wound in the collective human psyche. Deep ecology draws attention to the erroneous human assumptions about the cosmos that underlie the many acts of wanton destruction conducted in the name of human progress. Because they implicate anthropocentrism as the root cause of ecological destruction, deep ecologists propose a radical change to the assumptions that compose the human consciousness as a necessary catalyst for wider social, political, cultural, and economic reforms.

Fundamental to deep ecology's view is the delineation of a cosmic composition, wherein the ultimate and defining domain of existence, the universe proper, is endowed with its own intrinsic value. Thomas Berry(2006) describes the universe as the only self-referential entity, "the only text without context" (Berry, 2006, p. 23) and "the single multiform sequential celebratory event." (p. 23). It is within the universe and its ensuing abundance that the earth finds its place, unfurling in its own evolutionary trajectory, furnishing the biosphere with the conditions that nurture myriads of organisms, homo sapiens but one among many. The earth, composed of its multiple layers of biological inter-dependence and intersecting webs of ecological systems, is therefore the contextual precondition of human life, the gratuitous fecundity from which humans derive sustenance and prosperity. Berry, like the many indigenous

traditions around the world who abide by an earth-based cosmology, assigns a primary status to the earth and a derivative status to humans in recognition of the constitutive forces that supply and sustain life (Berry, 2000, 2006).

Further to this earthly cosmology, and particular to the theories issuing from deep ecology, Berry (2006) imbricates a psycho-spiritual dimension to the earth, characterizing the living planet as "a communion of subjects, not a collection of objects" (p. 17). For Berry (2006), the elemental composition of the earth and the manifold exchanges that feed the flourishing biosphere emanate a sacred presence, making the earth more than a sequence of physical processes, but a "biospiritual planet," (p. 31) a foundational totality whose workings cannot be completely accounted for by a materialistic science alone. It is the spiritual and sacred dimension of the earth that weaves together *the communion of subjects:*

> Our intimacy with the universe demands an alternative presence to the smallest particles, as well as to the vast range of stars splashed across the skies in every direction. More immediately present to our consciousness here on Earth are the landscape; the sky above, the Earth below; the grasses, the flowers, the forests, and the fauna that present themselves to our opening senses. Each in its own distinctive perfection fills our mind, our imagination, our emotional attraction (Berry, 2006, p. 34).

According to Berry (2006), human beings are part of this communion because human consciousness finds fulfillment in intimate participation with the natural world, in a mutual exchange of "wonder, admiration and emotional sympathy" through "a single psychic embrace" (p. 35). The quality of this psychological/physical reciprocity is

deemed *sacred* by Berry, a term evocative of a quality of being that surpasses what is superficially apparent and manifestly material.

However, what Berry calls sacred, in this sense, need not stir inklings of divinity nor evoke suspicions of religiosity. *Spirituality* and *sacredness,* terms fraught with difficulty for the modern mind, are brought into alignment with secular sensibilities in the work of David Abram (2010), who sees "sacredness" as a form of intuitive accord, a "felt relation to the mysterious that was active long before any formal or priestly religions. The instinctive rapport with an enigmatic cosmos is at once both nourishing and dangerous lies at the ancient heart of all that we have come to call "the sacred" (p. 277). For both Berry and Abram, the living planet, constituted by multiple layers of biological communities, is imbued with its own *life*, its own presence that occurs to us, not as a set of inert objects, but rather as an inspired chorus of biological flourishing. Adhering to the use of the Latin term *anima*, a word denoting a living, ensouled being, Berry (2006) asserts that the earth is *animate* and therefore deserving of inclusion within our circle of moral and ethical deliberations. Viewed through Abram (2010), what Berry calls "sacred" is no more and no less than the experience of relationship, the sense of connection to the *animated* natural world at large. According to Abram (2010), this rapport with the living earth is woven into the very nature of our being by virtue of our embodied existence; our own physicality situates us in a material landscape, whose stirrings and movements ring deeply within our own embodied consciousness.

That landscape finds a dimension of resonance within our consciousness, that our minds sense and respond to the felt presence of the earthly world, underlies a faculty whereby we enter into a *communion of subjects*, both physically and mentally.

This "inner presence" (Berry, 2006, p. 40), or the capacity for the conscious grasp of that which is perceived, allows the perceived to dwell within the perceiver.[2] A tree, say, can be apprehended in such a way that the tree is not only outside of me, but also in someway *inside* me as I hold the tree in my conscious embrace. This *indwelling*, according to Berry (2006), effects a psychological interchange, a mental attunement whereby the tree exerts a presence greater than the sum of its own material composition. When waves of wind comb through the forest, pushing against the branches, carrying the vibrations swirling from the rustling leaves, they enter my physical senses and precipitate a shift in my own consciousness in conjunction with the swelling of the cover above me. What I intuit, in a moment of sensual perception and recognition, is the *spiritedness* of the forest, a quality of its existence that manifests the precarious beauty of this earthly existence. For Berry, it would be a grave tragedy and an abject privation if the forest simply appears inert and utterly devoid of ontological significance. An objective accounting of the forest's manifold movements, ascribed to bio-physical mechanics in perpetual motion, cannot adequately expunge the immediate, sensual experience of the forest as its own entity with its own moods and dispositions. The effects of this visceral encounter with the living earth is most salient in Abram (2010), who declares that:

> . . . one cannot enter into a felt rapport with another entity if one assumes that that other is entirely is entirely inanimate. *It is difficult, if not impossible, to empathize with an inert object.* One cannot feel or suss out the intention of

[2] Berry's assertion here, I gather, serves as an explication of the ties that commit us to the earth community rather than as a phenomenological statement on the nature of perception. A more thorough discussion of the phenomenology of perception is presented in chapter 3.

> another creature if one denies that that creature *has* intentions; one cannot anticipate the shifting mood of a winter sky if one denies that the sky has moods, if one begrudges things their own inherent spontaneity and openness. (p. 44)

The implications of this conscious experience of the landscape as a living entity can be understood in two ways: 1) human consciousness emanates from, and is continuously shaped by, the life of the land and 2) a healthy consciousness, in proper sensual attunement with its physical situation, experiences the natural world as a living phenomenon. The first point underscores the interconnection between the human mind and the earth itself — human consciousness proceeds from the physical landscape as an intelligent awareness in constant interaction with the surrounding terrain. The second describes the quality of that awareness — the embodied mind experiences the embodied earth as a living and active phenomenon rather than an insentient, inanimate entity.

Thus, in the philosophy of Thomas Berry and David Abram, we encounter first a universal cosmology in which the earth occupies a primary status; second, a conception of the embodied human mind as a part of, and not distinct from, the earth itself; third, a respect for the living quality of the earth conferred by the embodied consciousness. The combination of these tenets inscribes an ecological worldview in which the human being lives as a denizen, rather than the ruler, of the biological community. The outline of these salient points from Berry and Abram sharply contrast descriptions of anthropocentrism, a pattern of human organization antithetical to the cosmology proposed by Thomas Berry.

2.2 — Anthropocentrism

Just as the cosmic order begins with the universe as the ultimate context in which the earth's planetary forces unfold, Berry's observation and characterization of the earth's primary status and human beings' derivative status compose the definitive refrain for deep ecology. Anthropocentrism reverses this cosmic order by installing human beings as the primary norm of reference and the preeminent judge of value for every aspect of a subservient ecological base. In effect, anthropocentric assumptions about the ecological order see the natural world as passive and inanimate. Devall and Sessions (2000) define anthropocentrism by the following propositions:

1. People are fundamentally different from all other creatures on Earth, over which human beings have dominion
2. People are masters of their own destiny; they can choose their goals and learn to do whatever is necessary to achieve them.
3. The world is vast, and thus provides unlimited opportunities for humans.
4. The history of humanity is one of progress; for every problem there is a solution, and thus progress need never cease.

As an elaboration on Devall and Sessions' (2000) definition, I add Berry's (2006) argument regarding the moral effect of anthropocentric thinking – that is, in holding human beings as the primary locus of existence, we apply moral and ethical considerations only within the domains of human interaction, but act amorally in relation to the larger ecological world:

> As regards our own specifically Western responsibilities, we must note that, although we have developed a moral teaching concerned with suicide,

> homicide, and genocide, we have developed no effective teachings concerned with biocide, the killing of the life systems of the Earth, or geocide, the killing of the Earth itself. (Berry, 2006, p.52)

In essence, anthropocentrism rests on the bifurcation between the human world and the natural world; the human species is separated from its natural context and adheres to a code of behaviour entirely contrary to the rules of mutual dependence that underlie all ecological operations. Once humans are taken as the only active subjects, the ontological norm of reference, the departure point for all judgements and valuations, then the biosphere and the organisms that spring from the Earth's become objects amenable to manipulation and exploitation, resources that serve the march of human progress.

Aldo Leopold (1986), one of the first non-native North Americans to have stated unequivocally the antithetical ethic to the anthropocentric position, argues for a *biocentric equality* based on an ecologically sensitive moral calculus: "a thing is right when it tends to preserve the integrity, stability, and beauty of the biotic community. It is wrong when it tends otherwise" (Leopold, 1986). What Leopold (1986) advocates, much in line with Berry (2000, 2006) and Abram (2010), is an egalitarian vision of the human being as a citizen of the ecological world that opposes the inherent tyranny of anthropocentrism. This "land ethic" requires what Leopold calls an "ecological conscience," a guiding mentality that respects the intrinsic value of the biological community and the Earth as a whole.

The ecological conscience of Leopold may be seen as a parallel to the apprehension of the sacredness of life as discussed by Berry (2006), and the experience

of embodiment explored in Abram's (2010) disquisition. These philosophies attempt to redress the harms of anthropocentric thinking by re-subjectifying the natural world and reinstating the intrinsic value of Earth. According to these three theorists, anthropocentrism cannot tenably insist on a separation between the human and the natural; the inextricable physical and psychological connection between the human species and the Earth demands a revolution in our collective consciousness whereby the human world is reunified with its earthly origins. The Norwegian eco-philosopher Arne Naess characterizes the unification with the natural world as a form of identification:

> There is a process of ever-widening identification and ever-narrowing alienation which widens the self. The self is as comprehensive as the totality of our identifications. . . Identification is a spontaneous, non-rational, but not irrational, process through which the interests of another being are reacted to as our own interest or interests. (as cited in Loy, 2003, p. 190)

Naess introduces into the debate the explicit mention of the *self* as the aggregation of identifications. Identification here implies not only a set of sympathies for the natural alterity, it also affirms the constitutional forces that unites all living beings as the progeny of the living earth, issuing from the primordial nourishment of the planet; observed differences among species do not obscure the prevailing principles of inter-dependence. The proper response to the bifurcation between the human and the natural world, according to Naess, takes the form of an expansion of self-identification – the earth is to be experienced as a part of oneself, and oneself as an inalienable part of the earth. Implicit in the expansion of identification is the dissolution of the subject-

object tension that plagues anthropocentric modes of thought. John Seed narrates the unification in these terms:

> The human is no longer an outsider, apart. Your humanness is then recognized as being merely the most recent stage of your existence. . . you start to get in touch with yourself as mammal, as vertebrate, as a species only recently emerged from the rain forest. As the fog of amnesia disperses, there is a transformation in your relationship to other species, and in your commitment to them. . . "I am protecting the rain forest" develops to "I am part of the rain forest protecting myself. I am that part of the rainforest recently emerged into thinking." (as cited in Loy, 2003, p. 193).

We witness in Naess' and Seed's propositions the implication of a parochial and alienated *self* without a sufficient set of identifications to adequately participate responsibly in the life of the biotic community. By extension, an ecological consciousness enjoins the expansion of identification so that the self becomes unitarily existent as the Earth itself.

2.3 — Earth and the Consciousness of Self

The inclusion of the *self* in debates about the ecological crisis paves the way for a more specific analysis of the ecological crisis on the level of the individual. David Loy (2003) claims that "the ecological problem seems to be the perennial personal problem writ large, a consequence of the alienation between myself and the world I find myself in" (p. 172). If anthropocentrism severs the connection between the human collective and the biotic community while ordering the cosmos according to human norms of

value, a similar ego-centrism rends the cords that tie an individual self to the external world while subjecting the earthly surroundings to the valuation of an alienated ego bent on serving its own comfort and convenience. This alienated subject discerns no consequence to exploitation and assumes no responsibility for the devastation of that which is *other* and *out there* (Loy, 2010, 2003). Egocentrism abides by the reification of a seemingly irreconcilable otherness posed by the external, natural world. If this sense of separation and distinction from the outer world lie at the heart of ecological destruction, then a reformation of the individual consciousness in the direction of reunification, or re-identification, with the earth seems imperative.

The expansion of identification and the corollary diminution of a self-centered ego is a requisite process if anything close to an ecological consciousness is to be cultivated among modern societies. David Loy (2003, 2010) draws attention to Buddhism, both as a system of thought and as a collection of contemplative methods, as a way to relinquish patterns of pathological self-adherence. In effect, Buddhist meditation aims to free the practitioner from the habits of self-centered perception, feeling, thought and action, through the cultivation of awareness, thereby opening the path for a wider, more embracing mental experience. In the words of the 13th century Zen teacher Dogen: –*to know the self is to forget the self; to forget the self is to be one with all things* (Dōgen, 2002). The unitary experience described here runs close to the philosophies of Berry, Abram and Naess, who have themselves, to varying degrees, drawn from eastern philosophies in their own ecological theories. Loy (2003) believes that we need to heal the broken bond between an alienated consciousness and the Earth, and find a way to dissolve the subject-object duality that ensnares the human

mind at odds with the natural world. There is a striking cohesion between deep ecology's concerns regarding a fragmented human consciousness that sees the earth as a distinct other and the Buddhist notion of a conditioned self, or ego, that exists apart from all others, human and ecological. The treatment for this affliction, according to both deep ecologists and Buddhists, lies in the reform of human consciousness in ways that help us to realize our inextricable involvement in the life of the planet. The care of the planet becomes imperative when ecological health is seen and experienced as a part of one's very own well-being; conversely, environmental ruin can no longer be dismissed as an unfortunate externality if one feels one's own well-being unraveled by ecological destruction.

2.4 — Critiques

Deep ecology builds on a thesis of a *integral self,* whose identifications extend to the entire ecological world, whose ultimate norm of reference lie in the vital balance of the earth rather than an individual ego driven by parochial concerns. An ecological consciousness, drawing from the theorists considered in this chapter, embraces the ecological community and the compositional fabric of interconnectedness; rather than seeing the natural world as distinct from the human sphere, an ecological consciousness unites the human and the natural while imagining the human species as one member among the community of beings in an eco-centric, rather than anthropocentric, order of existence.

The concept of the expanded self that widens the circle of identification has drawn criticism from Val Plumwood (1991), who faults deep ecology not only for its

equivocal use of the term "self" but also for its rationalist bias and metaphysical abstractions. Plumwood (1991) argues that by positing "nature" and "earth" as abstract entities, deep ecology employs a Kantian/rationalist method by construing the ecological crisis as a general and public concern, the only adequate response to which lies in universalized principles of moral action. The advocacy of the rational, universal and abstract (masculine) implicitly denigrates the private and the particular (feminine), and reinforces a duality that pits human reason against emotion, the body and the animal. Plumwood (1991) is decidedly against the generalization of moral concerns, as witnessed in environmental philosophies like Leopold's, where moral progress is seen as a movement away from "the merely particular - *my* self, *my* family, *my* tribe . . . the merely personal and, by implication, the merely selfish" (P. 6). Plumwood (1991) argues that a rights-based moral principle cannot properly compose a comprehensive and satisfactory environmental ethic, because predator-prey relationships that underlie ecological operations often challenge egalitarian and rationalist visions of rights and claims to moral status.

An even more incisive critique is leveled against deep ecology when Plumwood calls out the vague concept of "identification" and the shifting definitions of "self" at play within deep ecology: "there seems to be at least three different accounts of self involved – indistinguishability, expansion of self, and transcendence of self – and practitioners appear to feel free to move among them" (p.12). The failure to distinguish these conceptions of self, Plumwood believes, amounts to an imprecision that makes deep ecology an unworkable philosophical proposition. Furthermore, Plumwood asserts that, in its attempt to address the discontinuity between the human and the

natural, deep ecology erroneously obliterates all distinctions, effectively denying the ontological division between human beings and the natural world. Plumwood believes distinguishablilty to be the precondition of ethical behavior: one is only able to act respectfully and caringly towards someone else in so far as one recognizes that the other is distinct and independent – failing this recognition, one is liable to mistake one's needs for the other's. An effective environmental philosophy, as Plumwood would have it, builds not upon the unification of the self with the natural world through the dissolution of distinction, but rather through the preservation of the self-other dichotomy.

Turning to what Plumwood regards as the fallacy of the *expanded self* that is found in the work of Arne Naess, who believed that "the self is as comprehensive as the totality of our identifications" (Naess, as cited in Plumwood, 1991, p. 14), Plumwood points out that the conception of an expanded self with a wide circle of identification merely extends egoism and self-interest. Under the regime of an expanded self, ecological conservation is simply another form of self-preservation/defense. Egoism continues unabated under a more benevolent guise. Self-interest, now applied across the entire ecological sphere, remains unchallenged as the primary motivator of human action; the possibility of self-sacrifice is negated. The continuation of egoism in deep ecology, in other words, re-inscribes the offenses that wrought the ecological crisis in the first place. Plumwood (1991) maintains that deep ecology's failure to rectify the problems associated with egoism only highlights the need for a different, ecofeminist perspective that upholds views of a self-in-relationship and the independence of the other in an environmental ethic characterized by care and connectedness.

In fairness, Plumwood's criticism of deep ecology is lodged mainly against the work of Warwick Fox, whose exegesis represents merely one path across the landscape of deep ecology. A wider reading of theorists within deep ecology may assuage some of Plumwood's anxieties. For example, Plumwood's critique against rationalism, the abstraction of moral principles, and the generalized conception of nature at the expense of the particular finds the most complete response in the work of David Abram, who weaves his thesis from the concept of embodiment. For Abram, the corporeal constitution of our creaturely existence provides the most immediate and visceral starting point for an ecological consciousness. Our own physicality confers upon us an inalienable commitment to the physical earth; sensual and perceptual experience afforded by the body constitutes the first-order psychical connection to the land. The abstracted, disembodied rationalism maligned by Plumwood (1991) is altogether absent in Abram, whose attention to bodily experience makes possible the vision of an ecological consciousness proceeding strictly from the elaboration of the particular, the local, the specific. I surmise that an environmental ethic built upon the intelligence of the body would stand harmoniously alongside other feminist theories.

As for Plumwood's objection to deep ecology's tendency to favour the abstract over the particular, a thorough reading of Naess reveals a measure of reassurance. Far from advocating theories of nature as an abstract entity, Naess (2008) builds much of his philosophy on the intimate ties that bind people to their lands, believing that a relationship with the environment begins with a sense of belonging to a specific place that captivates our attention and imagination, which galvanizes our commitment to the land and our chosen way of life. This sense of belonging does not begin with abstracted

theories of nature: "people who are completely absorbed in the land have no need for high levels of abstraction and articulation, nor the training to make their *implicit* global attitudes a basis for action" (Naess, 2008, p.45). In other words, personal ties to a place promotes an underlying devotion to land that issues a corresponding set of sympathies for others whose places and ways of life are threatened. Therefore, in these cases, Plumwood's (1991) charges of neglecting the particular, and by extension the feminine, are overstated.

Plumwood's objection to the equivocal use of the term *self* by deep ecologists is more difficult to answer. I sympathize with Plumwood's disdain to a point, given the tone of mysticism that seems to pervade deep ecology. Indeed, indistinguishability, the expansion of self, and self-transcendence seem to be interchangeable within the discourse of deep ecology. However, we may find it useful to distinguish the *united self* as a philosophical proposition from iterations of *unitary experience* that contrasts more ego-centric patterns of thinking. Deep ecology builds on the basic observation that human beings are earthly creatures who live in the context of the earth's evolution, who are themselves emanations of the earth's creative powers. This is an ontological statement that unites humans with the earth as one cohesive phenomenon. The expression of unity and the language of "indistinguishability" is thus better read as a subjective encounter with one's involvement in the ecological world, an intuitive and personal actualization of deep ecology's tenets rather than as a categorical obliteration of all ontological distinctions. Plumwood's critique does not fully take into account the difference between deep ecology's views on humans as a part of nature and what humans feel when they realize they are a part of nature.

Perhaps a useful way to unpack the connection between deep ecology as a philosophical statement on the inclusion of human beings within nature and as an expression of subjective realization is through the concept of *identification* as proponed by Naess (2008). Naess submits the self as the aggregation of identifications. Yet, what is an *identification* in the first place? If I identify *with* an animal, do I become that animal and that animal becomes me, or do I merely infer its experiences and honour them as my own? The former cannot be tenable, given its obliteration of ontological distinctions. If the latter, then identification is merely, as Plumwood has written rather parsimoniously, "a pretentious and obscure way of saying that humans empathize with nature" (p. 15). Plumwood's critique is incisive here, for the *identification* spoken by Naess seems to indeed imply the extension of an empathetic, emotional concern to subjects beyond the self: to identify with, say a rainforest, is to recognize and associate oneself with the forest's existence in an act of ontological affirmation, to *feel* oneself as a part of the forest such that its demise *feels* like a threat to one's own existence. Thus, the larger self constituted by the wider circle of identification does indeed evoke what we commonly understand as empathy — yet I disagree with Plumwood that this larger *self* should be equated with empathy and nothing else. The most salient cases of ecological consciousness can be found in the history of environmental activism, where protesters risk their careers, the ire of the law, and in many cases, their own lives in stalwart opposition to environmental exploitation. Their audacious acts of self-sacrifice seem to evince a conviction beyond that which can be accounted for by empathy alone — something deeper is at play. How else might we account for activists who place themselves in the paths of whaling ships (as in the case of Paul Watson) or

live atop an ancient cedar tree to prevent its demise at the hands of loggers (as in the case of Julia Butterfly Hill) except that they count the well-being of whales and trees as more important than their own? The sacrifice of the individual self in the service of the greater welfare of the ecological community implies an entirely different order of values far beyond what is afforded by empathy alone. A widening circle of identification, therefore, is not merely a pretentious and obscure way of advocating empathetic connections with the natural world – it is a further elaboration on extant conceptions of morality and value. The *self* that identifies with the earth must follow an injunction to action on matters previously exempt from moral consideration. Even if identification is merely another word for empathy, then the expansion of identification proponed by Naess demands a concomitant expansion of empathy, and more importantly the recognition that individual prosperity is tied to the good of the biotic community. Further, Plumwood seems to view "self" with suspicion, citing that even an expanded sense of self, regardless of the wider circle of concern engendered by such expansion, does not challenge egoism and precludes the possibility of self-sacrifice. Apparently, Plumwood equates *self* with *selfishness* – even an expanded self is egoism under a different cloak. However, deep ecology does not problematizes the *self* per se; rather it is the assumption that the self is distinct and independent of external factors that leads to ecological destruction. Deep ecology attempts to redress the tendencies of a parochial self-orientation by emphasizing the earthly conditions that enable our working sense of self, by pointing out the many ways in which our constructed *self* is co-dependent with the evolution of the planet. The expansion of identification is the very antithesis of selfishness because it challenges the privileged position of the *I* in

relation to the other, dissolving dualistic patterns of perception that inflict tension and conflict within the realm of human interaction.

A more incisive critique might be launched against the deep ecological assumption that to identify with something as the self guarantees responsible treatment of that which is identified. This assumption proves dubious when we consider how many people continue to harm themselves through various forms of substance abuse, even though they may fully identify with their own bodies/minds. Plagued by competing impulses, humans are often beset by dilemmas and confused about what serves their best interest. If we are confused about how to protect and enhance our own well-being, then we cannot begin to ensure the well-being of the ecological community with which we identify. In fairness, the notion of an expanding circle of identification in deep ecology serves more to redress the bifurcation between the self and the ecological alterity, a dichotomy that facilitates an attitude of indifference toward ecological destruction, rather than to offer an efficacious course of practical action to dismantle systems of ecological exploitation. The expanded self might be likened to the attitude of enlightened self-interest (not selfish-interest) from which we discern ecological decline as a threat to our own existence, making responsible action all the more imperative. Beyond this, if we are unable or unwilling to respond to threats to our own survival, then the human species suffers a neurosis far more serious than that of anthropocentrism or the belief in a self that is distinct from the ecological other.

Finally, Plumwood's criticism against the obliteration of all ontological distinctions in deep ecology may stem from far too literal a reading of John Seed's

proclalmation: "I am the rainforest recently emerged into thinking." At its most basic level, deep ecology merely elaborates upon the banal point that human beings are a part of the terrestrial biome and depend on its balanced operations for survival. In this sense, there is nothing to exempt human beings from nature, nothing to categorically differentiate us from other fauna and flora in regards to our involvement within the earthly community. A statement on the inclusion of human beings within the ecological sphere is an attempt to address the dualism (or atomism, according Plumwood) that sets the human species apart from the natural world. The unity expressed in Seed's statement is misread by Plumwood as the eradication of ontological distinction, as if deep ecology allows for no qualitative difference between humans and nature, between the forest and myself. An alternative reading might be: the forest and I share the same material constituency, the same natural history, the same elemental composition that make us children of the planet – the forest and I are emanations of the same earthly power that unites us. The unitary statement uttered by Seed should be understood as an affirmation of the constitutive forces shared by all members of the biotic community, not as an obliteration of ontological distinction.

The language of unity brings a renewed intimacy and vigour to environmental conservation as ecological protection becomes an act of self protection and enhancement. Although Plumwood sees this construal as a reinforcement of egoism, I see the *expanded self* serving a different purpose: if ecological demise is tantamount to the destruction of the self, apathy becomes an unacceptable response. In so far as the tendency toward self-preservation is instinctual, the expanded self that identifies with the earth is more likely to engage issues of ecological degradation with a sense of

immediacy. Of course, a self remains intact, though not quite in the way Plumwood has pictured it. Plumwood's exegesis against egoism may be trenchant if applied to the individual, parochial *self*; however, the expansion of identification demands the transformation of the *self* into *the self that identifies with all things*, a metamorphosis that sometimes requires the sacrifice of, or in the very least a diminishment of, the parochial self, through processes entirely antithetical to Plumwood's charge of egoism. Thus, the *expanded self* that is central to deep ecology can only be deemed egoism if we so not recognize that deep ecology requires a transformation of ego entirely.

2.5 — Conclusion

In this chapter I have selectively drawn from the literature of deep ecology, borrowing concepts from a variety of theorists in presenting a diagnosis of the ecological crisis as a crisis within human consciousness. Alienation from nature, anthropocentric preeminence of over the earth system, and a prevailing tension between the self and other are among the chief factors that shape a mentality of ecological destruction. An ecological consciousness ameliorates the psychic wounds by reuniting the human consciousness with the biotic community, effectively dissolving the alienation that proceeds from a dualistic conception of the self and the ecological other while establishing an appreciation of integral value and dignity of the natural system in an eco-centric system of value.

Educators will take interest in how such an ecological consciousness can be cultivated and whether pedagogical programs can be designed to usher in greater sensitivity to the assumptions that undergird ecological destruction. Contemplative

practices from an eastern religious tradition may provide one possible response to the current situation, given their design as methods that untangle the self-obsessed habits of the mind. Though meditation in its myriad forms has been practiced in religious settings for centuries, westerners have only begun to investigate and apply the practice in clinical and educational settings. Whether meditation efficaciously alters habits of thought in the direction of ecological consciousness remains very much the question.

In raising mental, contemplative practice as a possible response to the ecological crisis, I may well be courting the opposition of more pragmatically minded critics, who may be unsettled by the cogitative and numinous orientation of meditative practice and its seeming inadequacy in dealing with systemic environmental exploitation. While I do not deny the urgent need for systemic reform, I have situated my analysis in deep ecology precisely because I believe that we must continuously emphasize our psychological and spiritual involvement with the earth community; to limit discussions of ecological justice to the realm of social and political activism without attention to the unspoken, anthropocentric assumptions that inform the prevailing modes of consciousness is to risk a course of action that merely changes the face of ecological exploitation without addressing the ultimate cause.

Further, if our own consciousness arises as a feature of our embodied earthly existence and an emanation of intelligence forged in the fires of the planet's fecundity, then a reformation in our conscious thinking, however incremental, is *directly* a shift in the evolution of the planet itself. David Abram (2010) has poignantly stated that our own physicality is intertwined with the physicality of the earth. Therefore, we must understand the corporeal as the physical dimension that coincides with the mental. In

this chapter, I have discussed the attitudes of some salient philosophers of deep ecology who have opposed the objectification of nature and underscored the psychical dimensions of the human/earth relationship. In the next chapter, I will traverse through a different, though parallel, landscape and examine how the physiological intricacies of the brain manifest the movements of consciousness. As an example, we might look to the physiology of muscle development as analogous to the neurogenesis that drive brain plasticity. Strenuous and repeated exertion of muscle fibres cause microtrauma in the muscle tissue, prompting the generation of new cells at the site of injury via satellite cells in the muscle fibres. Muscles growth occurs when the rates of tissue repair and protein synthesis exceed the rate of muscle protein breakdown (Chargé & Rudnicki, 2004). The understanding of the physiological processes of muscular hypertrophy (development of muscle) can then be used to design a course of resistance training that best yields results for strength and endurance. Similarly, a physiological understanding of the neurological assemblages that enable certain cognitive functions, as well as the conditions under which neurogenesis occurs, can help inform a course of interventions, clinical and educational, that best promote the development of the brain and the related cognitive functions. Admittedly, because science is still grappling with the vast complexity of the brain and a point-by-point correlation between neural-physiology and the self-oriented nature of subjective experience has yet to be definitively established, we should be careful in inferring and prescribing pedagogical interventions based on the neuroscience related to the cultivation of the ecological consciousness that deep ecologists have envisioned. Nevertheless, we may ponder the implications of the current neuroscientific knowledge

on our understanding of self and its sets of identifications. This examination of neuroscience, education and ecology only works if we understand the mind and the brain as one unified ontology, an embodied process whereby changes in consciousness are manifested in the physical brain and vice versa. In the next chapter, I will survey the philosophy of embodied cognition and thus establish more clearly how neuroscience, as an empirical method of understanding the brain, helps us to better understand the complexities of human consciousness.

Chapter 3 — Embodied Cognition

3.1 — Anxiety over the Science of the Brain

The 1990s has been described as the *decade of the brain* (Jones & Mendell, 1999). Advancements in neuroscience have influenced our understanding of the mind, altering conceptions of human nature and igniting debates on the constituent structures of mental life. The growing and widespread subscription to psycho-therapeutic and nootropic drugs further illustrate an understanding of the brain as the material organ that determines our mental and emotional worlds. The aggregate scientific knowledge of the brain, as presented in the popular media, often "explain" experience and behaviour through brain mechanisms and operations, thus insinuating in ever more concrete terms that *we are our brains.* Semantic appropriations of the brain in the descriptive language of mental experience further intimate the extent to which we have replaced mind with brain; indeed, idiomatic expressions such as *My brain hurts* make little biological sense – yet this semantic confusion between the physiological and the psychological has taken root within the popular discourse on most mind-related matters (Changeux & Ricoeur, 2000).

If, according to the materialist paradigm, our richly complex and textured conscious experiences arise from physiological processes in the brain, then careful manipulation of these processes can indeed alter, if not completely transform, experience and cognition. The brain, then, is analogous to a machine whose inner workings, once understood, become amenable to manipulation and intervention; the workings of the human psyche, once shrouded in the abyss of mystery, no longer eludes our control under the light of scientific discovery. This mechanistic interpretation of

mind promises efficacious solutions to psychological problems as the progress of the scientific project continues to improve the human condition – at least, so goes the claim.

C.A. Bowers (2005) has raised the alarm on this scientific hubris, fearing its most egregious extensions in the form of eugenic programs that seek to select the best brains for reproduction (Bowers, 2005). Though his anxiety is lodged in extremes, Bowers legitimately challenges the often unspoken assumptions in science and the uncritical way in which many scientists equate technical discoveries with progress. In addition to reducing cognition to electro-chemical events in the brain, the mechanical analogy of the brain assumes intelligence to be the quality of the autonomous individual; a brain is taken as its own system whose functional dynamics exist apart from a cultural and historical context. Thus, intelligence in the form of collective wisdom and cultural traditions is omitted and not easily accounted for in neuroscientific programs (Bowers, 2000). Furthermore, Bowers sees science as an industrializing force in its application of knowledge in the form of marketable commodities, which lends strength to the colonial impulses of corporate globalization. The evisceration of local and traditional systems of knowledge that has so far been the inadvertent consequence of scientific endeavours implicates science as a contributing problem, and not a solution, to the ecological crisis (Bowers, 2000).

Adding a further critique to Bower's concerns about epistemological hubris on the part of some in the scientific community, Alan Wallace (2007) identifies religion as one epistemological domain that is unjustifiably threatened by the materialist and reductionist paradigms of cognitive neuroscience. A categorical reduction, Wallace writes, is the tendency to "reduce something relatively unfamiliar or poorly understood

to a more familiar and understood class of phenomena" (Wallace, 2007, p. 31). This method of simplification, according to Wallace, not only fails to illuminate the processes of behaviour, it eliminates the more complex dimensions of experience such as spirituality by imposing psychological, medical, economic and other nonreligious terms upon its operations. Despite the limitations of these methods, Wallace believes that the physicalist[1] and reductionist paradigms, the *modus operandi* of scientific inquiry, is ensconced within an orthodoxy that refuses to recognize, or is unable to speak to the metaphysical issues related to consciousness and mental experience, especially as it relates to moments of transcendental and spiritual moments of awareness (Wallace, 2007).

Bowers and Wallace share a concern over the uncritical way some scientists drive their quests for knowledge. Because science does not exist apart from its socio-cultural context, a completely materialist neuroscience threatens to eliminate traditional forms of knowledge while eviscerating our sense of personal agency, forcing us to submit to determinist concepts of the brain, and therefore devastating a holistic encapsulation of the human person. Can science continue its empirical investigation, maintain the tenure of epistemological rigour, and avoid the materialist dogma while preserving a respect for the more metaphysical aspects of humanity?

3.2 — The Hard Problem

The recurring concerns over neuroscience, with its perceived mechanistic extrapolations and materialist assumptions, broadly parallel debates between neuroscientists and philosophers themselves, who have contested the nature of the

mind/brain problem and its methodological and ontological implications for many decades, if not centuries. For many scientists and philosophers, where the mind stands in relation to the brain remains as troubling today as it has been since the time of Descartes (Campbell, 2011). The riveting tension emanates from the fact that, while the mind resists attempts at materialistic reduction, it also cannot be said to exist outside of physiological substrates (Changeux & Ricoeur, 2000). This aporia challenges purely physiological accounts of consciousness,[1] on the one hand, and demands much more of introspectionist interpretations of experience on the other. If we assume that the physiological processes occur first in a causal chain of events that give rise to consciousness and its concomitant subjective valences, then our experiences are no more than the sum of neuronal activities. Riding on this materialist theory, some theorists argue for the elimination of subjective, first-person theories of mind in favour of a more rigorous and objective neuroscience capable of reconstructing the causal relations in a comprehensive theory of consciousness (Churchland, 2007). For Churchland (2007), subjective accounts of conscious experience that constitute a *common sense* theory of mind, or *folk psychology,* are deeply suspect and cannot conform to an inter-theoretic reduction pertinent to mental activity – that task is better left to an objective science based on material principles (Churchland, 2007).

However, there is much to question in the materialist paradigm proposed by Churchland. Chalmers (1995) articulates a trenchant criticism of such a materialist

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1. Physicalism "declares that the universe consists solely of configurations of matter and energy within space and time" (Wallace, 2007, p.33). The properties of material matter form the primary attributes that exist independently of all modes of detection (Wallace, 2007). The principle of physicalism becomes more problematic in quantum theory, where the observations made about matter depend much on the presence of the observer.

position. Outlining the limitations of objective methods of investigating brain activity, Chalmers argues that the *explanatory gap* (Levine, 1983) exists because while objective, scientific study of the brain provides insights into the physiological correlates of *function,* they do not offer any insight into what constitutes an internal, subjective *experience,* the immersion in phenomenological qualia that is the indispensable part of consciousness*.* To borrow the stark words from Wallace (2007), "at present there is no objective, scientific evidence even for the existence of subjective experience" (Wallace, 2007, p. 39). In so far as neuroscience can explain the "easy problems" related to mental phenomena (such as wakefulness and sleep) by elucidating the physical mechanisms of mental operations, it cannot readily provide explanations for how and why subjective experiences arise from these physical processes in the first place. Because third-person accounts of brain functions cannot provide a comprehensive explanation of subjective experience, neuroscientific projects employing only objective methods can only offer a partial explication of human consciousness. For Chalmers, to neglect the subjective realm of experience in the study of the mind is to miss the goal of neuroscientific study altogether:

> Experience is the most central and manifest aspect of our mental lives, and indeed is perhaps the key explanandum in the science of the mind. Because of this status as an explanandum, experience cannot be discarded like the vital spirit when a new theory comes along. Rather, it is the central fact that any theory of consciousness must explain (Chalmers, 1995, p. 206).

Until recently, the epistemological and methodological limitations of third-person cognitive science and first-personal phenomenological reports have been

incommensurate theories that cannot be coherently understood together without a connecting framework that bridges the explanatory gap. Formulation of such a connective framework requires a fundamental reexamination of the epistemological relationship between objectivity, subjectivity, materialism and phenomenology – without this reexamination, cognitive science will likely be relegated to a "non-collegiate pluralism" (Owen & Morris, 1999, p. 272), with neuroscience adhering to its preferred materialist vehicles that preclude the possibility of discoveries offered by alternative paths of investigation.

The hard problem and the explanatory gap can be seen as two manifestations of the same mind/brain tension. This problem raises the question of whether reality can be apprehended in terms of one or two substances – the material, as in the brain, and the metaphysical, as in the mind or the soul (Changeux & Ricoeur, 2000). This philosophical distinction imposes epistemological constraints on our understanding of the mind and has frustrated attempts at crafting comprehensive theories that unite the two domains. Cognitive neuroscience, working from the physiological dynamics of neural assemblies, has attempted to sketch out the neurological correlates of consciousness (NCC) by triangulating observed brain activity with known anatomical functions during the performance of certain cognitive tasks (Crick & Koch, 1990). However, the articulation of these physiological functions, Chalmers (1995) quickly points out, merely explain what part of the brain is active, not how it *feels*, nor why it should *feel like anything at all* when physiological processes occur in the brain. Indeed, many features of consciousness are inherently imbued with emotional valences that cannot be fully described and accounted for by objective methods alone. In other

words, while NCC can be taken as the physical correspondents of cognitive function and the observable material dynamics which attend mental events; they cannot, however, be equated with the mental events themselves, nor can they constitute a complete explanation (Thompson & Varela, 2001).

Take memory, for example, which involves the ability to integrate, record and recall sensory data (Byrnes, 2001). Using case studies of brain-injured individuals, surgical studies with animals and neuro-imaging techniques, neuroscientists are able to design experiments to test hypotheses regarding the physical components involved in memory capacities. The accumulated scientific evidence suggests six kinds of memory: explicit, implicit, semantic, conceptual, procedural, and episodic (Byrnes, 2001). Specifically, PET (Positron Emissions Tomography) studies have revealed heightened activity in the frontal cortex when subjects recalled personal experiences, or episodic memory (Tulving et al., 1994). Although this imaging technique is able to locate the cortical components involved in memory, it cannot be used to decipher and predict the emotional colours inherent in memory and the subjective qualia attached to past experiences.

On the other hand, if materialist accounts of cognition cannot so far surmount the wall that encloses the world of personal experience, purely subjective accounts of consciousness has proved even less successful in rendering a useful theory of consciousness. Introspectionist schools of psychology, made popular by the psychologist Wilhelm Wundt, were not able to establish a valid method of producing experimental results that could be verified and integrated into generalizable conclusions (Varela, 1991). Under the introspectionist regime, subjects were asked to

examine their own experiences as would an outside observer – however, without a system of observational procedures, subjects merely thought about thoughts and articulated their own preconceptions about their own minds. Researchers were unable to corroborate their findings and disagreed over the implications of experimental results. The ultimate consequence of such a methodological failure was the replacement of the introspectionist school by the behaviourist school of psychology, which ignored subjective experience altogether (Varela, 1991).

Given the incommensurate nature of the subjective and objective paradigms in the study of the consciousness, must we give up hope that neuroscientists should ever have anything to say about subjective experience, especially regarding transformative, transcendent or even mystical experiences which intimate a reality beyond those conveyed by our parochial, bodily senses? If so, then we have no choice but to follow the divergent paths of Cartesian dualism, submitting to Ricoeur's (2000) argument that "these discourses represent heterogeneous perspectives, which is to say that they cannot be reduced to each other or derived from each other" (Changeux & Ricoeur, 2000, p. 14).

3.3 — Towards a Non-Reductionistic Neuroscience

Since neuroscientific research cannot skirt the difficulties wrought by the mind/brain problem, we need a research paradigm that diffuses the physical/mental opposition, attends to the advantages and limitations of subjective and objective inquiry, and offers a methodological platform that utilizes both perspectives to yield a more comprehensive account of consciousness. Francisco Varela has argued for an

embodied approach to cognition based on an analysis of circular causality within living systems whose participation in the world enactivates cognition and conscious perception (Lutz, 2004; Rudrauf et al., 2003; Thompson & Hanna, 2003; Varela, 1996, 2001). This embodied conception of cognition stands in contradistinction to a computational theory of mind, which takes the brain as a system of sensory inputs that represent a pre-given world (Varela, 1991). Varela's Neurophenomenological program attempts to respond to the following difficulties issuing from the hard problem:

1) The gap between objective explanations of consciousness and subjective reports of experience.
2) The reduction of mental events to physiological processes within materialism, which yields a mechanistic model of mind that neglects lived experiences as an immanent part of human consciousness.
3) The one-directional path of causal relationships when the brain is taken as the material substrate of mental experience (Rudrauf et al., 2003; Varela, 1996).

The neurophenomenological approach, as I shall discuss in further detail, addresses these problems by building upon the phenomenology of Edmund Husserl and Maurice Merleau-Ponty's views on embodiment. The resulting paradigm is a non-reductive, pragmatic research program that resists the deterministic and materialist dogma that so often plague neuroscientific projects.

3.4 — Husserlian Phenomenology

Edmund Husserl's work builds upon the philosophy of Franz Brentano, who pointed to the *directedness* of psychical phenomena: in presenting a visual percept, something is perceived; in presenting a judgement, something is acknowledged or rejected (Husserl, 1917; Kockelmans, 1994). Husserl further elaborated on the *directedness* of consciousness with his notion of *intentionality*. For Husserl, consciousness is intentional in the way that it is related to, or open to something (Kockelmans, 1994). This inherent feature in the structure of consciousness is based on the relationship between the act of *meaning* and the object of meaning, or what is *meant*. Consciousness, therefore, is always consciousness *of* something. Every act of consciousness is intentional and therefore the experience of consciousness is also fundamentally intentional.

Given that consciousness directs itself toward an object, there then arises the question of how intentional experience stands in relation to objects of perception. If I see a dog in front of me, my awareness of the dog exhibits the intentional character of my consciousness. If I think of a dog even though none appears before me, I nevertheless conjure a dog's likeness in my mind, the presence of which in my imagination also manifests the intentionality of my thoughts. Because intentionality is rooted within every conscious act, even thoughts about my own mind remain intentional in that consciousness can sustain a conception of itself and treat it as an object like any other. Husserl was careful to distinguish the *thinking* from *the thought*, the *perceiving* from the *perceived* (Husserl, 1917). That which is perceived, is "perceived as such" within the intentional mind – that which is remembered is also

"remembered as such." A real, material tree, for instance, in is not the same as the tree perceived in my mind because the tree that appears in my mind is an object of my conscious thought (Kockelmans, 1994). This distinction leads us to Husserl's notion of *noema* (the objects of the thought) and *noesis* (the act of thinking). Noema and noesis are two inalienable features of intentionality, and as such, fundamental aspects of conscious experience (Føllesdal, 1969; Kockelmans, 1994).

A real object is meaningfully perceived within an intentional mind when the noetic act produces noematic content. The relationship between real objects and noematic objects was of utmost interest for Husserl, who argued that even though we experience the external world, the external world remains alien to our intentional interior. If I walk through a forest, the experience of that forest forms the intentional shape of my consciousness – but the forest itself remains untouched by my noetic formations. If I wish to learn something of my own mind, phenomenological investigation would require that I not confuse the noematic content (the forest in my experience) with the forest proper (Kockelmans, 1994). Since phenomenological inquiry attempts to get at the nature of consciousness itself, the investigator must bracket (*epochè*) the observations conferred upon consciousness by the external world and remain with the intentional processes of the mind alone:

> A consistent *epochè* of the phenomenologist is required, if he wishes to break through to his own consciousness as pure phenomenon or as the totality of his purely mental processes. That is to say, in the accomplishment of phenomenological reflection he must inhibit every co-accomplishment of objective positing produced in unreflective consciousness, and therewith [inhibit]

> every judgement drawing-in of the world as it "exists" for him straightforwardly (Kockelmans, 1994, p. 113).

In other words, the phenomenological *epochè* sets aside the qualities about the world gathered through experience in order to examine the constitutional act of conscious experience itself:

> the universal *epochè* of the world as it becomes known in consciousness. . . shuts out from the phenomenological field the world as it exists for the subject in simple absoluteness; its place, however, is taken by the world as given in consciousness (perceived, remembered, judged, thought, valued, etc.) – the world *as such* . . . individual things in the world as absolute, are replaced by the respective meaning of each in *consciousness* in its various modes (Kockelmans, 1994, p. 113)

The *epochè* allows the phenomenologist to suspend judgements and conclusions about the contents of consciousness, carving out a space for a pure inner experience to emerge. For Husserl, the methodological step of bracketing apparent observations as they appear within consciousness is called a *phenomenological reduction* (PhR) (Husserl, 1917).

PhR is, in essence, a shift in the attitude of the phenomenological investigator, a deliberate refusal to naively commit to the contents of conscious perception in the process of studying the very nature of the mind. Natalie Depraz (1999) describes the *epochè* as the "putting out of validity upon the world" (Depraz, 1999, p. 101). Therefore, "reduction," in this Husserlian sense, is not a negation or elimination. Rather, it is a placement of the conscious object within a neutral space so as to allow one to examine the conscious act itself. To utilize PhR is to "put in abeyance our habitual discourse

about something, a bracketing of the pre-set structuring that constitute the ubiquitous background of everyday life" (Varela, 1996, p. 337) so as to "disengage and free up another quality, another modality of subjective experience" (Depraz, 1999, p. 99).

In articulating the method of phenomenological reduction, Husserl introduced a methodological demand on introspection and imposed conditions on first-hand reports of experience. This phenomenological elaboration establishes a principled distinction between the world, the world as it is experienced, and the act of experience as immanent within consciousness (Husserl, 1917). This distinction is the first step in the formation of a scientific approach to a subjective analysis of mind. For Varela (1996), PhR is a rigourous technique through which we access our lived experience, a "special type of reflection or attitude about our capacity for being conscious" (p. 335). The application of PhR helps address the gap between the objective and subjective analysis of consciousness by supplying subjective methods with disciplined investigative procedures. However, though PhR attempts to impose a standardized methodology to subjective observation, the explanatory gap remains, as even a consistent program of phenomenological investigation does not answer questions of how subjectivity co-joins objective, bio-physical processes.

In addressing this question, Varela situates the neurophenomenological method in the notion of *embodiment*, put forth by Maurice Merleau-Ponty as a further development from Husserlian phenomenology. For Merleau-Ponty, the perceptual mind does not exist apart from the body, and its functions cannot be separated from the world in which perception unfolds. From this embodied perspective, the mind/brain dualism no longer remains intractable; one is not taken as the substrate of the another

but rather, they mutually reinforce one another in a circular reciprocity (Maldonato, 2009; Thompson & Hanna, 2003; Thompson & Varela, 2001; Varela, 1996)

3.5 — Merleau-Ponty's Phenomenology of Perception

Classical empiricism, as iterated by John Locke, holds the perceiver in relation to the external, pre- given world through a sensory apparatus. The observer and the observed exist in a straight forward relationship mediated by the senses:

> First, our senses, conversant about particular sensible objects, do convey into the mind several distinct perceptions of things, according to those various ways wherein those objects do affect them; and thus we come by those ideas we have of yellow, white, heat, cold, soft, hard, bitter, sweet, and all those which we call sensible qualities; which when I say the senses convey into the mind, I mean, they come from external objects and convey into the mind what produces there those perceptions (Locke, cited in Gordon & Tamari, 2004, p. 16).

In neurological terms, objects in the external world provide stimuli to the sensory systems that feed information to the brain. The perceiver exists apart from the pre-given world - his only access to external objects is through sensory data. According to Merleau-Ponty, empiricism abides by a "constancy hypothesis," which refers to the "point-by-point correspondence" between perception and stimulus (Gordon & Tamari, 2004). Merleau-Ponty rejects this naturalistic understanding of the empirical perspective, arguing that such descriptions ignore the facts of perception by simplifying the perceiver in relation to the world (Gordon & Tamari, 2004).

Empiricism, as envisioned by John Locke, problematically situates the observer and the observed in abstraction, where the human perceptive entity exists in passive dependence on the stimulus. Moreover, this perceiver, outside of any physical terminus, is more or less able to accurately represent the stimulus as it is presented. However, Merleau-Ponty counters that consciousness cannot be posited in abstraction, nor can it be inserted into an input-output equation within a purely conceptual world without active physical participation. The *transcendent eye of the observer*, as it were, exists only in theory, not in fact:

> . . . Science has not been able to construct the "central sectors" of behaviour from the outside like something which is enclosed within a cranial box . . . the illusion of a transitive operation of stimuli on the sensory apparatus and of the latter "against" consciousness comes from the fact that we actualize separately the physical body, the body of the anatomists or even the organisms of the physiologists, all of which are abstractions, snap shots taken from the functional body (Merleau-Ponty, 2007, p. 22).

Consciousness, as understood by Merleau-Ponty, presupposes a bodily form through which perception is activated and suffused with meaning. This *embodied* nature of consciousness engages us with the world; reciprocally, our bodily involvement is central to our perceptive experiences and our manner of being in the world.

Take for example, our perception of space. Merleau-Ponty points out that we cannot perceive or make sense of space unless we are engaged and involved in space: "the experience of our own body teaches us to embed space in existence. . . our body is not primarily in space, it is of it" (Merleau-Ponty, cited in Gordon & Tamari, 2004).

Space has perceptual meaning because it is an inherent part of our physical presence, an inseparable component of our somatic experience. We are able to maneuver ourselves in space, not because we *occupy* a space external to ourselves, but because space is *within* us and because our movements manifest changes in our spatial contour (Gordon & Tamari, 2004). That an organism is able manage itself and relate to other objects in space is precisely due to its own spatial constitution, the fact of it being formed *by* space rather than *in* space.

Consider then, as an extension of our experience of space, the perception of depth, which Merleau-Ponty elaborated upon in *Eye and Mind* (1964). Depth is what we see in front of us, both that which is near and that which stretches before us into the distance. Under the empirical model, depth is no more than another object of perception that is coherently represented in the mind through the integration of sensory data. This position, according to Merleau-Ponty, is untenable because the phenomenological experience of depth is *lived* rather than *seen*:

> . . . the experience of depth is not *created* in the brain any more than it is *posited* by the mind. . . we can discover depth, can focus it or change or focus within it, only because it is already *there*, because perception unfolds *into* depth – because my brain, like the rest of my body, is already enveloped in a world that stretches beyond my grasp. Depth . . . is that which *engenders* perception, is the announcement of our immersion in a world that not only pre-exists our vision but prolongs itself beyond our vision, behind that curved horizon (Abram, 1988, p. 105).

The perception of depth is made possible because it is woven into the

dimensions of our own bodies. Thus, we are included in the world we perceive far more intimately than what the classical empiricist would allow.

Merleau-Ponty's trenchant observation challenges the naturalistic observations by insisting on the *physicality of consciousness*, which does not assert a physical substrate for conscious action, but rather the physical reality intertwined in conscious experience:

> . . . for us consciousness experiences its inherence in an organism at each moment; for it is not a question of an inherence in material apparatuses, which as a matter of fact can be only objects for consciousness, but of a presence to consciousness of its own history and of the dialectical stages which it has traversed (Merleau-Ponty, 2007, p. 25).

Consciousness is, therefore, one aspect of the entire organism, the neglect of which within theoretical and empirical investigations severely constrains research parameters and limits the insights availed from controlled studies.

In contrast to Cartesian dualism, Merleau-Ponty refutes the analogy of the body as an instrument of the mind (i.e. the artist using tools to create a painting), asserting that "the mind does not use the body, but realizes itself through it while at the same time transferring the body outside of the physical space" (Merleau-Ponty, 2007, p. 25). The mind and the body, in other words, exist in mutual affirmation and creative interaction. Since the mind finds its coherence and expression through the body, scientific studies of mind cannot assume the mind to exist apart from a physical matrix with its own history of experience.

A further consequence of Merleau-Ponty's phenomenology of embodiment is the revision of the relationship between the perceiver and the pre-given world of classical empiricism. From the Lockean perspective, the mind is *dependent* on the external, material world for the provision of sensory stimulus. The sensory vehicle does not generate stimulus per se, but passively gathers detected information to project mental representations that inform behaviour. From the perspective of embodiment, however, consciousness is *enactivated* (Varela, 1996) through its involvement and engagement in the world viz. the body. What one perceives is a direct result of how one participates in the world. Take, for example, a situation in which I encounter a building I have never seen before. From one perspective, only two sides of the edifice are visible, and so only a partial view of the building is rendered as I cast my gaze. However, the building appears differently as I move; thus my spatial, bodily involvement with the building alters my perception. If I wanted to know the appearance of the other sides of the building that elude my field of vision, I would draw on my previous experiences with similar buildings to extrapolate an imagined picture to complete my perceptual apprehension. This act of drawing on memory is an act of reflection that also supposes a previous bodily/spatial experience with a similar object. The entire interaction, Merleau-Ponty convincingly points out, requires a functioning, embodied mind dynamically interacting with the world in a continuous process of action and perception that generates a meaningful, lived experience. Unraveling the causal events of classical empiricism, Merleau-Ponty reminds us that it is the action of the observer that guides the terms of perception. To cast the mind as the passive receiver of external

stimulus egregiously ignores the participatory relationship between the perceiver and the percept.

3.6 — Embodied Cognition

Merleau-Ponty's phenomenology of perception effectively reestablishes the prominence of the body in relation to mind. As such, Merleau-Ponty provides a response to the mind/brain problem by articulating the ways in which consciousness is activated, expressed and maintained within a somatic platform, thus establishing the mind and the body as two parts of one entity rather than opposing realities. This embodied approach to cognition is central to the epistemology of Francisco Varela, who believes that the empirical study of mind must grant that "(1) perception consists of perceptually guided actions; and (2) that cognitive structures emerge from the recurrent sensory-motor patterns that enable action to be perceptually guided" (Varela, 1999, p. 12). The mind and the body exist in a circular reciprocity that cannot be pinned down under the materialist position.

Experimental evidence corroborates Merleau-Ponty and Varela's assertions. Held and Hein's (cited in Varela, 1991) study of kittens highlights the importance of active perceptual involvement in the development of sensory-motor abilities. The researchers raised kittens in the dark and exposed them to light only under controlled conditions. One group of kittens was allowed to move freely. However, this group was harnessed to a carousel that was attached to a second group of kittens, who were confined to a carriage. The two groups of kittens, therefore, shared the same visual experience, but the second group was entirely passive in their perception as the

carousel turned according to the movements of the first group of kittens. When both groups of kittens were allowed to roam freely after a few weeks of experimental treatment, the second group of kittens behaved as if they were blind, bumping into objects and slipping off edges (Held and Hein, cited in Varela, 1991). This study supports the Merleau-Pontian view of perception as participatory action, rather than passive reception of stimulus, in the process of forming behaviour. Moreover, Held and Hein's study suggests that perceptive stimulus alone cannot furnish the perceiving subject with the behavioural capacity required of organisms situated in the physical world.

Varela et al. (1991) believe that the embodied approach to cognition rectifies two problems posed by materialist, objective programs of cognitive science. First, such programs ignore entire domains of human experience by precluding the somatic matrix in which consciousness appears. Second, such programs become remote from human experience and generates a "divided stance in which we are led to affirm consequences that we appear to be constitutionally incapable of accepting" (Varela, 1991, p. 127). The embodied nature of the cognizing subject requires, therefore, an open pragmatic approach that bridges the explanatory arenas of cognitive science with the phenomenological domains of lived experience. This method of research understands consciousness as "emergent"[3] within complex systems with reciprocal relationships of

[3] Emergence is defined by Varela as the processes whereby "local rules. . . give rise to global properties or objects in a reciprocal causality" (Varela, 1996, p. 331), the study of which requires the "intertwining of subjectivity and bio-physics" (Rudrauf et al. 2003), employing multiple methods that studies consciousness experiences from *within* and from *without*.

causality between neurons and conscious events (Thompson & Varela, 2001). Further, processes informing consciousness "cuts across brain-body-world divisions, rather than being brain bound neural events" (Thompson & Varela, 2001, p. 418).

Applying the phenomenological reduction of Husserl and Merleau-Ponty's notion of embodiment, Varela began to articulate a program of neuroscientific study as a response to Chalmers' hard problem (Varela, 1996). Neurophenomenology attempts to connect subjective, lived experiences with the objective, physiological understanding of neural events. In contrast to the eliminativist view of subjective experience (Churchland, 2007), Varela believed that subjective investigations of consciousness were not so non-communicable as to elude circumscription (Rudrauf et al., 2003). Subjectivity is not *merely* subjective, and need not languish in the domain of private experience, beyond the reach of scientific validation. Given the failure of introspectionist schools of psychology, Varela advocated for Husserlian reduction as praxis (Depraz N., 1999) that imposes methodological rigour upon first-person investigations, lending subjective accounts of conscious experience to inter-subjective review (Varela, 1996). The phenomenological reduction requires that the subject learn to a) modify her own *attitude* about her experience by putting aside habitual judgements about the experienced world; b) gain a more intimate grasp of phenomena as she becomes more open to the space of *intuition*; c) inscribe and translate phenomenal experience in communicable terms (*invariants*) that can be considered and examined by others; d) cultivate through *training*, a stability of attention, a capacity for conscious bracketing that allows her to yield deeper insights into the nature of phenomenological experience (Varela, 1996).

In order to close the explanatory gap, Varela argued, this disciplined, first-person data must be given equal consideration along-side neuro-physiological data, with the understanding that these two accounts of consciousness need not oppose each other (Varela, 1996). Varela believed that subjective data and neuro-physiological data can provide *mutual constraints* – that is, third-person and first-person accounts serve as two sides in a fertile dialogue that reveals a more complete picture of consciousness than when these accounts are considered in isolation. Neurophenomenology does not assume neural events to be the causal origin of subjective experience; rather, it assumes a circular causality in which experience affects neural interactions and vice versa. By attending to "the co-determination of both accounts one can explore the bridges, challenges, insights and contradictions between them" (Varela, 1996). Varela's innovation lies in the enlistment of disciplined, first-person accounts as "an integral element of the validation of a neurobiological proposal, and not merely a coincidental or heuristic information," (Rudrauf et al., 2003, p. 45) as in the case of the NCC used by Koch and Crick (1990).

3.7 — Neurophenomenology in Practice: A Case Study

The neurophenomenological program is implemented in Lutz et al.'s 2002 study on the variability of states of readiness in subjects exposed to autostereogramic visual stimuli (Lutz et al., 2002) Brain responses, the researchers point out, depend much on the attentional states and the cognitive contexts of the study subjects. Data on brain dynamics (Jones & Mendell, 1999) and operations, therefore, must include an account of the subject's subjective state of readiness prior to the stimulus. Because attention

shifts and ebbs, researchers cannot simply aggregate EEG data and average out reaction times – such a statistical manipulation would wipe away from the data set the distinct dynamic neural signatures (DNS) associated with specific states of attentional readiness (Lutz et al., 2002).

In establishing categories of conscious states, the researchers utilized self-reports from subjects to compile a phenomenological data set used alongside the neuro-physiological EEG (Electroencephalography) data. The experimental protocol required the subject (four male subjects in total) to fix his gaze on the center of a screen. An audio signal prompted the subject to fix his gaze on two squares at the bottom of the screen while adjusting the focus of his vision until the two squares fused. Then, a binocular (autostereogram) 3D image is presented. When the subject perceived the 3D geometric shape, he pressed a button with his right hand. Finally, the subject provided a brief, subjective report on his conscious experience throughout the experimental procedure (Phenomenological clusters, or PhC). Throughout the task, neurological signals were measured and recorded with a 62 channel EEG, along with eye movement data measured through an electro-oculogram (EOG).

Based on descriptions provided by subjects, researchers discerned four categories of PhCs – 1) steady readiness (SR), where subjects were fully attentive to and expectant of the visual stimulus; 2) fragmented readiness (FR), where subjects made an effort to focus on the task, but were only able to muster partial attention; 3) stable readiness, where the subject reported open attention without active preparation; 4) spontaneous unreadiness (SU) and self-induced unreadiness (SIU), where the subject

was entirely inattentive to the task and was surprised by the appearance of the visual stimulus (Lutz et al., 2002).

In considering the PhCs along side the EEG data, with both data sets working as the mutual constraints prescribed by neurophenomenology, researchers were able to discern an increase in patterns of gamma-range synchrony in the frontal electrodes during periods of performance when SR was reported. Likewise, a decrease in synchrony is associated with states of unreadiness. Based on the data the researchers conclude that 1) there is a relationship between the verbal reports of the subjects' cognitive contexts and the observed patterns of neural synchrony; (2) the states of readiness reported by subjects modulated both behavioural and neural responses after the stimulus; (3) although variations in responses varied between subjects, the patterns of correlation remained stable within each subject (Lutz et al., 2002).

This study illustrates two key components of the neurophenomenological program. The first is the use of first-person reports as valid data sets in defining subjective states of conscious experience. The four categories of attentional readiness were not *a priori* schemas imposed upon the subjects prior to experimental control, but rather structures of organization gathered from the subjects themselves. Secondly, the PhCs provided the researchers with qualitative descriptors that can be attached to EEG data, thus constituting a lens through which the EEG data can be coded and interpreted. Similarly, with the EEG data tracking patterns of neural synchrony, a picture of neural activation linked to various states of readiness begins to emerge, lending more information to the task of understanding the relationship between attentional state and cognitive performance.

3.8 — Caveats

However, given that the neurophenomenological program requires extensive training in the skills of phenomenological reduction on the part of the research subject, it might be argued that the neurophenomenological method skews consciousness in a particular direction by imposing a specific conscious state. In other words, are neurophenomenological findings valid if consciousness is transformed in the course of investigation?

Varela admits the transformative effects of phenomenological training, but counters that consciousness is by nature pliable and dynamic; attempts to establish a definition of a *normative* consciousness is fraught with difficulty. Thus, Varela rejects any standard of what counts as "real or normal experience" (Varela, 1996, p. 346). Since PhR makes available aspects of conscious structure that cannot otherwise be examined, scientists need not mourn for what is lost, but should delve with interest into what can be learned (Varela, 1996).

Still, others may see an irony in neurophenomenology, with its claims of providing a pragmatic response to the hard problem of consciousness, simply because the program itself, as proposed by Varela, imposes too demanding a discipline on the subject so as to make the research paradigm impractical. The glaring omission in the Lutz et al. (2002) study, for example, is the absence of a set of evaluation criteria to help subjects categorize their own states of attentional readiness, thus marking a departure from the neurophenomenological program designed by Varela in the first place. Granted, the researchers trained the subjects by instituting practice runs of experimental stimulus that helped the subjects discern various states of attentional

readiness — however, such *training* falls far short of the demands of Husserlian PhR. Without such methodological structure in subjective reports, the question of how researchers should interpret and utilize first-person data in the act of *inter-subjective* validation becomes much more pressing. Might we presume that certain subjective reports associated with simpler cognitive tasks can be taken at face value while others requiring sustained attention, perception and awareness can only be reliably examined by disciplined methods of subjective investigation? The answer to the question is not entirely clear. In short, the neurophenomenologists face a dilemma: while the Husserlian reduction poses too restrictive a constraint on subjective reporting, the lack of such rigour may undermine the neurophenomenological project entirely by skirting the demands of inter-subjective validation.

However, the methods of phenomenological investigation, Varela points out, are not entirely new. Pointing to Asian contemplative traditions, Varela cites Buddhist meditation as a living, thriving practice that applies a systematic method of subjective inquiry akin to Husserlian PhR (Marchitelli, 2010; Varela, 1991). The *vipashyana* (insight) method of meditation, for instance, emphasizes an open awareness of the conscious mind in a stable state of attention undisturbed by movements of discursive thought. *Vipashyana* meditators attempt to investigate the mind itself by adhering to an attitude of equanimity with respect to all mental events, refusing to follow the movements of thoughts and their concomitant emotional currents. Buddhists hold that insights into the workings of the mind, cultivated through the practice of *vipashyana*, is crucial to wisdom. However, such levels of stable awareness are only possible through consistent, prolonged training. For Varela, experienced Buddhist meditators constitute

a viable research pool whose expertise in phenomenological investigation can help uncover pre-verbal and pre-reflective states of consciousness that are otherwise inaccessible to untrained subjects (Thompson & Hanna, 2003; Varela, 1991). In building neurophenomenology on Husserlian reduction, Varela was grounding his methodological vehicle in one current of western philosophy while pointing to its practical implementation within a homologous eastern tradition.

This leaves us with questions regarding the scope of neurophenomenological study. If only experienced Buddhist and other eastern meditators possess the skills to conduct rigorous subjective research, how does neurophenomenology contribute knowledge about ordinary, every-day modes of consciousness experienced by those without extensive training in Husserlian reduction or Buddhist meditation? Some critics have argued that, outside of the meditative tradition, no research endeavour has properly employed the neurophenomenological method simply because no program of Husserlian reduction exists in practice (Owen & Morris, 1999). In my view, neurophenomenologists who wish to follow the trail carved out by Varela should fashion a response to this trenchant critique either by abandoning Husserlian reduction altogether or proposing other, less demanding methods of subjective investigation that nevertheless lend themselves to inter-subjective validation (Depraz & Cosmelli, 2003). Perhaps neuro-feedback[4] protocols that require the intentional monitoring and control of the subject's own state of consciousness may be more easily taken up in the laboratory context.

[4] Neurofeedback uses neuroimaging technology to provide real-time reports on the status of the brain so the subject can alter and adjust his own state of consciousness.

Other critics have pointed out that neurophenomenology does not adequately address problems posed by the explanatory gap and the hard problem of consciousness. While mutual reciprocal constraints (MRC) provide a useful heuristic strategy in the interpretation of neurological data (as in Lutz et al., 2002) it does not possess any explanatory power that effectively reconciles objective events with subjective events (Bayne, 2004). Without bridging principles that identifies operations within both subjective experience and objective processes, neurophenomenology is merely an epistemic effort at connecting subjective reports with objective measurement, and not an effective response to the explanatory gap or the hard problem of consciousness (Bayne, 2004).

In response to Bayne, we should note that Varela designed the neurophenomenological program as a *methodological* and *pragmatic* response to the hard problem, not as a definitive theoretical solution. His primary goal was to put forward a system of subjective investigation consistent with the principles of scientific inquiry and worthy of consideration alongside objective data. In this sense, neurophenomenology is a way forward for researchers sensitive to the challenges of neuroscience. Antoine Lutz has expressly admitted that the neurophenomenological paradigm attempts to *bridge* the explanatory gap, not to *close* it (Lutz & Thompson, 2003; Lutz, 2004; Thompson & Hanna, 2003). The viability of neurophenomenology will depend much on 1) the elaboration of new methods and vehicles of subjective investigation and report that broaden the scope of research; 2) the development of bridging principles with the explanatory power to coherently outline the operations

shared by both subjective and objective operations under the principle of reciprocal causation.

3.9 — The Brain and Beyond

One example of the attempt to not only *bridge* the explanatory gap but to *close* it, can be witnessed in one team's research into the physical, brain operational and mind space-time (Fingelkurts et al., 2010). Ever aware of the epistemological limitations of looking at the operations of the brain alone, the Fingelkurts (2010) hypothesize that the subjective experience of temporality is linked to operational properties within the brain through physical space-time reality (Fingelkurts et al., 2010). Beginning with the microscopic and macroscopic patterns of circular causality within physical states, largely reflecting changes in entropy, the Fingelkurts suggest that these scales of organization can be used to understand brain operations as well as the phenomenological experience of time. Their key assertion rests on the functional isomorphism between phenomenological space-time and brain-operation space-time that forms a "hierarchical coupling between brain and mind while simultaneously allowing them to retain their individuality"(Fingelkurts et al., 2010, p. 228). The researchers conclude that the operational space-time of brain organization *intervenes* with both the neural architecture within the brain and subjective phenomenological experience, with which it is isomorphic (Fingelkurts et al., 2010).

The Fingelkurts' (2010) paper exemplifies attempts by researchers at the frontiers of science to reconcile the traditional barriers that have relegated philosophers and neuroscientists to their respective silos. The salient feature of the

paper is the researchers' inclusion of phenomenological experience as a domain of study and a reality that can be tied into a coherent scientific theory of consciousness. Since its publication, the Fingelkurts' paper has already garnered much attention; discussion and debate over its merits provide a glimpse into the future development of neuroscience, in which the mind and the brain are studied in a non-reductive way, paving the way for ever-more comprehensive theories on consciousness that elucidate our understanding of the mind and the brain as one coherent reality.

Further to the Fingelkurts' (2010) paper, and mindful of Bowers' (2000) critique of the scientist's tendency to attribute intelligence to the individual, I also support the efforts of Ken Wilber (1997), who has attempted to build an *integral theory of consciousness*, recognizing the cultural, historical, linguistic, evolutionary, and social structures which make human consciousness possible. Wilber (1997) states that "there is no individual consciousness. You cannot generate meaning in a vacuum, nor can you generate it with a physical brain alone, but only within an intersubjective circle with mutual recognition" (p. 83). Wilber argues that our collective consciousness is embedded in cultural and social signifiers at the very foundations of human organization; therefore, the study of consciousness should feature a more comprehensive approach that does not separate the brain from the mind, the intellectual from the emotional, the individual from the collective. Inherent in Wilber's thesis is the profound conviction, akin to that of the Fingelkurts, that "the universe hangs together, and thus an equally legitimate endeavour is to investigate, theoretically and methodologically, the ways that these elements are *intrinsically* hooked together as an unbroken Kosmos" (Wilber, 1997, p. 92). Efforts such as Wilber's represent a way

out of the materialistic reductions stemming from the mind/brain problem while offering us a more holistic way of viewing our place in the world.

Given the vigorous debates within the neurosciences regarding the relationship between mind and brain, researchers should at least be explicit about where they stand on the issue (Campbell, 2011). In this respect, I follow the neurophenomenologist, who holds cognition and consciousness as an embodied reality with an immanent lived experience that corresponds to the observed physical processes in the brain. The mind and the brain are, as it were, two sides of the same ontological coin. The perspective of embodiment, as articulated by Merleau-Ponty, offers us a non-dualistic way of seeing our place in the world: the earth is just as much within us as we are a part of the earth (Abram, 1988). While neuroscience provides insights into the crucial biological components of our being, it does not have a preeminent and exclusive claim on matters of consciousness, especially when its investigations preclude everything but the material. In this respect, neurophenomenology offers us a way forward in respecting subjective experience while remaining objectively rigorous in the observation of brain function. Varela's program represents a more humanistic way of conducting scientific research and a more holistic encapsulation of human experience. Although Varela only began to articulate the broadest contours of the neurophenomenological program before his death in 2002, many of his colleagues have continued to develop Varela's methodology. Antoine Lutz, a student and colleague of Varela, has conducted many studies on mindfulness in the years since Varela's death – his research stands at the forefront of the neuroscience of meditation (Lutz et al., 2004; Lutz et al., 2009). Richard Davidson's work shares much of the same methodological components as that of Lutz,

with much consideration given to the first-person reports of meditative experience (Davidson, 2010).

Viewed through Wilber's (1997) work on an integral theory consciousness, the neurophenomenological program attempts to connect the intentional quandrant with the behavioural quadrants in Wilber's (1997) model. In the next chapter, I will explore in detail some salient neuroscientific studies of meditation and consider their relevance to discussions of ecological consciousness. Going further in the final chapter, I consider how the growing knowledge of the brain may help inform pedagogical practice – more importantly, I examine whether a scientifically-informed program of mindfulness practice, implemented in schools, could effectively address the challenges of ecological devastation. By imagining how schools as socio-cultural institutions might affect mindfulness-based programs and vice versa, I bring this inter-disciplinary discussion into the social realm, and thus extend the study of mindfulness into yet another quadrant within Wilber's (1997) model.

Chapter 4 — The Neuroscience of Meditation

4.1 — Embodied Cognition

In the preceding chapter, I discussed the theoretical difficulties stemming from the mind/brain dualism and the ensuing attempts, both in philosophy and in science, to alleviate the tension through the development of non-reductive, embodied conceptions of consciousness. Neurophenomenology, as we have seen, proposes a pragmatic approach to the mind/brain problem by including in its methodology both objective measures of neurological activity as well as circumscribed first-person reports (Lutz et al., 2002; Varela, 1996, 2001). Although Varela's program does not provide a theory that definitively unifies the seemingly irreconcilable domains of mind and brain, his methodological proposal has nevertheless provided a platform from which a non-reductionistic neuroscience can proceed. My own survey and investigation of neuroscientific research, referenced throughout this current chapter, is conducted under the principles of embodied cognition proposed by Varela – chiefly, that observed neurological activity is understood as the physiological dynamics that attend subjective qualia in a cycle of reciprocal causation rather than as the physiological substrate or the material cause of subjective valences. If consciousness is enactivated within a somatic matrix whose workings are in turn affected by movements of consciousness, then the intertwining of the material and mental should provide multiple avenues from which the intricacies of consciousness can be explored. Because the mind and brain are two sides of the same ontology, neuroscientific studies of the brain supply insights into the workings of the mind; thus, observable changes in brain structure should evince corresponding alterations in the nature of consciousness. The evidence of neurological

development, therefore, should be considered the physiological side of mental alteration and – in some cases, at least – cognitive development. This embodied understanding of mind becomes the guiding principle of investigation as I examine the neurological evidence relevant to the *ecological consciousness* proponed by deep ecologists.

4.2 — Consciousness as Affective State

Within the theoretical discourses related to consciousness, from philosophy to psychology, *consciousness* may be used to denote anything from awareness, intelligence, cognition, to apprehension, to name merely a few possibilities. The context of the discussion infers much of the meaning ascribed to *consciousness.* In deep ecology, for example, the word may reference an overarching awareness of place and cognizance of one's own existence in relation to earthly surroundings. However, the broad use of *consciousness* in deep ecology cannot be readily transposed into neuroscience because a more specific denotation of *consciousness* and its constituent mental constructs is required if the neural dynamics related to mental processes are to be operationalized and measured in an empirical context. In essence, the manifold aspects of mentality, from empathy to memory, work in conjunction to form a multi-layered intelligence that is loosely referred to as *consciousness*. Neuroscientists have tried to tease out the physiological side of the constituent mental faculties that compose a working consciousness. In this chapter, I propose a more precise definition of ecological consciousness that can be operationalized within an experimental program, and

explore possible neurological constructs of egocentric and anthropocentric patterns of thought.

To posit an ecological consciousness, first of all, is to discern one profile of consciousness, with a specific set of defining traits, among others. Is neuroscience able to identify the physiological patterns that underlie certain patterns of consciousness? To instantiate this claim, I point to Richard Davidson's (1995, 2000) work on affective styles. Davidson (1995; Davidson & Irwin, 1999) has conducted studies on the neurological substrates of affective states, mapping out the patterns of brain activation in subjects who exhibit a positive dispositional affect. Davidson (1995, Davidson & Irwin, 1999) hypothesized that subjects characterized by positive baseline affect and outlook demonstrate certain patterns of neurological activation that are discernably different from those who routinely experience negative affect.[5] Through experimental collection of EEG data, Davidson and colleagues measured higher levels of electrical activation in the left hemispheric prefrontal cortex (PFC), a region of the brain crucial to emotional and informational processing, in subjects who reported positive affective style. By contrast, subjects who struggled to regulate their own emotional states in the face of a negative stimulus were characterized by higher levels of neural activation in the right hemispheric PFC (Davidson, 1995; Davidson & Irwin, 1999). The studies indicate that a resting baseline measure of neural activation can predict the dispositional affective style of the subject at hand – subjects with higher levels of left mid PFC activation reported stronger experiences of well-being and self-acceptance

[5] In Davidson's work, affect is defined as a combination of dispositional mood, emotion regulation and reactivity in response to emotional challenges (Davidson, 1995, Davidson & Irwin, 1999).

compared to subjects who exhibited higher right-mid PFC activation (Davidson, 1995). A similar study conducted by Urry et al. (2004) indicate that subjects with a pervasive experience of eudaimonic well-being, described in this case as the high endorsement of "autonomy, environmental mastery, personal growth, positive relations with others, purpose in life and self acceptance" (p. 367), also exhibit pronounced levels of baseline activity in the left superior PFC (Urry et al., 2004). Urry et al.'s (2004) study examines eudaimonic well-being in conjunction with hedonic well-being, an affective style typified by a prevailing sense of satisfaction and frequent positive affect. Whereas eudaimonia is nourished by a guiding sense of purpose and a willingness to sacrifice the experience of positive affect for the sake of personal growth and mastery, hedonic well-being is maintained merely by frequent positive affective states. Although both affective styles are correlated with higher levels of activation in the left PFC, subjects who enjoy eudaimonic well-being demonstrate even higher levels of neurological activity in the left PFC than their hedonic counterparts.

We may consider these neuroscientific findings as an example of the neurological extrapolations of a specific mental orientation. The list of mental traits that compose an affective style is, in effect, a psychological order, a fundamental psychic orientation that describes a particular *type* of consciousness. In so far as those who exhibit positive affect *feel*, *experience* and *behave* differently compared to those with negative affect, these subjects possess different profiles of consciousness. Also significant in this context is the neuroscientific appropriation *eudaimonia*, a concept that flows from a stream of philosophical thought originating with Aristotle. The neurological mapping of brain activation associated with reported data on the

experience of eudaimonic well-being instantiates a neurological model predicated upon a philosophical construct, whereby a questionnaire designed to qualify forms of well-being is used as an interpretive matrix through which neurological data is analyzed. Urry et al.'s (2004) study operationalizes a classic philosophical concept within the circumscribed boundaries of empirical experimentation – thus, neuroscientists have begun to decipher the physical side of what Aristotle argued to be the good life over two thousand years ago. If a life of virtue can supply a store of eudaimonic fulfillment, a claim now corroborated by scientific evidence, then by implication we can reasonably speculate on the possibility that a profile of an ecological consciousness, with its requisite capacity of emotional empathy and wide scope of self-identification, may have its own physiological correlate with observable patterns of neurological activation that is discernibly different from the more usual ego-centered patterns of consciousness.

4.3 — Neuroplasticity and Transformation of Mind

The noted asymmetry of baseline neural activity that characterizes positive affect raises other questions of great import for clinicians and educators alike. How can we promote greater positive affect? Neurologically speaking, how do we promote greater activity in the left PFC? In other words, how do we shift our consciousness in a specific direction? Such questions assume that consciousness can indeed be transformed in the first place. Under the model of embodied cognition, the shaping of consciousness implies changes in the structure and function of the brain. For much of the 20th century, scientific theories has held the brain as a physiologically static organ without the capacity to regenerate or revise its functional and structural constitution

after the period of developmental formation during childhood (Pascual-Leone et al., 2011; Pascual-Leone et al., 2005). Evidence of neuroplasticity, the brain's ability to generate synaptic connections and alter functional capacities throughout one's life span, has replaced the former view of the static brain. In fact, scientists now understand neuroplasticity as an intrinsic property of the brain, the very faculty that enable all forms of learning and adaptive behaviours in the face of rapidly changing environments (Pascual-Leone et al., 2011).

Scientists are continuing to learn about the physiological mechanisms and processes involved in neuroplasticity. Primarily, the growth of new neurons and the formation of new synaptic connections is attributed to the release of neurotrophins, a family of proteins that prevent programmed cell death, promote cell differentiation and neurogenesis (Bradshaw, Blundell, Lapatto, McDonald, & Murray-Rust, 1993). Neurotrophins include a variety of nerve growth factors (NGF), each with its own effects on the nervous system. Among these, brain-derived neurotrophic factor (BDNF) is the most active substance in promoting neurogenesis in the central and peripheral nervous system (Yamada & Nabeshima, 2003). Memory acquisition and consolidation, for example, is associated with increased expression of BDNF mRNA (messenger RNA, the blueprint for protein polymers), the correlation of which suggests the role of BDNF in promoting activity-dependent neuroplasticity (Yamada & Nabeshima, 2003).

The formation of new neurons and synaptic connections under the influence of neurotrophins is the normative feature of a functional brain in constant interaction with the external environment (Pascual-Leone et al., 2011). However, in regards to

shaping a particular kind of consciousness or cultivating a specific mental acuity, the literature on *use-dependent neuroplasticity* supplies further evidence of alterations in the shape of mentality. Repeated engagement in a certain mental activity activates and strengthens related neurological pathways, cultivating greater efficiency and processing capacity within these neural circuits, as the neurons that fire together also wire together (Hebb, 2002; Siegel, 2007). In effect, structural changes in the brain reflect lasting changes in consciousness and mental experience. Neurological data, then, serve to identify the physiological changes that accompany alterations in mentality, especially those intentionally evoked and developed through deliberate training.

If we look at how the cultivation of a skill necessarily entails alterations in the brain, the embodied cognitive paradigm becomes clearer. For example, the experience of music requires cognitive engagement; the listener must, on some level, apply attention to the auditory stimulus while following movements of harmony and the path of melodious flourishes. A higher level of cognitive engagement is required of the musician, who, in practicing the precise coordination of her fingers as she masters an instrument, employs particular neurological pathways in the sensory-motor cortex. The development of the musical skill is achieved through rehearsing precise muscular coordination in conjunction with musical sensory-input – thus, a skilled musician exhibits stronger patterns of activation in the somato-sensory and pre-motor parts of the brain (Gaser & Schlaug, 2003). The relationship between the development of skill and changes in the brain is clear: as the musician gets better at playing her instrument, her brain also shows signs of development specific to musical ability, both in the

increase in the number of neurological pathways and in the efficient activation of those pathways (Croom, 2012; Gaser & Schlaug, 2003; Koeneke et al., 2004).

Suppose we were given the neurological data measuring cortical volume in a specific region of the brain without being told that such patterns accompany the development of musicianship. Based on the paradigm of embodied cognition, we may reasonably infer that the densification of neurons in one brain region must correlate with the strengthening of a particular type of mental acuity. Further, triangulated against existing knowledge about regional functions within the brain, we may be able to speculate, in a generalized way, the type of activity that the subject engaged in. In this case, the thicker cortical volume in the right hemispheric pre-motor, somato-sensory and auditory cortex implicates a creative/artistic endeavor involving an audio stimulus. Because these regions of the brain are enlisted in musical tasks, we may reasonably guess that these structural differences resulting from long-term involvement in musical activity.

If we can use neurological data to substantiate the changes in the brain associated with the development of musical skill, then we may also be able to observe changes in the brain as a result of other forms of mental activity. More importantly, because the neurons that fire together wire together, we may see use-dependent structural changes in the brain as evidence of changes in patterns of consciousness. Here, I use *consciousness* generously to refer to all manner of subjective experience and thinking that constitute states of mind - therefore, consistent training in, say, mathematics may cultivate an acuity in mathematical reasoning that may be construed as *a type* of mental capacity and conscious experience. If, under the paradigm of

embodied cognition, changes in mentality should also be reflected in changes in the physiology of the brain, we may be able to infer changes in the subjective experience of consciousness by recording, using objective methods, the alterations in activation and structure within the brain.

4.4 — Neuroscience and Meditation

Considering neuroplasticity as an intrinsic feature of the brain, and provided that disciplined mental training (such as musicianship) induces structural and functional alterations in the neural pathways, it should come as no surprise that meditation, itself a rigourous and methodical form of mental training, should effect observable changes in brain structure. Research over the last two decades has revealed many of the neuro-dynamics associated with meditation, and ongoing experiments promise to further shed insights into the workings of the mindful brain (Brown & Ryan, 2003; Brown et al., 2007; Davidson, 2010; Ekman et al., 2005; Garland & Gaylord, 2009). Clinicians were among the first to take note of the psychological effects of meditation and have since recommended mindfulness based interventions related to stress reduction and pain management (Grossman et al., 2004; Kabat-Zinn, 1982); other clinical interventions include mindfulness-based cognitive therapy and mindfulness-based stress reduction (MBSR) therapy (Segal et al., 2002), acceptance and commitment therapy (Baer, 2010; Hayes & Pierson, 2005). Scientific data suggest that, in addition to promoting mental health, meditation may also improve immune function (Davidson et al., 2003). The growing consensus garnered by the mounting evidence affirms the efficacy of meditation in "modulating peripheral biologic systems that may

be consequential for health" (Davidson, 2008, p. 389). These mindfulness-based clinical interventions are designed to direct the conferred benefits of meditation in promoting psychological health – in other words, clinical interventions utilize the psychological/physical benefits associated with meditation to treat a variety of health issues.

Although goal-based interventions such as MBSR has proven to be effective in alleviating overall experiences of stress (Kabat-Zinn, 1982), of greater relevance to educators is how mindfulness transforms fundamental cognitive processes that underlie all mental functions. In essence, regardless of the many peripheral benefits conferred by meditative practice, mindfulness can be seen as a method of training that changes the integral constitution of the mind. Slagter et al. (2011) have pursued this very question and suggest that systematic mental training fosters core cognitive processes that are not stimulus or task specific. The authors argue that the metacognitive acuity generated by meditative attention promotes a process-specific learning (the meta-cognitive monitoring of attention, performance and management of working memory) that is generalizable to novel stimuli and task contexts; in other words, whereas task-specific neuroplasticity engenders increasing competence in one activity (say, musical ability) but not others, Slagter et al. (2011) argue that meditative practice enhances core cognition that can be flexibly utilized in many cognitive tasks (Slagter et al., 2011). Process-specific learning involves the meta-cognitive monitoring of attention, performance and management of working memory — as such, in contrast to the exact and specified goals of mindfulness-based clinical interventions, the core-

cognitive faculties cultivated in meditation suggest a reordering of cognitive function and a revision in the prevailing structure of consciousness.

What are the neurological transformations associated with process-specific learning and meta-cognitive acuity? How does meditation rewire and alter the structures of the brain?

Before such questions are addressed, a qualification of the term *meditation* will serve to specify the relevance of particular styles of contemplative practice and minimize the risk of semantic generalization. A variety of meditative practices have been devised in the Buddhist tradition, each with its own issue of teachings and emphasis. Davidson and Lutz (2008) have offered two categorizations to typify these various meditative techniques. Focused Attention (FA) refers to the method whereby attention is directed on a chosen object in an effort to sustain and deepen the quality of concentration as awareness becomes more stable and less prone to perturbations of discursive mental content (Davidson & Lutz, 2008). In FA meditation, the subject fixes attention on a localized area of somatic sensation — such as the subtle feeling of air pouring in and out of the nostrils in the continuous act of respiration — while remaining vigilant about the consistency and quality of somatic sensations. When attention drifts in pursuit of discursive mental events, the subject restores concentration back to the somatic object while relinquishing the distracting thought. Thus, FA meditation requires three regulative skills: the monitoring of attention without destabilizing the object of focus, the ability to disengage from a distracting object, and the ability to promptly resume focus on the chosen object (Lutz et al., 2008). Prolonged practice in FA meditation results in a reduction in the effort required to

sustain concentration. Lutz et al. (2008) suggest that "FA induces a trait change, whereby the attention rests more readily and stably on the chosen focus. At the most advanced levels, the regulative skills are invoked less and less frequently, and the ability to sustain focus becomes progressively 'effortless'" (2008, p. 164).

A complementary form of meditation style is deemed Open Monitoring (OM), which "involves a nonreactively monitoring the contents of experience from moment to moment, primarily as a means to recognize the nature of emotional and cognitive patterns" (Davidson & Lutz, 2008, p. 176). Instead of a specialized attention on a target object, OM cultivates a 'reflexive' awareness that "grants one greater access to the rich features of each experience, such as the degree of phenomenal intensity, the emotional tone and the active cognitive schema" (Lutz et al., 2008, p. 164). Lutz et al. (2008) suggest that the lucid, reflexive awareness cultivated in OM "leads one to a more acute, but less emotionally reactive, awareness of the autobiographical sense of identity" that "occurs with a decrease in the forms of reactivity that create mental distress" (Lutz et al., 2008, p. 164).

Functional MRI scans of subjects in states of FA and OM show the activation of brain regions unique to each meditative style: FA meditation is believed to engage the dorsal lateral PFC, the visual cortex, the superior frontal sulcus and the intra parietal sulcus; OM meditation is associated with activity in the anterior insula, the somatosensory cortex, the anterior cingulate cortices, the right ventral-lateral PFC, the ventromedial PFC and the amygdala (Lutz et al., 2008). Further substantiating these findings, Wang et al. (2011) mapped differences in cerebral blood flow within the same subjects as they performed different meditative tasks, including a breath-based

meditation akin to FA model of Lutz et al. (2008). Wang et al. (2011) report higher levels of blood flow occurring in the limbic and forebrain structures in the left hemisphere, including the hippocampus, amygdala, inferior frontal and superior temporal cortex, thus substantiating the areas and patterns of activation measured by Lutz et al. (2008) in FA meditation. Wang et al.'s (2011) study also identifies common patterns of activation in the left inferior frontal lobes, the insula and the superior temporal cortex in two different meditation tasks (the first, a mental repetition of a given mantra; the second, attention on the sensations of the breath, i.e. FA). These are the brain regions that play a pivotal role in mediating the effects of stress. Similarities and differences in cerebral blood flow associated with different meditative tasks suggest that a baseline neural activation accompanies all forms of meditation; since all meditative tasks involve the deliberate and sustained application of attention, we may reasonably surmise that a common pattern of neural activation is shared between FA and OM, if we utilize the heuristic categories devised by Lutz et al. (2008). Currently, there is more neurological data on FA meditation than the OM counterpart; future studies will now aim to map the patterns and regions of activation common to both styles of meditation (Lutz et al., 2008).

If the neurons that fire together indeed wire together (Hebb, 2002), then the patterns of left-frontal activation observed in FA meditation may induce structural changes in the left frontal lobe, resulting in a higher concentration of neural connections and higher levels of baseline activity, thus facilitating patterns similar to what Urry et al. (2004) describe as eudaimonic well-being. We may guess that the patterns of activation seen in meditators working in both FA and OM modes of practice

induce structural changes in brain regions associated with greater resilience against stress and higher reported experience of agency and positive affect. Functional imaging of cerebral metabolism and blood flow, which offer snapshots of physiological events, need to be further analyzed in relation to structural maps in order to establish a connection between meditative states and neuroplasticity. An observed structural difference in the brain regions implicated in meditative attention may suggest use-dependent neuroplasticity as a direct result of mental training.

A landmark study published in 2005 was among the first to identify the neural effects of meditation. Lazar et al. (2005) recruited subjects with a range of experience in insight meditation[6], from beginners to expert meditators with more than seven years of meditation experience. The authors first measured the subjects' respiration rates throughout meditation and discovered that experienced meditators demonstrated a significant drop in respiration rate during formal practice compared to novices. A computed magnetic measurement of the subjects' cortical volume revealed marked differences in the cortical structures of the subjects: experienced meditators exhibited notably thicker cortical volume in the dorsal lateral PFC, anterior PFC, and right anterior insula (Lazar et al., 2005). Two sets of correlation was established in Lazar et al.'s (2005) study: first, experience in meditation is associated with a slower rate of respiration during meditation; second, slower rates of respiration during practice is

[6] While FA/OM function as useful heuristic profiles in specifying the methods of meditation, we should note that prominent meditative traditions in Buddhism often use a combination of both methods. For example, novices practicing insight (*Vipasyana*) meditation often begin with FA to stabilize awareness before moving on to a reflexive investigation characterized by OM. Though Lazar et al.'s (2005) study examines practitioners of insight meditation, it is not clear whether the subjects practiced FA, OM, or a combination of the two.

associated with a thicker cortical volume in the dorsal lateral and anterior PFC. Although the authors refrain from drawing a causal relationship between meditation experience and cortical thickness, they nevertheless indicate that the structural distinctions in experienced meditators are most plausibly accounted for by use and experience-dependent neuroplasticity.

Lazar et al.'s (2005) study corroborates what was previously known about the neurological functions of meditation. Firstly, the identified areas of increased cortical thickness fall in line with the previously known patterns of activation associated with attention and the monitoring of awareness (Carter et al., 1998; Ridderinkhof et al., 2004). More notably, the activation of the dorsal lateral, anterior PFC and right anterior seen in FA meditation corresponds with increased cortical thickness in these respective regions, thus providing further evidence for use-dependent neuroplasticity. The strengthening of the dorsal lateral and anterior PFC suggest a higher integration of emotion and cognition, leading to greater emotional stability and equanimity in the face of stress.

The increased cortical thickness in the prefrontal, insular and somato-sensory regions of the brain have also drawn the attention of Daniel Siegel (2007), who hypothesizes that meditation strengthens emotional and empathetic capacities. Empathy, our ability to create internal resonance with the emotional state of another, is the work of mirror neurons, whose coordinated activity generate representations of another's mental state. Resonance is the functional outcome of attunement that allows one to feel what is felt by another person; it is the basis for empathy, social bonding, and connection. This attunement allows us to be sensitive to the experiences of others

and informs our responses as we tailor our behaviour to appropriately meet the mental condition of our correspondents. More importantly, clusters of mirror neurons that form the resonance circuitry lie along regions of the brain purportedly strengthened by meditation in Lazar et al.'s (2005) study. The strengthening of these brain regions has led Siegel (2007) to propose the hypothesis that meditation cultivates emotional and empathetic attunement.

Many more studies are needed to put this hypothesis to the test. Meanwhile, however, the available evidence invites speculation regarding the role of meditation in promoting broader empathetic connections. Might meditation strengthen, not only inter-personal attunement, as Siegel (2007) suggests, but also ecological attunement, the emotional connection to the many members of the earth community and indeed the earth itself? If meditation strengthens core cognitive processes that can be applied to all forms of cognition, as Slageter et al. (2011) have suggested, then it is within reason to posit that the empathetic capacities cultivated in meditation are not only available to the human world, but extend also to animals, landscapes and the earth itself. For as long as empathy remains a salient feature of an emotionally responsive mind, it is entirely possible that we can empathize, not only with the suffering of other human beings, but also with the plight of other species. A core empathetic process, therefore, may be occurring in the resonance circuitry regardless of what subject is empathizing with. This capacity to feel internally what is observed externally may be a crucial part of an ecological consciousness, as any adequate response to the ecological crisis requires our ability to *feel* both the joy of terrestrial exuberance as well as the pain of environmental devastation.

4.5 — Meditation and Unitary Experience

With evidence of use-dependent neuroplasticity resulting in stronger emotional cognitive integration, an important modulating function in profiles of positive affect (Urry et al., 2004), we may turn our attention now to aspects of neurological function that pertain to the aspects of anthropocentrism and egocentrism laid out by deep ecologists. Recall Berry's (2000, 2006) indictment of anthropocentrism as the motive force behind the negation of the fundamental integrity and inter-dependency of the ecological system. In further elaboration on Berry's charge, Loy (2003) has submitted a diagnosis of the ecological problems as "the perennial personal problem writ large, a consequence of the alienation between [the self] and the world. . ." (p. 172). Loy (2003) sees self-centeredness (egocentrism) as the individual side of a broad system of anthropocentric impulses; rigid, unyielding self-adherence at the individual level plays out collectively in the form of ecological destruction. Can this specific profile of consciousness be appropriately circumscribed within a neuroscientific context, just as Urry et al. (2004) have done with Aristotelian *eudaimonia*? If Loy's argument can be examined through the embodied approach to consciousness, then a neurological model of an "ego" or "self" is required before any empirical venture can be meaningfully attempted.

The establishment of a trans-disciplinary, neurological construct of "self" is required in order to avoid the problem of comparing incommensurate models of "self". Yet, there cannot be a single neurological mechanism that constitutes a sense of a distinct *self*. For example, while the hippocampus enables the formation of memory, furnishing the narrative landscape of an *auto-biographical self*, the limbic system

generates an emotional dimension to accompany experience, providing the subjective valence underlying what the self *feels*. In fact, every function of the brain, in some form or another, contributes to a multi-layered *selfhood*. There is, therefore, no *self* within a specific neurological region or circuitry since the maintenance of multiple somatic and mental functions is distributed throughout the entire brain, the integration of which enables coherent cognition and behaviour (Varela et al., 2001).

Because a *self* is complex and its various functions regulated by multiple structures within the brain, I will limit discussion to one *aspect* of self rather than propose a definitive and complete conception. Specific to the neurological experiments conducted by Andrew Newberg et al. (2001), I point to the somatosensory self, the experience of an "I" situated within a somatic matrix that is physically oriented within the world. Newberg et al. (2001) describe the Orientation Association Area (OAA), located in the posterior section of the parietal lobes, as the region that creates a three-dimensional sense of 'body' through the extrapolation of data from multiple sensory modalities. Using a SPECT camera (single photon emission computed tomography), Newberg et al. (2001) determined the brain activity of experienced Tibetan Buddhists at the peak moments of meditative experience[7]. Researchers note a significant decrease in activity in the right hemispheric OAA. The decrease in activity in this brain region, Newberg et al. (2001) posit, corresponds with the subjects' experiences of dissolution and unification with a larger existence as the subject's sense of a physical

[7] The meditative task employed in the study is described as an attempt to reach "a subjective state characterized by a sense of no space, no time, and no thought" (A.B Newberg & Iversen, 2003, p. 283). Although a conclusive equation cannot be drawn, this description, taken at face value, would seem to place the method under the category of OM meditation.

self is significantly attenuated in moments of meditative absorption. The physiological side of this subjective experience of unification is attributed to the deafferentiation[8] of the OAA.

The degree of deafferentiation of the OAA corresponds to variations in the subjective experience of self dissolution – total deafferentiation is experienced as what D'Aquilini and Newberg (1999) calls absolute unity being (AUB), a state of "rapturous transcendence" (p. 113). According to D'Aquilini and Newberg (1999), the experience of AUB is precipitated by two conditions: the deafferentiation of both the right and the left OAA.

4.6 — Discussion

In light of Newberg's et al.'s (2001) findings, I raise the question of whether such meditative experience have any relevance to Berry and Loy's charge against anthropocentrism and egocentrism. At the very least, Newberg et al.'s (2001) data can be usefully analyzed through embodied cognition: we can say that the experience of unification with the universe through the dissolution of a somatosensory self is corroborated by the evidence of, and correlated with, the decreased activity in the OAA. Further, the experience of bodily dissolution may in fact be one, albeit limited, way of opening oneself to a non-egocentric, or anthropocentric way of experience.

[8] The reduction in nerve impulses moving toward the brain. The deafferentiation detected in the OAA is connected with activation in the thalamus. A relay center from which somatic input is wired throughout the brain, the thalamus triggers the release of the inhibitory neurotransmitter GABA during meditation, which blocks sensory input into the OAA (A.B Newberg & Iversen, 2003).

However, because unitary experience occurs during moments of peak meditative absorption, it should be considered a transitory state of altered consciousness. A perpetual deafferentiation of the OAA may prove to be problematic, because a fully afferent somatosensory cortex is crucial in modulating physical-spatial processing in day-to-day life. Unitary experiences, therefore, cannot be a useful normative mental state. The question now remains whether the momentary attenuation of the posterior parietal lobe affects long-term neurological function. Can the dissolution of the awareness of the bodily self in a moment of mystical rapture efficaciously instigate neurological changes in ways consistent with the profiles of ecological consciousness?

For one, the wide circle of identification proposed by Naess implies the transcendence of self-identification as one begins to experience the ontological reality of the ecological community as the inextricable condition of one's very existence. Whether the dissolution of the somatosensory self during peak experiences in meditation fulfills Naess's vision of self-transcendence remains very much in question. Newberg et al. (1999) have hypothesized that the deafferentiation of both the left OAA, the brain region involved in maintaining the self-other dichotomy, and the right OAA trigger the experience of AUB. Two difficulties arise in this suggestion. First, Newberg and D'Aqulini (1999) do not expound with sufficient clarity the parameters of the *self* purportedly maintained by the left OAA – is this *self-other dichotomy* engendered by the perpetuation of an autobiographical narrative for example, or might it be some other function of the mind in the discursive construction of self? Second, functional imaging data offers little evidence of left OAA deafferentation compared to right OAA (Newberg

et al., 2001). In subsequent publications, Newberg et al. (2001) gloss over the previous hypothesis regarding the left OAA, choosing to elaborate instead on the more salient deafferentiation of the right OAA (Newberg et al., 2001). With only the deafferentiation of the right OAA to work from, we may posit that the dissolution of a felt bodily self, may have *some* relevance to matters of sustainability and ecology because it offers a snapshot of the physiological manifestations of alternative states of mind, one that may prove to be important as we attempt to move away from anthropocentric assumption. However, a final equation between right OAA deafferentiation and ecological consciousness cannot be drawn.

In one sense, the somatosensory self may be seen as a neurological picture evocative of what David Loy (2009) calls the ". . .construction of a separate self *in here*. . . and the construction of an 'other' *out there,* that which is different from me" (Loy, 2009, p.105). In other words, right OAA deafferentiation may expunge the bifurcation between the *bodily self here* and the world *out there*. The attenuation of the somatosensory self, then, is a glimpse into a mode of awareness whereby one relinquishes a sense of one's body, thus opening the possibility of experiencing the world as one's own body, far beyond the duality of self and other. Deep ecologists have been primarily concerned with anthropocentrism and its corollary bifurcation between the human species and the ecological system. Indeed, it is the continuous experience of duality that weaves together a pattern of destructive behaviour, as if what we do to the ecological base has no effect on our selves. If this pervasive sense of duality is disrupted, even momentarily, we might glimpse another mode of awareness and being, an alternative pattern of perception that throws into relief the fixations on self that

exert such a relentless grip on our lives. Although neuroscience does not yet offer answers as to the lasting effects of such unitary experiences, we may nevertheless see meditation as one part of that larger endeavour to reform consciousness, individual and collective.

Still, the ephemerality of peak mystical experiences raises questions about their ability to produce lasting effects on consciousness. Subjective reports indicate that the depth and vibrancy of these experiences leave lasting impressions on the meditator (D'Aquili & Newberg, 1999). However, are these impressions sufficiently powerful enough to instigate lasting structural transformations? Mention has been made to the physiology of neuroplasticity – repeated activation results in the growth of new neurons and synaptic connections. While many studies have confirmed changes in cortical structure attributed to use-dependent neuroplasticity; we do not yet know the long-lasting effects of deafferentiation. Use-dependent neuroplasticity builds upon neural activation — working pathways are strengthened through repeated engagement in a certain cognitive activity. Afferentiation denotes the movement of nerve impulses to the central nervous system. In other words, neural activation and neural afferentiation are not the same physiological events – the former refers to the firing of the neurons themselves, the latter involves the transport of sensory information to the neurons. Therefore, the attenuation of neural activity from deafferentiation should be distinguished from the neural deactivation itself. Because Newberg et al.'s (2001) study was designed, not to address questions of neuroplasticity, but to investigate the physiology of mystical experiences, the findings raise more questions about the long-term impact of unitary experiences. Even though there is ample evidence of use-

dependent neuroplasticity, the neurological effects of deafferentiation is less certain. We cannot know from Newberg et al.'s (2001) work whether repeated deafferentiation of the right OAA through meditation results in the thinning of the right posterior parietal cortex. Even if such a thinning were to occur, we might wonder about the practical consequences of meditators having to negotiate physical spaces with little or no somatic orientation!

According to Aldo Leopold (1986), ecological consciousness is not merely a transient state of mind; it is, rather, built on an internal set of "intellectual emphasis, loyalties, affections and convictions" (p. 246) that informs an ethical life. It is unlikely that unitary experience would constitute the whole of the ecological consciousness; it may however, offer a glimpse into an alternative state of consciousness that operates as a distinct contrast to egocentric fixations. More importantly, even though unitary experience is often considered the apotheosis of meditative experience, Buddhist contemplative traditions tend to discourage the pursuit of blissful states of consciousness. The discipline of mental training is itself the challenge and the reward – euphoric experiences and insights are treated as incidental and peripheral to the main work of cultivating awareness. Thus, the real impact of meditation may lie in its methodical rigour in schooling attention and shaping cognition, irrespective of mystical, transcendent experiences. In this sense, the deliberate application of concentration and sustained direction of focus may also be seen as a way to loosen ego-centric patterns of thought. Although there is neuroscientific evidence to support the effectiveness of meditation in promoting attentional stability (Lutz et al., 2009), we do not yet know if meditators' thought contents tend to be less ego-centric. However, since meditative

methods aim to stabilize and strengthen an awareness that is unperturbed by discursive thought, we may surmise that the very attempt at meditation, even if unitary states are never reached, disrupts ego-centric patterns of rumination. The neurological imaging of peak meditative experience, therefore, should not be considered the only evidence of changes in consciousness.

Further, meditation might cultivate a quality of awareness with which one may attend to and observe the natural world with greater openness and sensitivity. Meditation is an experience of the mind, a close phenomenological encounter with the immediacy of perception and cognition. The observation of one's own mental landscape highlights the conscious awareness that underlie all perception and cognition. I submit that a more stable, sensitive and refined mind is better able to experience the natural world in its wonder and beauty. An open mind attuned to the subtle moods of the land and the sky is more likely to appreciate the living vibrancy and ontological reality of the earth. Granted, the ecological consciousness envisioned by deep ecologists include a comprehensive system of principles and ethical touchstones that cannot be fully enacted without explicit and systematic discourse, it is also difficult to imagine such an ecological consciousness in its full maturity without an attentive psyche that experiences the earth as a sacred and wondrous emanation of universal fecundity, worthy of reverence and moral consideration. Therefore, a stable and sensitive mind unfettered by personal obsessions is a basic requirement for an ecological consciousness, though not its complete fulfillment.

A sensitive attention to the natural world needs to be cultivated alongside a comprehensive ethical system if we are ever to adequately address the dire challenges

posed by the ecological crisis. Meditation alone, in its western appropriations, cannot fully effect a revolution in consciousness, because the secular, clinical adaption of mindfulness techniques, severed from its Buddhist roots, negates the values and beliefs that surround meditative practice. A *neutralized mindfulness technique* removes the ethical grounding that is essential to the formation of ecological consciousness. The explicit discourse surrounding meditation in Buddhist traditions tend to extol the virtues of a non-discriminatory compassion akin to the wider-circle of identification raised by Naess. Thus, the express values concomitant to meditative practice are very much in line with an ecological world-view. Meditation should be understood as the subjective, empirical and phenomenological investigation that accompanies a package of values. Attempts to appropriate meditative practice in a completely secular context, severed from the values for which it is designed to work in conjunction, may limit its effectiveness in reforming egocentric patterns of thought.

Given the available neuroscientific evidence on the effects of meditation, there is much to suggest that meditation indeed alters the brain and therefore the mind itself. In addition to building attentional stability and positive affect, meditation may play a role in strengthening emotional and empathetic attunement, though the research is still in the most nascent stages. However, the ecological consciousness envisioned by deep ecology seems to demand much more of our collective psyche than what is offered by meditation alone. The results of neurological studies surveyed in this chapter provide some points of consideration from which an embodied approach to ecological consciousness can take shape. In the next and final chapter, I will consider the limits of

meditation as an educational tool and the larger pedagogical program that is required in order to usher in a pervasive ecological consciousness.

Chapter 5 — Conclusion

On the eastern edge of a small desert village, a man appears on the horizon, riding on a hippopotamus. The animal lumbers painfully on the baking sand, blowing hot, moist air through its cavernous nostrils. The villagers are fascinated and puzzled by the strange scene, never having witnessed such an unusual beast of burden. As the man passes the inn, the first building on the outskirt of the desert town, the inn keeper, unable to contain his curiosity, hollers to the traveller:

"Where are you going with that beast there, sir?"

"Heading west for the golden city," answers the traveller

"Just when do you plan on being there riding on an animal like that?"

"I was hoping to make it by the end of the week," said the traveller.

"The golden city is over five hundred miles away. You'll count yourself lucky if you cover a quarter of that distance at the rate you're moving." The innkeeper chuckled.

"Well, how do you propose that I get there, then?" asked the traveller.

"What you need there, sir, is a very swift horse."

"And where would I procure such an animal?" inquired the traveller.

"There is a livery stable in town. You'll find some good steeds there."

The traveller curtly nods to the innkeeper and continues on his journey. At the livery, the traveller alights the exhausted hippo and produces a sack of silver from his cloak at the sight of the groom.

"Here's silver for your finest steed, sir" the traveller offers.

"Your silver will do much to pay my poverty had I the goods to complete the exchange. All of my horses are famished from the draught. There are no swift steeds here." The groom laments.

"Is there nothing you can do to hasten my journey?" The traveller asks.

"All I can offer you are a freshly forged set of horseshoes."

"If I cannot have the horse, I shall have the horseshoes." The traveller declares.

The groom gesticulates to the farrier, who measures the indolent hippo's trunks and disappears into the blacksmith's shop. An hour passes with the pounding clang of metal and hissing steam. The farrier emerges with four black rings and, with expert ingenuity, manages to fix the shoes on the corpulent hippo.

The traveller mounts the animal with renewed confidence. The hippo lunges forward, thumping the dusty ground with its new ware. The traveller smirks as he tips his hat to the groom and the farrier. His pockets heavy with silver, the groom snickers in disbelief at the absurd sight of the man fading slowly behind the swirling mirage of heat and dust.

5.1 — Mindfulness and the Education System

I began my discussion by presenting the ecological crisis as a consequence of the extent to which our way of life – including our system of education – is predicated upon assumptions of industrial and economic growth (Orr, 2004). The guiding ideas about the purposes and methods of education serve the development of a human economy without regard to ecological consequences, a conception rooted in anthropocentrism and a sense of separation from the natural world. I have presented these assumptions as an existential orientation, a pattern of consciousness that shapes our thoughts and behaviour, individual and collective. Without diminishing the need for cultural, economic, technical, social and a host of other reforms, I have looked at ways to address the psychological crisis behind the ecological crisis, noting ways that current trends of thought and behavior might be steered toward an *ecological consciousness*, discussed extensively in the philosophy of deep ecology. Essentially, educational efforts to cultivate this ecological consciousness must mend the broken psychic bond between the human species and the earth; I have examined, with reference to neuroscientific data interpreted through the paradigm of embodied cognition, the possible ways that meditation might promote this pattern of consciousness. I submit that, given the preliminary evidence, we should seriously consider the possibility that meditation can nurture a mentality that favours experiences of unity over dualism, identification over disassociation, and empathy over apathy. Empirical evidence and theoretical arguments support the hypothesis that the methodical training of focused attention and open awareness is a necessary component in the reconditioning of consciousness that is an important part of efforts to meaningfully address the ecological crisis.

However, this conclusion has no straightforward implications for educational practice in public schools because the adoption of an eastern contemplative practice in a western context is fraught with complexity. I have mentioned that the first westerners to examine the effects of meditation in a scientific context have been clinicians interested in the therapeutic potential of meditation (Kabat-Zinn, 1982; Siegel, 2007). Their aim was primarily the design of a mindfulness-based therapy in addressing mental health problems such as stress and pain. A linear paradigm is at work: meditation is used as the solution to the problem of stress and pain; meditation, in this case, is seen as a means to an end, a mental exercise that alleviates or moderates a variety of health issues. However, Buddhists tend to see the mitigation of afflictions as peripheral benefits incidental to the rigourous program of mental training practiced within the Buddhist tradition. Western clinicians have, in effect, utilized the mental and physical side effects of meditation in the process of appropriating an ancient contemplative practice. The significance of this modern appropriation can be interpreted in two ways. Firstly, the advent of mindfulness-based therapies signals the importation of religious knowledge from Buddhism to a more secular, modern context. Given that meditation, as a technique, builds on an attitude of first-hand empiricism and experimentation, the practice constitutes a method of contemplation, a phenomenological framework from which to conduct a systematic investigation of the mind. In this sense, the *technique* of meditation may transcend its religious origins and require no numinous commitments on the part of the practitioner. Thus, in strictly speaking of the technique, meditation need not be exclusively *Buddhist*. Secondly, by instantiating the health benefits of meditation as the chief rationale for practice,

western scientists and clinicians have transformed the meditative tradition in the process of transplantation, coaxing the practice along a new path of evolution away from its contemplative roots and into a therapeutic context. The western perspective on mindfulness practice, seen as an exercise in promoting personal wellness, both physical and mental, differs from a Buddhist view that sees meditation as a way to cultivate the wisdom (*prajna*) that helps one to appreciate life's meaning and alleviates fears of pain and death. Whereas Buddhists will undertake meditative training as a soteriological act that addresses the dissatisfaction and pain inherent in the experience of human life (Federman, 2011), western practitioners adopt the practice as a way to enhance mental and physical health. The former perspective views meditation as a way to untangle the neurotic habits of mind, a practice that reveals and radically alters the discursive and misleading assumptions about the nature of self. A western clinical approach, by contrast, does not advance meditation as a way to address an existential condition – rather, clinicians may see the practice as a healthy mental exercise to be utilized in the promotion of happiness.

With regards to the appropriation of meditative practice, we should emphasize that the cultivation of wisdom (*prajna*) through meditation is only one practice among a larger program of reformatory efforts within Buddhism. For instance, the eight-fold path[9] advocates a set of ethical precepts that form the foundation of the path of personal transformation. That "right meditation" is only one precept among eight

[9] The eight-fold path is one of the foundational teachings of Buddhism. Essentially a list of the requirements for a life free of suffering, the eightfold path emphasizes the role of wisdom, ethical conduct and mental concentration for Buddhists working toward spiritual liberation. The eightfold path includes: right view, right intention, right speech, right action, right livelihood, right effort, right mindfulness and right concentration (Buddha & Wallis, 2007).

shows that it is never meant to be practiced in isolation from the other injunctions; meditation may never confer its full effects in shaping consciousness without the complementary benefits of other practices. That the technique of meditation does not require religious or metaphysical commitment may mislead us to believe the practice to be a neutral vehicle, a method that can be readily taken up in a secular context without curtailing its benefits. However, to take the technique on its own without the larger foundation of teachings and values from which it arose, to highlight one practice over the wider program of which meditation was intended to be only a part, is to change the practice altogether in the process of appropriation. Meditation should be seen as a part of a suite of injunctions that altogether offer a view of what constitutes a meaningful, moral and virtuous human life. Although meditation need not be practiced exclusively in a religious context, the practice requires the support of a package of values and intentions that complement and augment the objectives of meditative training.

Given that the Buddhist teachings have paid close attention to the nefarious effects of an unbridled ego, it should come as no surprise that meditation, the practice of which requires the meditator to halt her identification with waves of self-centered thought, should play a central part in the Buddhist program. Meditation, in this sense, is a contemplative practice that naturally issues from, and is a complementary supplement to, a particular view of the human condition; therefore, a thorough exploration and full utilization of its benefits is only within reach when the technique is practiced in conjunction with a set of compatible views. The importation of the technique itself without including the concomitant views that furnish a complete vision of personal transformation must throw the effectiveness of meditation into question.

To illustrate, might we be convinced of the efficacy of meditation in promoting ethical conduct and ecological consciousness within a social institution the implicit and explicit culture of which is based on personal gain and material accumulation? Here, a meditative practice that requires one to detach oneself from thoughts of personal gain and return attention to the immediate present seems starkly at odds with the expressed values of the institution. We cannot expect a technique of mental training to transform people under the influence of a prevailing culture if we are not willing to question and alter the ongoing norms and values maintained by that culture.

The hope of cultivating an ecological consciousness in an educational context, then, cannot rest solely in the practice of a contemplative technique, but in the formation of a wider set of values, views and beliefs about the world. Given that meditation, undertaken under appropriate conditions, can moderate habits of self-centered thinking while promoting openness of attention and awareness, educational efforts at promoting ecological consciousness may find the practice useful in shaping mental spaces that allow for an appreciation of, and empathetic connection to nature. Such an ecological consciousness, as deep ecologists have argued extensively, must limit ego-centric and anthropocentric impulses in the effort to maintain the essential ecological balance. On the pedagogical front, this means the creation of a curriculum with the explicit goal of 1) reorienting views of an authentic human life away from selfish material gain and towards ecological balance 2) re-establishing a connection to and respect for the ecological community. Such a program of environmental education, I imagine, would provide ample opportunities for students to explore and develop an appreciation for natural spaces, and to cultivate the sense of place and belonging that

Arne Naess deemed to be essential to an ecological ethic. The connection to land and contact with natural ecological systems must be the constitutional principles of, not the peripheral addition to, this system of environmental education. A course on environmental education that supplements the mainstay programs in science, literacy and mathematics cannot be a sufficient educational response to the ecological crisis, because without a thorough revamping of the educational system (and the complete re-envisioning of the purposes of education required by such work) the industrial/economic model of education that contributes to the ecological crisis remains intact (Orr, 2004). Ecology, therefore, must be the underlying thread that interweaves all knowledge. The design of ecological education should aim to cultivate a curiosity and a love of the ecological world while furnishing the skills of judgement and analysis that empowers students to evaluate the impact of human action on the entire ecological community.

Imagining this system of education with its store of eco-centric values, a meditative practice may be used as a way to prime the core cognitive faculties of attention so that students may relate to the natural world and the ecological community in open and empathetic awareness. The cultivation of this core attentional faculty through training may be seen as the priming of observational capacity that is actualized in direct and frequent contact with nature. In other words, while mental training through meditation may deepen qualities of awareness, only when such awareness is applied in direct contact with nature can an ecological consciousness begin to take shape. To take an example from the social realm, Daniel Siegel (2007) has mentioned that the neural circuits responsible for empathetic, inter-personal connections are the

very circuits activated in meditation, suggesting the role that mindfulness practice may play in promoting inter-personal attunement and pro-social behavior. Even if meditation does confer such benefits, we can hardly imagine this capacity for interpersonal attunement having any practical value if practitioners never chanced upon another person, never interacted with others or were never required to meet the emotional needs of others. In other words, a core cognitive and emotional acuity cultivated in the neutral and space of meditation must be galvanized and actualized through real-life interactions. The same is true for efforts to cultivate an ecological consciousness: mental training instills the psychological qualities that are actualized in contact with the natural world; awareness becomes acute when students learn to observe the intricacies of natural phenomena; identification is possible when children have an opportunity to experience the multiple wonders of the wilderness. Educators cannot naively assume that the practice of meditation in isolation from nature promotes the ecological consciousness proposed in deep ecology.

That said, the current educational establishment continues to prime students for a techno/industrial world without so much as taking notice of the ecological catastrophe at hand. Almost every aspect of the school system as we currently know it is tuned to the rhythms of an industrial/technical society: fixed schedules around the year pay no attention to the changing seasons and natural life cycles; academic disciplines are taught in isolation from each other without emphasis of their relatedness; rankings based on test scores insinuate a social order based on competition rather than cooperation and inter-dependence; classrooms are used by default as the space of learning, intimating the disconnection between knowledge and

nature. Most importantly, current school models tend to see students as future workers and consumers – education merely supplies one with the credentials for a life of economic exchange. These are merely a few symptoms of underlying an education system designed solely for a human world, a system that views the ecological world as a secondary occurrence to the main project of human advancement, personal and collective. Meditative practice has very little to offer to this industrial/technical model of education; it instills no employable skill, spurs no motivation toward competition and breeds no practical knowledge. In fact, the educative value of contemplative practice run counter to the values of industrial/consumer society in many ways – the former imagines an authentic well-being rooted in a certain state of being, the latter imagines well-being as a function of pecuniary abundance. Without a thorough examination of the assumptions that underlie our current ideas of education, meditation in schools will remain at best an innocuous and pleasant novelty, or at worst an irrelevant and puerile exercise championed by a naïve few. So long as we imagine our future to be technological and economic, educators are not likely to pervasively embrace mindfulness practice as an educative tool in a wider program of ecological education. Even in schools where meditation is practiced, its salutary effects are likely to be negligible under the weight of a dominant economic ideology.

In surveying the neurological effects of meditation and considering how meditative practice might cultivate patterns of awareness and thought consistent with profiles of ecological consciousness, I have identified one method with a potential to help shape a more eco-centric future. However, in considering meditation as an educational tool, the importance of the larger educational landscape becomes more

apparent. If we are beginning to see the effectiveness of meditation in promoting greater identification with the ecological world, then we cannot help but be astonished at the staggering reality of the current educational establishment, with its dogged adherence to the technical economy and its hostility to a contemplative and ecological vision of education. The practice of meditation requires a foundational suite of values that formulate a vision of an authentic and meaningful human life. Deep ecology has insisted on an eco-centric, or life affirming, ideal of human organization. In other words, the integrity and health of the ecological community should be the ultimate measure of human action. An ecological pedagogy would attempt to critically examine all aspects of human behavior, including population growth, energy consumption, culture and politics, just to name a few. Ecology must be the thematic thread that inform every aspect of education; it is only when the overarching structure of education, explicit and implicit, fall in line with an ecological philosophy that meditative training and the practice of empathetic identification becomes most effective.

5.2 — Neuroscience and the Ecological Era

Considering the ideological gap between and industrial/technical and eco-centric model of education, we might see the scientific investigation of mind as a way to bridge the two spheres. If education is a persistent and systematic attempt to shape consciousness, then science may provide empirical data on the physical side of consciousness, mapping out neurological events that correspond with mental events. While the industrial/technical ideology may not readily acknowledge the import of spirituality, empathy and ecological consciousness as valid mental faculties,

neuroscience has attempted to examine all aspects of consciousness and therefore continues to keep the physiological investigation of contemplation under its purview. Continuing research on the effects and meditation and the neurological basis for transcendental states of consciousness can potentially contribute to evolving theories about the human mind; as our understanding of the mind develops with the expanding neurological picture of consciousness, educators must pay special attention to developments in neuroscience, the insights from which provide valuable insights into the workings of cognition (Federman, 2011).

This does not mean, however, that neuroscientists face no theoretical challenges to their work, given the continuing debate around the hard problem of consciousness (Chalmers, 1995) and the disagreement between theorists who adhere to a material view of mind (Churchland, 2007) and those who hold subjective experiences in higher esteem (Thompson, 2004). Even if these theoretical disputes are not settled any time soon, the process of research, discussion and debate should provide ample opportunities for educators to forge their own discourse based on an educational neuroscience, a field of research specifically targeted at the science of learning (Campbell, 2011).

Admittedly, reductionism remains a perennial trap in a physical science of the mind. In my discussion, I have taken pains to lay out a paradigm of embodiment that at least enables the layperson to broach the subject of neuroscience without being ensnared by the clutches of reductionistic materialism. The embodied mind put forward by Varela (1991) remains one of the more balanced theories within the philosophy of mind; further, Varela's methodological proposal in the form of neuro-

phenomenology exemplifies a neuroscience informed by both objective and subjective data. It remains to be seen, however, whether Varela's methods will be widely adopted in the neuroscientific community outside the circle of Varela's colleagues. Furthermore, even under the neurophenomenological paradigm, we await a viable method of phenomenological reduction through which reliable, consistent and rigourous first-person investigations can be conducted. Husserlian phenomenological reduction and Buddhist meditation seem to place far too great a demand on the subjects in terms of training to ever lend themselves to widespread experimentation. An easily learnable, yet rigourous and circumscribable method of first-person investigation will go far in closing the explanatory gap between subjective experience and objective physiological events. Experimentations involving neuro-feedback, however, whereby the subjects, connected to an interactive computer program, must deliberately induce a specific attentional state in order to manipulate an object presented by the computer program, are promising. Neuro-feedback may help researchers learn how the monitoring of attention, itself a form of phenomenological investigation, corresponds with the observable changes in the brain. Even though the research involving neuro-feedback only examines very limited aspects of cognition, it nevertheless provide a set of parameters through which subjective investigations can be reliably conducted.

If insights about the brain uncovered by neuroscientists are contributing to our evolving understanding of the mind, we must once again wonder, as we did with the transplantation of meditative practice, if existing educational institutions take seriously the physiological side of learning. Do current educational theories understand learning as a physical event? If so, then physiological data should provide valuable feedback on

the effectiveness of pedagogical methods. Here again, an educational neuroscience will provide the most relevant and necessary research into the neurological underpinnings of learning. Most importantly, educational neuroscience will likely acknowledge the social and institutional context of learning and thus design experiments within the complex learning environments that students and teacher find themselves engrossed in. After all, it is one thing for neuroscientists to map the neurological effects of meditation in the controlled confines of a laboratory, measuring the effects of meditation in the classroom, with its countless variables, is an entirely different endeavor.

C.A. Bowers (2000) has critiqued the way science construes consciousness as the property of the individual, ignoring the vast sphere of social and cultural exchange which shape our individual and collective mentality. Bowers' (2000) complaint echoes the work of Ken Wilber (1997), who attempts to connect the sociological theories of consciousness with the scientific study of the neurological processes that underlie thought. To pick up on Bowers' tune: if the neuroscience provides a picture of a brain in meditation, we might wonder about the social influences and values that have informed the meditator's practice, how her participation in a collective may have influenced her contemplative life. Are there social norms in addition to meditation that may have augmented the practice? If these influences exist, how much can we attribute the identified neuroplasticity to meditation over the other socio-cultural practices? We must note that the transmission of meditative techniques is a social act – teachers explicate the technique and address inquiries as they arise; students meditate in groups in accordance to a daily schedule. Further, a culture of introspection is shared by communities of contemplatives in meditative settings: Buddhist monks and western

novices often commit themselves to silence and abstinence during meditative retreats in order to fully explore and utilize the technique as they venture deeper into the innermost recesses of their minds. The social context of contemplative practice is therefore crucial to the successful cultivation of awareness. We might argue that a full experience of the benefits of meditative technique is only possible under the guidance of a supportive community organized around the nurture of contemplation. Very few people learn to meditate alone. So in drawing out the educational import of the neuroscience of mindfulness practice, we should at the same time attend to the question of how schools as social institutions, designed to promote certain goals, economic or ecological, can influence the implementation and the results of mindfulness programs. Thus, Wilber's four-quadrant model of integral education requires us to consider how neuroscience might play out in the social realm of educational practice, where the confluence of the personal, cultural and structural aspects of learning add further layers of complexity to the question of how we can promote ecological consciousness.

In considering the social context of meditation, educators might ask an important question: what kind of organizational, institutional and philosophical context is required in order for meditative techniques to take root? In the absence of rudimentary, structural and organizational support, meditative practices may be overwhelmed and undermined by other educational demands. I do not mean to suggest that we turn schools into an austere, monastic enterprise – but an allotted time for meditative reflection followed by, say, a period for subject-related video games hardly constitutes a coherent vision of education. A culture of reflection, observation,

communication and collaboration that builds the experience of our dependence upon each other and the ecological world is a necessary foundation from which meditative practice can flourish. Such a culture, and the collective consciousness it promotes, is also the very basis of an eco-centric model of education.

5.3 — Conclusion

In light of the neuroscientific evidence on the effects of meditative practice, we may feel hopeful about the prospects of meditative practice playing a role in shaping collective consciousness. Although the science of contemplation remains in its nascent stage, the issuing data tentatively suggests the transformation of mental features, as evinced by structural neuroplasticity. The attenuation of a felt somatic self in peak moments of meditative absorption may provide evidence of a state of mind whereby an aspect of the separate *self* is diminished. Such neurological evidence prompt further consideration about efforts to dislodge ego-centric patterns of thought emerging from somatic construction of self.

Nevertheless, the application of meditative methods in the educational context remains fraught with complexity. The technique is not without its own philosophical attachments. Any attempt at appropriating the technique apart from the store of values to which it is attached may inadvertently countervail the effectiveness of meditation. This does not mean, however, that meditation can only be effectively practiced in a Buddhist context; a system of values and views which promotes open awareness, reflection, identification and empathy may provide a supportive foundation from which meditative practices may proceed. The pedagogical use of meditation should be

considered alongside the larger reform of the educational system. As we undertake the work of reshaping the education, meditative practice may help us imagine the larger structure that facilitates such contemplative practices and the values that support its continuation.

An eco-centric model of education must extend from a commitment to ecological responsibility and recognition of the inherent value of the ecological systems that compose the biosphere. In assuming ecological responsibility, we widen the circle of moral concern beyond the realm of human interaction and begin to apply ethical consideration in our interactions with the ecological community. A land-based ethic challenges the current, anthropocentric systems of ethical construct by imagining the well being of the ecological community as the final good. Although this ethical orientation brings new layers of complexity to moral deliberations, the broader inclusion of entities previously denied moral status will intimate a maturity in our notions of what constitutes the *humane* while also representing an important development in the psychological and moral constitution of the human species.

The transition to this new ethical system requires an experiential grasp of the ecological system as a thriving entity, a flourishing and vibrant reality that exerts a psychical influence on the human mind. Without the appreciation of the earth as a communion of subjects (Berry, 2007), we are unlikely to appreciate trees, rivers, birds, glaciers and canyons as intrinsically valuable and thus worthy of preservation. Therefore, programs of outdoor education, where students are given opportunities to explore and study local flora and fauna, will help develop students' experiential connection to the land. Within these programs of outdoor education, mindfulness

practice might help students to tune their attention and prime their faculties of observation within natural settings, thus helping students assume a way of *being* that enables them to enter into communion with the natural world. The visceral experience of the natural world engages the whole student, immersing him in a physical surrounding that exerts a psychical presence; this immediate experience is the primal platform from which educators can cultivate a love of the land and an appreciation of the earth as a living entity. When students wade through the rivers and listen to the songs of birds, they inscribe the physical presence of the land into their memories and weave the reality of the earth into their own experiential history. The earth becomes a manifest reality that students are involved in rather than a distant and abstract construct.

Furthermore, an ecologically sound educational system must promote a thorough appreciation of the principles of ecology — namely, interdependence, diversity, and the finitude of resources — in all aspects of education across curricular areas. Because these principles of ecology govern all levels of biological interaction, an ecologically sensitive citizenry must have internalized and abide by the rules that enable human beings to thrive among others members of the biological community. For example, in the study of history, students might investigate the ecological endowment that spawned the earliest civilizations; courses in information technology will include inquiries into the environmental footprint associated technological innovation; home economics courses will highlight the entire process of food production and consumption, from the farm to the table. Throughout all these studies, students learn the dynamics of an inter-dependent relationship, how the biosphere

influences human society and vice versa. This understanding of ecological principles should pervade all areas of curricular investigation so as to underscore the primacy of ecological operations that underlie all human activities; to treat ecology as a distinct discipline is to insinuate a fragmented understanding of the world and risk its marginalization by the other subjects deemed more "useful" in the modern economy, such as chemistry, physics and math.

The path toward an educational system build on the foundations of ecology is a long and arduous one indeed. That said, perhaps meditation may be useful in the very efforts toward broader reform. Given the clinical benefits of meditation (Kabat-Zinn, 1982), we can surmise that, at the very least, meditation supports mental health and emotional resilience as educators engage in the very daunting task of changing the prevailing landscape of educational assumptions and the policies that issue from them. More importantly, meditative practice may help educators deal skillfully with conflicts, both internal and external, and the mental afflictions that lead to aggression. Furthermore, in softening one's attachment to multiple layers of self-identification, meditation may alleviate the tension brewed from the perception of an irreconcilable *other* and the dualistic mindset that often inhibits constructive critique, communication and progress. Because the reformatory task of moving toward a more ecologically sustainable mode of civilization is challenging and complex, a greater degree of mindful attention to one's own motives, mental tendencies and behaviours will likely assist rather than hinder our collective efforts in establishing the kind of human existence that deep ecologists have imagined.

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