Nature As Discourse:
A Co-Evolutionary Systems Approach to Art and Environmental Design

by

Susannah Hays

A dissertation submitted in partial satisfaction of the

requirements for the degree of

Doctor of Philosophy

in

Interdisciplinary Studies

and the Designated Emphasis

in

New Media

in the

Graduate Division

of the

University of California, Berkeley

Committee in charge:

Professor Galen Cranz, Chair
Professor Greg Niemeyer
Professor Alva Noë
Professor Richard B. Norgaard
Professor Hertha D. Sweet Wong

Spring 2016

Nature As Discourse:
A Co-Evolutionary Systems Approach to Art and Environmental Design

by
Susannah Hays

ABSTRACT

Nature As Discourse:

A Co-Evolutionary Systems Approach to Art and Environmental Design

by

Susannah Hays

Doctor of Philosophy in Interdisciplinary Studies

University of California, Berkeley

Professor Galen Cranz, Chair

Transdisciplinarity, an international education movement that explores pathways to a coherent epistemology beyond all disciplines, seeks to become a sustaining vital force in human development. To do so, it needs to be complemented by a branch of epistemology called epistemics or self-knowledge. Only if co-evolutionary phylogenetic principles of human-brain and autonomic nervous system functioning are included in transdisciplinarity's model can individuals experientially evolve to the levels of reality the model entails. An actual, "true to life," transdisciplinary education teaches isomorphic qualities intrinsic to perception, pattern mapping, language, and aesthetic (non-directive) skills. Curricula utilizing these educational tools will result in indispensable, creative learning environments. A trajectory not yet explored in other literature on Transdisciplinarity is an emphasis on cross-cultural research in human-brain and autonomic nervous system dynamics. Three key understandings that guide human biological evolutionary processes toward higher levels of consciousness are Paul MacLean's triune-brain neuroethology, Stephen Porges' Polyvagal Theory of emotions, and G. I. Gurdjieff's three-centered self-study practice. Each chapter describes a non-profit organization whose goal is to raise humanity's normative level of participation in environmental sustainability. These organizations demonstrate how Transdisciplinarity can recalibrate human evolution, if the educational movement synthesizes the autonomic/cognitive forces within Homo sapiens' biological organization.

Chapters 1 and 2 introduce central figures: Goethe, Husserl, Gurdjieff, Piaget, MacLean, Laborit, Porges, Jantsch, Lupasco, Nicolescu, and Mouffe. Chapter 1 draws a relationship between the science of evolutionary human-brain dynamics and the philosophy of Transdisciplinarity, with special emphasis on isomorphism.

Chapter 2 asks what is a human being and what is possible for human evolution, looking specifically at Paul MacLean and Stephen Porges' brain/body research in relation to G. I. Gurdjieff's self-study practices. The chapter concludes with a description of the Entropy/Consciousness Institute's program development.

Chapter 3 delineates Eastern and Western knowledge of states of consciousness, levels of reality, and the central importance of ecological approaches to visual/cognitive perception. Chapter three concludes with a description of the Center for Ecoliteracy's pedagogy for sustainability.

Chapter 4 presents Centre International de Recherches et Études Transdisciplinaires' "Moral Project" and presents an imagined conversation between Henri Laborit, Basarab Nicolescu, and Immanuel Kant illuminating what methods from biology, critical theory, and philosophy would advance the Transdisciplinary movement.

Chapter 5 proposes Art as research is fundamental to supporting Transdisciplinary methods, as in the quest of Helen and Newton Harrison's life work, and their founding of the Center for Force Majeure Studies.

Chapter 6 describes the curricular vision of two university-level art/theory courses, which apply methods presented in chapters 2, 3, 4, and 5.

Chapter 7 concludes that nature is not a separate reality outside ourselves, but integral to cultural discourse. Transdisciplinarity is the appropriate methodology for advancing the principle of *psyvolution*, an action that produces a conscious flow of biological connectivity in human-brain dynamics. This cognitive re-blending of substrates innervates our *psychic organs* in relation to processes of exchange between energy and matter in human/global environments. Organizations assisting schools and communities to prepare and adapt coherent systemic evolutionary frameworks can play a role in translating future findings in science, art, and environmental design research into curricula.

When every element
The mind's higher forces
Has seized, subdued and blent,
No Angel divorces
Twin-natures single grown,
That inly mate them;
Eternal Love alone,
Can separate them.

GOETHE, Faust II

Contents

List of Figures iv
Glossary v
Abbreviations vii
Preface viii
Acknowledgments x
Introduction xi

1. Evolution and Transdisciplinarity 1
1.1 Forerunners of The Transdisciplinary Movement 1
1.1.1 Jean Piaget 3
1.1.2 Erich Jantsch 5
1.1.3 Stéphane Lupasco 7
1.2 Relationship between the Science of Human Evolution 10
1.2.1 Aesthetic Experience of Isomorphisms 13
1.2.2 Differentiation, Symmetry Breaking, and Integration 18

2. Humans, What Are We? 23
2.1 What Humans Need to Know About Their Potential to Evolve 24
2.2 Evolutionary Processes and Paul MacLean's Triune Brain 27
2.3 Stephen Porges' Polyvagal Theory of Emotion 32
2.4 Model of Understanding:
Entropy/Consciousness Institute San Francisco, California 39

3. Enacting Perception 48
3.1 Crisis of Perception 48
3.2 Perception and States of Consciousness 50
3.2.1 Four States of Consciousness 51
3.3 Ecological Approaches to Visual Perception 53
3.3.1 Goethe's Way of Science 55
3.4 Self-Observation/Self-Remembering 57
3.5 Third-Force: A Three-Centered (ternary) Study 61
3.6 Model of Understanding:
Center for Ecoliteracy Berkeley, California 65

4. Advancing Transdisciplinarity's Model 68
4.1 Syncretism And Evolutionary Aesthetics 68
4.2 Swiss, Zurich, German group "Mode 2" Model 70
4.4 CIRET's "Moral Project":
Advancing Transdisciplinarity's Aim 72

5. Art as Research:
Scale of the life work of Helen and Newton Harrison. 83
5.1 The Land Art Movement 83
5.2 Watersheds to World Oceans 87
5.3 The Third Hand 88
5.4 Model of Understanding:
Center for Force Majeure Studies U. C. Santa Cruz. 93

6. Two Courses Taught at the San Francisco Art Institute 96
6.1 Teaching Philosophy 97
6.2 Topologies: The Construction of Space 98
6.3 Embodied Camera 99
6.4 The Problem of Language 100
6.6 Model of Understanding: Equipoise 104

7. Conclusion 113

References 117
Appendix One: Charter Of Transdisciplinarity 125
Appendix Two: Harrisons' "Manifesto For The 21st Century" 128

Figures

1.1 Education/Innovation System (after Eric Jantsch)

2.2 Tricameral Brain Structure (after Paul MacLean)

2.3 Autonomic Nervous System (after J. Hughlings Jackson/Stephen Porges)

2.4 Hierarchal Relationship (after J. Hughlings Jackson/John Chitty)

2.5 Vagus Nerve Anatomical Diagram I

2.6 Vagus Nerve Anatomical Diagram II

2.7 Ergodic Life Cycle (after Terry Lindahl)

2.8a Triptych Paintings (after Terry Lindahl)

2.8b India Ink Triptychs (after Terry Lindahl)

2.9 Transmutative Chemistries of Digestive Metamorphosis (after Terry Lindahl)

3.1 Double Arrow Dynamic (after P.D. Ouspensky)

5.1 Between Cedar & Vine pencil sketch (after Stefan Pellegrini)

5.2 San Diego as the Center of a World (after Newton and Helen Harrison)

6.1 Egypt, 1992 (after Susannah Hays)

6.2 Empty Bottle series, 1998 (after Susannah Hays)

6.3 Skeletal Leaves, 1998 (after Susannah Hays)

6.4 Microscope series, 2001 (after Susannah Hays)

6.5 Iluminated Garden, 2002 (after Susannah Hays)

6.6 Fractal Tree, 2014 (after Susannah Hays)

6.7 Icarus, 2010 (after Susannah Hays)

6.8 Mirror Landscape 5 (after Susannah Hays)

GLOSSARY OF KEY TERMS

Autonomic Nervous System—neuro-endocrine-immune structure that enables survival. Often described as having two branches, parasympathetic (rest/rebuild) and sympathetic (fight/flight) is now understood as a triune hierarchal system. The third branch, termed Social Nervous System, acts as a controller of the earlier (evolutionarily speaking) reciprocal branches. If the social nervous system isn't successful inhibiting the fight/flight system, it will naturally default to it, under stress.

Co-evolutionary—is a biological term coined in 1964 by Paul R. Ehrlich and Peter H. Raven. Co-evolution occurs when changes in at least two species genetic compositions reciprocally affect each other's evolution. In this sense, humans also share a biological relationship to nature.

Cosmopomoral—Entropy/Consciousness Institute's term for the organic reasoning, resolution process between Anthropocentric, Empirical Mathematical studies and Mystical/Gnostic Eschatological concerns.

Eco-revelatory design—ecological design concept in the field of landscape architecture that attempts to enhance a sites' ecosystem as well as engage users by revealing ecological and cultural phenomena, processes and relationships affecting a site.

Empirical—originating in or based on observation or experience as in, empirical data; 2: relying on experience or observation alone often without due regard for system and theory; 3: capable of being verified or disproved by observation or experiment as in empirical laws. (1569).

Endogenous—a self-sustained cycle, biologically growing.

Epistemology—deals with the origin, nature, limits and validity of knowledge. It represents a collective public approach that attempts to find what can be publicly agreed upon, on the basis of what is observable, that is, "fact."

Epistemics—is a complementary term for the branch of epistemology that deals with the body of knowledge and collective disciplines concerned with clarifying the nature and limitations of the subjective brain.

Ergodic— any collection of random samples from a process must represent the average statistical properties of the entire process. Conversely, a process that is not ergodic is a process that changes erratically at an inconsistent rate.

Exteroception—perception of the body's own position, motion, and state, known as proprioceptive senses. External senses include the traditional five: sight, hearing, touch, smell, taste as well as temperature difference.

Force Majeure—French legal term for "superior force" also known as cas fortuit (French) or casus fortuitus (Latin) "chance occurrence, unavoidable accident."

Isomorphic—having corresponding or similar crystalline form and relations.

Interoception—humans perceiving their interior organs.

Neuroception—the body's ability to detect risk outside the realm of awareness. Neurotransmitters are membrane receptors. Proteins in neurons receive an impulse across a synapse. Because initial response patterns in humans are not cognitive or perceptual, Porges coined the term neuroception to describe how neural circuits distinguish situations around our subconscious pro-social or defensive behaviors, from birth to maturity.

Ontology—the philosophical study of the nature of being, existence, or reality as such, as well as the basic categories of being and their relations.

Phylogenetic—the evolutionary development and diversification of a species or group of organisms, or of a particular feature of an organism.

Psyvolution—a neologism coined by the Entropy/Consciousness Institute expressing the process in which, what will emerge can be sensed from what has emerged.

Syncretism—the process of the fusion of different schools of thought or in a chemical sense, alloying metals.

Teleological—contends natural entities have intrinsic purposes, irrespective of human use or opinion—that is, a non-personal or non-human nature.

Third-force—a ternary self-study practice.

Transdisciplinarity—a research strategy where efforts to solve problems cross the boundaries of two or more disciplines.

ABBREVIATIONS

ANS	Autonomic Nervous System (sympathetic nervous system)
CEL	Center for Ecolitercary
CIRET	Centre International de Recherches et Études Transdisciplinaires
CFMS	Center for Force Majeure Studies
DVC	Dorsal Vagal Complex (parasympathetic system)
ECI	Entropy/Consciousness Institute
ERD	Eco-Relevatory Design
MOT	Manifesto of Transdisciplinarity
OECD	Organization for Economic Cooperation and Development
PVT	Polyvagal Theory
SFAI	San Francisco Art Institute
SNS	Social Nervous System / Sympathetic Nervous System
UCSC	University of California, Santa Cruz
UCSD	University of California, San Diego
VVC	Ventral Vagal Complex

The evolution of the universe is the history of an unfolding of differentiated order or complexity. Unfolding is not the same as building-up. The latter emphasizes structure and describes the emergence of hierarchal levels by the joining of systems "from bottom up." Unfolding, in contrast, implies the interweaving of processes, which lead simultaneously to phenomena of structuration at different hierarchical levels. Evolution acts in the sense of simultaneous and interdependent structuration of the macro and the micro world. Complexity emerges from the interpenetration of processes of differentiation and integration, processes running "from top down" and "from the bottom up" at the same time and shape the hierarchical levels from both sides. Microevolution (such as the emergent forms of biological life) itself generates the macroscopic conditions for its continuity and macroevolution itself generates the microscopic autocatalytic elements, which keep its processes running.

This complementarity marks an open evolution, which reveals ever-new dimensions of novelty and exchange with the environment. It is not adaptation to a given environment that signals a unified overall evolution, but the co-evolution of system and environments at all levels, the co-evolution of micro and macro-cosmos. Such an overall evolution is indeterminate, imperfect and prefers dynamic criteria in the choice of its strategies before morphological ones.
It is self-consistent and creative.

ERICH JANTSCH, 1980 p. 75

Preface

The term *discourse* generally defines a written or spoken relationship between humans. If we wish human discourse to be co-operative with evolutionary life, we need as a culture to nurture forms of discourse where *co-evolutionary* systems in social behavior function in an open relationship to Nature.[1]

In the following discourse, natural processes in human evolution provide both a historical and conceptual framework in relation to the philosophical and transdisciplinary fields of Art and Environmental Design. As we understand human evolution to be a living dynamic (i.e., animals and plants have their origin in other pre-existing types and distinguishable differences are due to modifications in successive generations),[2] so too can Transdisciplinarity return us to study natural living forces in human development. Our latent potentials, such as consciousness and creativity, are best cultivated in theoretical physicist David Bohm's notion of *asynordinate* implicit/explicit adaptive processes.[3]

The philosopher of science, Thomas Kuhn (1962) would have us believe that structurally, paradigms consist of patterning or modeling any discipline's achievement, until a new (revolutionary) paradigm replaces it. However, the human predicament is that shared preconceptions among communities include unknown assumptions along with cultural and social elements, thereby limiting collective discourse. Scientific revolutions alone are not the change. If Transdisciplinarity prepares individuals by the same basic evolutionary processes of mutation toward new, more complex dynamic criteria, as the above quote from Austrian astrophysicist Erich Jantsch suggests, a

1 ***Co-evolutionary***—a biological term coined in 1964 by Paul R. Ehrlich and Peter H. Raven. Co-evolution occurs when change in at least two species genetic composition reciprocally affect each other's evolution. In this sense, humans also share a biological relationship to nature.

2 Merriam Webster definition

3 ***Asynordinate***—David Bohm's term denoting degrees of implicitness, including integration of explicit in relationship to the implicit (hidden within seen elements) that is qualitatively part of all systems.

co-evolutionary systems view, moving beyond Kuhn's formulation, becomes a guiding principle, generating conditions that permit the production of entropy while fostering a metabolizing activity in the widest sense. The reciprocal exchange of energy, in all forms in which energy manifests—physical and psychic, matter and information, complexity and order, consciousness and mind, emotion and spirit—reveals itself in all domains as, "order through [Brownian] fluctuation." This was Belgian Physicist Ilya Prigogine's great discovery.[4] Art and environmental design education also works through these same self-realizing, self-centering processes (paraphrasing Jantsch, 1975 p. 289).

Schools and communities must make the commitment to verify the social implications of these structural paradigms through disciplined thought. Ideally, they would provide the means for experiential, recursive transformations—that is, schools need to provide spaces for learning where physical and mental subjective/objective adaptation will most effectively raise the normative level of human functioning in relationship to a systems view of life. In a conversation with biophysicist Harold Morowitz, I asked what role he thought paradigms played scientifically and culturally. His position underscored Jantsch's view. He explained that he lives primarily at the fringe of paradigms because, "Being at the center of paradigms is boring. Being on the outside of paradigms is crazy. Being on the edge is where life is. My thread of interest, starting with the origins of life, has verified that biological information itself is fundamentally structural and these structures demonstrate constant change, as one thing becomes another. Paradigms are useful only as building blocks."[5]

By focusing on the process of how one thing becomes another we are able to perceptually trace co-evolutionary recursive movement. If the measure of *Being to Becoming* (Prigogine, 1980) is the modus operandi, our interests can turn to all things in nature, the sum of which we are interdependent with. Paradigms operate more like scaffolding. We can think of them as brackets, temporarily stabilizing our concepts of "the world" asymmetrically, between known and unknown evidence.

Our greatest misconception is, otherwise, holding fast to paradigms beyond their limited purpose. A co-evolutionary, transdisciplinary purpose would reaffirm how life itself unfolds continuously. My research has sought to examine if there is an order of thought and practice that allows humans to come in touch with their inner creative and self-realizing evolutionary potential. Does organic scaffolding exist on which humans can individually develop higher levels of co-evolutionary consciousness? Can those who understand the science of systems theory—within the complex system of a human life—foster curricula that would nurture the qualitative connective tissue necessary for an embodied symbiotic exchange with nature? Can psyvolutionary-logos (evo-human) and nature's logos (eco-civility) become a unified source of knowledge in academic environments?

While this dissertation delineates current shifts reshaping the culture of academia, it concentrates on four institutions outside the university that are addressing the complex dimensions of environmental sustainability. Now that previous distinctions and methods in science are being called into question, a new threshold for basic levels of an inter-subjective, human understanding in co-evolutionary practices are not only emerging, but also slowly showing successful social/cultural integration. In conclusion, we will discover nature as discourse is not a separate reality outside ourselves, but a reality in which we are embedded and co-determinant.

---

4 Ilya Prigogine's thesis explains how the description of past and future in physics and chemistry does not play the same role when applied to phenomena. Where time-oriented processes were once considered static, the concept of second law of thermodynamics, entropy/negentropy, beginning with Clausius around 1850, was introduced as a living dynamic in the transformation process of molecular disorder to higher levels of complexity.

5 Phone conversation with Harold Morowitz November 11, 2012, George Mason University, Fairfax, VA.

Acknowledgements

A yearning to understand the evolution of consciousness appeared very early in my life. Gathering real information, however, was not a self-determined path. Those who share my ever-deepening questions come from cross-cultural traditions. I am indebted to my scientist/naturalist father, Richard Mortimer Hays, who was the first to hear and reply to the fateful question that broke open in me—Why are we here? What are we supposed to be doing? Years later, in 1993, the fortunate, quite by chance, introduction to the ideas of G. I. Gurdjieff offered more viable answers than could have been imagined. The University of California, Berkeley and the San Francisco Art Institute also offered invaluable opportunities. Their widely creative environments made conditions ripe for diverse exchange.

I chose the creative fields of art and environmental design as a transdisciplinary engagement because human evolution requires one to learn to act and "think for one's self." My admiration goes to individuals I have met along the way. Having withstood the fire of their own emergent life's work they've effectively made the world a better place. Given my broad interests, I wish to especially thank theoretical physicists Fritjof Capra and Basarab Nicolescu for their remarkable visionary stewardship; artist and architect, Terry Lindahl and pioneer eco-artists, Helen and Newton Harrison for allowing me the opportunity to work with them and share their visions with future generations. I'm grateful to biophysicist, Harold J. Morowitz, Clarence Robinson Professor of Biology and Natural Philosophy and the founding director of the Krasnow Institute for Advanced Study at George Mason University. Our discussions, which reviewed the origins of life as a series of emergences, confirmed aspects of epistemology and natural hierarchal levels of consciousness. I thank my committee for the opportunity to discuss major ideas and receive their critical comments: Galen Cranz, (Architecture); Richard B. Norgaard (Energy Resource Group); Greg Niemeyer, (Art and New Media); Alva Noë, (Philosophy); and Hertha D. Sweet Wong (English). Finally, I thank Nature. You've been by my side, visibly and invisibly, every step of the way.

Introduction

The majority of us living today were school age when the quantum revolution might have already shifted humanity's worldview. In the twentieth century, mechanistic views continued. And presently, in the twenty-first century, with all our determined ideas of scientific and technological "progress" in full motion, we remain unprepared to face environmental events irreversibly changing the biosphere's habitat, the domain of human life. Humanity's flight from co-evolutionary interdependent functioning, necessary for a sustainable ecology fills us with loss and hope simultaneously. Epic circumstances, such as global warming, stripping us of our illusions, are grave enough that comprehending the source of human blindness has to be examined. What has caused a radical misperception in our key reasoning capacity? From a systemic point of view, how might we speak about mind in nature or mind in consort with nature (Bateson, 1979)? What key principles would move us as a culture toward comprehending we, as citizens of the earth, are part of a larger global biosphere?

To answer these urgent questions, academic institutions face interdisciplinary challenges. While an increasing number of individuals are aggregating around the notion of moving "beyond the disciplines," a transdisciplinary approach presents a radical challenge.[6] We are, in fact, not sure if institutional structures as we know them are the single necessary platform for change, because something significant in the transdisciplinary model is being implied, not only within academic disciplines, but also within the necessary balanced functioning of individuals joining collectively. Human beings must be individually prepared to evolve their latent evolutionary potential in order to reach the dimension of reality that Transdisciplinarity's model proposes.

To this end, my research makes two major additions to the theory of Transdisciplinarity. First, it relates specific principles necessary for human evolution to complement Transdisciplinarity's model launched by Centre International de Recherches et Études Transdisciplinaires (CIRET).[7] While Basarab Nicolescu's 1985 *Manifesto of Transdisciplinarity* (Nicolescu, *tr* 2002) provides a philosophical framework, where levels of perception and constructions of "space" in Art and Environmental Design programs can be syntactically analyzed, I will argue that the transdisciplinary fields of art and environmental design alone cannot transform community understanding of culture's relationship to nature's processes. Just as we must move from biological to ecological thought (Capra, 1975), a coherent epistemological format moving from psychology to *psyvolution*[8] (individuals moving beyond personal psychology and its modes of habitation) must be instilled by virtue of lived experiential practice. Only then can the inversion from anthropomorphic reasoning toward *cosmopomoral* reasoning serve to consciously sustain human life on earth.[9]

Cultural awareness must shift from intellectualizing and historicizing paradigmatic structures toward embodying a primordial, holistic sense of mind within nature. This step requires the essential diminishment of formatory (reptilian/mammalian) dichotomous brain and autonomic nervous system reactivity, while reconciling neocortical processes in the body/mind's inner environment.

---

6 Nicolescu provides three meanings to Trans: "Trans is Latin, which means at the same time. That which is in between, that which crosses and that which is beyond" (Nicolescu: recorded interview, Paris 2011).

7 First proposed in 1994, at the World Congress of Transdisciplinarity in Portugal, a second meeting occurred in May 1997, at the International Congress in Locarno, Switzerland. An additional project with UNESCO involves the World Conference on Higher Education.

8 ***Psyvolution*** is a neologism coined by ECI expressing the process in which: what will emerge can be sensed from what has emerged (Lindahl, 2009). The Institute's program is discussed in Chapter 2 section 2.3

9 ***Cosmopomoral*** organic reasoning is ECI's term for the resolution process between Anthropocentric, Empirical Mathematical studies and Mystical/Gnostic Eschatological concerns.

The second addition, described in my research is, therefore, a presentation of natural triune-brain dynamics, autonomic nervous system functioning, and methods for transformational engagement of aesthetic ecological approaches to perception. By answering what is necessary for humans to learn, individually and collectively, about their *phylogenetic*, naturally agonistic three-in-one neural assembly, inner and outer conflicts may be tempered.[10] From these lived activities, *paradigms of consciousness* may emerge, harmonizing an undivided understanding of micro and macro worlds.[11] Through understanding and developing our neocortical reasoning capacity, individuals can more openly experience *isomorphic* modes of flexibility.[12] The sensibilities inherent in activities such as movement, aesthetics, and recognizing "patterns of mind" connect to otherwise imperceptible environmental spheres. These voluntary activities inhibit automaticity and work to establish the possibility for apprehending phenomenological transcendence.

How Transdisciplinarity's model, which integrates modern science with levels of reality, might become more closely aligned with primary, secondary, as well as college level curricula occupies the third layer of my research. Each chapter concludes with an established non-profit organization presently working to provide pedagogical, co-evolutionary measures that address invariant, natural resistances within everyday human experience. Their community outreach programs, which blend biological evolutionary principles with experiential practice, endow cognitive understanding of our epistemic responsibility for a sustainable future.

Direct experience has allowed me to verify individual and community outcomes. I gathered information during my years of teaching college level courses at *San Francisco Art Institute* (ten years), my observation of *The Center for Ecoliteracy* (fifteen years), and my participation with *The Center for Force Majeure Studies* (six years) and *The Entropy/Consciousness Institute* (six years). After several decades of incubation, prior to their being established in landmark buildings in the California Bay Area, these organizations are now cultural landmarks as they mirror life's adaptability, diversity, and creativity. Having integrated their knowledge of Western science with some of the earliest traditions of Eastern thought, they provide *consilient* frameworks for schools and community programs to study and possibly emulate.[13]

My work in association with these non-profit organizations was entirely on a volunteer basis, although, at certain periods, time spent was that of a full-time job. The inspiration for this commitment was an opportunity to repair the past, to contribute and carry forward meaningful change in my immediate community, and to enhance the studio/theory course material I prepared for my students at San Francisco Art Institute. These experiences along with my Eastern/Western formal education and fine art practice have evolved into this dissertation and the exhibition: *In/Visible Cosmos*. Created in two sections—Part I, *Everyday Constellations* (in partial completion of my MA in Environmental Design), was exhibited at U. C. Berkeley Townsend Center for Humanities in 2002; Part II, *Equipoise* was completed in partial fulfillment of my PhD dissertation in 2016. The entire collection is housed at Stanford University Special Collections Green Library.[14]

---

10 ***Phylogenetic***—the evolutionary development and diversification of a species or group of organisms.

11 ***Paradigms of Consciousness***— a term A. Lohrey uses in *The Meaning of Consciousness* (1997).

12 ***Isomorphic***—*having* corresponding or similar crystalline form and relations.

13 ***Consilience***—the principle that evidence from independent, unrelated sources can "converge" to strong conclusions. E. O. Wilson (1998) prefers the word consilience to coherence for its precision in emphasizing the need for unity of knowledge—beyond science. Wilson's 1998 treatise argues why all disciplines must be tested through natural sciences as a way of renewing liberal arts, especially philosophy's relationship to science.

14 ***Susannah Hays*** Stanford University Archive: http://searchworks.stanford.edu/view/8608225

Chapter 1
Evolution and Transdisciplinarity

For our age to have become conscious of evolution means something very different from and much more than having discovered one further fact… It means (as happens with a child when he acquires the sense of perspective) that we have become alive to a new dimension. The idea of evolution is not, as sometimes said, a mere hypothesis, but a condition of all experience.[1]
P. TEILHARD DE CHARDIN

During the last three centuries, all education has been based on the mental things because of the incredible success of mathematical formalizations, abstraction and so on. The first step in educational reform is to say that there are the mental, the physical and the instinctual/emotional and all three must be addressed.[2]
BASARAB NICOLESCU

I have very good leather to sell to those who want to make themselves shoes.[3]
G.I. GURDJIEFF

A philosophical movement called Transdisciplinarity seeks to generate a new stage for humanity's future where the study of natural systems will succeed the recognized limits of both a mechanistic worldview and Marxist socialist thought. This chapter will first address forerunners of the Transdisciplinarity movement and proceed with contemporary thought that defines human plurality as the center of antagonistic conflicts.[4] Following this brief history, I will begin to establish the terms for human evolutionary growth that are essential for transdisciplinarians to adopt. For example, Transdisciplinarity requires humans to ascertain an inter-subjective agreement in order for levels of reality to move beyond the fragmentation of dialectical thought. How specifically is this accomplished, individual-by-individual? How do experiential practices create a path toward affording a vibrant aesthetic vision? Distinctions are then shown, in relation to energy fields. How do humans experientially learn to differentiate open and closed systems? The chapter concludes that individuals who comprehend isomorphic and network dynamics in relation to their own biological functioning will have a greater chance of evolving a new self-understanding in relation to the natural world. A higher level of norms can only be collectively achieved through Transdisciplinarity's model if nature's multi-dimensional cosmological scale relates directly to educational conditions. Transdisciplinary individuals need to learn how to balance empirical evaluative skills with intuitive experiential practices.

1.1 Forerunners of The Transdisciplinary Movement

While second-generation transdisciplinary thinkers are on the rise (J. T. Klein, M. Gibbons, S. McGregor, T. Augsburg, and others), my purpose in concentrating on pioneers of the movement is to return to the original, still nascent, micro/macro scale model where an imperative for humans to understand their inner biological structure has been overlooked. When it comes to the study of human potential, everything after Darwin is relative to animate matter with key characteristics for a systems view of life being established by the 1930's.

1 Pierre Teilhard de Chardin, (1968) p. 193.
2 Basarab Nicolescu, recorded interview Paris, France, December 19, 2011.
3 Kenneth Walker quoting Gurdjieff from *A Study of Gurdjieff's Teaching,* London: Jonathan Cape; 1957, p. 16.
4 ***Human Plurality*** defined by Hannah Arendt: "The basic condition of both action and speech, [and] has the twofold character of equality and distinction" *The Human Condition*, p.175.

Most of the modern existential, psychological challenges individuals and world cultures have experienced over the past hundred-fifty years can be traced to two notable events: Darwin and Wallace's theory of evolution (1859), and Einstein and Pauli's announcement of the quantum field (1905). If these events remind historians of Heraclitus, Pythagoras, Parmenides, Anaxagoras or the poems of Epicurean philosopher Lucretius (99 BCE – c. 55 BCE), they are now "safely left unread…as [their] ideas [have] been absorbed into the mainstream of modern thought" (Greenblatt, 2011). However, as Goethe reminds us, "In science, it is a service of the highest merit to seek out those fragmentary truths attained by the ancients, and to develop them further" (Goethe, 1820 [*540*]). As Nature's model gradually makes its way back, beyond the limited worldview of Cartesian/Newtonian thinking, mainstream modern institutions become more aware of their embedded, disproportionate emphasis on binary empirical methods of research.

Today, our education system is showing signs of penetrating *The Systems View of Life* (Capra/Luisi, 2015) with Eastern spiritual traditions. Scientists, philosophers, and artists of the West more fully comprehend humanity's function within holistic perspectives. Whether looking forward or back, the history of Transdisciplinarity anchors itself in a holistic perspective, which mirrors in science systems thinking or in ecology systemic thinking. In Eastern, non-linear spiritual traditions, systemic thinking may be recognized as *Tao* "the way" (Capra, 1975), or the *Fourth Way* practice "in life" (Ouspensky, 1947). But, integration of objective/subjective perspectives within the sense of the Universe's nature (Vernadsky, 1924), Prigogine, 1971; Jantsch, 1970; Capra, 1975; et al.), has taken decades to show signs of cultural synthesis. Efforts will press onward until university education systems can meet pressures and break through static structures of classical thought. What do macro-systems, like education, have to emulate in their re-appraisal of causality? What does Darwin's revolution take for granted when individuals come into existence? What are the dynamic characteristics of nature within the growth of human consciousness? Can ecoliteracy advance aesthetic awareness of evolutionary forces in humans? Is the knowledge of self a responsibility for science to derive?

Transdisciplinarity established its roots in the field of sociology. The dance between the social sciences of the nineteenth-century and the interplay of discipline specialization began with August Comte in the 1930's. Though patterned in the model of Newtonian physics, Comte's positivist framing was a social physics, whereby the field of sociology set about looking at patterns and dynamics rather than fixed laws. "The work of Vladimir Ivanovich Vernadsky (1863–1945) related the concept of the Biosphere in 1924, in his essay *La Géochimie*, which was based on a series of lectures he gave at La Sorbonne from 1922—1923. Philosopher and paleontologist, Pierre Teilhard de Chardin (1881–1955), philosopher Henri Bergson (1859–1941), and mathematician and philosopher Eduard Le Roy (1870–1954), attended those lectures, and they and Vernadsky influenced each other's thoughts" (Piqueras, 1998 p. 1). Theoretical biologist Ludwig von Bertanlanffy (1901–1972) then introduced the first model for general systems theory in biology (without an axiomatic base), and mathematician and philosopher Norbert Wiener (1894-1964), studied patterns of communication, establishing the field of cybernetics. Together, these interdisciplinary fields created a new foundation whereby cybernetics and systems theory formulated a non-linear understanding of social/cultural patterns. On the scale of the universe, Piqueras writes:

> It is the concept of biosphere related to biogeochemistry, expressed in *La Géochimie* that is widely accepted today. Vernadsky understood biosphere as the external envelope of the Earth, which is inhabited by living things, and comprises both all the living organisms of the planet and the elements of inorganic nature,

> providing the medium for their habitat. Thus, oxygen, carbon, hydrogen, nitrogen and other elements and chemical compounds involved in the vital process are constituent parts of the biosphere. As are the products of an organism's activities, such as animal burrows and lairs, birds' nests, deposits of lime and of fossil fuels. Even water is a component—a major component—of the biosphere (8).[5] Solar radiation, which is crucial for the maintenance of life on Earth, should be considered also a biosphere's component, and so should products of human activities. In fact, the human species is a major changing force in the current composition of the biosphere (Piqueras, 1998 p.1).

Passing quickly through the Zeitgeist of philosophical and scientific thought during the post WWII era (1930's-50's), by May 1968 mass strikes emerged creating waves of struggle for the social working class. With student protests at Nanterre University and the Sorbonne, and their Situationist inspirers, capitalist countries around the globe, saw a new Left politics emerge.[6] As social questions dominated life to varying degrees, the environmental movement, "Survive et Vivre" (Survive and Live) was at the center. By 1970, at the University of Nice, France, Swiss developmental psychologist and philosopher Jean Piaget introduced the idea of Transdisciplinarity at The First International Conference on Interdisciplinarity. From the scientific/psychological perspective, Piaget brought a structural format based on "a common system of axioms for a set of disciplines," which Austrian-born astrophysicist and engineer Erich Jantsch and French philosopher and sociologist Edgar Morin amplified. OECD published the record in 1972.[7] Where Piaget's ideas called for an overall fundamental shift in academia to a new total system without any boundaries between disciplines, Jantsch focused on a pragmatic "education/innovation system" motivated towards specific problem solving for human evolution (Apostel, 1972: p. 138; Nicolescu, 2010). All three understood creativity to be a primary feature of co-evolutionary, transmutative processes. They called on universities to integrate these values into their curricula.

1.1.1 Jean Piaget (1896-1980)

Jean Piaget, revered philosopher of science, chose to evaluate children as an instrument of knowledge when studying the development of cognition and grasping the nature of thought as a whole (Bringuier, 1977 *tr* 1980 p. xi). As a biologist, Piaget was primarily interested in problems of epistemology—the processes of formation and the conditions in which knowledge occurs. His interest was in gathering data that would reflect the way a child reasoned, the difficulties they encountered, the mistakes they made, their reasons for making them, and the methods they came up with in order to get to the right answers. Piaget made qualitative analyses instead of preparing statistics about right and wrong answers (Bringuier, 1977 *tr* 1980 p. 9). It's important to review Piaget's groundbreaking research methods as they relate his intuitive experiential practice in developmental epistemology. Similar to Goethe's aesthetic, Piaget chose inductive observation methods when locating patterns. Too, his approach to education agrees with the Entropy/Consciousness Institute's *psyvolutionary* concept for conducting experiential growth exercises. Piaget worked directly in dialogue with a pupil, using Socratic methods, which Fourth Way practices also support. In Bringuier's *Conversations with Jean Piaget,* Piaget states: "Education, for most people, means trying to lead the

5 Kamshilov M. *Evolution of the Biosphere* (trans. from Russian) Mir Publishers, Moscow (1976).

6 The ***Situationists International*** (SI) was an international organization of social revolutionaries made up of avant-garde artists, intellectuals and political theorists from 1957-1972.

7 ***OECD*** Organization for Economic Cooperation and Development (Apostel, 1972 p.26).

child to resemble the typical adult of his society ... but for me and no one else, education means making creators ... You have to make inventors, innovators—not conformists" (Bringuier, 1977, p.132). Piaget defined knowledge as the ability to:

> modify, transform, and 'operate on' an object or idea, such that it is understood by the operator through the process of transformation. Learning, then, occurs as a result of experience, both physical and logical, with the objects themselves and how they are acted upon. Thus, a learner must assimilate knowledge in an active process with matured mental capacity, so that knowledge can build in complexity by scaffold understanding. Understanding is scaffold by the learner through the process of equilibration, whereby the learner balances new knowledge with previous understanding, thereby compensating for "transformation" of knowledge (Piaget, 1964).

When asked by Bringeuir at what level of life psychology begins, Piaget responded, "I am convinced that there is no sort of boundary between the living and the mental or between the biological and the psychological. From the moment an organism takes account of a previous experience and adapts to a new situation, that very much resembles psychology." In *Biology and Knowledge* (1967) Piaget showed isomorphism between sunflowers and humans—organic regulations working with cognitive processes. "Behavior," he said, "is found in cells. The science of consciousness shows behavior in general or, more specifically, conduct" (Bringuier, 1977 p 3).

> The living organism is capable of foreseeing, of anticipating. In the world of life, there are all sorts of anticipations. … The plants, which in fact I am studying; the bud, for instance, prefigures the flower, just as the stages of embryogenesis prefigure full grown organs, and so forth. I wanted to study a case of anticipation that would show much greater variability and would allow a detailed analysis, species by species. These plants, the sedums, lose their secondary branches, which fall to the ground and make new plants; the fall is prepared for, the fissures shrink, and so forth. For any given species there is a series of anticipations, a series that varies from one environment to another. All this is among living things that have no nervous system. No brain. This interested me, and I studied it (Bringuier, 1977 p. 4).

Asked where consciousness begins, Piaget initially replied it was insoluble; there was no criterion. On further reflection he said, "There are degrees of consciousness at every level—but only degrees. One can have consciousness of an act and not integrate it. I call that elementary consciousness. Knowing one has consciousness is already refined. It's an upper level consciousness (Bringuier, 1977 p. 5).

Piaget's research data and position on interdisciplinary education is valuable and will be referred to again in Chapter 3. There I will discuss the link between Piaget's observations of how learning takes place, levels of consciousness, and the basis of ECI's concept for the conduction of psyvolution. All three of these points show an intuitive approach that supports educative evolutionary development—gathered through direct, informal conversation, where new skills are experientially learned (Bringuier, 1977 p. 25). Piaget specified that knowledge couldn't truly be formed until the learner had matured the mental structures to which learning is specific. Nevertheless, he says, knowledge can be "built" by building on simpler operations and structures that have already been formed. Good teaching, he says, is built around the operational abilities of the students

such that they can excel in their operational stage and build on pre-existing structures and abilities and thereby "build" learning (Piaget, 1972).

1.1.2 Erich Jantsch (1929-1980)

Trained as an Astrophysicist, Erich Jantsch was one of the original six founding members of *The Club of Rome, a* global think tank, which published a report entitled: *The Limits of Growth* in 1972.[8] Their mission, still today, is: "to act as a global catalyst for change through the identification and analysis of the crucial problems facing humanity and the communication of such problems to the most important public and private decision makers as well as to the general public."[9] He gave the *Gauthier Lectures in System Science* in 1979 at the University of California Berkeley, which became the basis for his book entitled: *The Self-Organizing Universe: Scientific and Human Implications of the Emerging Paradigm of Evolution* (1980). But before this, in the late 1960's and early 70's in Paris, London, and Berkeley, during student and faculty pressures erupting in Universities, Jantsch, with others, answered the call for proposals on how universities might adapt his integral education/innovation human-based system within the context of "levels of knowledge" (See Fig. 1.).

Equating Jantsch's program with a co-evolutionary systems approach to Art and Environmental Design programs has a significant place, here in this work, as Art and Design fields demonstrate interdisciplinary features, particularly the dynamic feedback loop between subject and object. Rather than human life finding meaning in the margins somewhere, Jantsch, and others, agreed on a new ecological economic-growth/consumption framework. It is Jantsch's vision that carries forth the model transdisciplinarians work to implement today.

Jantsch's proposal extended the principles of biology to human life systems, in particular social and cultural systems. If followed, he felt human consciousness and human design processes would see their direction naturally. He wrote, "Behind these intuitively guided hypotheses, which are open to scientific investigation, lies the great hope of laying a new and modern foundation for a profound truth which man has known, forgotten, refound, reduced and expanded over many millennia: *the evolution of mankind forms a meaningful and integral part of a universal evolution—mankind is an agent of this universal evolution, and even an important one*" (Jantsch, 1975 p. xvi).

Well versed in hermetic philosophy and implicit/explicit factors of the evolution of consciousness, Jantsch outlined four principles for education through disciplines, multi-disciplines and cross-disciplines. They are: empirical, pragmatic, normative and purposive, whereby the common axiomatic principles of higher and lower levels of education would coordinate interdisciplinary links. Emphasis, in his model, is placed on method and organization rather than accumulated knowledge. How to view science as part of society he resolved to be simply *What Is* rather than *What Ought* (Jantsch, 1970, p. 8). Aspects of a comprehensive system needed science to gain feedback from social innovation—or recognized social goals. This new normative level is the third-tier of his 1970 diagram, (Fig. 1). It leads to the fourth, which concerns epistemic responsibility.

What is the organic relationship Jantsch sees between the disciplines? He felt the risk of emphasizing technology would be neglecting the systemic nature of social arenas,

8 ***The Club of Rome*** is the original international group (before CIRET) that gathered knowledge from fields of academia, civil society, diplomacy, and industry to address "The Predicament of Mankind" (Meadows,1972).

9 http://www.clubofrome.org/

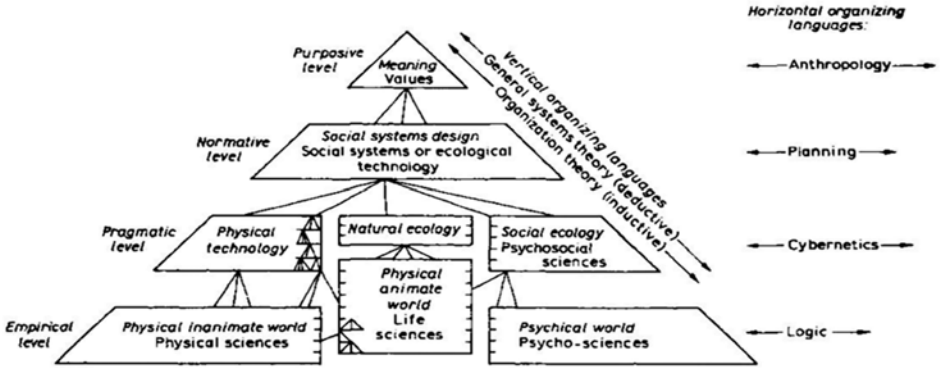


Fig. 1. Education/Innovation multi-level/multi-goal hierarchal system. Branching lines betwen levels and sublevels indicate possible forms of interdisciplinary coordination. (Jantsch, 1970 p.14)

ultimately driving economics in the direction of unsustainable productivity growth over integration. Indeed, we find this to be the case forty-five years later (Capra/Luisi, 2015). Jantsch expressed that "interdisciplinarity has to be understood as a teleological, normative concept"[10] (Jantsch, 1970 p. 103). Recognizing human purpose as a conscious work of conceiving the whole from parts or the co-ordination between disciplines and pragmatic purpose, he defined interdisciplinarity; (1) A common axiomatics for a group of related disciplines is defined at the next higher hierarchical level or sublevel thereby introducing a sense of purpose; (2) teleological interdisciplinarity acts between the empirical and pragmatic levels, (3) normative interdisciplinarity between the pragmatic and normative levels, purposing interdisciplinarity between the normative and purposive levels (Jantsch, 1970 p. 106).

Using Piaget's corresponding theory of levels of knowledge (see section 3 of Jantsch, 1970) we can compare Kant's well-known view of epistemology in his *Critique of Reason* with Gurdjieff's less-known discernment of the *Reason-of-knowing* and the *Reason-of-understanding*. Gurdjieff (1950) wrote: "Any information, even if true, gives to beings in general only mental knowledge, and this mental knowledge, … always serves beings only as a means to diminish their possibilities of acquiring knowledge-of-being" (p. 902). Gurdjieff further discerns the Reason-of-knowing and the Reason-of-understanding when he says,

> The conscious Reason-of-understanding, which in general it is proper for three-brained beings to have, is a 'something' which blends with their common presence, and therefore information of every kind perceived with this Reason becomes forever their inseparable part. The information perceived with this Reason, or results obtained thanks to being-contemplation of the totality of formerly perceived information—however, a being himself may change and whatever changes may proceed in the spheres around him—will be forever a part of his essence. And for that Reason which for most of your contemporary favorites has become habitual and which I called the Reason of knowing, every kind of new impression perceived through this Reason, and likewise every kind of intentionally or simply automatically obtained result from formerly perceived impressions is only a temporary part of the being (Gurdjieff p. 1166-1167).

10 ***Teleological*** contends natural entities have intrinsic purposes, irrespective of human use or opinion—that is, a non-personal or non-human nature. Kant uses this principle in his *Critique of Judgment*.

Gurdjieff understood, when founding his Institute for the Harmonious Development of Man, that this necessary blending of knowledge and being is a complex visceral engagement between the autonomic nervous system and human triune-brain dynamics (Gurdjieff, 1950 p. 791). An empirical explanation of this organic (primary) agonistic discernment process, differentiating order, follows in Chapter 2, with Paul MacLean and Stephen Porges' research.

1.1.3 Stéphane Lupasco (1900-1988)

While philosopher and sociologist Edgar Morin's influence on the Transdisciplinarity movement is more widely known, Stéphane Lupasco, Romanian biologist, physicist, and philosopher is my choice of a central third figure. Lupasco's work provides the vital logic for understanding several essential layers of this dissertation. Though Piaget, Jantsch and Morin's work contribute strong heuristic values in education, Lupasco, a relatively obscure philosopher, contributed a non-Aristotelian logic, which Nicolescu emphasizes in his *Manifesto of Transdisciplinarity* (MOT). Lupasco's theory illuminates the value of Gödelian dualism for understanding human evolution. By emphasizing the friction that naturally occurs between two entities, the logic inherent in energy itself can be experienced objectively. Like Piaget, Jantsch, and Morin, Lupasco studied science and philosophy primarily to arrive at a cultural contemplative logic. This move from deductive reasoning to intuitive practices is an essential step for humans. Lupasco's method of the "included middle" brings to the fore how paradoxes, by natural law, exist/persist between all living things. A requisite dynamic, Lupasco shows how energy and evolution move simultaneously as one whole natural endeavor.

Although Nicolescu brings our attention to Lupasco's scholarly contributions in MOT, the work of Joseph E. Brenner is the primary source for gathering Lupasco's logic in depth. In Brenner's (2010) paper "The Philosophical Logic of Stéphane Lupasco," he outlines a brief history that explains why Lupasco's work has gone unrecognized and the need for addressing his insights in full. Brenner writes,

> Starting in 1935, the Franco-Romanian thinker Stéphane Lupasco described a logical system based on the inherent dialectics of energy and accordingly expressed in and applicable to complex real processes at higher levels of reality. Unfortunately, Lupasco's fifteen major publications in French went unrecognized by mainstream logic and philosophy, and unnoticed outside a Francophone intellectual community, albeit with some translations into other Romance languages. In English, summaries of Lupasco's logic appeared ca. 2000, but the first major treatment and extension of his system was published in 2008 (see Brenner, 2008). This paper is a further attempt to establish Lupasco's concepts as significant contributions to the history and philosophy of logic, in line with the work of Gödel, general relativity, and the ontological turn in philosophy (Brenner, 2010, p. 243).

A contemporary of Ludwig von Bertanlanffy, Lupasco's 1935 thesis *On Logical Becoming and Affectivity* (republished in 1973), proposed a new logical systems format, grounded in the physics and cosmology of Planck, Pauli and Heisenberg.[11] His theory was based on a principle of dualistic, dynamic opposition in energy, characterized by a law of

11 Lupasco's Thesis of 1935 *On Logical Becoming and Affectivity* is in two volumes. Their subtitles are respectively: *Antagonistic Dualism* and *Essay on a New Theory of Knowledge*. He originally conceived his Thesis as a study of method entitled: *Sketch of a New Discourse on Method* (see Hofweber, 2005).

the "included middle" (Brenner, 2010, p. 245). Brenner reports, Lupasco devoted a significant portion of his Thesis to a novel critique of some major predecessors: Kant, Hegel, Schopenhauer, and Bergson. Lupasco was able to show that each philosopher was able to maintain the coherency of his system only by ignoring or relegating to an inferior ontological status one or the other of the two essential aspects of existence, identity or diversity. The diametrically opposed approaches to time and space by Kant and Bergson could be read as an example of the way in which dialectics "plays out" at the level of individual psychologies. … Lupasco asked, with all due respect to Kant, how such synthetic judgments could be possible, since a posteriori, any link between the two entities could also only participate in the contingency of all existence. The first part of Lupasco's answer, not Kant's, was to consider that a real analytical judgment was possible, one that would "un-link" two homogeneous concepts; unlinking should be as acceptable a process as linking, especially if the link were somehow imposed from outside (Brenner, 2010, pp. 271-272).

Since theoretical works remain abstract without practical methods for engagement, how, in this case, does "un-linking" actually take place? How is non-connection a positive feature when maintaining coherency or an actual function of co-existence? As Brenner explains Lupasco further, an ear must be kept toward discerning how un-linking might occur in real time/space.

> Lupasco's basic dialectical concept is that, as in Kant, the connection between A and B is a phenomenon, but so is the non-connection: A phenomenon is something which contains in itself, coming from nowhere else, its life and its death at the same time, its affirmation and negation of itself, without one being able to annihilate the other, because their existence is a function of their coexistence. This belief is behind all the examples we have discussed previously of the relations of contradictory terms. No thing has an absolute value. Nothing is not the absence of something but a logical quantity a positive absence of link, a contradiction of a thing by itself, a non-identity, but existential and constitutive of an analytical factor having the same value as the synthetic factor responsible for the link (Lupasco, 1935; Brenner, 2010 p. 272-3).

Lupasco's basic insight, conferred by Brenner is:

> Logic not only should, but can be extended to reality, provided one takes into account and gives proper metaphysical weight to some of its characteristics that have tended to be neglected. These include the concepts, present since antiquity, of dialectic conflict as well as change and alternation between the different but closely related, interactive elements of a phenomenon. Dialectics can be considered neither more, nor less, than the generalization and mental expression of conflicts in nature and civilization, and their resolution, that man has observed from time immemorial. Quoting Lupasco, 'Beings and things seem to exist and are able to exist only in function of their successive and contradictory conflicts.' For Heraclitus, conflict did not mean the splitting or destruction of the unity of reality, but its constitution. The logos, the only 'abiding thing' is the orderly principle according to which all change takes place, a 'binding-together.' Conflict (polemos) and logos are the same (Brenner, 2010 p. 248).

While Brenner, for Lupasco, describes his concept intellectually, these passages imply there is a method, an actual activity that is doable, in-situ, creating a sense of disciplined order whereby an intentionally lived experiment can be later verified. Brenner writes,

> This new method 'would consist in seeking, in the presence of any phenomenon, first, what is its contradictory phenomenon and second, to what extent it potentializes (virtualizes) it or is potentialized by it.' This key thought in Lupasco's writing continues: 'In a general way, one must link the rational and the irrational, identity and non-identity, the invariant and the variant [. . .] by the constitutive relation of contradictory complementarity, of a duality of dynamic terms, with a principal double aspect, including, for each term, the passage from potential to actual and the passage from actual to potential, each of the terms acting on the other (Brenner, 2010 p. 248).

Here, Lupasco's logic meets Eastern practices of self-observation, a vital thread discussed at length in Chapter 3. Specifically, in section 3.5, Lupasco's principle of the "included middle" affirms Gurdjieff's principle of the "law of three."

We must be particularly interested in Lupasco's strike against the dialectic. His principle extends and expands attention to issues regarding how signs, symbols, cultural forms of a transdisciplinary art and environmental design education might function if taught in relation to our phylogenetic structure. Today, the question remains open whether Western empirical findings and Eastern traditions will meet the integrated educational methods Jantsch, Lupasco, Porges', Gurdjieff and many others have proposed over the past fifty-years. An education system where individuals prepare their inner digestive psychic organs to receive direct impressions, a *non-identified* (objective) working practice would strengthen co-evolutionary practices within the context of nature's discourse (Goethe, 1820; Husserl, 1929; Ouspensky, 1949; Gurdjieff, 1950; Porges, 2011).

As it stands, consciousness institutes, centers for ecoliteracy, and Force-Majeure studies, working in tandem with universities, can only hope their holistic systemic models will one day influence standard school curricula. The challenge for a new level of norms to advance human consciousness has reached a criticality. Individuals who aspire for wholeness are a vital source for stewarding this Cultural shift. These early pioneers of Transdisciplinarity could not have emphasized enough how the field of non-equilibrium thermodynamics points the way toward overcoming dualism. Prigogine's model, "order through fluctuation," governs the evolution of physical, biological systems, in addition to guiding systemic solutions for a civil social society (Lupasco, 1935; Jantsch, 1975; Capra/Luisi, 2015). Art and Environmental Design programs that teach the science of human evolution and the philosophy of a systems view of life have a significant opportunity to demonstrate implicit/explicit experiential hands-on approaches, when creating and designing social communities for the future.

1.2 Relationship Between the Science of Human Evolution and the Philosophy of Transdisciplinarity

A transdisciplinary study intuiting the natural contention between agonistic systems has always been a central axis of Eastern traditions. By way of empirical measurement, neuro-scientists today are establishing verifiable data that indicates how experiential pathways of Zen/Buddhism meditation and yoga, may contribute holistic development of mental/physical processes of evolution.[12] Though Gurdjieff's science of human evolution, a cosmological model for the harmonious (transmutative) development of man came to London, Paris, and New York in the 1920-30's and San Francisco in the early 1960's, his system remained largely impenetrable.[13] A consensus for Gurdjieff's cosmology may play a wider role in the future as schools established by him and his early followers maintain his teaching today. Known in Western science as the "Fourth Dimension" or in Eastern Studies as the "Fourth Way," human evolutionary development requires holistic forms and conditions whereby syncretic experiential practices can be taught.

Since the turn of the twentieth-century, an incomprehensible mass of exploitation and destruction of the planet has occurred in the name of religion, democracy, capitalism, and Marxism, as well as in the name of industrial and technological "progress." If it were not for the balance the ecological movement has brought, I fear to think what human social conditions would be like today. While we are each individually responsible for our carbon footprint, we are, on a subtler level, responsible for making efforts to "know ourselves." If raising the normative level of human consciousness becomes a priority, our environmental impact would naturally be reduced, for evolving human consciousness requires organic life be preserved.

The science of human evolution, with its major tenets, and Transdisciplinarity with its "Moral Charter" together form a framework for identifying threshold points of human development. My purpose, here, is to advance beyond Transdisciplinarity's theoretical propositions by outlining what needs to occur practically so educative processes can meet greater fulfillment of their goals. Ervin László, representing Ludwig von Bertanlanffy's general systems theory, identified six major tenets of co-evolution. Though I won't review them in detail, the six tenets are: **1.** Nature is composed of a hierarchy of systems, each with a specific structure made up of certain maintained relationships among its parts and manifesting irreducible characteristics of its own. **2.** Homologies or isomorphisms are similar structural patterns up through the whole succession of physical, biological and social systems. **3.** Similar developmental patterns are manifest throughout all of nature's systems. Evolution is toward order, integration, complexity and individuation and away from multiplicity and chaos. **4.** Cybernetics are open systems, interacting wholes, with inputs, throughputs and outputs of energy and information. Through negative feedback, systems maintain a dynamic equilibrium. Coding (communication triggers), negative entropy (organization of energy from the environment in order to maintain the system) and equifinality (different development paths can lead to the same destination) are basic concepts in cybernetic models. **5.** Macro-determinism, a prediction of individual events, is neither possible nor necessary, though general movements and state qualities of systems can be predicted. **6.** Holism

12 The *Mind In Life Research Institute* is one example organization publishing data regarding outcomes of contemplative practice. They are working with the Dalai Lama and Neuroscientist David Ritchie.

13 Gurdjieff's introduction to Fourth Way principles provides practical study through the voluntary (intentional) work of blending the psychic properties of wish and aim. Practice initially brings awareness of the lack of unified intention/attention in the three-centers. Seeing this lack is what gradually evolves a fourth body. The aim for self-study is to regulate inner vibrations of all three centers.

means systems are viewed as integrated wholes of their subsidiary components and never as mechanistic aggregates of parts in isolatable causal relations (Bertanlanffy, 1968; László, 1972).

As László states, the systems view of nature and humanity is clearly non-anthropocentric, but it is not non-humanistic either. It allows us to understand that humans are but one species of a larger system that is complex and embraces the hierarchy of nature. If humans understand they are a connecting link within a complex natural hierarchy, human anthropocentrism falls away, as the hierarchy expresses self-ordering and self-creating nature, encouraging humanism (László, 1972 p.118). Underlying diversified and localized gross layers of ordinary consciousness there is a unified, non-localized, and subtle layer of "pure consciousness" (László, 2007 p. 120). László continues,

> As we have already glimpsed and will continue to discover, we are able to expand our awareness beyond the perceived limitations of our own person and access the dimensions of a transpersonal consciousness. As we open ourselves to the realization of the informed universe, this shift in our collective awareness heralds a resolution of the schisms that have divided us for so long—both among and within us (László, 2008 p. 101).

Even as the worldwide educational movement of Transdisciplinarity takes hold of issues that ask institutions and humans to comprehend how perception functions, the movement does not yet provide a curriculum. What is needed is a curriculum in which humans can learn how brain/body-dynamics operate, when negotiating, for example, the conflicting impulses of an inter-subjective/objective agreement. For example, Nicolescu presents Peter Brooks' art in theater as illustration of how human conflicts play-out in cultural discourse. Academic institutions, however, must provide students, in their learning environments, experiential/heuristic opportunities. Only by establishing epistemic experiential *practice* in balance with expository/theoretical concepts will the levels of reality that Nicolescu outlines be obtainable. Natural limits of the subjective brain and nervous system must go through somatic learning processes.[14] This need for coming in touch with internal sensations, as way to educate the nervous system, is addressed more fully in Chapters 2 and 3.

Without more specific method-based/experimental approaches from psychology and neuroscience, the structure of most universities, with their single discipline format, wrongly assumes that students automatically blend theoretical information and real world, eco-literate activities. Since a transdisciplinary education, is not about connecting the dots across disciplines, it requires physical spaces of learning where conditions of those environments support transmutative (psyvolutionary) experiences. Many psychologists and scientists who understand the morphological dynamics that neuroscientists map visually are, overall, trained specialists. Transferring quantitative information to qualitative art and environmental design practices must work in relation to each other. An overload of information gathering is a clear sign that we as a culture live with an imbalance of information, of theoretical empirical facts, the implications of which function apart from syncretic engagement. A transdisciplinary education requires a co-evolutionary, non-directive aesthetic engagement to be taught in schools, whereby actual lived experiences prepare individuals to evolve their mental/physical biological being. If our approaches to teaching include, for example, ways of asking students to work with *isomorphic* perceptions, an inherent potential opens toward consciously engaging a reconciling "third-force."[15] Humans skilled to include

14 Richard Shusterman, for example, demonstrates how academic literature on experiential education has grown.
15 ***Third-force*** is used here both generally and specifically in regard to resolving paradoxes/dualities.

this otherwise dormant third-principle would mark a major adaptive-evolutionary gain. This third-principle, noted theoretically by Lupasco and Nicolescu, is verifiable, through actual exercises given by Stephen Porges and G. I. Gurdjieff. Their research is the harbinger for humans to learn how to integrate the theoretical with experiential practice. Higher levels of cognition and higher levels of reality come through this embodied engagement.

Outwardly, the negotiation of 'public space' figures directly in this same process of inner adaptive learning. Framed as either "agonistic spaces" or "uncontested spaces," Art and Environmental Design programs play a crucial role in helping individuals to move from metaphorical language to an actual physical space where self-reflexive consciousness in relation to all forms of hegemonic conflict are actively engaged. Consciousness naturally develops if envisaging and engaging in the public sphere comes with inner attention toward the mental, the physical and the instinctual/emotional centers. The IF is big here, because the tension between public spaces and private needs are in conflict. As humans live with subjective/interior conflict, consensus emerges through evaluative processes, which ideally move toward shared values within the spaces of place and politics. New cultural paradigms of consciousness can emerge through individuals in communities who are able to modify former contingencies of dualistic thinking.

Stewards of the earth, several of whom are represented in this dissertation, are making "discursive spaces" realizable for future forms of social analysis. For example, since the turn of the nineteenth–century, humans have been attempting to come to terms—against all odds—with what Fritjof Capra (1975) called "a crisis of perception." Today, Basarab Nicolescu has like Capra, and many others for the past 40 years, engaged in a systematic examination of the philosophical and social implications of contemporary science. In the case of Nicolescu, we know that his earlier writings, before taking on the Transdisciplinarity movement, returned to views of nature by way of the wisdom of ancient Greeks (Aristotle), German Christian mystic and theologian Jakob Böhme (1575-1624) and the teachings of Greek/Armenian Esoteric Cosmologist, G. I. Gurdjieff (1866-1949).[16] In his introduction to MOT, Nicolescu reminds us that the term Transdisciplinarity was coined to give expression to a need that was perceived—especially in the area of education—to celebrate the transgression of disciplinary boundaries. However, in order to move into this new territory, humans must comprehend the emergence of at least two different levels of reality, which the philosophers Goethe and Husserl pioneered. Nicolescu states:

> Respect for the trans-Nature of human nature implies the recognition in every human being of his double interior and exterior transcendence. This transdisciplinary vision is incompatible with any attempt to reduce the human being to a definition that has some formal structure no matter what it is.… Where biological evolutionary constraints have ended, a new kind of evolution linked to culture, science and consciousness is emerging…. It is precisely the orientation of the flow of consciousness cutting across the different levels of perception that gives meaning—meaning and direction—to this co-evolution. There is hidden here an aspect of democracy that merits profound study in all its dimensions (Nicolescu, 2000 p. 73).

16 G. I. Gurdjieff died in 1949 leaving behind a teaching, colloquially called "the Work," with a number of disciples, primarily in Europe, England, and North America. They came together under the guidance of Jeanne de Salzmann (d.1990) and Lord Pentland, (d. 1984) who headed the continuation of the Work until their death. Proliferations of independent groups, outside the San Francisco, New York, London and Paris Foundation centers that did not come through this lineage, are unclear sources for the actual teaching.

In the subject-observer relationship where multi-referential and multi-dimensional perceptions of reality are visible, the third-force discussed in Lupasco's axiom for studying "natural systems"[17] is a vital concept (Nicolescu, 2000 p. 156). Third-force provides "charge" or energy to do the work of transporting isomorphic pathways.

1.2.1 Aesthetic Experience and Isomorphisms

> *Transdisciplinarity is not concerned with the simple transfer of a model from one branch of knowledge to another, but rather with the study of isomorphisms between the different domains of knowledge. To put it another way, transdisciplinarity takes into account the consequences of a flow of information circulating between the various branches of knowledge, permitting the emergence of unity amidst the diversity and diversity through the unity.*[18]
>
> BASARAB NICOLSECU, 1987

All theories of evolution provide distinctive ideas of development and change in the universe, including situating humans in the history of geological time. With regard to the scale of developmental time, a holistic perspective shifts human understanding. A co-evolutionary aesthetic—a qualitative, synthetic relationship between art and science—emerges contingent on individual self-awareness. As Kant asked in his work *Critique of Pure Reason*: What is there to depend on in this process of growth? Roger Scruton summarizes Kant: "For the empiricist view to be true, there cannot be a synthetic a priori knowledge: synthetic truths can be known only through experience" (Scruton, 1982 p. 28). And, quoting Kant: "In a-priori synthetic judgments, this help [of experience] is entirely lacking. Upon what, then, am I to rely on when I seek to go beyond the concept? Through what is the synthesis made possible" (Kant, 1871 [A9/B13])?

Although at first seeming abstract, Stephen Porges clarifies that humans have evolved a bidirectional, hierarchal, and visceral top-down/bottom-up "field of play" between brain/body (2.3). It is through this experiential field that humans find the capacity to engage an inner vibratory "field of sensation," which conducts coherent signals between brain and gut. While this conscious aesthetic engagement can be defined as a process that leads to evolving humans, how do individuals pursue this form of study, if methods of praxis come through ordinary—everyday—a priori understanding? In contrast, an existentialist's attitude is fear-filled, often stated as "what will I get" or "prove it to me first." A skeptic's closed dualistic thinking does not connect the heart with the body's mind. A transcendental approach means, at first, bracketing subjective/objective thoughts, suspending them as one and the same perception. A harmony divides out, so to speak, making the form and nature of one's thought (the capacities of the knower and living energies) vibrate as one "digested" understanding. It's this concept, experienced as a working process, which makes a priori knowledge possible (Scruton, 1982 p. 34). Though a strong wish may initiate the hope for a transcendent attitude to open, an affirming aesthetic "taste" becomes a substantive quality when directly experiencing the unknown. One can sense traction, something unfamiliar yet "right."

Transdisciplinary education and isomorphic dynamics share two central qualities with evolution: reflexive-flexibility and adaptive potentials. While disparate brain

---

17 Lupasco's axiom of the 'included middle' states: A third term *T,* which is at the same time *A* and *non-A*. The dynamics are an asymbolic triangle, where one of the vertices is situated at one level of Reality and the other two vertices at another level of Reality. If one remains at a single level of Reality, all manifestation appears as a struggle between two contradictory elements (i.e.: wave *A* and corpuscle *non-A*). Refer back to 1.1.3 for more about Lupasco.

18 See Article 3 of the 1987 Charter: http://ciret-transdisciplinarity.org/moral_project.php

dynamics (discussed at length in Chapter 2) are innate to humans, unifying energies that are operating in a "far-from-equilibrium-state" must be consciously assisted through experiential innervative/enervative—fight/flight—response practices. Zehou Li suggests, "The formal structure of external objects and the human physiological-psychological structure produce similar patterns of electric pulses in the brain, the object outside and the emotion inside reach a state of agreement and harmony"(Zehou Li, 2006 p.51). Over a period of time, this aesthetic qualitative experience brings equilibrium to the human system. Adaptation then, on all scales—micro/macro worlds and mind/body—means the transmutation or harmonizing of forms. Physically, how does an individual experience subjectivity separating from objectivity? What are the innate pressures, forces, vibrations and plasticity alive in substrates of matter? How is an ontological shift not just an intellectual transposition of opinion, but also an altogether new feeling of brain/body constitution? I will attempt to answer these questions by first substantiating various dynamic types of isomorphic forms.

The word isomorphism derives from the Greek *iso*, meaning "equal" and *morphosis*, meaning "to form" or "to shape." According to Wolfram's math world dictionary, the most common meaning of isomorphism is the possession of intrinsic topological equivalences. *Formally*, an isomorphism is a "bijective" morphism. *Informally*, an isomorphism is a map that preserves sets and relations among elements. Mathematically, an equation would look something like "$\boldsymbol{A}$ is isomorphic to $\boldsymbol{B}$" and can therefore be written: $\boldsymbol{A} \cong \boldsymbol{B}$. The term can also be put, as a rule, somewhat abstractly. For example, objects are said to be isomorphic if a continuous, invertible mapping can deform them into each other. Such an isomorphism ignores the space in which surfaces are embedded. The deformation can, therefore, be completed in a higher dimensional space than the surface it was originally embedded in.[19] In these several ways of defining isomorphisms, the question arises: is it possible to make contingent categories of those "things" which are recognizable as "shared forms," even if they do not share a material base? Apparently so. For example, some objects are formed from organic material processes, while others are made of man-made material processes, and yet both types fit categorically, as long as they share the same shape. The term isomorphism can, in other words, be used *informally* to suggest vastly generalized similarities, while scientists and mathematicians, in a *formal* sense, may limit isomorphisms to exact, one-to-one relationships of corresponding crystalline forms.

If contingencies are placed within our way of formally looking at isomorphisms, lack of corresponding notions or properties are naturally excluded. What becomes of the eliminated properties? When discussing this question with mathematician Beresford Parlett, he said: "If you select out the parts of what interests you to map, you may ignore the parts that are not of value to the problem. If you're solving for X, the other parts are simply not of concern."[20] This suggests the very subjective, constructed nature of knowledge. How would we then map an isomorphism if strictly limited to "natural" evolutionary growth patterns and the emergence of brain dynamics? With the understanding of the boundary of forms and shapes just expressed is it not preferable to focus on Nicolescu's terms *In Vitro* and *In Vivo* where he compares differences between the flow of disciplinary knowledge vs. transdisciplinary knowledge (Nicolescu, 2002 p.153)? If adaptation is by principle holistic, morphological transformations operate under conditions where one entire form allows another to be present simultaneously. Isn't friction with coherence then an essential value of Transdisciplinary action? In the case of Chantel Mouffe, who blends biological pathways when mapping complex individual and social/political factors, we see a framework for understanding how

19 http://mathworld.wolfram.com/Isomorphism.html
20 Conversation with Beresford Parlett, U.C. Berkeley Professor of Math on April 20th 2011.

Transdisciplinarity supports "zones of non-resistance" that also proves to be essential for communicative flow. Nicolescu defines how one sustains the other this way:

> The two zones of *non-resistance* in transdisciplinary Object and Subject must be identical in order that the transdisciplinary Subject can communicate with the transdisciplinary Object. A flow of consciousness, crossing the different levels of perception in a coherent manner, must correspond to the flow of information crossing the different levels of Reality in a coherent manner. The two flows are in a relation of isomorphism, thanks to the existence of one and the same zone of nonresistance. Knowledge is neither exterior nor interior: it is at the same time exterior and interior. The study of the universe and the study of the human being sustain one another. The zone of non-resistance permits the unification of the transdisciplinary Subject and the transdisciplinary Object while preserving their difference (Nicolescu, 2002 p. 6).

If the traits of adaptation or the dynamics of Goethe's morphology is employed, a window opens for us to see that co-evolutionary processes also occur simultaneously and consistently, whether subjects/objects are isomorphic or not. (i.e., what a tree is doing, what a human being is doing, and what a city is doing all involve subjects/objects interdependent on each other.) Like isomorphisms, a transdisciplinary point of view has to be wide and flexible enough to "answer many questions in the most rigorous way possible."[21] In Chapter 8 of MOT, Nicolescu asks: "What is the nature of the theory that can describe the passage from one level of reality to another? Is there truly coherence, a unity among all levels of Reality? What is the role of the subject-observer of Reality in the dynamics of this possible unity? What is the role of reason in the dynamics of this possible unity of knowledge" (Nicolescu, 2000, p. 49)?"

To help direct our attention further into this extended line of questioning, D'Arcy Thompson's theoretical work *On Growth and Form* (1917) shows that complex isomorphism existing in nature can be examined in the following way:

> In a very large part of morphology, our essential task lies in the comparison of related forms rather than in the precise definition of each; and the *deformation* of a complicated figure may be a phenomenon easy of comprehension, though the figure itself has to be left unanalyzed and undefined. This process of comparison of recognizing in one form a definite permutation of deformation of another, apart altogether from a precise and adequate understanding of the original "type" or standard of comparison, lies within the immediate province of mathematics, and finds its solution in the elementary use of a certain method of the mathematician. This method is the 'Method of Coordinates,' on which is based the *Theory of Transformations* (Thompson, 1917 p. 1032).[22]

Cognitive psychologist Steven Lehar defines isomorphic gestalt as an entire change that reshapes or transmutes a previous form, including brain perceptions (which are understood to be physical). Lehr states,

---

21 http://ciret-transdisciplinarity.org/bulletin/b15c4.php

22 Thompson's footnote on this same page suggests that the distinction among biologists between a mutation and a variation is analogous to Substitution groups and Transformation groups, one being discontinuous and the other continuous in such a way that within one and the same group each transformation is little different from another.

> The isomorphism required by Gestalt theory is not a strict *structural* isomorphism, i.e. a literal isomorphism in the physical structure of the representation, but merely a *functional* isomorphism, i.e. a behavior of the system *as if* it were physically isomorphic (Köhler, 1969, p. 92). For the exact geometrical configuration of perceptual storage in the brain cannot be observed phenomenologically any more than the configuration of silicon chips on a memory card can be determined by software examination of the data stored within those chips. Nevertheless the mapping between the stored perceptual image and the corresponding spatial percept must be preserved, as in the case of the digital image also, so that every stored color value is meaningfully related to its rightful place in the spatial percept…. Neurophysiological models of perceptual processing and representation should concern itself with the actual mechanism in the brain.[23] (Lehar, 2004, p. 375)

What Lehar is describing relates to yet another type of isomorphism called *psychophysical isomorphism*, which is defined as a correlation that exists between conscious experience and cerebral activity. I will again rely on D'Arcy Thompson, who teaches us most everything we need to know when it comes to the growth of both animate and inanimate objects. In Chapter XVII of *On Growth and Form*, titled "On The Theory of Transformations or The Comparison of Related Forms" he concludes:

> We have attempted to study the interrelations of growth and form, and the part which physical forces play in the complex interaction; and, as part of the same inquiry, we have tried in comparatively simple cases to use mathematical methods and mathematical terminology to describe and define the forms of organisms. We have learned in so doing that our own study of organic form, which we call by Goethe's name of Morphology, is but a portion of that wider Science of Form which deals with the forms assumed by matter under all aspects and conditions, and, in a still wider sense, with forms that are theoretically imaginable. … The study of form may be descriptive merely, or it may become analytical (Thompson, 1917, p.1026).

This passage leads me to include, amongst the types of isomorphics mentioned so far, *ontological* studies,[24] where a co-evolutionary systems approach to Transdisciplianarity may be studied analytically by way of Jantsch's categories, (isomorphic or otherwise). While scientists *empirically* measure through equations and algorithms to arrive at "proofs," in contrast, visionaries (such as Teilhard de Chardin or Goethe) *intuitively* sensed that the transition from direct seeing to interpreting had always the tendency of the mind to impose an intellectual structure that wasn't actually present in the thing itself. "How difficult it is...to refrain from replacing the thing with its sign, to keep the object alive before us instead of killing it with the word?" Goethe asked (Goethe, 1820 *trs* 1994, p. 275). And elsewhere: "The senses do not deceive; it is judgment that deceives"

---

23 Lehar's most radical theory is that the solid spatial world that we see around us in visual experience is not the world itself, but merely a miniature replica of that world in an internal representation. This is known variously as the theory of *Indirect Perception, Indirect Realism, Epistemological Dualism, and Representationalism*. His idea is not new, having been first proposed by Kant.

24 ***Ontology*** is the philosophical study of the nature of being, existence, or reality as such, as well as the basic categories of being and their relations. Traditionally listed as a part of the major branch of philosophy known as metaphysics, ontology deals with questions concerning what entities exist or can be said to exist, and how such entities can be grouped, related within a hierarchy, and subdivided according to similarities and differences.

(Goethe, 1948 HA, XII No. 295, p. 406). Almost 200 years later, Nicolescu and many others insist that *experience* must take a privileged role over the *theoretical* in order that all formally imposed "thinking" structures are cleared. He explains, "The definition of Nature that I propose signifies neither a return to magical thought nor a return to mechanistic thought, because it rests on a twofold affirmation: (1) the human being can study Nature by means of science; (2) Nature cannot be conceived except in terms of its relation to the human being…. Nature seems more like a book in the process of being written: The book of Nature is therefore not so much to read as to be experienced, as if we are participating in the writing of it [ourselves]" (Nicolescu, 2000, p. 65).[25]

Niscolescu describes the value and limits of isomorphic mirroring in this way:

> Human beings have always dreamed of pondering their own face in the mirror of Nature. The mirror of magical Nature is, of course, a magic mirror: everything can be seen, perceived, experienced, at least potentially, in this mirror. Unity is actualized; diversity is potentialized. In contrast, the mirror of mechanist Nature is like a broken mirror, or a scalpel. It is enough to take one piece of the tissue (that is, Nature) in this mirror/scalpel in order to make pronouncement about the entire Nature Machine. This piece of Nature is conceived as if it were a miniature copy, conforming to the entire whole. The privileged instrument for interpreting the image produced by this mirror/scalpel is theory, more and more formalized on the mathematical plane. Etymologically, *theory* means the action of observing, the fruit of intellectual contemplation, the action of seeing a spectacle, or of participating in feast. For mechanistic thought, the feast is transformed into a conquest and the spectacle is transformed into the reading of a book in advance, the book of Nature (Nicolescu, 2000, p. 65).

Goethe's philosophy defines how the physical mind takes hold of an impression and interprets what it is seeing.[26] "Man," he says, "is sufficiently equipped for all his genuine earthly needs if he trusts his senses and cultivates them in such a way that they remain worthy of trust" (Goethe, 1948, HA, VIII No. 90, p. 473). While he does not say exactly how this trust is formed, he alludes to a capacity. Stephen Martinson, a scholar on Friedrich Schiller suggests Schiller and others who corresponded on this question understood that the "problem of modernity, namely the rupture of the original harmony between the human being and Nature, could not be overcome by intellect alone. … The true crisis of Schiller's writings may well reside in the seemingly irresolvable conflict between the desirability of the goal of completion and the knowledge of is unattainability" (Martinson, 1996 p. 270-271). That humans can come to know themselves and observe if the mind is clear of former notions is, however, clearly implied in Goethe's statement. If there is a specific form of practice for self-observation that allows bracketing repetition and habits that co-opt interpretations, instructions that would guide individuals is left abstract. Martinson, I think rightly concludes in the case of Schiller's work that since, "he set up a goal or an ideal only to deconstruct it, may be perceived as either a failed attempt and an ultimate failure, or a hermeneutic process of self-critical reflection, which in the light of history would situate the writer between Enlightenment and romanticisim" (Martinson, 1996 p. 270).

25 For example: A fly experiences a different nature than humans; this is called "umwelt" (Worldview) by German Ethologist Konrad Lorenz and other in the 60's and probably earlier.

26 Goethe's life (1749-1832) closely overlaps Kant's (1724–1804).

Though sound in judgment, perhaps the abstract ideals Goethe and Schiller left behind are what inspired Edmund Husserl's intellectual eidetic project. Husserl's description of the conflict, however, attends largely to phenomena in the mind of consciousness. Though many styles of phenomenology have emerged since, phenomenology's central aim in the twentieth-century, according to Husserl (1859-1938), is "to the things themselves" (Spiegelberg, 1960 p. 109). Taking Goethe's principles a step further, what Husserl enforced was the need for a participatory, self-reflexive action. He asks how the thing, if studied, describes itself, as if it had the ability to speak (Seamon, 1998 p. 2). In Chapter 3, we will learn that Gurdjieff provides an actual method for transmutation, by way of three-centered (i.e., moving-motor, intellectual-thinking, and emotional-feeling) self-study exercises. Terms Gurdjieff taught in an actual school clarify—these otherwise abstract notions.

In a conversation with Harold Morowitz, he restated Kant's position about the complexity that comes with human observation: "Kant's *a priori* posteriori says this: what the mind brings to the phenomena and what the phenomena brings to the mind are these *unknown somethings*, which are manifested within the noumenal—although we can never know how or why, as our perceptions of these unknown somethings are bound by the limitations of the *categories of the understanding* and we are therefore never able to fully know the 'thing-in-itself.' Kant did not mean there is no 'real world,' but just that you will never get to the bottom—it is epistemologically impossible."[27] How we differentiate and integrate our observations must therefore follow understanding what forms a subject can undergo. Forms are temporary and meant to be recognized as processes of becoming.

1.2.2 Differentiation, Symmetry Breaking and Integration

Western empirical and Eastern eschatological traditions consider a range of concepts when describing how it is one thing becomes another. As Jantsch noted, complexity in all things emerges from the interpenetration of processes of differentiation and integration. Differentiation and integration, running "from top down" and "from the bottom up" at the same time, are valued processes for reshaping and reforming hierarchical levels from both sides. For humans, the body/mind biologically undergoes a "bottom up" approach when consciously separating coarse energy from finer energy. While implicit human hierarchal phylogenetic processes will be discussed at length in Chapter 2, a continued understanding of explicit synthesis for integration of scientific and philosophical thought, as it plays out culturally is important to secure. An explicit understanding of epistemology allows deeper appreciation for the epistemic dynamic forms of objective/subjective and biological/psyvolutionary processes, which humans learn through social engagement.

As we have just reviewed the pioneering work of key transdisciplinary thinkers, Lupasco in particular brings us to the vital philosophical logic of differentiation, symmetry breaking, and integration. If latent knowledge comes through a third-space (the included middle), can humans verify the natural forces binding such a subjective/objective agreement? Is a (hidden) third-force naturally implicit when there are two things? How does a third-space actually open through voluntary efforts to suspend preconceived notions? How do we move from philosophical and social norms toward experiencing our individual psychology and energies unmediated by the past or by culture? The layers in these questions show the complexity involved in both micro/macro scales. While many agree that humans must learn to perform this voluntary non-directive skill in order to find the cornerstone of their individual evolutionary

27 Morowitz, Harold: Recorded interview March 15, 2012 at George Mason University Fairfax, Virginia.

growth, it's not possible to perceptually arrive there all at once. A transdisciplinary education, however, assists an individual's understanding of how the social/political affects an individual's evolutionary growth. Art and environmental design practices qualitatively engage humans in the necessary experiential embodied component.

To return to living forms that differentiate, break, and integrate, D'Arcy Thompson addressed, at the end of *On Growth and Form*, how the rigors of Science and Math have, like art and design, introduced us to endless freedom and higher understanding of order and movement. We find these same freedoms and higher understanding embedded in philosophical forces of Transdisciplinarity's structure. Thompson writes:

> Once more, and this is the greatest gain of all, we pass quickly and easily from the mathematical concept of form in its static aspect to form in its dynamical relations: we rise from the conception of form to an understanding of the forces which gave rise to it; and in the representation of form and in the comparison of kindred forms, we see in the one case a diagram of forces in equilibrium, and in the other case we discern the magnitude and the direction of the forces which have sufficed to convert the one form into the other. … In a nutshell: We can move matter—that is all we can do to it (Thompson, 1945 p. 1027).

When I met with Basarab Nicolescu in 2011, we discussed that although he is a particle physicist, what he is bringing forth in his *Manifesto of Transdisciplinarity* is much bigger than science. I asked, if science and reality are unable to solve differences by equation, because more than one answer may be correct, how are differences resolved?[28] Harold Morowitz, speaking as an evolutionary biophysicist, answered this same question similarly to Nicolescu so I bring their responses together. "Where we have algorithms or equations to measure truths, we also have *evolution* and *enigmatic traits* where the prediction of phenomena are equivalent to the unknowable *"ding an sich"* (thing itself), which Immanuel Kant discusses [in his Critique of Pure Reason]."[29]

Transdisciplinary Nature, as Nicolescu describes and D'Arcy Thompson would agree, has a ternary structure, which defines living Nature. According to Nicolescu's transdisciplinary model of Reality, he differentiates three major aspects of nature. His three distinctions are:

> **1.** *Objective Nature*, which is connected with the natural properties of the transdisciplinary Object; objective Nature is subject to subjective objectivity. This objectivity is subject to the extent that the levels of Reality are linked to levels of perception.
>
> **2.** *Subjective Nature*, which is connected with the natural properties of the transdisciplinary Subject; subjective Nature is subject to objective subjectivity. This subjectivity is objective to the extent that the levels of perception are connected with levels of Reality. Nevertheless, the emphasis here is on subjectivity, to the extent to which the methodology employed is that of the ancient science of being, which is present in the traditions and religions of the world.
>
> **3.** *Trans-Nature*, which is connected with a similarity in nature—a veritable communion—that exists between the trans-disciplinary

28 Nicolescu, Basarab: Recorded interview December 19, 2011 in Paris, France
29 Morowitz, Harold: Recorded interview March 15, 2012 at George Mason University Fairfax, Virgina.

> Object and the transdisciplinary Subject. Trans-Nature concerns the domain of the sacred and corresponds to the 'veil," which is the zone of nonresistance mentioned in the previous chapter. It cannot be approached without considering the other two aspects of Nature (Nicolescu, 2009 p. 63-64).

This nature is living because life is there, present in all its degrees. In humans, its study demands the integration of lived experience. The quantum leap between understanding objects and subjects (in terms of their shape) and experiencing intrinsic qualities (namely through a subject/object's energies and vibrations), leads us toward a holistic comprehension of ternary structures. Ternary structures are dynamic. They are characterized by constant change—not fixed answers. One of the key differences between mediation of the flow of information as a single discipline and Transdisciplinarity is the gap between what Nicolescu calls the logic of *In Vivo* (Latin for "within the living") and *In Vitro* ("within the glass", i.e., in a test tube or petri dish). While experimentation *In Vivo* uses a whole, living organism, *In Vitro* employs a partial or dead organism, and the logic of a controlled environment (Nicolescu, 2002 p.153).

This takes us back to a definition of nature that Nicolescu proposes is: "neither a return to magical thought nor a return to mechanistic thought, because it rests on a twofold affirmation: (1) the human being can study Nature by means of Science; (2) Nature cannot be conceived except in terms of its relation to the human being" (Nicolescu, 2009 p. 65). As levels of perception are key to what an individual can experience, political theorists Chantal Mouffe and Ernesto Laclau take up several important explicit aspects of a social trans-nature vision in *Hegemony and Socialist Strategy* (2001). Theoretically they agree with Thompson, Jantsch, Lupasco and Nicolescu that new starting points emerge for social analysis precisely from these differences of Nature, which Nicolescu outlined. Mouffe and Laclau contribute:

> Any substantial change in the ontic content of a field of research leads also to a new ontological paradigm. Althusser used to say that behind Plato's philosophy, there was Greek mathematics; behind seventeenth–century rationalism, Galilean physics; and behind Kant's philosophy, Newtonian theory. To put the argument in a transcendental fashion: *the strictly ontological question asks how entities have to be, so that the objectivity of a particular field is possible.* There is a process of mutual feedback in the incorporation of new fields of objects and the general ontological categories governing, at a certain time, what is thinkable within the general field of objectivity. The ontological implicit in Freudianism, for instance, is different and incompatible with a biologist's paradigm. From this point of view, it is our conviction that in the transition from Marxism to post-Marxism, the change is not only ontic but also ontological. The problems of a globalized and information-ruled society are unthinkable within the two ontological paradigms governing the field of Marxist discursivity: first the Hegelian, and later the naturalistic. … If a relation of hegemonic representation is to be possible, its ontological status has to be defined. This is the point at which a notion of the social conceived as a *discursive* space—that is, making possible relations of representation strictly unthinkable within a physicalist or naturalistic paradigm—becomes of paramount importance (Mouffe/Laclau 2001, p. x).

Chantal Mouffe's notion of 'agonistic pluralism' relates to Nicolescu's approach in several interesting ways. One is certainly based on questioning Marxism and post Marxist theory, but others are the changing view of the concept of citizenship, the internal frontiers of society and the limits of all objectivity. This is to say that very new practical forms for politics are emerging that focus on 'life' issues in a generative way that allow for people to make things happen. By transforming the existing relations of power and leadership the modernist illusion of the privileged position of the artist is also evaporating. It is Mouffe's opinion that in our information age, things are not being acquired for "good," but on the contrary, they are always reversible (Mouffe/ Laclau 2001, p. x). This is as much occurring due to the "double void" discussed in Nicolescu's discourse as much as it involves the topographical political and social realm in Mouffe and Laclau's visualization of public space. Though everything carries a morphological character, there is certainly less emphasis on underlying principles of unity in Mouffe and Laclau's view; however, both agree that there is no predetermined center to diversity and that unresolved differences are meant to be part of the rigors of perpetual search. Mouffe's pronouncement relates to Nicolescu's approach particularly when she defines what is at stake in the misconception of the agonistic model she is delineating in the public domain.

> The most important consequence is that it challenges the widespread conception that, albeit in different ways, informs most visions of the public space conceived as the terrain where consensus can emerge. For the agonistic model, on the contrary, the public space is the battleground where different hegemonic projects are confronted, without any possibility of final reconciliation. I have spoken so far of the public space, but I need to specify straight away that we are not dealing here with one single space. According to the agonistic approach, public spaces are always plural and the agonistic confrontation takes place in a multiplicity of discursive surfaces. I also want to insist on a second important point. While there is no underlying principle of unity, no predetermined center to this diversity of spaces, there always exist diverse forms of articulation among them and we are not faced with the kind of dispersion envisaged by some postmodernist thinkers. Nor are we dealing with the kind of 'smooth' space found in Deleuze and his followers. Public spaces are always striated and hegemonically structured. A given hegemony results from a specific articulation of a diversity of spaces and this means that the hegemonic struggle also consists in the attempt to create a different form of articulation among public spaces (Mouffe, 1998).

Transdisciplinarity's structure is meant to be flexible so that a meaningful, dynamic process is redefines and recalibrates old issues of tolerance. The model is inherently confrontational toward reconciliation as it questions and reveals the nature of social and collective life in communities. In a recent interview, Mouffe abandoned the idea of a final goal because, "the idea of radical and plural democracy implies that this fully reconciled society, which was the goal of Marxism and of many socialist struggles, can never be reached. … This in fact, is not something that we should see as negative, and there is no reason to be sad about that. In fact, it's something to celebrate, because it means that it's the guarantee that the democratic pluralist process will be kept alive."[30]

30 Hegemony and Socialism: An Interview with Chantal Mouffe and Ernesto Laclau in *Conflicting Publics*, Simon Fraser University, 1998. http://anselmocarranco.tripod.com/id68.html

From all the evidence, Nicolescu states that a transdisciplinary approach does not replace the methodology of each discipline so much as it enriches each of the disciplines. Transdisciplinarity brings indispensible insights that cannot be produced by disciplinary methods alone (Nicolescu, 2002 p.122). Therefore, *contested spaces* are actually complementary when they are perceived as a triad while resolving a third-space or even a fourth-space, the space of consciousness.[31] Mouffe also agrees: "By limiting pluralism, power relations are limited and we are left with illusions." The Transdisciplinarity movement in education helps make her point more decisive. "Hegemony is not just a simplistic criticism of liberal politics, since power is not limited to the external. This is a radical new politics, which asks for the 'we' collectively to also consider identities themselves as a way to struggle against subordination" (Mouffe, 1996 p.245-246). For the "we" to collectively understand the powers of social politics, so must individuals come to this understanding as well, in the contested spaces of their physical (visceral) inner being.

To summarize, this chapter has provided a brief history of Transdisciplinarity and the environmental movement that emerged in tandem during the late 1960's early 1970's. These cultural movements demonstrated the vital need for humanity to understand human psychology. Studied through the lens of phenomenology, the implications of isomorphism and evolutionary aesthetics profoundly affected fields of social sciences, politics, economics, spiritual and the academic world overall. The consensus, during these two decades, was an appreciation for the need to transcend the limited foundation of single specialized areas of research toward integrating and widening humanity's worldview. To transcend the anthropomorphic means providing a more inclusive cosmological view—from plant and animal domains—to that which humans aspire to fulfill in their being. The work of Piaget, Jantsch, Capra, Lupasco, Mouffe, and many others, indicates how biological knowledge with ecological understanding and psychology (psychoanalysis and psychopathology) with transpersonal or psyvolutionary potential all advanced knowledge of humanity's potential co-evolutionary functioning. Transforming the environment of education toward supporting Homo-sapiens vertical growth, however, continues to have social and political challenges. Having theorized, in this introduction, a way of transforming a reductionist ethos and then outlined a fuller range of human experiences, in Chapter 2 I move to consideration of key figures in nineteenth and twentieth-century neuroscience. How their experimental and empirical data contributes to contemporary understanding of co-evolutionary body/brain and autonomic nervous system functioning provides a more intimate view of human nature.

31 Nicolescu, Basarab: Recorded interview, Paris, France on December 19, 2011.

Chapter 2

Humans, What Are We?

The animal is a freely moving plant because all the phases of its gestation are fixed in organs—in specific individualizations—because the root has become intestine, the leaf has become lung, the taproot has become stomach, the circulation of sap has become blood and veins, and the flower has become sex. This totality has been linked together by the marrow to form a conductive organ, the brain and through that have [come] cerebral intelligence, conscious memory, and makes possible the expression of the innate consciousness that generated instinct. The faculty of coordinating ideas is still lacking in order for man to exist.

SCHWALLER DE LUBICZ, 1947 p. 48

Evolution of man means the development of certain inner qualities and features, which usually remain undeveloped, and cannot develop by themselves. In order to become a different being, man must want it very much and for a very long time. A passing desire or a vague desire based on dissatisfaction with external conditions will not create a sufficient impulse.

P. D. OUSPENSKY, 1950 p. 8

This potential self-destruction of our species has a triple dimension: material, biological, and spiritual. In the Age of Reason, the irrational is more active than ever.

BASARAB NICOLESCU, 2002 p. 7

While investigating the origins of life starting from three billion years ago, evolutionary biologist Harold Morowitz keeps a reproduction of Gauguin's 1897 painting "Where Do We Come From? What Are We? Where Are We Going?" over his desk. This image hangs along side a poster of the Periodic Table, which he calls his altar. The same Gauguin painting is reproduced on the cover of E. O. Wilson's book entitled, *The Social Conquest of the Earth* (2012). As we continue to ask this age-old question—Humans, What are we?—a significant amount of empirical and intuitive information is easily gathered. Yet, in our daily lives, our energies deftly take us away from any unified sense of our individual purpose. And even less do we share consensus as to our species' evolutionary obligation. With awareness of these deflections, what can we conclude?

Working often in isolation from nature, humans sense their dispersed, entrenched habits of resistance. If topological maps were drawn, identifying forms of education and cultural patterns, conflicts and overlapping relationships might be better visualized. Those holding fast to mechanistic models of duality and those studying emergence in a systems view of life remain socially at odds with one another. Those who study bio-physiology, within specialized disciplines of medicine, emphasize parts rather than whole entities. Even those individuals who succeed intellectually and/or artistically to transgress old systems of communication are scorned by conservative skeptics. Our Culture has not yet found a way for humans to embody nature's model.

Though we have the scientific data that indicates the need for a fundamental overhaul of our educational culture, adopting a holistic understanding for human development and ecoliteracy remains a major challenge for global culture. In light of the ideological limitations of science and medicine, school curriculums would need to offer a synthesis of contemporary science for humanity to reach higher levels of communication. As empirical findings support, educators need to provide conditions where individuals can develop transdisciplinary skills. Described in this chapter, these are skills known to bring a sense of well-being and individual wholeness that, in turn, effectively bring natural outcomes for co-regulating environmental conditions. Until then, primary,

secondary, and university education systems will prolong divisive political and economic values that devolve social and cultural outcomes.

This chapter focuses on what humans need to know about their potential to evolve. It addresses how, from a neurobiological perspective, human development is contingent upon engaging our hierarchically ordered brain structure. It reveals how we as a species may celebrate (and struggle with) the inborn moral imperative to self-regulate our mammalian limbic-brain and autonomic (visceral) nervous system that governs our conscious (voluntary) social connectivity. To become conscious of the consciousness that forged human evolution, Paul MacLean, Stephen Porges, and G. I. Gurdjieff agree it is essential for humans to have an intra-subjective/objective understanding of their phylogenetically ordered neuro-biological structure. Higher levels of consciousness can then emerge through self-regulating (psyvolving) channels of neuro-receptivity.[32] With the hope of advancing Transdisciplinarity's over-arching theoretical model, the chapter concludes with the Entropy/Consciousness Institute's program that teaches transdisciplinary skills.

2.1 What Humans Need to Know About Their Potential to Evolve

> *As long as people on this planet remain unaware of how their brain works and how they use it, as long as it has not been said that hitherto it has always been to dominate others, there is little chance that anything will change.*[33]
>
> HENRI LABORIT

When a systems view of life is applied specifically to human social life (i.e., education, economics, rural/urban communities, politics, etc.), it brings advantageous conditions for transmitting knowledge of human development. As Chantal Mouffe states in Chapter One, by shifting from dualistic divisions to the ontology of the social, human life is enhanced through cultural participation. Or, as technology advances its neuro-imaging capacity, humans can visualize the anatomy and physiology that governs brain-networks. And similarly, as Transdisciplinarity provides its theoretical model for education, humans have the potential to conceptualize a framework where Lupasco's theory of the "included middle" can potentially surmount the limitations of binary dialectics. However, for humans to draw reciprocal exchange from external cultural/social spaces affectively, they must (axiomatically) physically evolve their internal higher thinking and emotional centers. This qualitative, co-evolutionary development will not manifest involuntarily. As reports show in the National Institute of Health, "We human beings are bio-psycho-social creatures whose health or illness reflects our relationship with the world we inhabit—including all the variables of family, class, gender, race, political status, and the physical ecology of which we are a part. National Institutes of Health (NIH) calls for a new foundational theory for medicine, based on a bio-psychosocial-ecological paradigm."[34] According to a NIH report published in November of 2010,

> The current biomedical and psychosocial frameworks that form the conceptual basis of medicine today are insufficient to address the needs of the medically complex and environmentally challenged populations of patients often cared for by physical medicine and rehabilitation specialists. … The highly integrative

32 ***Neuroception*** is a term Stephen Porges coined in 1995 to describe the body's ability to detect risk outside the realm of awareness. Neurotransmitters are membrane receptors. Proteins in neurons receive an impulse across a synapse. Paul MacLean used Interoception to describe these events.

33 Kunz, 2014 p. 117.

34 http://www.yesmagazine.org/issues/good-health/gabor-mate-how-to-build-a-culture-of-good-health-20151116

> bio-psycho-eco-logical framework provides an expanded basis for understanding the objective causes and subjective meanings of disabilities. Disabilities are reduced through Health Environment Integration by seeking to maximally integrate the body and mind (the self) with both the surrounding physical environment and other people in society.[35]

While such government health reports are indicative of many aspects of learned material and socially based outcomes known well before the industrial revolution, it's essential, as this article claims and I am attempting to show, for educational institutions to return to a primary understanding of bio-psychosocial-ecological issues. The following phylogenetic description of Paul MacLean's triune-brain theory and Stephen Porge's polyvagal theory of emotions together address the neurochemical regulation involved with bio-behavioral adaptive processes. These are dynamic processes humans can learn to engage through conscious inner study. If school curriculums supported the experiential enrichment of human brain/body engagement, individuals would more fully participate in higher levels of integrated social experience. Through intuitive/evaluative modulation (self-regulation) of limbic-brain and vagal nervous systems, contingent phylogenetic limits learn to adapt to higher, (latent) neocortical capacity. Consequently, until this adaptive model is taught in schools and supported in communities, humans will naturally default to their non-social sympathetic nervous system—that of our inherited (lower) reptilian ancestry (Darwin, 1872; Hughlings Jackson, 1884; MacLean, 1988; Porges, 1995, 2011).

MacLean's triune-brain model and Porges' Polyvagal Theory can be understood in the context of cross-cultural postulations that come from psychology. Peter Ouspensky (1878-1947)[36] begins *The Psychology of Man's Possible Evolution* (1950) with a reminder that psychology is not only the oldest science, but also a science in which many of its essential features have been forgotten. Too, he says, psychology never existed under its own name and for one reason or another was suspected of wrong or subversive tendencies (either religious or political or moral), and had to use different disguises (Ouspensky, 1950 p. 3-4). If we ask reflexively: What isn't psychology?—it becomes clear that perception of our emotional and physical experiences, as well as forms of those expressions, such as art, poetry, and architecture all engage processes of human psychology. Ouspensky suggests these forms can be looked at in two principle ways: through reactions (i.e., habits of liking or not liking, memories and associations) or through evaluation responses (i.e., self-knowledge or aesthetic skills), whereby reactions are consciously separated through discernment of inner sensations. While either of these means can be studied, the latter is the direction of our interest as it relates to complexity, Transdisciplinarity and its axioms, as well as bio-behavioral development of higher (conscious) mind.

While Gurdjieff and Ouspensky come directly from the line of Eastern esoteric teaching traditions, the lineage of Western philosophical traditions that relate indirectly to Eastern thought are Goethe (1749-1832), Husserl (1859-1938), Bergson (1859-1941), Merleau-Ponty (1908-1968) and Lupasco (1900-1988). Their shared legacy led "the way for the transcendental ego [to emerge] by becoming immersed in science qua noematic phenomenon," in other words relating to the understanding that science is a guide that remains undisclosed until we move from differentiating the general idea

35 http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3071421/ PM R. 2010 Nov; 2(11): 1035–1045

36 ***Pieter D. Ouspensky*** was born in Moscow and became a journalist and writer of esoteric thought. His interest in man's possibilities was established prior to meeting Gurdjieff, in 1916, with whom he directly studied for 10 years. His book, *In Search of the Miraculous* (1949), is a transcription of Gurdjieff's first group meetings in Russia, which due to the war moved from St. Petersburg to Paris. Ouspensky established his own school in London, drawing large audiences to his lectures.

to the immersive practice (Husserl, 1929 p.7-22). Their science of phenomenology or "Ontological turn" was pioneered at the end of the nineteenth-century. By introducing the self as the primary subject for study, axioms concerning natural tensions and conflict, which Lupasco identified in his principle of the "included middle," are furthered by Gurdjieff who introduced the intentional participatory practice of a "third-striving."[37] While all agree humans must engage with, as Husserl put it, the "apodictic evidence of 'I am' (Husserl, 1929 p. 22; Gurdjieff, 1975), it was Gurdjieff who demonstrated exercises for the actual physical engagement that would assist man to "work on himself."

What Eastern traditions share with Western science and philosophy, at this Ontological turning point, is an opening toward comprehending mind/body unification both theoretically and experientially. Since an embodied mind/consciousness carries the potential for humans to evolve through an agreement of "third-force" dynamics, the question I wish to pursue is this: Can "third-force" methods be included in Transdisciplinarity's model so that humans are taught how to harmonize mind/body tensions? If so, an individual's experiential sense of self is made primary, because a self-conscious state of self-remembering is required for "third-force" to appear in one's being. Human social understanding of levels of reality would then show signs of emergence, as skills for perception are enhanced. These are the essential cognition processes for reversing Cartesian "cogito," where atomistic mind was previously thought primary. These are the essential skills that would effectively nurture transdisciplinarity's goal for raising the normative level of education.

If humans (individually and collectively) were to experientially verify how levels of reality emerge coherently and holistically, they would in time invert man's lack of discourse with nature. As Merleau-Ponty said, "The phenomenal thing is not the unchanging object, but the correlate of the human body, our sensory-motor functions, and a subjective view of time where all consciousness is a perception of consciousness"[38] (Merleau-Ponty, 1945). While it would be more than interesting to cite other overlaping agreements between esoteric thought of the East with the science of philosophy emerging from the West at the turn of the twentieth-century, a primary consensus is Husserl's "radical self-investigation" that advises humans learn from their inseparable innate/universal qualities of being. Husserl wrote,

> Radical self-investigation and completely universal self-investigation are inseparable from one another and at the same time inseparable from the genuine phenomenological method of self-investigation, in the form peculiar to transcendental reduction: intentional self-explication of the transcendental ego, who is made accessible by transcendental reduction, and/systematic description in the logical form of an intuitive eidetics. But universal and eidetic self-explication signifies mastery of all the conceivable constitutive possibilities 'innate' in the ego and in the transcendental intersubjectivity (Husserl, 1929 p. 153 <180>).

As we enter MacLean and Porges' empirical research, we will learn what remembering nature's plan—its innate discourse with humans—means. For, as it stands, nature has left the furthering of human evolution to humans themselves (Ouspensky, 1950; MacLean, 1990; Porges, 2011).

---

37 Gurdjieff's *Fourth Way* School The Institute for The Harmonious Development of Man was founded in 1922 near Paris, at Fontainebleau France. Third-striving defines an individual's aspiration to move from dualistic limitations. Third-force is discussed at length in Chapter 3.

38 https://en.wikipedia.org/wiki/Maurice_Merleau-Ponty

2.2 Evolutionary Processes and MacLean's Triune Brain

An interest in the brain requires no justification other than a curiosity to know why we are here, what we are doing here, and where we are going.
PAUL MACLEAN, 1967

In the late 1960's, American physician and neuroscientist, Paul MacLean, in his neuroethological research, unveiled how Homo sapiens' disparate hierarchal brain system is bio-behaviorally an ongoing, natural evolutionary emergence. Influenced by his predecessors in this field (James Papez, John Hughlings Jackson, Darwin, et al.), MacLean recognized in 1952 an interconnected system of a "visceral" triune-brain structure that mapped through neural circuits. An older reptilian brain governs our ability to negotiate a mammalian (limbic-brain) emotional *'fight-flight'* autonomic system. Primarily sensory, a potential yet latent reasoning capacity learns to separate from its historically reflexive involuntary (automatic) response patterns in order to control certain visceral functions. This adaptation from reptilian/mammalian patterns of behavior toward conscious connectivity to our higher (newer) neo-cortical functioning, (i.e. *afferent* signals conveyed to the neo-cortex), is largely a voluntary effort. If involuntary interoception cues are inhibited, perceptions can form from voluntary attention.[39]

Learning how to consciously engage this simultaneous, differentiating bi-directional communication is an evolutionary step for humans. Transdisciplinarity cannot become a sustaining vital force in human development without including triune-brain and triune autonomic nervous system functioning in its model. In this section I relate MacLean's phylogenetic triune-brain structure, which is later shown in conjunction with Stephen Porges' triune vagus nerve model (2.3). Unifying both studies is Gurdjieff's approach, discussed at length in Chapter 3. Gurdjieff's "Fourth Way" system conveys exercises that bridge and harmonize MacLean and Porges' triune systems. Gurdjieff's method, known as a three-centered—self-study practice, unifies the ethologically divided centers, namely, the way of the fakir (physical), monk (emotional), and the yogi (mental).

Evolutionary aesthetics, as discussed in Chapter 1, is "process physics" with pragmatic roots in life itself. When Terry Lindahl coined the term *psyvolution* he meant to describe a human transition state that directs perceptual emphasis from psychological content toward an impartial existence. While stories and memories exist, in order to pass through their energies objectively, subjective content is experienced and processed, but released simply as energy vibrating and moving through neuroreceptive activity. Through this effort of "Non-attachment" or "Non-identification" an "un-linking" process takes place. In *Comparative Neuroscience and Neurobiology* MacLean proposes a similar epistemic perspective:

> In the human quest for a cosmic view of life, a better understanding of the brain is of central importance. In both its substance and communicative capacity, the brain is incommensurate with our presumed instruments of precision used to gauge "the world out there." Might not certain problems be resolved if we were more conversant with the limitations of the subjective brain? Take, for example, questions regarding the origin of the universe. Some

39 ***Interoception*** means humans perceiving their interior organs. ***Exteroception*** is perception of the body's own position, motion, and state, known as *proprioceptive senses*. External senses include the traditional five: sight, hearing, touch, smell, taste as well as temperature difference. ***Afferent*** (the opposite of efferent) means conducting inward.

> physicists calculate that there was a moment when there was infinite density at a point in space, whereas others claim that at time zero "the whole universe, the infinite space, was filled with an infinite density of matter." Or consider the nature of time and space (Kant's "transcendental aesthetic"), which do not exist per se, but are derivatives of the subjective brain, being purely information that is of itself, neither matter nor energy. Foremost of all, it is possible that further knowledge of the subjective brain ("epistemics") might give insights into the meaning of life and justification for the perpetuation of life with the untold suffering that afflicts so many forms of life (MacLean, 1988 p. 126-128).

So, in effect, what occurs through limiting subjectivity? In the process of conserving our subjective energies, do our metabolisms gain energy in service of consciousness? How much energy is transpired—used-up—through our emotional/defense mechanisms that might otherwise be conserved for higher purposes? How does the ontological status of a limiting self-referential neural network learn to experience higher levels of reality? To answer these questions let's first look at the evolution of human brain structure.

Paul D. MacLean, M.D. (1913-2007), chief researcher of *Brain Evolution and Behavior* at Yale from 1971-1985, presented his first paper on the visceral brain in 1949. Interested in the series of anatomical and neurobehavioral questions raised in that paper, he accepted the opportunity to combine research and teaching in the department of physiology and psychiatry at Yale Medical School. From clinical and laboratory observations (1949-1956), MacLean developed his concept of the limbic system. His value for understanding the whole from the parts of the brain is comes through the human brain's phylogenetic properties. He explains,

> An evolutionary approach to the study of the brain has special appeal because it requires both reductionistic and holistic analysis. It is now recognized that in all animals there are molecular commonalities with respect to genetic coding, enzymatic reactions, and so on that carry over into complex cellular assemblies. Nowhere is the uniformity of complex cellular assemblies more striking than in the cerebral evolution of vertebrates, both as applies to similarities within classes and to certain commonalities across classes (MacLean, 1988 p.126).

In 1967, MacLean illustrated the triune development of the human brain in the *Journal of Nervous and Mental Disease* (Fig. 2.2). "The forebrain itself," the caption stated, "evolves and expands along the lines of the three basic neural assemblies that automatically and biochemically reflect ancestral commonalities with reptiles, early mammals and late mammals."

He further describes their arrangement as, "Markedly different in their structure and chemistry and in an evolutionary sense, eons apart, the three assemblies constitute an amalgamation of three brains in one, a triune brain" (MacLean, 1988 p.126). Of the three mentalities, only one—the neo-cortex—has the capacity for verbal communication (MacLean, 1968; 1990 p. 9).

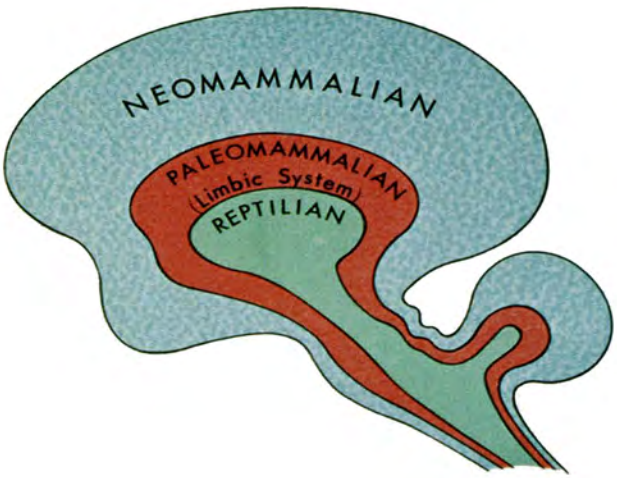


Fig. 2.2 Symbolic "triune brain," which expresses the evolution of the brain from reptiles, early mammals to man. After P. D. MacLean (1967, 1990).

Evidence based on comparative anatomy, ontogeny, phylogeny, and paleontology indicates that Homo sapiens triune, neural assembly is not automatically coordinated or integrated; to the contrary, they live in tension with one another, each having its own feeling of subjectivity and its own perception of time, space, and memories. If these facts are not considered a limitation, but a potential, humans might find that the larger purpose of their existence is the opportunity to reciprocate the gift of life by further evolving their neo-cortex. The triune neural assembly within us needs to feel its way toward consciously working as one. Only a body of attention can bring understanding of "normalization." As MacLean noted in his autobiography,

> It [triune neural assembly] schematized the overlapping of interoceptive and exteroceptive systems in the hippocampal formation which, because of the analyzing mechanism of the evolutionarily primitive cortex, might account for the seemingly paradoxical overlapping of affective experience whereby primitive peoples and those with psycho-neurotic and so-called psychosomatic conditions, appear to experience outside conditions as though they were happening inside. In terms of Freudian psychology, I suggested that the visceral brain is not at all "unconscious (perhaps not even in certain states of sleep) but rather eludes the grasp of the intellect because its animalistic and primitive structure makes it impossible to communicate in verbal terms (MacLean, 1949-1998 p. 259).

As far as perception is concerned, MacLean points out: "Epistemology disregards the realization that everything selected for study, every observation and every interpretation, requires subjective processing by an introspective observer. The irony of the purely objective approach is that there is no logical way of circumventing the realization that the cold hard facts of science, like the firm pavement underfoot are informational transformations by the software of the brain, the physical properties of which are defined as 'viscoelastic'" (MacLean, 1990 p. 5). Because humans must evolve their inner "organ of perception" for neocortical capacity, MacLean emphasizes the complementary term "epistemics" (MacLean, 1952). While epistemology and epistemics share the same domain, their difference lies in their point of view. While epistemology represents the public view and scientific approach from the outside, epistemics represents the subjective view, approached from the inside out (MacLean, 1990 p. 6).

Being more conversant with our subjectivity and its limits continues to be a form of human blindness primarily because epistemic knowledge in relation to human brain dynamics is not taught in schools. MacLean and others have suggested that it is of primary importance for humans to obtain inner knowledge of their organs of perception because how will we otherwise know how to measure subjective information that is neither matter nor energy? MacLean defends his argument by stating: "Questions of this kind may seem quite esoteric and removed from the real world until one pauses to reflect that the subjective brain, imprisoned in its bony shell, is the sole judge of its own existence and the presumed existence of what lays outside. Moreover, because the brain reconstructs the world we live in, it does not have, nor ever can have (because of self-reference), any yard stick of its own by which to measure itself (MacLean, 1990 p. 3). MacLean further revealed the importance of subjective understanding, in the same vein as Ouspenky's emphasis on psychology, when he wrote,

> No measurements obtained by the hardware of the exact sciences are available for comprehension without undergoing subjective transformation by the "software" of the brain. The implication of [Herbert] Spencer's statement that objective psychology owes its origins to subjective psychology could apply equally to the whole realm of science. For such reasons, one is obliged to consider how the nondimensional emanations of the subjective brain may account for a dimensional view of the world (MacLean, 1990 p. 5).

The risk of education emphasizing objective approaches to science over the subjective limits of the limbic brain is underscored by this empirical data. It is, in other words, predictable that humans manipulate the external environment due to their lack of epistemic knowledge. Conversely, if human psychology does not look at the questions of epistemology—in relation to the subjective self—how are we to receive impressions of our internal "visceral" environment? MacLean views this crisis of perception as an epistemic void or impasse. Not to be confused with Cartesian perceptual illusions, his point is: the human brain functions underlie all experience. If humans do not understand the limbic function of their brain, the cause of what is dragging us as a species to a meaningless sense of our human purpose is left concealed (paraphrasing McLean, 1990).

MacLean's visceral (limbic) brain paper (1949)[40] was significant as it introduced that a phylogenetically older part of the brain, occurring as a common denominator in all mammals, might receive information from all the sensory systems. With respect to the hippocampus itself, this would indicate, "it was not an autonomous little factory of its own, manufacturing the raw materials of emotion out of thin air" (MacLean, 1990. p.266). "In conclusion, I made the suggestion that, although our intellectual functions are mediated in the newest and most highly developed part of the brain, 'our affective behavior continues to be dominated by a relatively crude and primitive system. This situation provides a clue to understanding the difference between what we feel and what we know'" (MacLean, 1949 p.351).

MacLean, in his autobiography, stresses the complexity between what we feel versus what we know (MacLean, 1998 p. 259). A complex dynamic, this was Gurdjieff's central premise when he indentified three localizations. "Every wish of which we are conscious derives from one of our three centers, and for the other two centers it is an apparition, an interruption" (Orage, 1985 p. 70). If we overlay Gurdjieff's form and sequence of three

40 MacLean, P. D. (1949) "Psychosomatic Disease and the "visceral brain." illuminated new developments bearing on the Papez theory of emotion, *Psychosom. Med.* 11, p. 338-353. The term ***viscera***l explicitly means strong inward feelings and implicitly these feelings are accompanied by visceral manifestations.

centers on the primary features of MacLean's phylogenetic study, as Keith Buzzel, M.D. has done, we can compare the integrated neurobiological relationship of MacLean and Gurdjieff's three-in-one physiological system. As Buzzel points out, "During the past fifty years, studies of the structure, function and evolution of man's triune brain have advanced our factual knowledge to a considerable degree. Many of these studies make it possible to view the difficulties we face in work-on-oneself and work-with-others from a biological perspective that is now more detailed than was possible in the first half of the century" (Buzzel, 2006 p. 85). Buzzel wrote, quoting and citing Gurdjieff extensively, that

> **The *moving–motor-center*** in biological terms is the primitive reptilian brain (600 million years ago). The entire mass referred to as the "R-complex" is directly part of the brain stem. The primary focus of its sensory motor instrument is on the outside world—predominately reflexive (Gurdjieff, 1950 pages 1172 and 762).
>
> The feeling brain [*what Gurdjieff calls the* ***emotional center***] in neuro-anatomical terms is the limbic or paleo-mammalian brain (Gurdjieff, 1950 pages 441, 443, 491, 1172). It marks the transition from cold-to-warm-blooded life (200 million years ago) and has its primary focus on the inside world—interior of the mammal. The subtle internal control of all muscular activity leads to the development of the spectrum of expressions of those states of relationship, via facial expression, gesture, posture, carriage and tone of voice. Multi-leveled monitoring of internal metabolic states, when blended with the first brain's sense of the outside world, develops the sense-of-self-other.
>
> The Neo-Cortex, neo-mammalian or third-brain are terms for what Gurdjieff calls the ***thinking center*** (Gurdjieff, 1950 p. 164, 441, 444, 491, 1172). The center of gravity or focus, of third-brain development lies in its progressive capacity to abstract the images of the outside world (first brain) and the inside world (second brain) and create levels of symbolic representation that can be creatively molded in a multitude of ways (Buzzel, 2006 p. 250).

From these overlapping descriptions, patterns of behavior between brain developments are recognizable, especially from the self-survival mode of reptiles to sense-of-self and caring for offspring and others in mammals. In *Affective Neuroscience* Jaak Panksepp refers again to MacLean's theory:

> This three-layered conceptualization helps us grasp the overall function of higher brain areas better than any other scheme yet devised. Of course, exceptions can be found to all generalizations, and it must be kept in mind that the brain is a massively interconnected organ whose every part can find an access pathway to any other part. Even though many specialists have criticized the overall accuracy of the image of a "triune brain," the conceptualization provides a useful overview of mammalian brain organization above the lower brain stem (Panksepp, 1998 p.70).

How one brain works dynamically in defense of the other becomes further complex as the autonomic nervous system shares connectivity with the visceral brain. In the following section, Stephen Porges' Polyvagal Theory clarifies (1) the physiologic and phylogenic hierarchical relationship of the limbic system to emotions and (2) categories

of neural autonomic self-understanding, as well as (3) respiration. By having first presented MacLean's hierarchical model of the brain, Porges' study of the vagus nerve's function facilitates the integrative view of mind/body behavior that may be essential to teach in schools.

While it might appear that the cerebral hierarchal structure is one of linearity, the direction between their different functions show that the three brains are stochastically communicative. Between verbal and nonverbal (prosematic) behavior humans can experience a whole other unified sense of being when presumed subjectivity, driven by perceptual constraints, is held in check. As brain/body empirical studies now support the need for unifying an experience-generating system, the shared domains of epistemology and epistemics can also be addressed. A human being's chance for "change of mind" (metenoia) or "change of being" is locked, undeniably, in this lack of balanced development of knowledge and being.

2.3 Polyvagal Theory of Emotion

> *Humans are unique mammals that share brain circuits from phylogenetically older vertebrae—reptilian circuits—and we recruit these older circuits when we go into defensive states. We cannot turn off these circuits unless we are in safe places. The effectiveness of methodologies that are coming from Eastern thought meditation, listening, chant, posture and breath, fostering mental states and health, is due to a common phylogenic change in the neural regulation of the autonomic nervous system. If you can recruit this circuit, you can experience certain aspects of being human, true feelings of being human, including the true appreciation of aesthetics.*[41]
>
> STEPHEN PORGES, 2012

> *The higher nervous system arrangements inhibit (or control) the lower and thus, when the higher are suddenly rendered functionless, the lower rises in activity.*[42]
>
> HUGHLINGS JACKSON, 1884

> *In speaking of evolution it is necessary to understand from the outset that no mechanical evolution is possible. The evolution of man is the evolution of his consciousness. And 'consciousness' cannot evolve unconsciously. The evolution of man is the evolution of his will, and 'will' cannot evolve involuntarily.*
>
> G. I. GURDJIEFF (Ouspensky, 1949 p.58)

In *Leonardo on the Human Body* (1952), da Vinci's anatomical drawings are organized into eight major categories of study, one being the Nervous System and Cranial Nerves. Well ahead of all modern scientific work, his sixteenth-century illustrations stand-up today, five centuries later. When he drew the Vagus Nerve his explanatory notes, adapted from Galenic physiology, provided an evaluation of the nerve's relationship to the whole of the body. He called the Vagus, as did medieval anatomists, the reversive nerve because it functions as a recurrent branch that innervates the larynx, trachea, esophagus and stomach. In his observations, he also noted how ventricles of the heart and lungs bring the nervous system into action with connectivity to the brain. He wrote,

> Do not leave the reversive nerves until the heart, and see whether these ever give motion to the heart, or if the heart moves of itself. If its motion comes from the reversive nerves, which have their origin in the brain, then you will clarify how the soul [i.e. animal

41 Stephen Porges, Telluride *The Science of Compassion: Origins, Measures, and Interventions*, August 27, 2012.

42 S. Porges (2011) quotes British Neurologist John Hughlings Jackson on pp. 161-69. For Jackson's original text: "Evolution and Dissolution of the Nervous System" 3 Lectures in *British Medical Journal* (March-April 1884).

> spirit] has its seat in the ventricles of the brain, and the vital spirits have their own origin in the left ventricle of the heart. So you should attend well to these reversive nerves and like wise to other nerves because the motion of all the muscles arise from these nerves which with their branches are diffused through the muscles (da Vinci, [1504]; 1952 p. 222).

Today, science has made great strides in Vagal research. Stephen Porges' polyvagal theory of emotions (1995) shows particular integrity. Just as MacLean's study unveils the phylogenetic ancestry of our triune brain structure, the polyvagal perspective unveils its phylogenetic ancestry. Both the brain and the vagus nerve run automatically through their involuntary neural circuitry, challenging voluntary pro-social behavior.

This section delineates how Stephen W. Porges, PhD Behavioral Neuroscientist, Department of Psychiatry, University of North Carolina, Chapel Hill, discerned the neurophysiological and neuroanatomical pathways between the triune branches of the vagus nerve that originate in the medulla brain-stem.[43] It will then describe how each vagal branch is associated with a different adaptive behavioral and physiological response strategy to stressful events (Porges, 2011 p. 267). Because MacLean and Gurdjieff also ascertained three involuntary centers for potential voluntary growth of consciousness, this section concludes that MacLean and Porges' empirical study, along with Gurdjieff's pragmatic self-study exercises, provides a foundation for raising the normative level of education. With these empirical and intuitive models, Transdisciplinary movement leaders can confirm that development of pro-social behavior is a natural adaptation process that must be taught in school, so that higher levels of reality can become humanly perceptible.

Porges' triune model corrects a previously thought two-way reciprocation system. Poly meaning "many" and vagal, referring to the "Vagus" together specify there are three, functionally distinct branches of the vagus nerve, also called the tenth cranial nerve. The nerve's tri-hierarchal arrangement regulates behavioral and physiological adaptation to safe, dangerous and life threatening environments. Nature's own evolutionary process provides its own irrefutable organizing principles. These principle facts are further significant in that they provide the dictums "Know Thyself" or "The unexamined life isn't worth living" with an entirely new objective sense of sacred purpose.

In a nutshell, the polyvagal theory unpacks how our autonomic nervous system (ANS) predictably recruits one of three neural response strategies in the following hierarchal order. The higher, (most recently evolved and most complex) neo-mammalian Ventral Vagal Complex (VVC), with somatomotor component, is a myelinated-efferent-supra-diaphragmatic system. This higher (newer) development in humans has the capacity to regulate psychological response patterns and broader perceptions. When VVC tone is high, neurotransmitters trigger oxytocin, a chemical that bathes and strengthens the nervous system while maintaining a healthy immune system. Inducing pleasurable communicative sensations via facial expressions, vocalizations, and gestures, the emergence of neo-cortical capacity inhibits *fight-flight-freeze* reactions. If the VVC does not sense a "safe field," it automatically recruits and activates the reptilian sympathetic-adrenal defense system that causes the vascular system to contract (Porges, 2011 p. 168-9). The (middle) sympathetic (SNS) mammalian *fight-flight* circuit regulates the adrenal when vagal tone is low; or defaults to the even older (lower) dorsal vagal complex (DVC), an unmyelinated-sub-diaphragmatic system, which neuroceptively immobilizes circuits when danger is sensed in the environment (Porges, 1988 Abstract). "Cortically

43 Triune branches of the polyvagal system are: (1) Dorsal Vagal Complex (DVC), (2) Sympathetic Nervous System (SNS), (3) Ventral Vagal Complex (VVC) (Porges, 2011, p. 158).

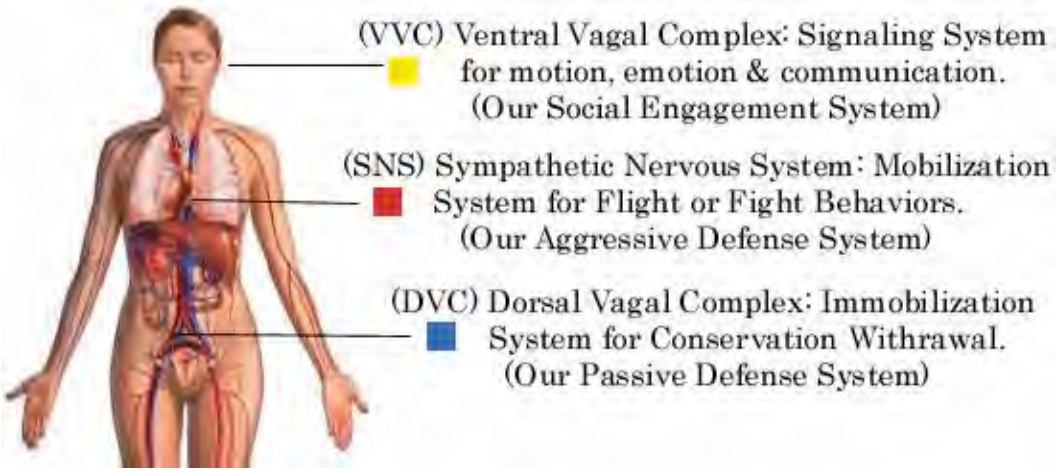


Fig. 2.3 Evolution and Dissolution: An Emergent Hierarchal Response Strategy.
http://bipolarbatesy.blogspot.com/2011/06/bipoloar-condition.html

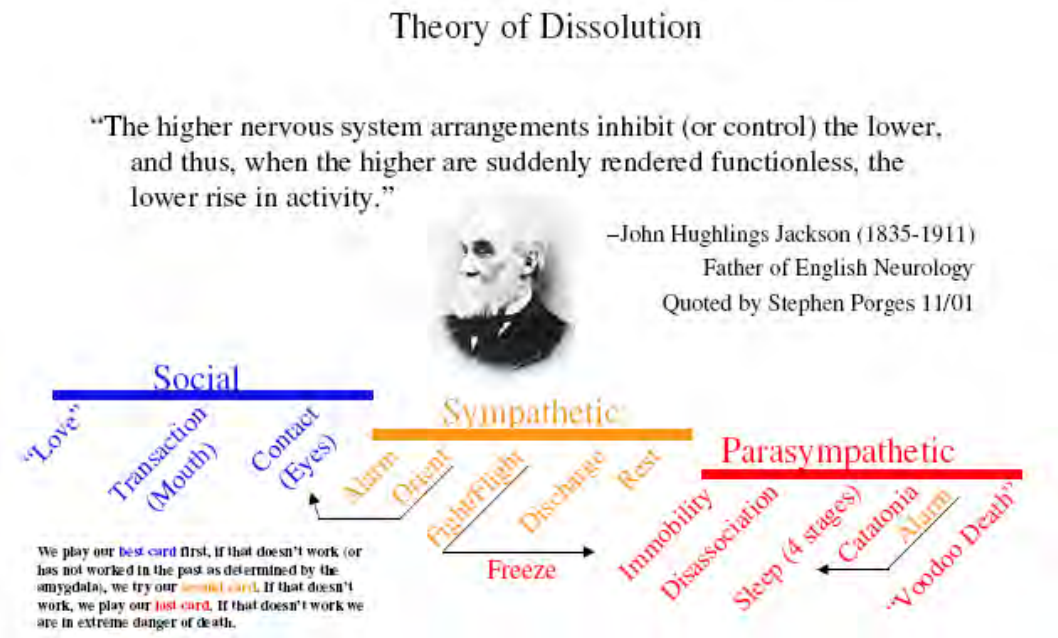


Fig. 2.4 *Theory of Dissolution* John Hughlings Jackson, 1884. Diagram by John Chitty.

activated reactions of the parasympathetic nervous system regulate the hypothalamic, pituitary, and adrenal glands and heart rates. Signals arrive in the evolutionarily older regions (the amygdala, the cingulated gyre, the hypothalamus, and the brain stem (Damasio, 1994 p. 88)).”[44] (Fig. 2.3)

Porges cites Paul MacLean (1967) and John Hughlings Jackson’s 1884 *Croonian Lectures on Evolution and Dissolution of the Nervous System* (Fig. 2.4) for collaborative evidence. Given Jackson’s lecture date it seems plausible Gurdjieff was also aware of Jackson’s “dissolution” concept as an empirical explanation for diseases of brain function.[45] In either case, Gurdjieff’s ordering of human *thinking, emotional, moving centers* is

44 Although Antonio Damasio does not cite Hughlings Jackson’s theory of dissolution, he adheres to it in *Descartes’ Error.* Hughlings Jackson credits Herbert Spencer for his work, following Darwin.

45 ***Dissolution***—devolving, the reverse of evolution. Hughlings Jackson borrows this term from Herbert Spencer.

supported by the same hierarchal involuntary subsystems of engagement that Porges, MacLean, and Hughlings Jackson delineate. "… the higher blends with the lower to actualize the middle…"(Gurdjieff, 1950 p. 751). Evolution is a passage from the most to the least organized where sensory and motor elements join so that "currents flow." Where nerve currents meet great resistance dissolution takes place. Because our newer brain (higher) is the most complex, it is the least organized. Dissolution therefore takes place until the centers learn to function in relation to each other.

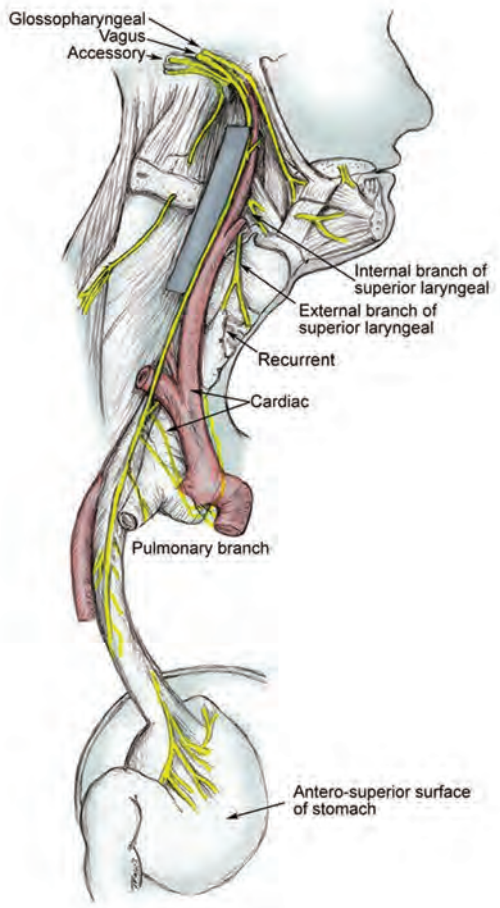


Fig. 2.5 Vagus Nerve. Wikipedia Commons.

Porges begins *The Polyvagal Theory: Neurophysiological Foundations of Emotions, Attachment, Communication and Self Regulation* with a series of essential questions humans need to be able to discern, if they wish to evolve their higher center's potential. He asks: "What determines how two human beings will act toward each other when they meet? Is this initial response a product of learning from culture, family experiences and other socialization processes? Or is the response the expression of a neurobiological process programmed into the very DNA of our species" (Porges, 2011 p. 11)?

In a community radio interview, Porges expressed that the PVT is a search for the rules that trigger how our nervous system works—what it means to be a living organism, what regulates all our visceral organs, heart, lungs, endocrine system, hormone system and our immune system. Porges said, "All the organs that float in a visceral sea, in our body cavity, are not really floating but connected to our brain with well defined neural pathways which go in two directions—from the brain to the heart and from the heart to the brain. This bidirectional system informs us that our body literally affects our brain and our brain affects our body (Fig. 2.5). When people live under challenges there are changes in all these features."[46]

As an organizing principle, the Vagus Nerve is a profound visceral feedback system limited by physiology and our adaptive brain functions. The PVT shows there is no separation between the brain and our visceral organs and that "continued phylogenic development, where behavioral repertoire is enriched, brings affective pro-social behaviors" (Porges, 2011 p. 267).

46 Radio Interview http://radioinvivo.org/2015/07/22/polyvagal-theory/

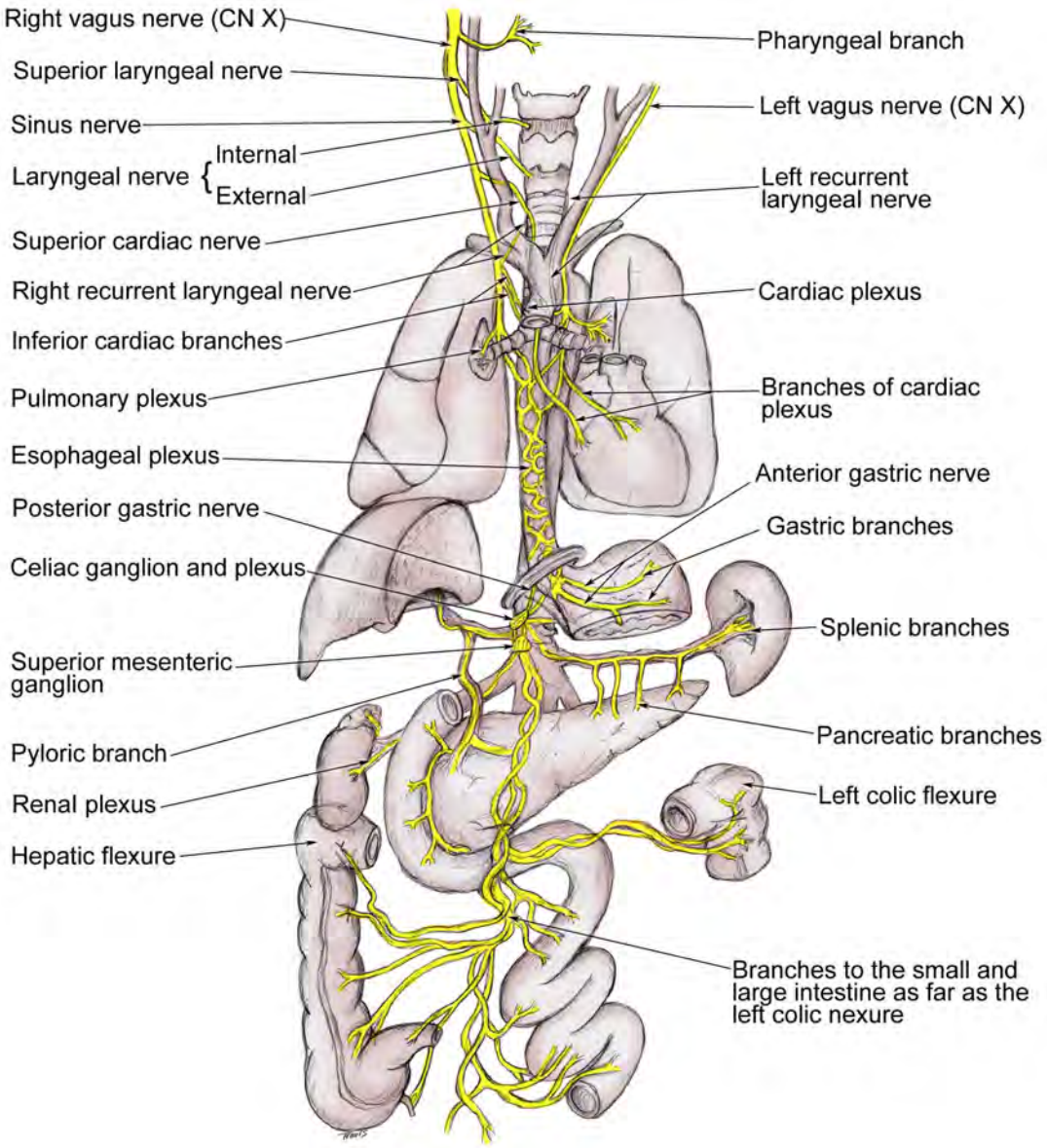


Fig. 2.6 Vagus Nerve. Wikipedia Commons.

Historically, when neurologists, psychologists and internists have studied the brain-body problem as separate disciplines, the function of our higher nervous center was missed. Today, the underlying neuro-regulation of our brain and viscera can be viewed as a syncretic holistic understanding of digestive processes. PVT reveals how human "portals" of communication can intentionally create a context where afferent (incoming) signals reach the neo-cortex. From a transdisciplinary perspective, I am also inquiring, if humans are taught to engage their waking consciousness, can a cultural understanding emerge in our relationship to others, nature and the biosphere? While Eastern traditions have taught for centuries that this effort comes through a purposeful "inner look" (i.e. self-observation and self-remembering), neuro-physiological states are now empirically measureable so that "teaching our organs" to function is a basis for our species to live toward our evolutionary capacity.[47] The PVT confirms that tempering, adapting, and consciously evolving our sub-conscious automatic visceral

47 I borrow this phrase from Goethe, which I discuss further in Chapter 3.

defense system depends on implicit/explicit learning environments. "The 'conductor' is basically at the top of the hierarchy regulating and controlling older circuits. When we're talking about the ANS, it's not merely from the neck, down; it's really the brain stem that is regulating it, and then the cortex is regulating the brain stem" (Porges, 2013 p. 4; Jackson, 1884).

Porges' theory indicates, as Gurdjieff's practice supports, if humans observe habits and patterns of behaviors they bear witness to inherited/unconsciously "learned" dynamics. Most important to underscore, in this regard, is how our complex evolutionary origins are not initially cognitive or perceptual responses, but an involuntary autonomic nervous system response. What allows development of latent higher consciousness of our ANS, which is connected to the brain stem is, therefore, voluntary/intentional engagement of our newer VVC neural circuitry. Because initial response patterns are not cognitive or perceptual, Porges coined the term *neuroception* to describe how neural circuits distinguish situations around our subconscious pro-social or defensive behaviors, from birth to maturity.[48] Porges confirms, "Because of our heritage, as a species, neuroception takes place in primitive parts of the brains, without our conscious awareness. Even though we may not be aware of danger on a cognitive level, on a neuro-physiological level our body has already started a sequence of neural processes that facilitate adaptive defense behaviors such as *fight, flight, and freeze* (Porges, 2011 p. 11).

As MacLean has differentiated triune brain system connectivity, Porges has discerned the potentially modifiable reins of our ANS. Brain structures found in Mammals—especially primates—evolved a second limbic-brain that regulates both social (VVC) and defensive (DVC) behaviors. Evolutionary processes show that forces continued to mold human physiology and human behavior in tandem. As the vertebrate nervous system became more complex, its affective behavioral repertoire expanded (Porges, 2011 p. 267). Though humans are phylogenetically more advanced (complex) than other species, we are at the same time limited by and dependent on our human physiology as we experientially learn the relationship between neuro-regulation of our viscera and our adaptive (conscious) brain functions.[49] How environments feel to us is a large part of what regulates our subconscious neural system. In other words, if both Nature and human nature are environmentally compromised so is our evolutionary potential.

Today, co-evolutionary facts are no longer abstract but measureable. We, as individuals and as a culture are a phenomenon within nature. As a species that carries as somatomotor component, we have the capacity to vibrationally verify, through self-observation practices (Gurdjieff) and scientifically measure behavioral ANS response patterns. None of these elements can be abstracted or reflected on separately from nature (Hefner, 2005 p. 523). Porges' case studies measure a wide range of circumstances, from autism to panic attacks, from rape victims to abused children. Collected data allows trauma center therapists to enhance the neural feedback critical to intervening and regulating damaged vagus nerves. Their results are significant because otherwise pharmaceutical companies profit through drug prescription. Since most social and emotional issues are biological, humans who live under stressful conditions are consistently biochemically activating their sympathetic survival system. Physically, psychologically and spiritually, their nervous systems are not able to innervate their Neo-cortex. A stronger neuroception network is,

48 ***Neuroception*** is a term Porges coined to describe the body's ability to detect risk outside the realm of awareness.

49 "Chardin called this the "Law of Complexity-Consciousness"—evolution proceeds in the direction of increasing complexity and the increase in complexity is accompanied by a corresponding rise of conscious awareness and, culminating in human spirituality (Capra, 1975 p. 304).

therefore, the only pathway humans have to process higher thinking, feeling and motor-moving experiences.

It is important to question how this interactive triune system we inherited, evolutionarily speaking, has been mistaken as a dual system. Has this error inflated, if not defined dualistic mechanistic structures of the Cartesian mind/body split? How has this erroneous biological duality fortified atomistic cultural thought? Porges' study supports Homo-sapiens' earliest sense of the potential that without individually engaging and developing neuroception skills, human evolution will stagnate. While the dual system has proven to be inadequate and destructive socially/culturally, a triune understanding gives humanity a hopeful outlook.

Porges advocates for neural exercises that assist the production of oxytocin and new energies into our bloodstream that affectively "change our physiology, change our health, and change our psychological experiences." Neural exercises such as: playing wind instruments, making prosodic[50] vocalization sounds, playing, dancing and doing other movement activities, and experimenting with breath and posture, are a biological imperative for enhancing neural (neo-cortex) connectivity. All the arts carry an essential role—performing and visual art as well as physical activity, especially in nature. Porges includes ancient knowledge on his list. Embedded in religious and spiritual practices are vagal pathways. For example, he advocates, Pranayama yoga and certain religious chants, postures, dances, and prayers are more than just calming exercises, but part of ancient purification rituals that coordinate the need for oxygen with the release of toxins in the body (Porges, 2011, 2016).

What does the PVT perspective imply when it comes to preparing Transdisciplinarity's education model—a model that requires minds to adapt to higher levels of reality? Given evolutionary life's own complexity, are schools obligated to provide environments for humans to come in touch with their latent capacity? Porges' ANS platform indicates it is essential for humans to biologically understand the neural regulation of their viscera. If practice, inherent in the PVT brings new learning strategies, outcomes would demonstrate how regulating ANS functioning effectively normalizes brain connectivity. While Chapter 3 discusses further how VVC myelinated connectivity fosters higher levels of perception, overall, Porges' neurobiological findings offer a channel whereby our physiological limitations must necessarily work through our capacity to discern, intuit, create, and care for the environment. Humans can then find equilibrium with nature, albeit the spirit of Transdisciplinarity's goals.[51]

50 ***Prosody*** defined by variations in rhythm and pitch, is a feature of mammalian vocalizations that communicate emotion and affective state. Through study and practice of intonations in language, one can learn to modulate and integrate their social engagement system.

51 Basarab Nicolescu states in Article 11 of MOT (2002), "Transdisciplinary education revalues the role of intuition, imagination, sensibility and the body in the transmission of knowledge" (p.150).

2.4 Model of Understanding: Entropy/Consciousness Institute

Laws are everywhere the same, in the world as well as in man. Having mastered the principles of any one law we must look for its manifestation in the world and in man simultaneously. This parallel study of the world and of man shows the student the fundamental unity of everything and helps him to find analogies in phenomena of different orders.
G.I. GURDJIEFF (Ouspensky, 1949 p.122)

Energy must not possess a logic that is a classical logic nor any other based on a principle of pure non-contradiction, since energy implies a contradictory duality in its own nature, structure and function. The contradictory logic of energy is a real logic, that is, a science of logical facts and operations, and not a psychology, phenomenology or epistemology.
STÉPHANE LUPASCO, 1951

The world is neither spiritual nor material—it vibrates in internecine reciprocality. Whether by appetite, ambition or aspiration, production of the vibration rates of negentropy is commensurate with its complexity. This process is not a matter of personal decision. Humanity as a whole, individual by individual, functions as a dissipative system, invariantly producing just sufficient negentropy-gain through the intentionally engaged psyvolution of our psychic organs.
TERRY LINDAHL, 2016

Since science has seldom explored the function of humankind within galactic-solar-biospheric functioning, the Entropy/Consciousness Institute (ECI), a non-profit organization based in San Francisco, focuses on the syncretic ways of knowing science, art and religion, fulfilling an intrinsic wish to embody the understanding of humanity's purpose in life. It relates scientific research and artistic practices in conditions where individuals learn to adapt the drive of their human aspiration to their survival *fight-flight* system. It reconciles principles found in the fields of physics, biology, and psychology asking philosophers, scientist, environmentalists, artists, and theologians to consider: What cosmic laws are binding upon us that it is therefore imperative to integrate the study of human phenomena? Is the evolution of humans a cosmic law? In either micro/macro scale, the implicit question the Institute addresses is what material exists in humans for regeneration? Through what medium, channels or neuronal network do humans learn to conduct finer energies? To teach processes of human adaptation objectively, where human minds learn to work in consort with Nature, the appropriate model is Transdisciplinarity's "Moral Charter." But this is only if the Charter (see Appendix One) adopts a clause for the human need to evolve their organs so that higher levels of Reality are realizable.

Terry Lindahl, founder of ECI, studied Architecture with Bruce Goff at the University of Oklahoma. A *Senior Designer* with Charles Luckman Architects in New York, he brought together a polydisciplinarian design group in the 1960's called, "The American Thought Combine." As *Chief of Design* for Haines and Tatarian in San Francisco (1970) he designed major civic projects. Before starting his own firm in 1980, he had coordinated a consortium of premier manufacturers of building products and won GSA approval to bid his invention of an integrated building system. Continuing studies in San Francisco, New York, and Paris Gurdjieff Foundations, under the auspices of John Pentland, Lindahl, in 1978, led the Berkeley, California Gurdjeff Group with

Leona Butler and Fredrica Parlett (after Don Hoyt and Beresford Parlett).[52] In 1993, the Berkeley group acquired a historical building to renovate on Potrero Hill; the organization became the San Francisco Gurdjieff Society.

I first met Lindahl and a number of other senior leaders of the Gurdjieff Foundation in 1993. In 2009, as a Fourth Way project, I helped co-found ECI with Lindahl, David Wooten (Ph.D. Berkeley 2007), and several other members of the original Berkeley group. ECI's program is an experimental model that parallels many of the goals stated in CIRET's "Moral Charter" (see Appendix One). To understand how human functioning exists within the cosmic domain, the Institute states:

> The present disparity between Science, Art, and Religion requires facilitation of the emergent inversion of epistemic emphasis from anthropocentric mathematical reasoning to cosmopomoral organic reasoning. Its program identifies itself as a laboratory that normalizes three lines of wisdom/empiricism convergence: In PHYSICS: the universe is configured by the inverse ratio of the density of mass to the density of vibrations. In BIOLOGY: the evolution of consciousness, not the evolution of the body-plan but the psychic organs—the material of the cosmos. In RELIGION: the *psyvolution* of the psychic organs of emotion and thought to the vibration rates of conscience and reason, as the name Homo sapiens implies.[53]

ECI's program answers Tanya Augsburg, Sue McGregor and others who question Transdisciplinarity's viability. They ask: "What is a transdisciplinary individual? How do we educate transdisciplinary individuals" (Augsburg, 2014, p. 233; McGregor, 2015 p.9)? Its curriculum integrates the science of MacLean, Porges, and Gurdjieff and addresses CIRET's central themes. For example, while CIRET's three axioms include (a) *Epistemology:* knowledge is inherently complex; (b) *Ontology*: multiple levels of Reality are mediated by a Hidden Third; and (c) *Complexity*: the Logic of the Included Middle in contrast to binary, reductive logic of disciplinary knowledge (Nicolescu, 1996, p. 24), ECI regards these principles as simply a formal agreement to study the natural energies and substrates produced in humans when performing triadic or *third-force* exercises.[54]

ECI hopes Transdisciplinarity will advance its model of reality by including the laws of entropy/negentropy, the natural processes in which human energy is conserved and dissipated, with emphasis on increasing negentropy production on the psyvolutionary gradient.[55] (See Fig. 2.5 for the gradient that indicates how intention and attention are food for the psychic organs and the evolution of consciousness.) By integrating this qualitative way of "Knowledge through Being and Being through knowledge" within the quantum field model, transdisciplinarians could envision potential levels of human consciousness being greatly raised.

---

52 ***John Pentland***, a student of Ouspensky, Gurdjieff and Jeanne de Salzmann, was instrumental in disseminating Gurdjieff's teaching in the U.S. He was president of the *Gurdjieff Foundation of New York* from its inception in 1953. In 1992, he established the *California Foundation.*

53 ***Psyvolution*** a neologism coined by the Entropy Consciousness Institute expressing the process in which what will emerge can be sensed from what has emerged or evolved through psychic organs (Lindahl, 2004, p. 6).

54 ***Third-force*** relates to a ternary self-study practice discussed at length in Chapter 3.

55 Human potential, within energy/mass invariance, found in galatic-solar-biospheric processes is verifiable data, which the Entropy/Consciousness Institute wishes CIRET to advance knowledge of, within the spectrum of their present model of Reality (see Fig. 2.7).

Fig. 2.7 Solar System Dynamics Nested In Milky Way Dynamics
Ergodic life cycle of humanity nested in the biosphere, nested in the solar system, nested in the Milky Way, nested in the world of all galaxies. Diagram, by independent scholar Terry Lindahl amplifies Roger Penrose *Shadows of the Mind* (1994) fig. 8.1 (p. 414). Penrose's triad was redrawn in *Road to Reality* (2004) fig.4 (p.20).

ECI's model (Fig. 2.7) demonstrates that ergodicity is Nature's model. We learn from Nature. Lindahl states, "Statistically—functioning at the tip of the evolving extension of photosynthesis on earth—the gradient of human percipience, from paleo, to neo, to sapience, transpires a specific property of highly refined negentropy (thought), to applicable solar strata. Each human is a dissipative system churning with the ever-cresting release of the potential in our function. By virtue of the potential of the psychic organ of *intention*, we have the potential to coalesce and refine the vibration rates of the psychic organ of *attention*" (Lindahl, 2016). Each of our brains, instinctive, sexual, moving motor, emotional, and intellectual, expresses itself in accordance with the fluctuations of negentropy production specific to its evolutionary station—efficacy depends on the engaged/unengaged morphology of our particular intention/attention interactions.

Lindahl's unifying principles are supported in the underlying theories of Jantsch, Capra, Nicolescu and others. Jantsch, for example, wrote:

> A unifying principle will be found in the dynamic conditions of non-equilibrium systems and the ensurance of continuous metabolizing, entropy-producing activity and energy exchange with the environment. Open, or partially open systems in all domains—from atoms to galaxies, bio to social organisms, human consciousness to cultures and mind at large—will then be carriers of an overall evolution which ensures *life continues*, that a non-equilibrium world evolves to ever new dynamic regimes of complexity. Life itself takes on a new and broad connotation in this light, far beyond the narrow notion of organic life (Jantsch, 1970 p. xvi-xvii).

Jantsch predicted that the social sciences would see the greatest change, particularly in human affairs, if we were to understand a systems view of life. While new models for education are slowly emerging for academia as a whole, here and there unique programs of art and environmental design have come and gone. Lindahl has, by bringing Gurdjieff's practical work on the emotions to art and environmental design, worked to advance how embodied knowledge is derived, epistemologically and epistemically, from the ordered processes of nature's product (humans).

ECI offers the study of philosophy and the sciences necessary for understanding human phylogenetic development. From this study anthropic reasoning is recalibrated to understand the purpose of cosmopomorphic reasoning. The curriculum provides seminars covering the philosophical lines that bind pre-Platonic intuition with scientific empirical thought. The ten seminar topics are as follows:

- STRUCTURE OF THE CONSCIOUSNESS CYCLE
- COGNO-CATALYTICS
- PRESENT FAR-FROM-EQUILIBRIUM CRITICALITY
- HOMOGENY RELATIVE TO HOMEOSTASIS
- EVOLUTIONARY/PSYVOLUTIONARY PHASE TRANSITION
- HISTORY OF THE REPTILIAN FUNCTION
- HISTORY OF THE MAMMALIAN FUNCTION
- HISTORY OF THE HUMAN FUNCTION
- TRICAMERAL MINDEDNESS
- DIGESTION OF IMPRESSIONS

Activities include: Syncretic study of the complexities of Homo-sapiens' disparate tri-cameral brain functions and the interactive force that brings reconciliation of their percipience; study of autonomic nervous system responses to musical composition; symbolic forms in objective art; and creation of hermeneutic theatrical productions of parables, myths and fairy tales that investigate the holonomic nature of reality and intuitive expressions of esoteric meaning.

As principle coordinator for the projects at ECI, Lindahl's artistic vision, architectural and engineering skill, and strong foundation in the ideas of Gurdjieff enabled, a large group of mostly unskilled men and women to renovate an 8,000 square foot building. As a member of this group, I can say what we shared in common was a wish to study ourselves through everyday life conditions. We call it a laboratory or "conditions" because the environment is one of learning through making. As Ouspensky explains,

> Knowledge by itself does not give understanding. Nor is understanding increased by an increase of knowledge alone. Understanding depends upon the relation of knowledge to being. Understanding is the resultant of knowledge and being.

> And knowledge and being must not diverge too far, otherwise understanding will prove to be far removed from either. At the same time the relation of knowledge to being does not change with a mere growth of knowledge. It changes only when being grows simultaneously with knowledge. In other words, understanding grows only with the growth of being (Ouspensky, 1949 p. 66-67).

ECI's model for transdisciplinary education in art and environmental design carries some relationship to schools of art and architecture that spawned in the 1930-60's. While New Bauhaus and Black Mountain College education movements were connected to the philosophy of John Dewey, Montessori and Waldorf elementary school curriculums were designed by Maria Montessori and Rudolph Steiner. In 2011, I conducted an interview between Lindahl and Art Historian Dr. Peter Selz who taught at the New Bauhaus in the late 1940's. In this exchange, Selz shared his views. "Sometimes the Bauhaus is thought to be only about International Style and geometry, but when I first started teaching at the New Bauhaus in Chicago, it was this idea of bringing together knowledge, Biology and the study of Nature, really—to bring Art closer to human life."[56]

To describe the aesthetic of the Bauhaus Walter Gropius acknowledged that concepts of time and space problems were being addressed in compositions of color, form and content. "Laws" of counterpoint, harmony and scale were viewed from an objective—or at least separated out from the individual point of view. Gropius, director of the Bauhaus (1919-1932), writes in the preface of Moholy's *New Vision*:

> Today we are confronted by new problems, i.e. the fourth dimension and the simultaneity of events, ideas foreign to former periods, but inherent in a modern conception of space-time. The artist often senses a coming discovery before its advent. Science now speaks of a fourth dimension in space, which means the introduction of an element of time into space. Before the First World War, futurists and cubist artist were already attempting to introduce movement into action, that is, the actual passing of time into hitherto static pictures (Maholy, 1938, p. 1).

Moholy was even more specific in his introduction about the subjective role for following biological rhythms. What he called "self-experience" was a process-oriented, circuitous path to find the center of a problem. Maholy thought experience was determined by biological nature and participation outwardly in society carried cultural objective meaning for all people. He explained,

> At present in art education we are striving toward the timeless biological elements of expression, which are meaningful to all people and useful to all people. This is the first step of creativity for everyone, before culture (values of historic development) can be introduced. We are therefore less interested in the immediate production of the "objective" quality of expression usually called art, than the ABC of expression itself. We regard art for its basic roots, which permeate life. We shall attempt to clarify them—at least in their essential points, without distressing ourselves unduly if we must at times take a circuitous route to approach the center of the problem—self-experience. From there we proceed to our own sincere expression (Maholy, 1938).

56 "The Harmonics of Unity," recorded interview with Peter Selz and Terry Lindahl, Berkeley, California on April 12, 2011. Quote from Maholy is from *The New Vision, from Material to Architecture*, 1938, p. 11.

Maholy's *New Vision* foresaw the future needs of man to strive to become more inclusive through a specialized education—that is, a transdisciplinary education. He wrote, "A student's training is directed toward sensory experiences, enrichment of emotional values, and the development of thought along the lines of his biological functions, so he will achieve a natural balance of his intellectual and emotional power" (Maholy, 1938, p.11, 18). He saw that the disciplines were equivalent to quantitative acquisitions, bringing no intensification of life, no widening of scope. The qualitative would come from clarity of feeling.

In addition to Bauhaus programs that attempted to combine Art and Design with Industry in the United States, some small offices and schools were devoted solely to organic architecture. Each espoused a purity of aesthetics, teaching art, architecture and design, with a *natural systems* approach. Maybe only Taliesin West in Phoenix, Arizona, came close to what Johannes Itten (1888-1967), a Swiss expressionist painter and art theoretician brought to the Bauhaus at Weimar. Magdalena Droste, a former Bauhaus archivist claims that Itten's influence, as part of the original core faculty, characterized the school's first phase. With a devout interest in Eastern Philosophy, he introduced movement exercises for development of inner being and preparation for painting and drawing. Droste writes,

> The pedagogical principle on which Itten's teaching was based can be summarized in a pair of opposites: 'intuition and method' or 'subjective experience and objective recognition.' Itten often started his classes with gymnastic and breathing exercises to loosen up and relax his students, before seeking to create 'direction and order out of flow.' Students were to find their own rhythm and develop a well-tuned personality (Droste, 1990 pp. 25 and 31).

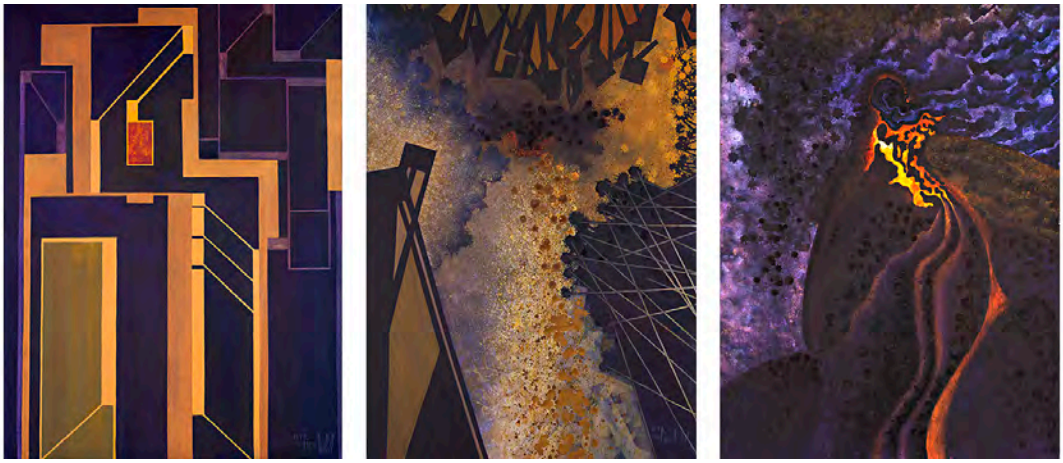
Olgivanna (Hinzenberg) Lloyd Wright, a student of Gurdjieff's between 1919-1924, instructed Frank Loyd Wright's architecture students at Taliesin in Gurdjieff's three-centered movement studies. Frank L. Wright, as an apprentice to Louis Sullivan, learned principles ideas of organic art. His architectural expression and school incorporated Sullivan's evolutionary language, "remembering the 'germ' and the 'seed.'"[57]

From 1943-1955, Bruce Goff taught organic architecture in a similar tradition at the University of Oklahoma. His students, and those who had attended the program at Taliesin West, apprenticed in his office. Lindahl, encountering both Goff's teaching and Gurdjieff's cosmology, found many shared vector points that he first utilized in his architectural firm and later brought into his painting and sculpture. In his (unpublished) work *Logosophy* (2004), Lindahl presents his model for an organic art, an organic science and an organic religion. He gathered sources—indications from within a wisdom/empiricism synapse—that show cycles of existence relative to experience" (Lindahl, 2004).

In Lindahl's triptych paintings, symmetry breaks to finer and finer states. Emblematic of the history of evolution, he shows how humans are bound through the atmosphere, lithosphere, hydrosphere, and these days, the ionosphere—from Vernadkian space to Darwinian time (Vernadsky, 1926 [Margulis foreword 1998 p.19]). He states, "These spheres interact according to the "inverse ratio of the density of mass to the density of vibrations [quoting Gurdjieff] at the speed of light squared [quoting Einstein] (Selz, Lindahl, Hays, 2011 p. 3).

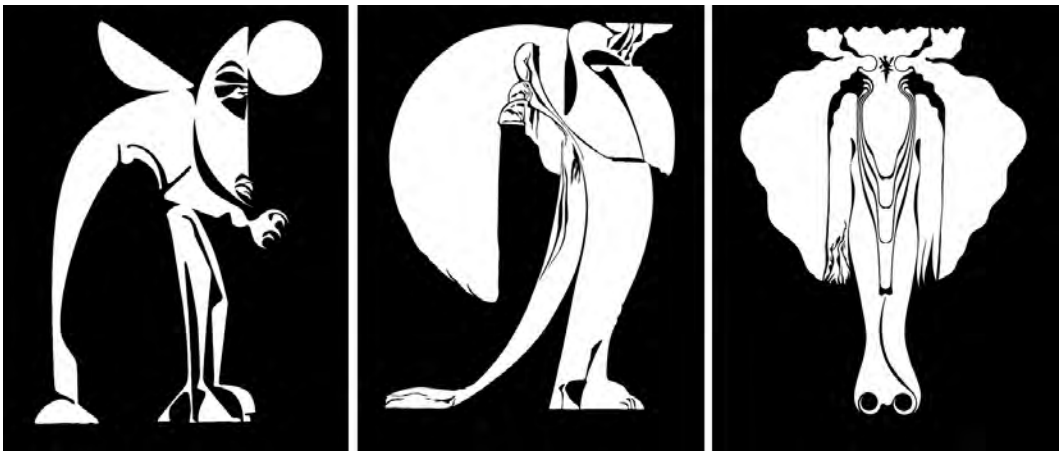
57 In 1924, Sullivan was commissioned by the Art Institute of Chicago to produce his final work: *A System of Architectural Ornament According with a Philosophy of Man's Powers*, a series of illustrations, unfolding diagrams, and accompanying descriptions of his aesthetic theory. See also Richard Etlin's essay: "Louis Sullivan: The Life-Enhancing Symbiosis of Music, Language, Architecture, and Ornament" in *The Orchestration of the Arts* (2000), pp. 165-182.

In the following triptych panels Lindahl depicts human levels of consciousness and their level of chemical processes (see Figures 2.8a, 2.8b, and 2.9).



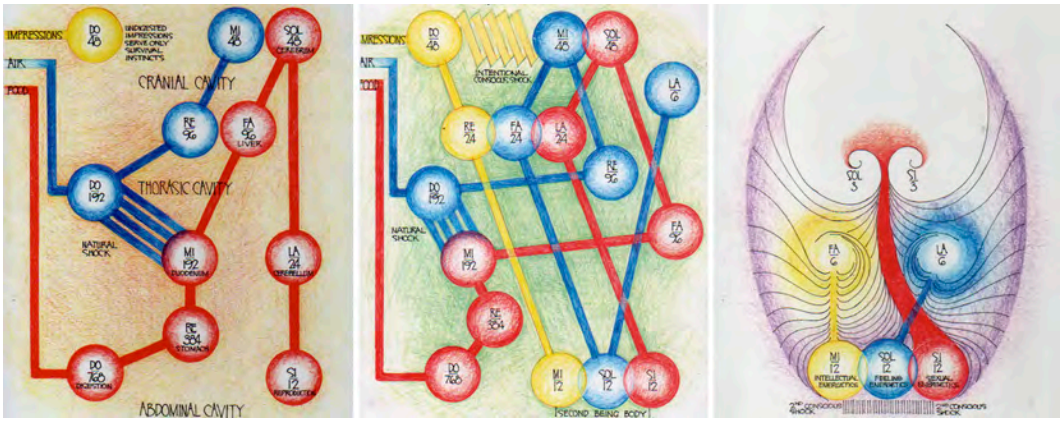
SOCIALIZED VERTEBRATE ESSENCE INDIVIDUAL CONSCIENCE BEING

Fig. 2.8a *Lithosphere, Atmosphere, Cognosphere*, watercolor on paper 30" x 22"



SOCIALIZED VERTEBRATE ESSENCE INDIVIDUAL CONSCIENCE BEING

Fig. 2.8b *Mort Feeder* III, India Ink on board, 30 x 40 inches



SOCIALIZED VERTEBRATE
Digestion of minerals & atmosphere

ESSENCE INDIVIDUAL
Initiation of digestion of impressions

CONSCIENCE BEING
Full digestion of impressions

Fig. 2.9 *Transmutative Chemistries of Digestive Metamorphosis*, colored pencil on board, 8 x 10 inches

> TRANSMUTATIVE CHEMISTRY DESCRIPTION: Organic life prevails through the ingestion/digestive refinement of substances on a scale of vibration rates from iron to oxygen to reason (i.e., involutionary=iron, evolutionary=thought, psyvolutionary=reason). The digestion of *minerals, air,* and the *senses* feeds human life. The small intestines, the alveoli, and the cerebrum process these three foods. As these foods enter beings, digestive processes separate the fine nutrients from coarse materials. From minerals and air the body manufactures the substances able to reproduce itself (SOCIALIZED VERTEBRATE) and then 'die.' The food of the senses is registered, but the organs for their digestion are dormant—with latent potential. The practice of "first conscious shock" (self-remembering) initiates the digestion of the finer particles of the air and the sense impressions, and manufactures within the vertebrate an ESSENCE INDIVIDUAL. The practice of "second conscious shock" fully awakens the digestion of the finer nutrients of the sense impressions and from an essence individual manufactures the substance COHERENT CONSCIENCE and from impressions of coherent conscience, the substance COHERENT REASON. These finer substances 'die' in their own time (Lindahl, Selz, Hays, 2011 p. 12).

Inquiring about Lindahl's work, Selz asked: "How does this relate, to entropy and Objective Art?" Lindahl responded:

> To address more deeply the examination of what the human dimension adds to natural processes, let me say first, humans have not recognized their Being on the basis of the realization that they are constituted of three separate brain agendas. These three brains, conductors of nature's imperative, while intercommunicative, are ontologically disparately formed. The lizard, the mammal and neocortical functioning—**3 in 1**—defines the human species. The triptychs symbolize these functions.
>
> We haven't understood yet that the world's problems stem mainly from the survival instinct of this inchoate, but trenchant reptilian brain. Its appetites are the major determinant of our behavior. Even if we have learned our manners really well, we each have a stable of offensive self-protective reactions that are fundamentally violent. They are expressed both outwardly towards others and inwardly towards ourselves. The function of all brains is survival. The overlay of mammalian and ratiocination instincts on the reptile are, so far, undeveloped, with rather superficial effect on the human situation. Beyond the lizard or the mammal, the survival instinct of humans, if it were to mature, is *'conscientious reason.'* We are being pressured to come to a reasoning that is based on the ***experience-of-existence*** informed by the whole (Selz, Lindahl, Hays, 2011 pp. 4-5).

To summarize, as Porges' work informs us of the importance of vagal toning, ECI initiates exercises for observing *'fight/flight'* system reactions. In laboratory-like conditions, individuals have the potential to register natural shifts from embedded parts of the mind (i.e., the associative miasma of thoughts and memories) that prevent a core attention from forming, within the larger context of our emotions (limbic-brain).

In small groups, guided by those who have more experience, testimonials are shared accordingly.[58] Exercises allow individuals to work counter-intuitively. For example, working with one's resistances, "liking what 'it' does not like," observing daily habits, and initiating exercises that allow experiencing the release of tensions in favor of re-cognition. The exercises given are understood to be "tools" for examining and experimenting with associative patterns seen in relation to the triune system at work; discerning neuroceptive reactions from perceptions; "dying to one's self" and openly questioning: "How am I being?" An aesthetic "taste" is acquired toward becoming more inclusive of that, which deflects, denies, forgets, resists and conserves energy. ECI provides work conditions where an individual might allow a black-and-white conflicting thought or conflicting emotion to be temporarily both. This form of mentation or bracketing is an experiment toward locating what can be implicitly sensed within the complex range of mind/body connectivity. A felt sense may appear (Gendlin, 1981).[59] By attending to evaluative (limbic) processes directly—essential for inner growth—re-cognition obtains a previously unrealized third possibility.

58 ECI records their exchanges. See *Exchanges Within*: *Questions from Everyday Life* (1997) for a published account of select meetings guided by John Pentland between 1955—1984 in California.

59 Eugene Gendlin, PhD coined the term: ***"felt sense"*** to express a holistic, implicit, bodily sense of a complex situation.

Chapter 3
Enacting Perception

For a parallel to the lesson of atomic theory regarding the limited applicability of such customary idealizations, we must in fact turn to the quite other branches of science, such as psychology, or even that kind of epistemological problem with which already thinkers like Buddha and Lao Tse have been confronted, when trying to harmonize our position as spectators and actors in the great drama of existence.
NEILS BOHR, 1933

You cannot solve a problem from the same level of consciousness that created it. You must learn to see the world anew.
EINSTEIN

We have to remember that what we observe is not nature in itself, but nature exposed to our method of questioning.
WERNER HEISENBERG

I wished to create around myself conditions in which a man would be continuously reminded of the sense and aim of his existence by an unavoidable friction between his conscience and the automatic manifestations of his nature.
G. I. GURDJIEFF, 1969 p. 270

Nicolescu's formulation of space is divided into levels of perception. Multidisciplinary or interdisciplinary education requires a move away from binary forms of perception (subject and object) to a more expansive array of perceptions that resist dichotomized experiences of space. The methodology of Transdisciplinarity is founded on this more complex potential level of self-awareness. Theoretically stated (see Chapter 1 p. 46) the three postulates again are: Objective Nature, Subjective Nature and Trans-Nature. My focus in this chapter is to examine specifically how perception functions in relation to states of consciousness and the ternary structure of transdisciplinary nature. Chapter 1's theoretical discussion of isomorphisms and Chapter 2's neural platform of triune-brain/autonomic nervous system dynamics, allow us to now look at experiential systematic practices. I consider phenomenological approaches, introduced by Goethe and Husserl and refined by Gurdjieff, as aesthetic limbic processes. If one accepts their postulates of an *endogenous* dynamic, which engages human subconscious reflexes, it is possible to consider the different levels of human perception—some more inclusive than others.[60] The chapter concludes with a description of the Center for Ecoliteracy's (CEL) partnership programs. CEL has successfully demonstrated how ecological perceptions of global realities clarify environmental values naturally.

3.1 Crisis of Perception

If we define human perception as an action of discernment, Emmanuel Kant and Neils Bohr provide two concepts that relate to two participatory exercises I will describe in section 3.4. Kant says, if we take away the subject or the subjective constitution of our senses in general, then not only does the nature and relation of objects in space and time disappear, but even space and time disappear. What may be the nature of objects considered as things in themselves is quite unknown to us. We know nothing more than our mode of perceiving them (paraphrasing Kant, 1871, SS 9, sect. I). Emphasizing humans as instruments, Neils Bohr expands Kant's observation: "In order that we can

60 ***Endogenous*** means a self-sustained cycle biologically growing or originating within an organism.

observe or perceive the macro-scopical world, an exchange of energy must take place between the object and the person who observes. How could we ever confirm that the table exists, if we at the same time deny that photons pass from the table to us?" As subjects with faculties of cognition, he said further, "We are part of the world we explore. We are both spectators and actors" (Bohr, 1958 p. 19-20).

Perception lies somewhere within Kant and Bohr's statements, where an evaluative separation process between observer and the observed can potentially discern a new third possibility. When a visceral internecine change in outlook is experienced—a phenomenon that the experience verifies in itself—an inner organ of conscious being begins to develop. Referring back to Lindhal's diagram (fig. 2.5), psyvolutionary processes engage this endogenous/emergent moment of conscious/experiential re-cognition, where two separate animate/inanimate entities bring a newly realized third perception.

Only voluntary participatory experiences make this theory realizable. Bohr's description especially suggests that perceiving and receiving are potentially an activity of reciprocation—one simultaneous, whole dynamic. This idea first resonated for me when I came in contact with painter Agnes Martin's book entitled *Writings* (1992). She wrote:

> *Perceiving*, is the same as *receiving* and it is the same as *responding*. Perception means all of them. Perception is a function. A function is part of a process. We are not identified by perception. We also think. Perception is the primary experience. Thinking, we consider that which we have perceived. It is a secondary experience. Thinking compares everything that we have perceived with everything that we perceive at the moment (Martin 1992; p. 89).

Martin's conception of a *primary experience* began a critical effort for me to understand the difference between pure observation and thoughts that consumed observations.[61]

In the following short personal narrative, it's possible to trace how my search for order and wholeness required direction beyond intuition. Ever since I can remember, listening was a way of seeing. Totally unaware of anything like Jung's synchronicity, "causal moments" or the Situationists' movement in Paris, "magical thinking" had functioned as a survival strategy.[62] I invented connections where things in reality were coming apart. Following "leads," wherever intuition took me, I experienced energetic moments of wholeness.[63] In this form of imaginative play, an undeniable yet random balanced energy came over me, particularly when I was in motion. These moments of sensation caused me to wonder. Was it possible to achieve them intentionally?

Born a preemie, my scientist father heard two heartbeats through his stethoscope forewarning a panic situation. My twin brother and I arrived. With two earlier siblings, my parents had four children in three years. Our household was filled with tension. My siblings left for boarding school. Alone, a yearning to live closer to nature led me to transcendental philosophers Emerson and Thoreau. I gravitated toward trees and my grandparent's home on the Silvermine River. *Small is Beautiful* by E. F. Schumacher was a favorite book of my grandmother's. In a college admission's interview it was suggested that, given what we'd discussed, I would like *Zen and the Art of Archery* by Eugen Herrigel. I did. Roland Barthes' *Camera Lucida* was required reading for a history of photography course. I loved it. On a return flight from New York a woman sitting next to me was reading Eugene Gendlin's *Focusing*. She said it was good. Yes!

61 In 1993, I met the ideas of G. I. Gurdjieff. Prior to this guidance—I relied on chance moments of grace.
62 The film *Inside Out* produced by Pixar has a character called Bing Bong who serves this function.
63 My artist's book (MA thesis) *Between Cedar & Vine* is an actual record of this idiosyncratic behavior.

These books had a special place on my bookshelf. They had a transdisciplinary thread, without my knowing what Transdisciplinarity meant. Is this how a meaningful life unfolds? "*Willy-Nilly*"–"*Hit and Miss.*"

In 1978, arriving in Berkeley, California, age seventeen, I encountered Eastern traditions that spoke to my heart. In 1993, the chance meeting of a group of like-minded people put fire under my wish. I was a sponge soaking-up Gurdjieff's detailed cosmology. Genuine insights struck me. With a deepened interest for creative expression, I entered graduate school in 1998.[64] What had coalesced was my level of attention—an ability to participate with my perceptions.

3.2 Perception and States of Consciousness

Eastern traditions and many Western schools of psychology concur that humans experience states or levels of consciousness that vibrate at higher frequencies than our ordinary "waking" state. Since Einstein, Bohr and others determined material—energy and matter—operates within a framework of space and time continuum, consensus amongst modern quantum physicists led to a science of phenomenology. Eastern ideas coming to Europe and the United States, at the turn of the twentieth–century was largely a movement of metaphysical mystics. "Psychology reduced psychological data to physical data" (Tart, 1975 p. 244). The discoveries of quantum field energy dynamics and Darwin's theory of Evolution inspired Eastern mystics to hope that practices of *self-observation* with Western science and psychology would find synergy. Blending Western empirical methods with Eastern intuitive, psycho-spiritual exercises continues to work toward higher levels of consciousness today. While holistic methods of *psychosomatic* therapy appreciate the subtle interplay between body/soul/mind or physical/intuitive, emotional and intellectual factors, polarities—tenaciously part of everything—are a natural function of evolutionary growth. Separating finer energies from the coarse is, in fact, the necessary labor that prepares our psychic organs.

A thorough account of states of consciousness aligning Eastern/Western approaches to the brain/body problem can be found in Ken Wilber's *The Spectrum of Consciousness* (1977). Wilber describes consciousness as a spectrum with ordinary awareness at one end and more profound types of awareness at higher levels. Evan Thompson's in-depth analysis in *Mind in Life* (2007) and *The Embodied Mind*, which he co-authored with Francisco Varela and Eleanor Rosch (1991), are also excellent sources. Thompson bridges cognitive neuro-phenomenology with philosophy—that is, a theoretical foundation of Husserl's account all the way through to biological cellular organization of life itself. Another strong account is transpersonal psychologist Charles Tart's systems approach in *States of Consciousness* (1975). He writes,

> Consciousness, as we ordinarily know it in the West, is not pure awareness but rather awareness as it is embodied in the psychological structure of the mind or brain. Ordinary experience is neither pure awareness nor pure psychological structure, but awareness modified by the structure of the mind/brain, and of the structure of the mind/brain embedded in and modified by awareness. These two components, awareness and psychological structure, constitute a gestalt, an overall interacting, dynamic system that makes up consciousness (Tart, 1975 p. 258-9).

64 I returned to Western schooling, earned and MFA in 2000 and MA in 2002, concentrating on my artist book *Between Cedar &Vine*, and two exhibitions: *Everyday Constellations* and *In/Visible Cosmos*.

As MacLean and Porges confirm, this "gestalt," blended in human operations and response patterns, is easily confused (biologically) with states of consciousness. We are better off placing the term "perception" in quotation marks, as the human brain must first learn to regulate behavior through the action of inhibition. After identifying sequential states of consciousness, it will be possible to identify how patterns of habit/automaticity (autonomic phylogeny) exist as a lower stage of "being" before states of self-consciousness begin to produce a unified sense of actual perceptions.

3.2.1 Four States of Human Consciousness

The human capacity for perception, what we observe in and around us, is explicably tied to four potential, inner states of consciousness. Listed in descending order, states 3 and 4 are realms of experiential vision and depend on an individual's conscious, voluntary effort (Ouspensky, 1954 p. 34-36).

4. Objective Consciousness

> A unified vision is experienced. For this fourth state to come about, the third state functions "naturally." Gurdjieff and others suggest those efforts of being in the position of the other, living beyond self-referential biography and ordinary time-space limitations, brings a perceptual sense of impartial "free energy."

3. Self-consciousness

> Non-directed skills of attention dividing *self-awareness* are refined. An effort, moving from state 2 to state 3, is envisioned as a double-arrow. (Fig. 3.1) With the aim of cognizing actions in the moment, one is able to sense manifestations, reactions, and vibrations. Separation between observer and observed, subject and object, a third experience, independent of dualities (like/dislike) is attended to. It's possible to see the truth of our situation (Ouspensky, 1954 p. 35).

2. Waking Sleep or Relative Consciousness

> An unreflective mostly subjective state in which humans walk the streets identified with a perceptual defense distorting what is seen to fit a selective preconception or misperception as a primal form to survive in relation to the environment. Everything outwardly or inwardly takes subjective attention. Noticing this state causes the wish for the ego's purification; depending on how much real information gets through the filtering, this state is sometimes delusional (Tart, 1975).

1. Sleep

> A purely subjective and passive state a person lives by dreams and vague perceptions (Ouspensky, 1954 p. 35).

When understanding potential states of consciousness (3 and 4), what Goethe suggested, and Gurdjieff refined, is the crucible in which a man must struggle with himself. "If the doors of perception were cleansed everything would appear to man as it is, infinite. Man has closed himself up, till he sees all things thro' narrow chinks of his cavern" (W. Blake

The Marriage of Heaven and Hell, 1790). Gurdjieff described consciousness as being simultaneously aware of all of one's feelings. But, since our feelings are experienced separately, their contrary nature escapes us. Gurdjieff included universal laws in his self-study approach so that human psychology would not be solely governed by one dimension of "knowing-one-self." He expanded self-understanding to a cosmic scale–a scale that includes all the phenomena of life. Ouspensky, who conscientiously recorded group meetings, quotes Gurdjieff:

> Man is an image of the world. He was created by the same laws, which created the whole of the world. By knowing and understanding himself, he will know and understand the whole world… And at the same time by studying the world and the laws that govern the world, he will learn and understand the laws that govern him (Ouspensky, 1949, p.75).

Are Ouspenky's words the depth of what Santiago Ramón y Cajal (1852—1934) meant in his often quoted line: "As long as our brain is a mystery, the universe, the reflection of the structure of the brain will also be a mystery."?

Having come thus far in my explanation, I'd like to take a moment to compare levels of human consciousness with Transdisciplinarity's first level of reality. I am here pointing to how we can more fully comprehend Nicolescu's definition of Objective Nature and Subjective Objectivity with states 3 & 4 levels of perception. He states,

> **1.** *Objective Nature*, which is connected with the natural properties of the transdisciplinary Object; objective Nature is subject to subjective objectivity. This objectivity is subject to the extent that the levels of Reality are linked to levels of perception. Nevertheless, the emphasis here is on objectivity, to the extent to which the methodology employed is that of science (Nicolescu, 2009 p. 63-64).

If a scientific methodology is needed for this level of perception to operate, Transdisciplinarity needs to establish its own methodology: experience. By combining Gurdjieff's pedagogy with the practice of art, I hope to contribute a Transdisciplinary model for the movement to address. In addition, while Nicolescu briefly presents the theoretical work of Husserl and Lupasco, MacLean and Porges' contribution is essential. Their work brings the empirical evidence for an epistemic understanding. Their work reveals that human evolutionary development is primarily based on learning how to self-regulate our autonomic triune nervous system. Neuroceptions must transcend (inhibit) our habitual reactions in order to achieve higher levels of "objective" perception—or higher states of awareness.

To summarize, co-evolutionary, transdisciplinary practice requires humans evolve an epistemic cosmological worldview. This scale of worldview offers a context for ecological perception. By encompassing the bigger picture, humans are directed toward perceiving the essential distinction between subjective associative psychology and a Goethian/Gurdjieffian holistic gestalt—the study of life itself. A transcendental coherence, where individuals re-cognize how humanity as a whole relates to larger living systems, becomes a gradual, natural turning point based on both individual and community consciousness.

As we have learned from the Polyvagal perspective, our species is emotionally pressured through our viscera. The veritable experience of existence informs and strengthens our nascent, unmyelinated nervous system. Vibrationally verifiable, neuroreceptive

processes allow humans to self-regulate their inborn divisive and evaluative autonomic nervous system. As Porges' research shows, natural (primary) pre-conditions limit each human's integrative potential. Our physiology has an intervening variable that will only lead to potential higher states of awareness if it learns to regulate itself through practice. It is imperative that humans practice conscious labor in order to apprehend nature's complexity. As Gurdjieff taught,

> Our mind has no critical faculty in itself, no consciousness, nothing. And all the other centers are the same. What then is our consciousness, our memory, and our critical faculty? It's when one center specially watches another, when it sees and feels what is going on there and seeing it, records it all within itself (Gurdjieff, 1973 p. 271).

Huglings, Jackson, MacLean, Porges, and Gurdjieff show us that when human consciousness functions at a higher level, we are able to develop our neo-cortical faculties. This higher-body (brain-center) is our innate evolutionary potential. *Cogito, ergo sum—In that I am experiencing, I am.*[65]

3.3 Ecological Approaches to Visual Perception

> *The world does not speak to the observer. Animals and humans communicate with cries, gestures, speech, pictures, writing and television, but we cannot hope to understand perception in terms of these channels; it is quite the other way around. Words and pictures convey information, carry it, or transmit it, but the information in the sea of energy around each of us, luminous or mechanical or chemical energy is not conveyed. It is simply there. The assumption that information can be transmitted and the assumption that it can be stored are appropriate for the theory of communication, not for the theory of perception.*[66]
>
> J.J.GIBSON, 1979 p. 242

Though John Dewey was the first to introduce pragmatic aesthetics in his treatise *Art as Experience* (1943), moderns Johann Wolfgang von Goethe, Friedrich Schiller and Alexander von Humboldt in the early 1800's, Heraclitus and the Greek Polis, well before that, are also remembered for their claims to unity and coherence in the organic natural world. In the twentieth-century, when Husserl announced his phenomenological approach, he faced, as we still find today, the dichotomy between evolutionary thinkers and believers of Intelligent Design. As Richard Shusterman reminds us:

> A whole skein of thinkers stretching back to Heraclitus insist on the possibility that such unity not only contains, but is sustained and enhanced by the tensions of the opposites it embraces; and modern science seems to reveal that radical opposition inhabits the unities of nature right down to the positive and negative charges of the atom (Shusterman, 2008 p. 64).

For pragmatism to make its way beyond skepticism, humans and institutions must critically engage that which ethologically polarizes and dominates—that is, namely,

---

65 Richard Hodges discusses Descartes possible meaning/use of the Latin phrase, which he translates in: "Thus Spake Beelzebub," in the *Gurdjieff International Review* (2012).

66 Psychologist James J. Gibson (1904-1979) argued that when we perceive an object we observe the objects affordances and not its particular qualities. He believed that perceiving affordances of an object is easier than perceiving the many different qualities an object may have. Affordances can be related to different areas of the habitat as well. Some areas of the world conceal while others allow foraging.

the inherent, naturally driven conflict in human neuroceptive reactions that may potentially evolve ecological perceptive responses. As we learned in Chapter 2, humans are physiologically inhibited by autonomic body/mind reactivity until pro-social connectivity evolves. And, as I argue, this phylogenetic complexity is a primary explanation for the imbalance we see reflected in our social/cultural institutions. Educational learning practices that privilege analytical methods over experiential embodied practices keep individuals from knowing their human potential. Even holistic knowledge applied to school models like Black Mountain College, Rudolph Steiner and the Bauhaus, struggled to overcome the complexity of human-brain and autonomic nervous system connectivity, a complexity they might have addressed, if evolutionary science had been emphasized in social/cultural discourse. This section will briefly consider aspects of epistemic understanding of human perception in relation to principles of scientific observation, philosophical, and ecological cultural thought.

At the turn of the twentieth-century, an aesthetic ecological perception, inclusive of human biology, was beginning to form similarly to what Goethe and Alexander von Humboldt had expressed in the nineteenth-century. Phenomenologist David Seamon explains their interactive conception of humans:

> If the two geniuses of the German Enlightenment were mutually influential, Goethe went further to expose the human encounter with nature and to reveal a belief in the purposefulness of that encounter. As he believed that all things in nature reflected a universal whole imbued with spiritual intention and order, so too did he believe that the universal whole might be demonstrated experientially though immersion in the events of nature. In the process he gave definition to a highly systematic yet radically empirical method for the study of nature. … Nature here was not only the natural things of the world—the rivers, valleys, mountains, clouds and season—but also human nature as it appeared in simple, humble persons, children, peasants, the pure in heart. 'Man comes to know himself,' he wrote, 'only insofar as he knows the world; he becomes aware of the world only though himself, and of himself only through the world' (Seamon, 1998).[67]

C. S. Peirce (1834-1914), William James (1842-1910), and later John Dewey (1859-1952) searched for axioms so individuals in society could verify levels of perception in their social patterns. However, the hesitation for society to accept experiential practices delayed formal praxis of their writings.[68] After the basic philosophy declined, its revival came in the 1970s—the decade of the environmental and transdisciplinary movements' emergence. William James equated free inner attention with democracy, asking: How do individuals learn to conserve energies habitually lost in psychological reactive outcomes? To be availed of the weight of emotions, for example, voluntarily engagement of our inborn physiological *trilemma* assists gradual transcendence of both our anatomical and personality constructs.[69] Conservation of energy brings negentropy gain. Expressed in the sense of triune brain and ANS functioning, once neuroceptive reactions are cleared, ecological perception can be *afforded* (Gibson, 1977).[70] Where mind was previously associated with the brain and behavior, an epistemic understanding of the nervous system, "knowing through sensation" was empirically understood, since

67 Seamon quotes A. Bergstrasessser *Goethe's Image of Man and Society* (Chicago: H. Regnery, 1949) p. 41.
68 Even the call for experiential practices that emerged in texts of the 1970's are in waiting to be integrated.
69 ***Trilemma*** is a neologism Lindahl coined to describe innate three-brained—three-centered conflicts.
70 Psychologist James J. Gibson originally introduced the term affordances in his 1977 article "The Theory of Affordances" in *Perceiving, Acting, and Knowing*, edited by Robert Shaw and John Bransford and explored it more fully in his book *The Ecological Approach to Visual Perception* in 1979.

Hughlings Jackson's day to be an essential action for human evolutionary development. While twentieth-century psychologists have since clarified this need as part of human perceptual development, the ancients, eastern traditions, and philosophers have understood it all along, following their intuitive—deductive, experiential knowledge.

3.3.1 Goethe's Way of Science [71]

Goethe's last letter, Weimar, 17th March, 1832, was a reply to Wilhelm von Humboldt who had asked Goethe to explain in further detail what "awareness of mind" he had experienced, "unlike any previous time in his creative life, when writing part II of *Faust*." Goethe's reply implicitly laid forth his phenomenological attitude:

> The Ancients said that the animals are taught through their organs; let me add to this, so are men, but they have the advantage of teaching their organs in return.
>
> Every action, and so any talent, needs some inborn faculty, which acts naturally, and unconsciously carries with it the necessary aptitude, and which, therefore, continues to act in such a way that though its law is implicit in it, its course in the end may be aimless and purposeless.
>
> The earlier man becomes aware that there exists some craft, some art that can help him towards a controlled heightening of his natural abilities, the happier he is; whatever he may receive from without does not harm his innate individuality (Goethe, 1957 [1832] p. 537).

According to Barker Fairly, artist and professor of literature at Toronto University, *Faust II*, written in 1808, was "sealed up and put away" because Goethe felt part II was ahead of his readers, "as it proved to be, and had better wait 'til after his death for publication'" (Fairley, 1957 p.1). *Faust* was published posthumously in 1832, the year of his death.

Later in Goethe's letter, he explains how the practice of art, through the warp and weft of conscious and unconscious relations, creates a sense of unity for the individual. "Through practice, teaching, reflection, success, failure, furtherance and resistance, and again and again reflection, man's organs unconsciously and in a free activity link what he acquires with his innate gifts, so that a unity results which leaves the world amazed" (Goethe, 1957 [1832] p. 537).

Goethe's 1793 essay, "The Experiment as Mediator between Object and Subject," complemented his plays and poetry by offering an analytical description of how he conceptualized his approach to observation. Whether or not Parmenides' "Way of Truth" informed his understanding of ontology, Goethe emphasized that "truth" must be tested as an experiment—an experiment tried many times so to move from the everyday naïve to a pure phenomenon, with no other property. Herbert Hensel describes it like this: "Its leitmotif is a methodical withholding of judgment or 'epoché.' By bracketing all conceptual interpretations, positing, valuations, and judgments, we proceed from the categorically preformed world of things to pure phenomenality"(Hensel in Seamon, 1998 p. 71).

71 After David Seamon and Arthur Zajonc, editors of *Goethe's Way of Science*, 1996.

To deepen our relationship to nature what else makes trusting our senses worthy, but developing them? The human being, Goethe wrote, is adequately equipped for all genuine needs on earth, if we trust our senses. His poem *Blessed Longing* expresses how self-consciousness haunts and stirs this human primordial wish.

Tell no one else, only the wise
For the crowd will sneer at one
I wish to praise what is fully alive,
What longs to flame toward death.

When the calm enfolds the love-nights
That created you, where you have created
A feeling from the Unknown steals over you
While the tranquil candle burns.

You remain no longer caught
In the penumbral gloom
You are stirred and new, you desire
To soar to higher creativity.

No distance makes you ambivalent.
You come on wings, enchanted
In such hunger for light, you
Become the butterfly burnt to nothing.

So long as you have not lived this:
To die is to become new,
You remain a gloomy guest
On the dark earth.

Goethe's wish—represented in most everything he wrote—was to privilege experience in order to learn what things are in themselves, without being led astray by subjective judgment. More philosophical than empirical, moving away from quantitative materialist approaches to things in nature, he wasn't considered a scientist. His use of intuition was, however, that of a keen observer capable of bringing clarity to the context of phenomena. Since reasoning from observation is the first law of science, from Aristotle forward, Goethe was a philosopher influenced by the science of observation. He renewed his philosophical point of view through science. Seamon continues,

> Only in the twentieth century, with the philosophical articulation of *phenomenology*, do we have a conceptual language able to describe Goethe's way of science accurately. Though there are many styles of phenomenology, its central aim, in the words of phenomenological founder Edmund Husserl, is "to the things themselves"—in other words, how would the thing studied describe itself if it had the ability to speak? (Seamon, 1998 p. 2)

By calling to mind that the first law of science is observation, we are placed in good stead as section 3.4 brings a special form of self-observation—one of action brought by the observer. MacLean, with empirical caution, reminds us that given the complexity of our three-brains, self-observation—in and of itself—requires vigilance. He says,

> Sensations represent 'raw' feelings activating both 'intero-ceptive and extero-ceptive fields' (Sherrington, 1906). In such Sherringtonian terms they fall into two broad classes of interoceptions and exteroceptions. They are distinguished in terms

> of quality (modality) and intensity. Individually or in combination, sensations become more informative as they are appreciated in terms of time and space. In such cerebral transformation they are introspectively recognized as perceptions. It may be presumed that sensations and perception are basic to the original generation of compulsions, affects and conceptions, which, paralleling the triune development of the brain would appear evolutionarily to represent a hierarchic order of information (MacLean, 1990 p. 423–24).

To summarize, while the practice of self-observation requires the bringing of perception through sensation, we humans distort our observations in the everyday, until our organs are prepared to distinguish between subjective psychology and other functions of the nervous system.[72] "A philosopher such as Kant," MacLean suggests, "might have referred to subjectivity as an *a priori* "form of consciousness" (MacLean, 1990 p.423). I am also, once again, clarifying how Transdisciplinarity's model requires individuals to evolve. To comprehend what Nicolescu means specifically in his second definition of Subjective Nature, we can look more closely where he states:

> **2.** *Subjective Nature*, which is connected with the natural properties of the transdisciplinary Subject; subjective Nature is subject to objective subjectivity. This subjectivity is objective to the extent that the levels of perception are connected with levels of Reality. Nevertheless, the emphasis here is on subjectivity, to the extent to which the methodology employed is that of the ancient science of being, which is present in the traditions and religions of the world (Nicolescu, 2009 p. 64).

For individuals to obtain the capacity to perceive subjective nature, higher levels or states of consciousness must be cultivated experientially. Today, the combination of ancient wisdom and modern science can be included in educational curricula.

3.4 Self-Observation/Self-Remembering

While eastern traditions have brought practices of yoga and meditation to address human's health and well being for thousands of years, Gurdjieff's esoteric system specifically teaches three-brained/three-centered beings. In his school, Gurdjieff introduced a scientific philosophy to help individuals develop 'non-identified' space of voluntary separation. These practices, to be distinguished from ordinary introspection, sense aesthetic qualities of experience that arrive from emotional chemical shifts in the body/mind's between *thinking, moving, and emotional centers*. Experiences are exchanged in small groups.[73] Where Husserl offers a mental, theoretical reductive process, Gurdjieff's system engages humans in developing an actual "body of attention" which gradually, through the work of sensation, awakens neural circuitry channels. To experience visceral cellular energy, arising from non-identified differentiating processes, is a conscious labor. Jackson, MacLean and Porges' empirical studies would support this form of voluntary conductivity that assists disengaging or inhibiting fight/flight reactions. Body/Mind practices like Alexander technique and Feldenkrais method also relate exercises that teach the organs.[74]

---

72 See MacLean (1960a) for a paper he wrote on "Psychosomatics" in *Handbook of Physiology, Neurophysiology III.*

73 John Pentland, first generation student of Gurdjieff, led exchanges that are collected in *Exchanges Within* (1977).

74 Dr. F. M. Alexander (1869-1955) who developed the *Alexander Technique* and Moshe Feldenkrais (1904-1984) who developed the *Feldenkrais Method* were also influenced by Gurdjieff's teaching (Alexander coming first).

Self-observation and self-remembering, two non-directive discerning skills, allow humans to develop their latent capacity, beyond the western academy's traditional schooling. Non-directive simply means that, without imposing or changing habits, one attunes to observing habits of the organism—just as they appear—in situ. While philosophers and scientists of the twentieth-century valued the concept, Gurdjieff gave specific exercises in conditions—a legacy his students and later generations of students learned to transmit to others in small groups. Whether Gurdjieff called them brains or centers, "Conscious labor and intentional suffering" (his way of expressing the necessary study of our natural 3-in-1 agonistic brain mentalities) assists evolvement of our higher-being-state-potential. In other words, by experiencing rather than suppressing or denying one's automatic unavoidable inner conflicts, one comes in contact with higher (more complex, but less organized) mind.

As the Polyvagal Theory empirically demonstrates, to "know thyself"—feel how we are mechanically structured—means we must consciously cultivate our aspiration to evolve. The study of our individual Ontology means self-observation of habits will reveal, over a period of time, a specific picture of our experience of "being in the world." The goal of self-observation is therefore self-remembering. If in plant morphology the Xylem conducts nutrients to the development of connective tissue, in humans signals from the Vagus Nerve serve as the potential conductor for myelinating the nervous system. Our autonomic nervous system, functioning alongside the spinal cord, provides food for the development of our higher (newer) nervous system. "Depending on what level of connectivity is possible," Lindahl told Selz, "the instinct we feel as spiritual or religious is the *psyvolutionary* conscious refinement of the vibration rates of our endowment of consciousnesses." Quoting Hegel, "Spirit… in truth, is consciousness" and psyvolution is simply the continuance of the evolutionary processes from which our consciousness evolved" (Lindahl, Hays, Selz, 2011 p. 9).

In Jacob Needleman's brief account in *G. I. Gurdjieff and His School,* he acknowledges the increasing recognition of the non-material, spiritual landscape of the twentieth century. Gurdjieff's name continues to evoke a variety of reactions ranging from awe and reverence to suspicion and hostility. Historians agree that there is as yet no cultural consensus about Gurdjieff's teachings (Needleman, 1992). Needleman's profile of Gurdjieff's early life informs us about his education:

> The portrait Gurdjieff draws of his father, a well-known *ashokh*, or bard, suggests some form of participation in an oral tradition stretching back to mankind's distant past. At the same time, Gurdjieff speaks of having been exposed to all the forms of modern knowledge, especially experimental science, which he explored with an impassioned diligence. The influence of his father and his early teachers, contrasts very sharply with the forces of modernity that he experienced as a child. This contrast, however, is not easily describable. The difference is not simply that of ancient versus modern worldviews or patterns of behavior, though it certainly includes that. The impression, rather, is that these "remarkable men" of his early years manifested a certain quality of personal presence or *being*. That the vital difference between human beings is a matter of their level of being became one of the fundamental elements in Gurdjieff's teaching and is not reducible to conventional psychological, behavioral, or cultural typologies (Needleman, 1992).

The concept of self-remembering is challenging to comprehend. An actual change of being occurs only through years of study and practice. To move beyond everyday sensory experience, exercises are first engaged to orient oneself. Terms like presence and awareness are "quick-sand" when attempting to separate everyday language from organic processes, particularly without benefit of transmission through a group leader. Associations and shades of meaning coming from ordinary mind will automatically seize an idea and consume the power of its possible meaning in a deeper context (i.e., science, phenomenology, or etheric understanding). As reviewed in section 3.2, subjective memories, associations, and illusions will at first naturally predominate over impartial self-observation.

The challenge of overcoming language and ordinary meaning of words was so deeply understood by Gurdjieff that he purposefully used language playfully, so that readers and practitioners of his ideas would not believe they already new what he meant. Ouspensky discussed the need for finding a new language—a common, universal language. He explains,

> Every branch of science endeavors to elaborate and to establish an exact language for itself. But there is no universal language. For exact understanding exact language is necessary… This new language is based on the principle of relativity; that is to say, it introduces relativity into all concepts and thus makes possible an accurate determination of the angle of thought—making it possible to establish at once what is being said, from what point of view and in what connection. In this new language all ideas are concentrated around one idea. This central idea is the idea of evolution … *and the evolution of man is the evolution of his consciousness* (Ouspensky, 1949 p. 70).

While the problem of language will be addressed further in Chapter 6 (6.4), we have so far ascertained from MacLean in Chapter 2 that humans inherited three mentalities. The development of language and verbal expression is strictly unique to the capacity of the neo-cortex. The common ground for humans to comprehend the complexity (discontinuity) of language is, therefore, the neo-cortex's ethological relation to the limbic brain, R-complex, and autonomic nervous functioning (Wooten, 2008).[75]

Comprehending the principles of self-observation and self-remembering are at the center of the Gurdjieff teaching. Individuals come to "the work" with the wish to learn how to bring greater attention to their lives, in life itself. From the point of view of the school, teaching the full scale is essential. Dr. Ravi Ravindra, who wrote of his accounts working with Mdme de Salzmann states: "The purpose of man's existence on the Earth is to allow the exchange of energy between the Earth and higher levels of existence" (Ravindra, 1999 p.33). Ouspensky illustrates the action/nature of *self-remembering* in the following way:

75 For in-depth reading on language and discontinuity see *Triune Mind in Semiosis* by David Wooten, 2008.

> When I observe something, my attention is directed towards what I observe—a line with one arrowhead:
>
> I ==========> the observed phenomenon
>
> When at the same time, I try to remember myself (be *self-conscious*) my attention is directed both towards the object observed and towards myself. A second arrowhead appears on the line:
>
> I <==========> the observed phenomenon

Fig. 3.1 Ouspensky, 1949 p.119

"Work on one's self" involves the study of the three centers which Hughlings Jackson, MacLean, and Porges have shown to be phylogenetically ordered (Fig. 2.3 and Fig. 2.4). Dr. Jerry Needleman, introducing Gurdjieff's term of self-remembering, within the hierarchal structure of humans, writes:

> Gurdjieff gave the name of 'self-remembering' to the central state of conscious attention in which the higher force that is available within the human structure makes contact with the functions of thought, feeling and body. The individual 'remembers,' as it were, who and what he really is and is meant to be, over and above his ordinary sense of identity. This conscious attention is not a function of the mind but is the active conscious force which all our functions of thought, feeling and movement can begin to obey (Needleman, 2008, p. xviii).

As Gurdjieff advises, "Attention is gained only through conscious labor and intentional suffering, through doing small things voluntarily" (Gurdjieff, 1973 p. 90). The 'active mentation' in a being and the useful results of such active mentation are in reality actualized exclusively only with the equal-degree functioning of all his three localizations of the results spiritualized in his presence, called 'thinking-center,' 'feeling-center,' and 'moving-motor-center' (Gurdjieff, 1950 p.1172). For the conscious development in one's self of natural given impulses inherent in humans, Gurdjieff recommended simple exercises, which were presented in detail in the program of the Institute he founded. One example from his series is to experiment with learning how to "divide one's entire attention in three approximately equal parts, and to concentrate each separate part simultaneously for a definite time on three diverse inner or outer 'objects' (Gurdjieff, 1973 p. 112). He wrote:

> First, all one's attention must be divided approximately into three equal parts; each of these parts must be concentrated on one of the three fingers of the right or the left hand, for instance the forefinger, the third and the fourth, constating[76] on one finger—the result proceeding in it of the organic process called "sensing," in another—the result of the process called "feeling," and with the third—making any rhythmical movement and at the same time automatically conducting with the flowing of mental association a sequential or varied manner of counting.

76 ***Constatating***—Gurdjieff means: to stimulate within oneself a positive effort toward self-observation.

> In order to explain to you this very important question, the difference between "sensing" and "feeling," I shall give you a corresponding definition. A man "feels"—when what are called the "initiative factors" issue from the "sympathetic nerve nodes," the chief agglomeration of which is known by the name of "solar plexus" and the whole totality of which functioning, in the terminology long ago established by me, is called the "feeling center"; and the "senses"—when the basis of his "initiative factors" is the totality of what are called "the motor nerve nodes" of the spinal and partly of the head brain, which is called according to this terminology of mine the "moving center."
>
> And for cognizing its importance and indispensability for you, as well as its real difficulty, it is necessary to do it many, many times. At the beginning you must try all the time only to understand the sense and significance of this exercise, without expecting to obtain any concrete result.
>
> And so, if you really wish to have in yourself that which alone can distinguish a man from an ordinary animal, that is to say, if you wish to be really such a one to whom Great Nature has given the possibility with the desire, that is, with a desire issuing from all the three separate spiritualized parts … then you must always and in everything, struggling with the weaknesses that are in you according to law, attain at any cost, first of all, an all-round understanding, and then the practical realization in your presence, of this exercise just elucidated by me, in order to have the chance for a conscious crystallizing in yourself of the data still engendering the three mentioned impulses which must be present obligatorily in the common presence of every man (Gurdjieff, 1973 p. 112-116).

This example exercise, one of few published, shows the depth of internal practice that "work on one's self" requires. Specifically, how one positions themselves inwardly—constating oneself—allows a degree of authenticity to come in direct contact with the nature of one's whole being and whatever presents itself from the outside (Tracol, 1992 p. 427). Bringing the practice of self-remembering into Transdisciplinary education would help develop a new dimension of human consciousness. After all, Transdisciplinarity's model, at its highest level of reality, requires not only crossing disciplines, but also unifying them.

3.5 Third-Force: A Three-Centered (ternary) Study

In Gurdjieff's "Three Totalities of Functioning," he states: "The general psyche of every man on reaching maturity . . . consists of three totalities of functioning, which have almost nothing in common with each other. The course of action of all three of these independent totalities of functioning in the common presence of a man who has attained maturity takes place simultaneously and incessantly" (Gurdjieff 1975, p. 144). This statement, of course, agrees with MacLean and Porges, particularly MacLean whose triune brain model articulated different features. Note the similarity to MacLean's description:

> Three basic evolutionary formations reflect an ancestral relationship to reptiles, early mammals, and recent mammals. Radically

> different in chemistry and structure and in an evolutionary sense countless generations apart, the three neural assemblies constitute a hierarchy of three-brains-in-one, a triune brain. Based on these features alone, it might be surmised that psychological and behavioral functions depend on the interplay of three quite different mentalities each having its own special intelligence, its own subjectivity, its own sense of time and space, and its own memory, motor, and other functions (MacLean, 1990 p.8).

Porges' Polyvagal theory highlights his own, MacLean and Gurdjieff's key understanding: true perceptions only arrive at the point of actual voluntary contact with subject/object interactions. Gurdjieff (1975) wrote, "The original forming of all the factors for the functioning of the three entirely separate totalities of functioning proceeds in people in accordance with the universal law of 'threefoldness.'" He continued,

> For the formation of factors of the FIRST totality, there serve as the "anode beginning," on the one hand, all kinds of involuntarily perceived outer impressions and, on the other hand, impressions resulting from so-called "all-centered dozing"; and as the "cathode beginning" there serve the results of reflexes of the organism, chiefly of those organs having an hereditary particularity.
>
> For the formation of the factors of the SECOND totality, they serve as the "anode beginning" outer impressions taken in under a certain pressure and having thereby the character of being intentionally implanted from outside, and as the "cathode beginning" the results of the functioning of factors formed from impressions of a similar kind previously perceived.
>
> The factors of the THIRD totality of functioning are formed from the results of "contemplation," that is, from results received from the "voluntary contact" of the factors of the first two totalities, for which moreover the results of the second totality serve as the "anode beginning" and the results of the first totality serve as the "cathode."
>
> One of the properties of such an actualization of all three separate totalities of functioning's producing the general psyche of man is that which, by combinations of the "voluntary contact" of the actions of these three independent totalities of functioning, causes to proceed in one of them the imprintation of those processes proceeding in the other totalities, as well as those proceeding outside of the given man which happen to fall into the sphere of the subjective action of his organs of perception. The part of this property found in the common presence of man, ordinarily perceived by people, is that which is called "attention." The degree of sensitivity of the manifestation of this property or, as otherwise defined by ancient science; "the strength of embrace" of this "attention" depends entirely upon the so-called "gradation of the total state" of a given man.

> For the definition of this property in man, which is called "attention," there is, by the way, found also in ancient science the following verbal formulation: THE DEGREE OF BLENDING OF THAT WHICH IS THE SAME IN THE IMPULSES OF OBSERVATION AND CONSTATATION IN ONE TOTALITY'S PROCESSES WITH THAT OCCURRING IN OTHER TOTALITIES.
>
> This above-mentioned "gradation of the total state" of man extends, as science formulates it, from the strongest subjective intensity of "self-sensation" to the greatest established "self-losing." That totality always becomes the initiating factor for the realization of a common function of the three separate totalities, which represent the general psyche of man in which at the given moment this "gradation of the total state" has its center of gravity (Gurdjieff 1975, p. 145–147).

"The Law of Three" works to overcome the automaticity of dialectical thought. Since all processes have cadences, gathering attention amplifies an individual's experience. But where do we find this force? From personal experience working with Gurdjieff's participatory model, the un-linking process (to use Lupasco's term), separating forces experientially creates verifiable heat or "friction" when allowing resistances on a cellular level to release.[77] From this comes conserved energy that hasn't dissipated (dispersed) in the habitual way. An intentional physical reblending "in situ" comes through the process of temporarily suspending all thoughts, voices, and judgments. Subtler energies can be sensed while habitual predominating energies become more peripheral. During this engagement process, chemical substrates (i.e., bile, neuropeptides, oxytocin, vasopressin) are released—detoxifying the system. While conducting such physical efforts brings a potential difference (evolutionarily speaking), moment-to-moment clarification of psychology also comes in stages—psyvolving.

At first, physically locating this third inner reconciling force appears abstract. But, a shift in chemical substrates brings the palpable sensation of friction, traction and cognitive awareness of subtler energy working in contrast to habitual energies. For an individual to bring awareness to what occurs on a sensorial level allows an otherwise abstract theory to experientially penetrate cells of the body. The aesthetic, non-directive skill for sensing inner qualities of substrates in the whole body/mind environment is an integrative process where inner vibrations are brought into equilibrium.

In the 1970's, pharmacologist, Candace Pert (1946-2014) who studied brain biochemistry, discovered the actual elusive pattern of opiate receptors, demonstrating empirically how emotions habitually act like drugs in the brain and body. In *Molecules of Emotion* (1997), she identifies peptide and hormone receptors, which led to the molecular study of the emotions. Acclaimed for her research that bridged science and psychosomatic medicine, it is recalled at the end of Pert's 1985 article, "Neuropeptides And Their Receptors: A Psychosomatic Network," that she "closed with the notable observation that 'Neuropeptides and their receptors thus join the brain, glands, and immune system in a network of communication between brain and body, probably representing the biochemical substrate of emotion.' She went on to declare the body was in fact your subconscious mind. Imagine that, and imagine what that means for your health, well-being, your integration."[78]

77 Here is where Piaget's work can be further reconsidered (Section 1.1.1).
78 http://candacepert.com/achievements/

Pert's work was groundbreaking on the empirical side of science. However, the Entropy/Consciousness Institute's position is that where Husserl lacked the teaching of a specific practice of his epoché and Pert did not include a system for learning the processes for chemical digestion of impressions, Gurdjieff had an understanding of both.

It's challenging to describe chemical processes, initiated through self-observation and self-remembering. I asked Terry Lindahl if he could express what action occurs as we separate from habitual chemical response patterns, which Pert's empirical data shows.

> When we ask, is a person conscious, we are asking, does this individual *experience* their situation—an unadorned friction/pain. Consciousness is the "field" within which the **X**-axis, existence (mass) is bound in an entropy/negentropy interaction with the **Y**-axis, experience (the energy of cognition). Now, the field of the **Y** axis = the "field" of experience—(an experience, for example, of the automatic force of an emotion predominating my intellectual ability to reason. "It" must learn to separate the coarse (pushing force) emotion—by way of sensing /receiving a second more subtler/finer energy X.[79]

A physical pain transpires at the nexus of this conscious effort—one center criticizing the former unbecoming perceptions and manifestations at the moment of another part of its whole being (paraphrasing Gurdjieff, 1950 p.139-148). The possibility for a direct experience is based on intuitive finding, or assumption, of a profound correspondence between universal and human dynamic order, in the spiritual as well as in the social and the physical domains—'as above, so below; as below so above' in the succinct formulation of ancient Hermetic philosophy (Jantsch, 1975 xix). With this thought in mind we can revisit Nicolescu's third definition of Reality:

> **3.** *Trans-Nature*, which is connected with a similarity in nature—a veritable communion—that exists between the transdisciplinary Object and the transdisciplinary Subject. Trans-Nature concerns the domain of the sacred and corresponds to the 'veil,' which is the zone of nonresistance. It cannot be approached without considering the other two aspects of Nature (Nicolescu, 2009 p. 64).

Nicolescu's sentence leads me to ask: How do three levels of Reality work together? Since it comes to a mater of lived experience, the following model of understanding demonstrates how the theory works in situ. The Center for Ecoliteracy has demonstrated specifically how a community might socially experiment in bringing the three levels into reality. Effectively assisting the "veritable communion that exists between the transdisciplinary object and subject," we see the philosophy of Transdisciplinarity come alive in The Center for Ecoliteracy's program of action.

79 Email correspondence with Terry Lindahl, October 7, 2015.

3.6 Model of Understanding:
The Center for Ecoliteracy and Edible School Yard Program

We are faced with a whole series of global problems, which are harming the biosphere and human life in alarming ways that may soon become irreversible. Ultimately, these problems must be seen as just different facets of one single crisis, which is largely a crisis of perception. It derives from the fact that most of us, and especially our large social institutions, subscribe to the concepts of an outdated worldview, a perception of reality inadequate for dealing with our overpopulated, globally interconnected world.
FRITJOF CAPRA, 1975, 1996

Since a model of understanding in relation to art, agriculture and climate change, will be addressed in Chapter 5, here I discuss The Center For Ecoliteracy (CEL), a non-profit organization in Berkeley, California. As an example of how humans can become effective activists outwardly, individuals learn through the language and principles of ecology how to sustain themselves as part of a larger "web of life"—that of the biosphere. CEL's programs represent efforts toward preparing young minds to think not only nutritiously and of their well being, but also of their interdependent relationship to nature as a whole. After a brief overview of CEL's history, I will make note of the *Edible School Yard* as one program CEL inspired and help to cultivate.

The Center for Ecoliteracy launched its mission in 1995. Having made their start in the flatlands of Berkeley, in 2010 they moved into the David Brower Center, a LEED building, centrally located, adjacent to the University of California Berkeley campus. The Brower Center houses a number of resident international and national non-profit organizations that are cultivating educational conditions for sustainable systemic change. Earth Island, Friends of the Earth, American Rivers, to name a few, work on a wide range of issues from river restoration to social justice.[80] CEL is specifically dedicated to education for sustainable living by fostering educational reform. They teach the principles and practices of ecology through the "language of nature." Their mission is to guide and sponsor nationwide school activities and grant-giving programs that advocate goals for a sustainable future.

Fritjof Capra, co-founder of CEL, has been engaged in a systematic examination of the philosophical and social implications of contemporary science for over forty-years. As a theoretical physicist, science educator, and social activist his work has reached an international audience. In addition to CEL, he is on the faculty of the *Amana Key* executive education program in São Paulo, Brazil, *Schumacher College*, an international center for ecological studies in the UK, and serves on the *Council of the Earth Charter Initiative*. Joining him at CEL are business leader, farmer and philanthropist and executive director Peter Buckley and Zenobia Barlow, pioneer in creating models of schooling for sustainability.

Since the First International Conference on Interdisciplinarity in 1970, a seed was planted in which Capra began to sow his ecoliteracy program. Having participated in May '68 Paris upheaval, his vision took form. His life's work since has advanced systems thinking education in local communities around the globe. His view, differing from Nicolescu who came from Paris to Berkeley Lawrence Lab in that era, was that in addition to valuing modern contemporary science, Capra valued the spiritual/mystical dimension (Nicolescu/Volckmann, 2007 p. 78-79)[81]. The *Tao of Physics: An Exploration*

80 For a full list of the Brower Center tenants see: http://www.browercenter.org/tenants
81 Given Nicolescu's text on Jacob Boheme and Gurdjieff's work, his disagreement with Capra surprised me.

of the Parallels Between Modern Physics and Eastern Mysticism, published in 1975, was ground breaking. *The Turning Point: Science Society and the Rising Culture* (1983), became the film *Mind Walk* (1990). *Web of Life* (1996) followed. He then published two books about Leonardo da Vinci that explore the life of the artist as a scientist. These have contributed a dimension, which underscores Capra's holistic view. And, most recently, *The Systems View of Life* (2014), a college-level textbook published in collaboration with Pier Luigi Luisi, professor of Biology at the University of Rome, shows his resounding commitment to education. As a twelve-week course, offered twice a year to online subscribers, he brings synthesis to the biological, cognitive, social, and ecological dimensions of life for educators around the world.

To be a theoretical physicist for forty-years has meant that all the implications of modern science needed to be brought together in order to detail the perceptual shift from seeing the world as a machine to understanding it as a network. Coming out of the industrialization movement in which this shift was bound, as I discussed in Chapter 1, to integrate knowledge of ecology, economics, climate change, inequality and turn-of-the-twentieth-century science, so that society would comprehend the interdependent functioning of living systems and sustainable solutions for communities.

CEL provides schools, small businesses and corporations with conceptual tools to understand the nature of systemic issues. To determine solutions for implementing those values and transforming organizations, Capra advises, "We first need to understand the natural processes that are embedded in all living systems. Once we have that understanding, we can design processes of organizational change accordingly and create human organizations that mirror life's adaptability, diversity, and creativity" (Capra, 1996). By advancing ecology and systems thinking in primary and secondary education, CEL has nurtured epistemic responsibility for co-evolutionary literacy for administrators, educators, psychologists and a whole generation of youth to embrace.

In twenty years, CEL has flourished, making strides in building sustainable communities not only for humans, but also the ecosystem as a whole—plants, animals, and microorganisms—the biosphere around us. Their major projects include: *California Thursdays®* was implemented as a strategy for providing healthy, freshly prepared school meals from California-grown food. This program has advanced to a state-wide network of school districts serving more than 250 million meals a year. Their seminars, *Education for Sustainable Living,* attract participants from five continents and 40 states. Their Publications, *Smart By Nature: Schooling for Sustainability* and *Ecoliterate: How Educators Are Cultivating Emotional, Social* and *Ecological Intelligence* provide structure and insight for schools and organizations to educate, implement and advocate a systems change with USDA and other government food and health organizations. On-line, numerous articles teach essential principles and provide practical tools for encouraging lasting positive change. They are openly available to be downloaded so that efforts of any small or large-scale organizations can be self-supporting. Their *Farm to School* program takes students out of the classroom and into natural environments. Finally, their Educational time-based documentary resources include: *Big Ideas: Linking Food, Culture, Health and the Environment*; *Making The case of Health, Freshly Prepared School Meals*; and the discussion guide for the Academy award nominated documentary, *Food*, *Inc*.

Smart by Nature uses four principles as their guide:

1. Nature is our Teacher
2. Sustainability is a Community Practice
3. The Real World is the learning environment
4. Sustainability is deeply rooted in Knowledge of Place

Subcategories of these principles of ecology disseminated are: Interdependence, Ecological Cycles, Partnership, Energy Flow, Flexibility, Diversity and Co-evolution.

Put into civic action, a program CEL helped to foster is the Edible School Yard.[82] Advocating for an edible and ethical lunch to be offered to children, the seed for the idea was planted in a small middle school in North Berkeley. Under the direction of famed restaurant owner and writer, Alice Waters, she and CEL consulted with a local team of teachers, administrators and parents that coordinated in order to prepare for the first year's harvest. Their success raised the revelatory conversation that the rest of the United States has joined. Her advocacy, in fact, went so far as to successfully dig-up the front lawn of the White House. By joining Michelle Obama's "Let's Move" campaign to end childhood obesity, both the problem and solution was undeniable for all institutions of science, agriculture, politics, economics and education to see. In 2015, when President Obama presented Waters with a National Humanities Medal, Carolyn Lochead for the San Francisco Chronicle wrote: "Initially dismissed as an annoying but harmless Berkeley eccentric by the conventional food and agriculture industries, Waters' focus on school lunches became a catalyst for reforms of the $10 billion federal school lunch program that reaches millions of children."[83]

CEL has succeeded in showing social/cultural integration, on a global scale. They are performing transdisciplinary education that relates biological principles with aesthetic awareness of human evolutionary forces. Their projects instill, by virtue of providing lived experiential practice in secondary schools, an inter-subjective human understanding of co-evolutionary practices. Their explicit knowledge of systems theory derives an implicit result of cognitive understanding, fulfilling an epistemic responsibility for a sustainable future.

By advocating their co-evolutionary values, the Edible School Yard project has generated a conscious endeavor for humanity to return to the garden. Within that theme they touch every aspect of social concerns. From health care costs to climate change, a systems view—the web of life—is undeniably cost effective. The American diet is only a fraction of the picture being served. Though no single agency regulates all the shared responsibilities of ingredients, production, processing or transportation—the Edible School Yard's farm to table thinking has reawakened consumers. In return, it has raised the co-evolutionary normative level of education for the benefit of all society. Community by community, district-by-district, state-by state, their collective discourse has succeeded in cutting ties to the mechanistic model. Through CEL's cultivation of emotional, social and ecological intelligence, transdisciplinary leaders have a functioning model for reflecting back to schools and universities what transdisciplinarity means. Having made the real world the learning environment, CEL has implicitly and explicitly effectively changed political, economic and social discourse toward a unified, sustainable, co-evolutionary future.

82 http://edibleschoolyard.org/sites/default/files/2015%20Edible%20Education%20Syllabus_Revised.pdf
83 www.sfgate.com/bayarea/article/President-honors-Alice-Waters-vision-of-6496957.php

Chapter 4
Advancing Transdisciplinarity's Model

For in every action, what the doer primarily intends, whether he acts from natural necessity or out of free will, is the disclosure of his own image. Hence it comes about that every doer, in so far as he does, takes delight in doing; since everything that is desires its own being, and since in action the being of the doer is somehow intensified, delight necessarily follows . . . Thus, nothing acts unless [by acting] it makes patent its latent self.
DANTE

Greek philosophers enumerated three principal values: the good, the true, and the beautiful.[84] While the first two are consistently accepted, beauty has always had a questionable position, including being panned by the Art world itself, depending upon the prevailing philosophy of that era. In the wake of Transdisciplinarity, will the role of aesthetics be revived? As methods of transdisciplinary research cross the disciplines of philosophy, biology, neuroscience, and psychology, I maintain that, overall, an aesthetic practice with Nature's model, particularly expressed in the nature of human-brain and ANS functioning, the fields of art and environmental design will substantiate a basis for rebinding the Greek triad.

While transdisciplinary movement leaders, evolutionary biologists and critical theorists intimate that aesthetics will play a major role in the future of education and evolution of humans, contemporary artists may be the least prepared to create art that moves 'beyond disciplines' because contemporary art is already so greatly marginalized within a capitalist system of production. Too, our educational system, which remains the bastion for advancing humanity, faces the real concern that if political parties do not integrate Eastern intuition with Western empirical findings, the disconnect between humans, nature and cosmos will continue to grow so great that we'll lose touch with what it means to be human. In this chapter I equate Transdisciplinarity with the movement of evolutionary aesthetics since both concepts indicate the need for an inclusive approach toward reconciling our chronologically, disparately formed brain systems.[85] I will also review the Swiss, Zurich, German "Mode 2" model, a group that offers alternative ideas to CIRET, primarily that of building partnerships. In conclusion, I created an imaginary conversation between Henri Laborit, Basarab Nicolescu, and Immanuel Kant illuminating how CIRET's philosophical model might include triune human-brain and ANS functioning as an addendum to their "Moral Project."

4.1 Syncretism And Evolutionary Aesthetics

The word aesthetics is derived from the classical Greek (*aisthetikos*), which means to perceive, to sense, and to have the faculty of feeling. Art that holds the connotation of beauty is derived from the Latin (*ars*) meaning to fit, to join, and to make form. Together then, aesthetics provides an entry for the mind to perceive a natural structure in art—to comprehend what an object possesses, in and of itself.[86] German Philosopher Alexander Gottlieb Baumgarten (1714-1762) is credited for appropriating and expanding the term

84 Plato and Plotinus established these categories as things we pursue for their own sake—each brings a state of mind into the ambit of reason, by connecting to something in our nature, as rational beings, to pursue. Beauty was always suspected because of its subversive nature, i.e., the enemy of truth (Roger Scruton).

85 ***Evolutionary aesthetics*** is closely tied to theories of evolutionary psychology—where psychological adaptations in animal and human traits, including aesthetic preferences evolved to enhance survival and reproduction.

86 Hegel, Kant and Schopenhauer and American figures such as Dewey, Langer, Collingwood followed the Greek definition. While they initially critiqued Baumgarten's meaning, they eventually accepted his point of view.

in 1735 and making it a philosophical discipline. He defines the term as "the science of what is sensed and imagined" (Baumgarten, *Meditatione*s §CXVI, pp. 86–7). Given the emphasis that has been placed on feeling and sensation in my dissertation, it would be more than interesting to follow the history "between the traditional theory of aesthetic experience as a special form of the cognition of truth and the newer theories of aesthetic experience as a free play of cognitive (and sometimes other) mental powers and as a vicarious experience of emotions in eighteenth-century Germany."[87] I would do so following my thread of interest and ask: how has the term aesthetics shifted its meaning in relation to empirical/epistemic findings, discussed in Chapter 2, and the esoteric/ancient knowledge of self-observation and self-remembering brought in Chapter 3?

For the time being, a brief historical overview of aesthetics relationship to academic disciplines is what must be established in relation to Transdisciplinary education. The relationship of aesthetics to academic disciplines reveals a distinguishable line between two distinct ways of knowing the physical world. Simply put, if cerebral intelligence depends upon the empirical recording of observed facts, by contrast, the intelligence-of-the-heart depends upon the functioning of an intuitively innate consciousness (de Lubicz, 1947 pp. 1-9).[88] While our phylogenetic (evolutionary) history displays inherent (natural) disparities within our triune-brain structure, academic disparities privilege empirical disciplines over the Arts. An imperative for the Transdisciplinarity movement is for humans to educate their *intellectual, emotional* and *moving centers* syncretically so that equilibrium between the energies of the cerebral intelligence of the mind and the innate intelligence of the emotions may be obtained.[89]

Over the past hundred years, academic divisions, binary politics, capitalist's interests and religious sects, etc. have added layers of disorder, impeding our ability to comprehend triune-brain functioning. Our mechanist ways contribute to limiting the functioning of our triune brain/body ANS structure. While we as a culture are learning to lift old models of the past, and human *evolutionary aesthetics* is part of making that shift successful, teaching principles of epistemic functioning will, overall, have a greater influence on Transdisciplinarity education. In other words, to understand experientially, as Kant said, our mode of perceiving (3.1), I am arguing that levels of reality and perception are tied to phylogenetic adaptation levels of triune brain and autonomic nervous system functioning. Transdisciplinarity, defined as moving across boundaries, literally means how well individuals learn to self-regulate their triune brain and autonomic nervous system. An actual transdisciplinary experience depends on individuals evolving beyond their involuntary functioning. Aesthetic appreciation can only come into "being" (as in presence of being), if the higher (newer) complex (least organized) triune system is able to inhibit neuroceptive reactions.

Syncretism and evolutionary aesthetics are key conceptual tools for understanding the relationship between Art and Science. As Kant noted in the *Critique of Judgment*: "For the empiricist view to be true, there cannot be a synthetic a priori knowledge: synthetic truths can be known only through experience" (Kant, 1790). This experience, as I asserted in Chapter 1, is fundamental to understanding evolutionary aesthetics, since evolutionary aesthetics is a pragmatic natural struggle for humans to evolve their consciousnesses. As was stated, while disparate brain dynamics are innate to humans, energies operating without equilibrium can be consciously assisted through a study of one's own innervative/enervative nervous system. Over time, the practice of

87 http://plato.stanford.edu/entries/aesthetics-18th-german/

88 Intuitive innate consciousness is difficult to define. It can mean an immediate apprehension by the mind without reasoning—by sense or by insight—as if there are two levels to the mind, one being innate.

89 ***Syncretism—t***he process of fusing different schools of thought. In a chemical sense, alloying metals.

self-observation, recalibrates fixed-action response patterns that learn to inhibit and "normalize" automatic fight/flight neural behavior patterns.

Evolutionary processes require separating conflicting energies through an aesthetic limbic process. This effort of going beyond optically sensed impressions, means experiencing the "digestion impressions" through the visceral organs of the body. The study of our own Ontology means self-observation, a non-identified look at habitual reactions. As Lindahl describes, "If in plant morphology it is the Xylem that is the conductor of nutrients to the plant, in humans it is the *Vagus Nerve* which functions alongside the spinal cord. The instinct we feel as spiritual or religious is the psyvolutionary conscious refinement of the vibration rates of our endowment of consciousnesses. As Hegel put it 'Spirit… in truth, is consciousness' and psyvolution is simply the continuance of the evolutionary processes from which our consciousness evolved" (Selz, Lindahl, and Hays, 2011).

The call for transdisciplinary individuals would be a major turn for academic disciplines. It asks philosophers and scientists and other practitioners of empirical methods to balance intellectual knowledge with physical moving and emotional feeling-centered practices. Because intellectual dominance is privileged over embodied aesthetic feelings for nature and human environments, humanity's imbalance and disconnect is reflected in nature. Depraved, dry, and brittle, our food supply is loosing its nutritional value. Our capitalist system works in opposition to the logic of nature's logos. While nature never charges a profit, our consumption as well as our chemical synthetic imitations of nature well exceeds the resources of the earth. In our age of technology and information, knowledge is used counter natural rhythms, cycles and systemic thinking.

4.2 Swiss, Zurich, German School "Mode 2" Model

Sue McGregor, Professor Emerita MSVU, profiles "Mode 2" and CIRET's "Moral Project" side-by-side in *The Nicolescuian and Zurich Approaches to Transdisciplinarity* (2015).[90] Seeing these transdisciplinary tracks together, one can conclude that "Mode 2's" Model, is an important counter proposal to CIRET, yet not as provocative or substantial as Nicolecu's manifesto. "Mode 2," does underscores two important directions related to this dissertation: (1) a direction for building partnerships between universities and non-profit organizations and (2) their possible interest in Helen and Newton Harrison life's work, which will be discussed at length in Chapter 5. While Zurich meeting facilitators raise the question, "How can research be organized to solve real-world, practical problems as effectively and cheaply as possible?" (Häberli et al., 2001b, p. 20), I maintain that the central issue when solving real-world problems pertains to the deficiency in human development.

"Mode 2" hasn't written a manifesto because they feel knowledge emerges in a *context of application* with its own distinct characteristics. Instead, their model for Transdisciplinarity has four maxims. They are: (a) The evolving framework for addressing problems emerging in the context of application (not before hand) that entails genuine creativity and theoretical consensus. (b) The solution to the problem is a genuine contribution to knowledge (beyond disciplinary knowledge), with said knowledge creation viewed as a cumulative process beyond disciplinary maps. (c) The diffusion of results and new knowledge is accomplished in the process of their production, and newly formed networks and relationships serve to ensure ongoing

90 http://integralleadershipreview.com/13135-616-the-nicolescuian-and-zurich-approaches-to-transdisciplinarity/

communications. (d) Transdisciplinarity is dynamic because it is "problem solving on the move" (Gibbons et al., 1994, p. 5).

McGregor's overall assessment of the two groups is that though both models value science, society, and the complexity of today's world, the model of Transdisciplinarity itself is understood at fundamentally different levels of formulation (McGregor, 2015 p. 66). Those in attendance at the Zurich conference wished to know more comprehensible ways to formulate Transdisciplinary research. As it currently stands, Transdisciplinarity appears to many as a theoretical research practice that falls largely within the spectrum of scientific research—using axioms to pontificate abstractly. Participants were concerned that overall, Transdisciplinarity's model allows science to continue as the primary knowledge system in society, snowballing unrealizable intellectual potential (Häberli, Grossenbacher-Mansuy, and Klein, 2001a, p. 4).

Do "Mode 2" and CIRET have contrary positions or do the two models actually enhance each other? Based on McGregor's report, it appears to me that the Zurich conference highlights the inherent flexibility of CIRET's pioneering model. For example, "Mode 2" valuably extends CIRET's conversation by asking how Transdisciplinarity will effectively participate in the process of educating transdisciplinary individuals. Of course, I agree with "Mode 2" the movement needs to consider efforts outside the university system, such as the groups this dissertation highlights. Might the Entropy/ Conscious Institute, Center for Ecoliteracy and Center for the study of the Force Majeure partner with "Mode 2" and build transdisciplinary curricula?

The Zurich model of 2000 was brought about due to fears that higher education continues to privilege science over real-world issues. I ask: Do problems in education exist because scientists lack interest in the social qualitative measures of purpose? While Transdisciplinarity's axioms may appear to be prescriptions for education, if science works creatively with art and environmental design programs, co-evolutionary solutions for humans and the environment would emerge. As McGregor states, more pressure is needed to strengthen "Mode 2's" points of concern.

Though Transdisciplinary activists appreciate that "Mode 2" has identified some of the problematic areas of Transdisciplinarity, neither wrestle specifically with issues of human perception, patterns of aesthetic and isomorphic adaptation. Human evolutionary adaptation processes cannot be overlooked. Zurich's wish to build transdisciplinary partnerships between academic and non-academic organizations could assist the process of leaving the university's reductionist model behind. However, the sciences and humanities would need to jointly define an individual's transdisciplinary educational path, so that the ideological culture of science can more effectively partner in the effort toward raising social cultural norms.

Continuing the comparison, a mjor difference between "Mode 2" and CIRET is that "Mode 2" strives to re-contextualize existing available knowledge into a form that is socially robust, accountable, and reflexive. CIRET, on the other hand, contends that "new transdisciplinary knowledge is complex, emergent, embodied, and cross-fertilized; this new knowledge cannot be reduced to its old forms. Transdisciplinary knowledge is created using the Logic of the Included Middle. This logic enables disparate ideas to be connected, made possible because of Lupasco's unique conceptualization of reality (i.e., Multiple Levels of Reality are mediated by a Hidden Third)" (Nicolescu, 2000). At the end of the day, my position remains, wherever social constraints are an obstacle for implementing the values of Transdisciplinarity, universities will continue to be complex environments for re-organization. Univerisities are dependent on community organizations, not as a business or educational model per se, but in terms of ethics. While community organizations can introduce transdisciplinary values based on

ethical values, universities have multiple goals and special interest investments. The less complex route appears to be university and city ordinance collaborative contributions toward co-evolutionary sustainability. Since sustainability is not unrelated and serves the common good of all, future development of transdisciplinary individuals is still a hopeful outcome in the long run.

Under the rubric that Transdisciplinarity is an open model for dialogue, CIRET not only anticipates, but also welcomes other models. CIRET agrees that "holistic thinking leads to socially robust reflexive ideas that touch values of cross section of people" and anticipates that "context driven problems help to focus work and should be funded to experiment with objectives and outcomes reviewed by science and others." Because "Mode 2" does not concern itself with the axioms of logic, epistemology, ontology or axiology, it does not conceive Transdisciplinarity as a methodology for creating knowledge. Their model then does not present a convincing argument for transforming education. Since CIRET agrees that research and even the specialties of the disciplines are valuable, McGregor concludes, and I concur, deeper synthesis is needed, beyond both perspectives, to which this dissertation is attempting to contribute.

4.3 CIRET's "Moral Project": An Imagined Conversation Advancing Transdisciplinarity's Aim

Born in Romania, Basarab Nicolescu moved to Paris in 1968 and obtained his doctorate at the University of Paris. His publications include the study of elementary particle physics, *Nous, la particule monde* (Paris: Le Mail, 1985), *Science, Meaning and Evolution: The Cosmology of Jakob Boehme* (1992) and an important essay, written in 1992, called: "Gurdjieff's Philosophy of Nature," which was first published in the French anthology *George Ivanovitch Gurdjieff (Les Dossiers L'Age d'Homme*). As a theoretical physicist at the Centre National de Recherches Scientifique, he founded Centre International de Recherches et Études Transdisciplinaires (CIRET), a non-profit organization with 163 members from 26 countries in 1987. Advocating modern science and culture take a transdisciplinary approach, Nicolescu describes CIRET as having made the first step towards a dialogue between different fields of knowledge, particularly between science and traditional religious ideas.

Today, given the Internet's wide scope, learning environments are now borderless. The capacity for cross-disciplines to reconnect us to the natural environment is realizable on a global scale. While CIRET's theoretical system reflects the concept of borderless boundaries between disciplines, they hope human discourse can be reconciled with the natural world. My particular interest for Art and Environmental Design programs to work with CIRET's understanding of "space" and "levels of reality" is that these two disciplines make significant contributions to human visionary, "hands-on" experience.

When I met Nicolescu in 2011, his willingness to discuss ideas was favorable toward the Arts. The following imagined conversation for implementing Transdisciplinarity's goals, are asked under the rubric of "open systems" and experimentation. These are necessary forms for expressing complex adaptive processes that haven't yet fused. Like trying on clothes, garments are left loosely tied. Questions asked are **1]** How can borderless education resources establish a framework for distinguishing Nature as our primary cultural environment? **2]** Can CIRET adopt a curriculum whereby humans may consciously evolve in harmony with nature's phylogenetic order? **3]** To what extent can social levels of understanding and achievement in art and environmental design evolve through collective experiences, as much as they also represent individual, personal experiences? **4]** What are the implications of these answers for future curriculums

in Art and Environmental Design programs? By employing Nicolescu's *Manifesto of Transdisciplinarity* as an axis for evaluating the broad implications of cross-discipline learning, these four questions are visualized on two levels. The first level is "everyday" perceptions of space. From here, the logic of the "included middle" acts as a catalytic agent for transforming perceptions of space into the complex understanding of multiple levels of reality.[91]

In the following imagined conversation the writings of Scottish embryologist, *D'Arcy Wentworth Thompson* (1860-1948), French chemist, biologist and philosopher *Henri Laborit* (1914-1995), and German philosopher, *Immanuel Kant* (1724–1804) are recaptured in an exchange with Romanian theoretical physicist, *Basarab Nicolescu*. In this conceptualization, I arrange for twentieth-century empirical findings to be inserted within these speakers' knowledge of Darwin's theory of human evolution. How do brains evolve and how is inner biological adaptation understood as a natural imperative for human evolution? What role does perception play in the development of consciousness? Are isomorphisms a study for aesthetics? What methods for understanding human potential are necessary, in order to move beyond our circumscribed perceptions of reality?

The creative liberty I take to bring 19th and 20th Century thought into the flow of 21st Century thought attempts to unify intuitive reasoning with empirical truths of our time. For an audience to experience the exchange as an unmediated conversation—a conversation that demonstrates these thinkers learning from each other's research—models one of the vital skills we know transdisciplinarians must engage in order for knowledge to advance beyond single disciplines or a singular point of view. Collaboration requires an open attitude that resonates. Leadership can then inspire the value of what it means to transform and transcend the status quo. Humans, through their manner of communicating, work together for greater social good. They model, by example, how to overcome the inherent complexity of intra-subjective/objective discourse.

It is the year 2016. Embryologist **D'Arcy Thompson,** philosopher **Immanuel Kant** and Physician/Surgeon, **Henri Laborit** (MD, Centre d'Etudes Experimentales et Cliniques de Physio-Biologie, de Pharmacologie et d'Eutonologie de la Marine Nationale) have been invited to meet theoretical physicist, **Basarab Nicolescu** at his home in Paris. In their discussion of the Transdisciplinarity Movement, a movement that embraces existential questions in context of the humanities, they hope to influence stewardship of the earth.

KEY TO ABBREVIATIONS: The following conversation flows from either a quotation taken from a primary text written by the speaker or contemporary knowledge that advances their earlier line of reasoning. When liberty is taken to add contemporary knowledge, I use my initials [SH] and in many cases, a footnote. **KANT** [COJ] speaks from *The Dialectic Of The Teleological Judgment*, the second division of *The Critique of Judgment*[92]; **LABORIT's** [HL] words rely on his Alfred Korzybski Memorial Lecture of 1963 titled, "The Need For Generalization In Biological Research: The Role of the Mathematical Theory of Ensembles." **THOMPSON** [OGF] speaks from his classic text *On Growth and Form*. **NICOLESCU's** [MOT] words are quoted from in his *Manifesto of Transdicisplinarity*.

91 Piaget's cognitive theory development and epistemological view would apply here as an example of spatial abilities. Suzi Gablik's, Progress In Art would be another. In Philosophy, Alva Noë *Perception in Action* accounts for a third example.

92 *Critique of Judgment* is one of Kant's major works of philosophy, designed to place the discipline on a sound rational footing. This volume deals with aesthetic and teleological questions.

IMMANUEL KANT: So much has been left to science to empirically prove since I wrote the *Critique of Judgment*. I am wondering, is it possible to return to a basic understanding of the human condition? With all its complexity, can humans realize their natural purpose through the Transdisciplinarity movement? [SH]

BASARAB NICOLESCU: Yes, the growth of knowledge today is without precedent in human history. We have explored unimaginable levels: from the infinitely small to the infinitely large. The sum of all knowledge about the universe and natural systems accumulated during the 20th Century surpasses all previous centuries combined. How is it that we know more about what we do, and less about who we are? A transdisciplinary view allows us to ask: Is a full understanding of the present world and our place in it possible [MOT]?

HENRI LABORIT: Before making any generalizations from my discipline of biology, I feel we should say a few words about research and researchers. While the researchers' motivation is the desire to understand better Man's place and role in the Universe, the collection of information is just that, information. There is no understanding. Though a problem may be approached in many ways, we only multiply investigations within a limited conceptual framework. The elaboration of a working hypothesis often calls on what is generally referred to as intuition [HL]. I suggest Transdisciplinarity brings *ways of knowing* through *ways of being* [SH].

KANT: How do we know what we know? Do we need to review the two distinctions between *a priori* and *a posteriori*—the analytic and the synthetic? They are of a wholly different nature. It is mere dogmatism on the part of the empiricists to think that they must coincide. For the empiricist view to be true, there cannot be a synthetic *a priori* knowledge: synthetic truths can be known only through experience [COJ].

LABORIT: A specialist who pays attention to scientific development only within the restricted field of his specialty has a slim chance of making a significant discovery. A significant discovery generally affects many aspects of human activities; it can be applied in many disciplines and opens new paths in various directions. If such a discovery assumes the form of a law, it is because it most often deals with structures [HL].

NICOLESCU: A new paradigm is emerging—no question. Henri, why don't we take as an example the film you participated in making, *Mon Oncle D'Amerique*. Do you feel its significance is related to a new dimension of reality for humans [SH]?

LABORIT: While working on the film, the only thing I asked myself is, "Can this be understood?" At the time, I was discerning how ordinary lives unfold and how biology co-exists with human behavior [HL].

NICOLESCU: Through the art of cinema, you've informed people about the brain itself. "The basic theme of the movie was that achieving the right equilibrium between action and inhibition of action is paramount to mental and physical health. Fleeing is the solution to escape inhibition of action, when other behaviors are not possible."[HL][93] In the movie credits, I noted that you were influenced particularly by the neuro-ethological studies of Paul MacLean as well as Stéphane Lupasco. Your point of departure was a direct question: Can humans comprehend how trapped they are by their biology—that their potential for coherence is trapped in the addictions of their biology [SH]?

LABORIT: Bien sur. Do you recall MacLean's allegorical statement? He said: "We might imagine that when a psychiatrist bids the patient to lie down on the couch, he is asking

93 Kunz, 2014 p. 116.

him to stretch out next to a horse and a crocodile."[94] Our brains, you see, live in conflict with each other until we have learned to be analytical and then reason [SH].

KANT: If each of the two conflicting maxims I've presented has its ground in the nature of cognitive faculties, this may be called a *natural Dialectic*, and an unavoidable illusion, which we must expose and resolve in our Critique, to the end that [our cognitive faculties] may not deceive us [COJ]. I've not made the connection until now that the premise for this might actually be based in the structure of the brain itself! But yes, we deftly deflect from the experience of ourselves as we really are—and this is true on more levels than we imagine. A '*coherent conscience*' sacrifices many aspects of our personalities [TL][95].

LABORIT: MacLean's study showed us how we are anatomically structured—how each new brain has phylogenetically evolved over the more primitive one, all three maintaining their original functions albeit in the context of a new opportunity [HL]. D'Arcy, have you ever observed the embryonic development of the human brain structure—the reptilian, mammalian and neo-cortex [SH]?

THOMPSON: Technology today is bringing us to the point where human brains can be directly observed. It is as if this "new reality" we are speaking of, "hidden in plain sight," is now actually measurable. Our lives are but a trace resulting from these interactions [SH]. Although I have studied mathematical relationships and isomorphisms in evolution, we've come to a real limit with mathematics when entering the complexity of human experience relative to conscious evolution. I'd defer to Alan Turing to answer your question. Turing suggests we need to develop a new model of reality. Our lack of understanding human purpose may be central to that which distorts our perceptions.[96] What I'd like to understand is, if a leaf's structure is isomorphic to the vascular system of human's, what are humans isomorphic to in relation to the system of the Cosmos? An answer to this would all humans to understand their purpose relative to that which is greater than our species. In what way do humans serve organic life [SH]?

KANT: In the critical project of exploring the limits and conditions of knowledge, I have argued for a transcendental aesthetics. We need an approach to the problem of perception in which space and time are not objects, but ways for observing how the subject's mind organizes and structures the sensory world. The end result of this inquiry is that there are certain fundamental antinomies in human Reason, most particularly there is a complete inability to favor, on the one hand, the argument that all behavior and thought is determined by external causes, and, on the other, there is an actual "spontaneous" causal principle at work in human behavior [COJ].

LABORIT: Aesthetics, considered as a science of structures, is an open system, constantly changing and is entirely in our hands, since we are solely responsible for the enrichment of our structures. As long as people on this planet remain unaware of how their brain works and how they use it, as long as it has not been said that hitherto it has always been to dominate others, there is little chance that anything will change.[97] [HL]

THOMPSON: Real science must be centered on the processes of our phylogenetic evolution. We need to know and understand the forces embodied in our being [SH].

---

94 MacLean, Paul: "New findings relevant to the evolution of psychosenual functions of the brain."; *Journal of Nervous and Mental Disease* Vol. 135 No. 4 October 1962 pp. 289-301. Quote on page 300.

95 This thought comes from a recorded interview between Peter Selz and Terry Lindahl, Berkeley, CA 2011

96 Turing, Alan M.: The Chemical Basis of Morphogenesis, University of Manchester; 1951 It is suggested in this paper that a system of chemical substances, called morphogens react together and diffuse through our tissue. This knowledge may be adequate enough to account for the main phenomena of morphogenesis.

97 Kunz, 2014, p. 117.

LABORIT: Yes, absolutely. At present, life on our globe has manifested itself through numerous and different forms which nevertheless show obvious structural analogies. Everything leads us to believe that the most complex structures that can be observed in our days are the results of long evolution, and it is essential that the biologist try to know what the most elementary forms of life were like at its beginning, as well as what relationships existed in the past among the early forms with those that followed. The diverse forms taken in the earliest periods by photosynthesis, forms still in existence today, definitely show increasing complexity. ARNON for example has described a cyclic type of photosynthesis, which existed when hydrogen was still plentiful, and oxygen scarce in the earth's atmosphere, and a non-cyclical photosynthesis, which led to chlorophyll photosynthesis in which the hydrogen donor is water, which was the origin of the accumulation of oxygen in the earth's atmosphere [HL].

NICOLESCU: Gurdjieff, on who's philosophy of nature I have written, says that evolution of man can only be understood as the development of the potential of those possibilities, which cannot develop by themselves, that is, mechanically—automatically. A human must find order within his *being* and through this process he brings his own conscious evolution. Man has to study himself—learn how he operates.[98] I believe history will credit Stéphane Lupasco with having shown that the logic of the included middle is a true logic, formalized, and multivalent (with 3 values A, Non-A and T) and non-contradictory. Lupasco, like Husserl, was truly a pioneer. These philosophers take quantum physics as their point of departure, which in turn has had a powerful impact among psychologists, sociologists, artists, and historians of religion [MOT]. Henri, what do you feel the role intuitions and aesthetics will play in the future of Science and Art? What should be taught in schools [SH]?

LABORIT: Intuition is not a mythical figure related to the Muses or a special gift similar to the 'hunch' in mathematics. It is not quite an inborn gift either. However, if you will accept that 99 percent of our past experience has become subconscious, although always present in our nervous system, in my opinion, intuition is the confidence granted to this now subconscious acquired experience. Whoever accepts only clear ideas, a working hypothesis based on conscious, logical, let us say Cartesian reasoning, deprives himself of the enormous mass of information he has accumulated since childhood and which populates his subconsciousness [HL].

NICOLESCU: But of course we can't leave the whole operation to intuition. We listen to intuition in order to discern and assimilate—to sense something more than what science alone brings in the way of comprehending the whole [SH].

LABORIT: A Transdisciplinarian like your self knows that experiments will explore only a limited number of possible solutions—those connected with his present state of consciousness—with his consciously available information [SH]. I recommend that it behoove the researcher to let his 'sixth sense' guide him, with the knowledge that this guidance is probably no more than an integrated expression of the information that he has been able to acquire, and that constitutes the experimental capital acquired by his nervous system. It is necessary for the researcher to emerge as often as possible out of his immediate environment to establish a broader contact with the most diverse scientific personalities and thinkers. Besides the quantity of information, its quality must be considered. Our education system needs to allow space for 'taking stock' to penetrate broader implications [HL].

98 G.I. Gurdjief as noted in Ouspensky "In Search of the Miraculous" p. 57. Basarab Nicolescu has written directly about Gurdjieff's view of nature and humans (see Nicolescu, 1998).

Another principle concerning research and researchers might deal with the dynamics of 'team-work'. Obviously, an assembly of scientists belonging to various disciplines is not in itself a sufficient guarantee of the group's efficiency. Such a group can only be called a gathering. In this case, each individual, sharing no common principle with any of the others, will speak a language that only he understands. In a Transdisciplinary sense, an efficient group may be visualized as an ensemble, of which each individual represents a sub-ensemble. Each specialist must, therefore, share many elements in common with his colleagues. This can be achieved only if each specialist, while remaining perfectly informed in his own field and its progress, makes a daily effort to acquire information in disciplines other than his own [HL].

NICOLESCU: So, there's the criticality. We're now hovering over the true definition of Transdisciplinarity. How do we advance beyond ideas of combining disciplines with a vague idea of synthesis [SH]? Henri, I agree with you when you said: "Man himself is a plurality and certainly in a social political way—in our governmental structure—natural agonistic spaces replicate human structure. In view of the enormous breadth of learning, which will be required of future researchers, if we wish them to be productive, they must be chosen early, prepared for their role, and surrounded by specialized technicians capable of supplying experimental [experiential] confirmation of their hypotheses" [HL].

LABORIT: A Transdisciplinary approach to education needs to go beyond its theoretical surface, which is impenetrable for most of society. Transdisciplinarity's axioms have to meet hands-on experiential practice. How are humans individually hard-wired? We need to look at the actual means for reprogramming the innervation/enervation distribution of psychic energies. D'Arcy in your beautiful book *On Growth and Form,* you were able to show how Nature and geometry symbolize the morphological processes. If humans were able to start early enough, I mean what do humans need to know about their potential to evolve? How can designers design for the necessary integration of the *thinking*, *moving* and *emotional* centers that exist within our brain system [SH]?

THOMPSON: I fully agree and I am sure Immanuel does as well. The study of phenomena is essential [SH]. As I've written, an organism is so complex a thing, and growth so complex a phenomenon… for growth to be so uniform and constant in all the parts as to keep the whole shape unchanged would indeed be an unlikely and an unusual circumstance. Rates vary, proportions change, and the whole configuration alters accordingly [OGF].

LABORIT: A living phenomenon is a unique phenomenon, which must in the end be approached in its ensemble, because it is we who, on account of our inability to grasp synthetic and dynamic organization, are responsible for the analytical and artificial study of its biochemical, bioelectrogenetic, physiological, physio-pathological aspects—to which I have dedicated my life [HL].

THOMPSON: The study of human Ontology would mean self-observation of habits. If in plant morphology it is the Xylem, in humans it is the Vagus Nerve. How does the nervous system function along the spinal cord beginning at the medulla oblongata? How about writing an owner's manual: *Humans What are We*? By the way, something very important came in my literature from the NIH the other day. Stephen Porges' Polyvagal Theory unveils the phylogenetic structure of our autonomic nervous system in relation to Paul MacLean's triune-brain. His research indicates that the autonomic nervous system structure previously taught in medical schools is wrong—we actually, each of us, have a triune-vagus nerve system that we must learn to regulate in order to evolve our limbic *fight-flight* system to our higher (newer) pro-social, neo-cortex. This

is lost information. Darwin and Hughlings Jackson new of this predictable default of the higher to the lower systems in humans. If the paradigm change is to become more than an intellectual concept, something is up to individuals to physically embody [SH].

KANT: [nodding] We might return to Goethe's beautiful work on Plant Morphology as another example [SH]. As I have said, we are in fact indispensably obliged to ascribe the concept of design to nature if we wish to investigate it through continuous observation; and this concept is therefore an absolutely necessary maxim for the empirical use of our Reason. It is plain that once such a guiding thread for the study of nature is admitted and verified, we must at least try the said maxim of Judgment in nature as a whole; because thereby many of nature's laws might discover themselves, which otherwise, on account of the limitation of our insight into its inner mechanism, would remain hidden. But though in regard to this latter employment that maxim of judgment is certainly useful, it is not indispensable, for nature, as a whole is not given as organized (in the narrow sense of the word above indicated) [COJ].

LABORIT: I am aware of Stephen Porges' Polyvagal Theory and believe it's the missing part to the puzzle—required understanding for all interested in the evolvement of their being. Our inner visceral constitution is extremely complex. I also recommend the work of Candace Pert. She wrote a book called: *The Molecules of Emotion*. There is real information in her research, well beyond my own. She has found much about the brain's opiate receptors and neuropeptide sites, the biochemicals of our emotions, which carry information in a vast network, linking the material world of molecules with the nonmaterial world of the psyche [SH].

NICOLESCU: Pert's studies have unconcealed the chemical dance going on between our *body*, *mind*, and *emotions*—which most definitely would help us look at the actual means for reprogramming the innervation/enervation distribution of psychic energies. For a true Transdisciplinary approach, we need to establish a curriculum that is based on a three-centered study. Our capacity to be self-reflexive must be developed as a valued skill, first for 'seeing our habits' and then for 'growing our attention.' It is possible for individuals to verify how their self-consciousness informs their conscious awareness. We cannot evolve unconsciously. If Pert, Porges, and Turing's research can be employed in methods of experiential learning, we might understand how chemical detoxification brings about a natural change of *Being*. This is in fact required in order to for individuals to evolve to the levels of reality Transdisciplinarity's model requires [SH].

LABORIT: If we can avoid getting lost in the complexity of living phenomena for a minute, it would be well, first of all, to agree on some very general notions. We might turn to the 'Theory of Ensembles' (or Sets) for a methodology. From the 'Universe,' taken as an ensemble, man abstracts those elements that he is aware of through his senses. This awareness seems to be limited to the abstracting of discontinuous elements. Man's knowledge as far as it concerns action is limited to the quantum, and as far as it concerns mass, to elementary particles. I share with our friend Jean Charon the opinion that these two forms constitute the elements of the Known—whereas one can validly think of the Real as being continuous.[99] [HL]

THOMPSON: We also need to discuss isomorphisms. The rigors of Science and Math have actually introduced us to endless freedom and higher understanding of order; the dynamic forces that are embedded in the philosophy of the Transdisciplinarity Movement are still a bit too obscure [SH]. Perhaps we can pass quickly and easily now from the mathematical concept of form, in its *statical aspect*, to form in its *dynamical relations*: we rise from the conception of form to an understanding of the forces, which

99 *General Semantics Bulletin*, Numbers 28 & 29, 'Toward Understanding the Universe' by Jean Charon, p. 4-11.

gave rise to it [OGF]. As Basarab just mentioned, Turing, Porges, and Pert's work are vital to map. Mapping and finding patterns is fundamental to aesthetics, biology, and critical theory. We can begin to see that a topological map could be drawn showing the relationships between those who are studying the human function from different categories or reference points. Our leadership needs this information so more holistic programs can be integrated and made more socially robust for learning [SH].

You all are probably aware that concepts about *Direct Perception* come from the Scottish School of Common Sense. This school of thought influenced remarkable pragmatic thinkers such as Charles Sanders Peirce [SH]. For Peirce, conceptions of truth and the real involve the notion of a community without definite limits (and thus potentially self-correcting as far as needed), and capable of a definite increase of knowledge.[100] It was the Scottish school that also enabled Einstein's approach to formulate the theories of relativity, and Thorstein Veblen's analysis of scientific method, which focuses on developing scientific creativity. Two of Peirce's insights into the nature of science provide a powerful framework for interpreting Veblen's view of science. There are, first, his three-stage logic of inquiry, and, second, his concept of musement. To understand properly the role of musement one must keep in mind: (1) his argument that logic is based on ethics, which, in turn, is based on aesthetics; (2) the nature of abductive inference; (3) his knowledge of and attraction to Friedrich Schiller's concept of the play impulse.[101]

NICOLESCU: There is hidden here an aspect of democracy that merits profound study in all its dimensions. Our evolution is a self-transcendence. No one is obliged to evolve. The natural constraints of the environment that have obliged man to evolve biologically are no longer exercised. Biological evolution has reached full term. A new kind of evolution is emerging linked to culture, science and consciousness. We need to connect to our real freedom as individuals and as a collective society [MOT].

LABORIT: May we now propose a distinction between the artist and the scientist, who often share a strikingly similar approach? We would say that the artist, like the scientist, restructures relationships among elements perceived in the external world; the scientist must also abstract unknown elements from the environment. Hence the importance of technology in the evolution of science—while the difference between cave painters and our contemporary artists is that the latter uses ready-made colors in tubes [HL].

KANT: While Greek philosophers enumerated the three principle values of the good, the true and the beautiful, I would add, as one of the sensible facts, freedom [SH]. Freedom is the only concept of the supersensible, which proves its objective reality in nature by means of the effect it can produce there; and thus, renders possible the connection with nature. All three together bring a sense of Religion. We have in us a principle capable of determining the idea of the supersensible within us, and also that of the supersensible without us, for knowledge, although only in a practical point of view; a principle this of which is mere speculative philosophy (which could give a merely negative concept of freedom) must despair. Consequently the concept of freedom (as fundamental concept of all unconditioned practical laws) can extend Reason beyond those bounds, within which every natural (theoretical) concept must remain hopelessly limited [COJ].

NICOLESCU: These are the advance levels of reality, which have to be taught in order to broaden our experiential processes. We must draw from the cosmological point of

100 Peirce, C. S. (1868), Essential *Peirce* v. 1, pp. 28–55.

101 Dyer, Alan W. *Veblen on Scientific Creativity: The Influence of Charles S*. Peirce Journal of Economic Issues (Association for Evolutionary Economy; March 86, Vol. 20 Issue 1, p. 21

view by inverting the anthropocentric perspective [SH]. Kant, wasn't Schiller's concept of freedom in play—"Live aesthetically" an attempt to move away from your theoretical-methodical procedure of taste into a practical-moral task?[102]

KANT: I've really had to come around to a different way of thinking about aesthetics.

LABORIT: Since we have scientific access only to the known-sensorial perceived, which is anthropomorphically distorted to our image—let us beware of talking of the real. What is there between the electron and its nucleus? Space-time? Are we not essentially made of such 'stuff', while our current biology is based on waves and particles? What does this non-material energy, which constitutes most of our being, have in store for us? What relation has it with our flesh and with the general? A better understanding of mimesis has to be understood for a methodology to evoke large-scale integration of this understanding. This would be the ultimate for humans to comprehend Art, Science and Religion's syncretic purpose [HL].

NICOLESCU: These seed ideas are now planted. We understand a level of change in education is involved [SH]. During the last three centuries all education was based on the mental things, because of the incredible success of mathematical formalizations, abstraction and so on. Now, this first step in educational reform is to say that there are the mental, the instinctual and the emotional [MOT].[103]

LABORIT: We agree. What is called the personality is constructed from a mishmash of value judgments, prejudices, and commonplaces which weigh heavily and which, with age, become ever more inflexible, increasingly unquestioned. And when a single brick in the edifice is removed, when the edifice collapses and the person discovers anxiety, then this anxiety will express itself even if it means murder, in the case of an individual, or genocide or war, for social groups. Here we begin to understand by what mechanisms, why and how, through history and in the present, hierarchical scales of dominance are established. As long as people on this planet remain unaware of how their brain works and how they use it, as long as it has not been said that hitherto it has always been to dominate others, there is little chance that anything will change.[104] [HL] I put it that the mental part is, if not consumed by technology, the reconciling or the included middle. The point we have to get across is that you can't unify—or better, the potential cannot appear mechanically. True change of being is only possibly in *far-from equilibrium, interactively dynamic conditions* [TL].

NICOLESCU: This means what in simple words? It means that in education you create situations, interactions of professors, in which this equilibrium [occurs] between *moving motor centered activity, instinctual feelings* and *intellectual things*. And when you create equilibrium, a fourth force can appear. What is the fourth force? It is something that does not belong to the three parts. It is information coming from consciousness. This is what brings a new intelligence or your intelligence, but this is something that is caused because we are interacting [MOT].[105]

LABORIT: So we might organize ourselves in triads when we work. You can learn from all 3-essence types (emotional, intellectual and moving centered types of people) when working together on problems, which are discipline specific. Now there are probably not very many emotional mathematical types—but let's sa advanced *thinkers* who have skills where their *feeling function* or artistic abilities are developed would work on a team with artists in order to relate and produce research that has a larger range than

102 Martinson, S. 1996 p. 280.
103 Basarab Nicolescu, Recorded interview, Paris, December 19, 2011.
104 Kunz, E.: "Henri Laborit And The Inhibition of Action," *Dialogues in Clinical Neuroscience*, Vol. 16, No. 1. 2014.
105 Ibid.

simply one dimensional thinking—as grids, graphs and numbers represent. What problems can be *naturally* attended to in this practical way—so that humans begin to understand problems vibrationally—in terms of mass and conservation of creative energy? We need to consciously assist the friction between brain centers in order for adaptation to reach higher levels of consciousness [SH].

KANT: There seems well to be a natural way that creative phases of inquiry and inductive reasoning take form. As I wrote in *Critique of Judgment,* mediation between the two is indispensible when it comes to issues of morality. How we look and how we frame are already our *a priori* perceptions at work. Adaptation enters when it's possible to sense the picture plane—a phenomenon occurs—a transformation of mind. The drawing and mapping of ideas do assist—particularly if a student is asked to *imagine and imagine only.* The brain's plasticity is flexible this way to explore new boundaries—and from inspiration, dynamics are initiated individually and in relation to others present [SH].

NICOLESCU: To free ourselves from our illusions, by having a line of work towards this reasoning, is what we are trying to instill [SH].

LABORIT: Aesthetics, considered as a science of structures, is an open system, constantly changing and entirely in our hands, since we are solely responsible for the enrichment of our structures. Aesthetics is a neocortical development leading to infinite universal structures. One has been necessary for the other, but simply the recognition of a change, which one can affirm the reality of by the fact that the latter includes in its structure elements of the first. When it comes to the larger scale and the web of life, I see co-evolutionary processes and symbiosis as the relational interdependent form where we become knowledgeable of the larger exchange essential for continuation of human life, the earth, and our sun[106] [HL].

KANT: Chardin's mentations are really the best, aren't they? He probably wasn't aware of Boltzmann's words, but his intuition of a noetic aspect of energy within the sciences of thermodynamics, statistical mechanics, and information theory was right in line with Boltzmann's findings. I brought this quote along: "The general struggle of living beings for existence is therefore not a struggle for materials nor energy (that is present in every body and in large quantity as heat, unfortunately not interchangeable) but a struggle for entropy [following Schrödinger we would regard this as negentropy] that becomes available in the transition of the energy from the hot sun to the cold earth. To exploit this transition as much as possible the plants spread out the immeasurable areas of their leaves and force the solar energy in an as yet unexplored way to carry out chemical syntheses of which we have no idea in our laboratories." [107]

LABORIT and **THOMPSON:** [together] Wow, when was that written?

KANT: Broda's autobiography of Boltzmann came out 1978.

THOMPSON: In the same vein, I have marveled at this statement by Schwaller de Lubicz, the Egyptologist. I once shared it with Goethe, who in his reverent way nodded in silence [SH]. "The animal is a freely moving plant because all the phases of its gestation are fixed in organs—in specific individualizations—because the root has become intestine, the leaf has become lung, the taproot has become stomach, the circulation of sap has become blood and veins, and the flower has become sex. This totality has been linked together by the marrow to form a conductive organ, the brain, and through that has become cerebral intelligence, which is conscious memory, and makes possible the expression of the innate consciousness

106 Laborit, Henri *Biologie et Structure*, 1968 (Introduction).
107 See Broda's autobiography of Boltzmann, 1978, p. 3.

that creates instinct. The faculty of coordinating ideas is still lacking in order for man to exist."[108]

NICOLESCU: This quote expresses the ternary structure of Transdisciplinary Nature—(objective Nature, subjective Nature, trans-Nature) defines living Nature. It shows how symbiotic nature really flows—so elegantly! This Nature is living because it is here that life IS present in all its degrees and because the study of Nature demands the integration of lived experience. The three aspects of Nature must be considered simultaneously in terms of their inter-relation and their conjunction within all the phenomena of living Nature and the need for privileging *dynamics* over *fixed* answers. [SH + Nicolescu who relates the thought of German Christian mystic *Jakob Böhme* (1575–1624)][109]

KANT: Well, true. It expresses why we really need to punch through all the empirical studies and begin to relate them to "the tree of life" itself, which evidently cannot be found by physics or mathematics alone. I myself have pushed some boundaries by reading Teilhard and I have with me a quote from an article I recently read in *Zygon* about Teilhard's experience of the two energies [SH].

> We shall assume that all energy is essentially psychic. But we shall add that in each individual element this fundamental energy is divided into two distinct components: a tangential energy making the element interdependent with all elements of the same order in the universe as itself (that is of the same complexity and same "centricity"): and a radial energy attracting the element in the direction of an ever more complex and centered state, toward what is ahead.*[110]

From this quotation I may have to retract not what I said about psychology but theology. Teilhard, of course, is unique among the lot of them—you know he studied mechanical engineering. He is more or less describing the teleological experience, is he not [SH]?

Regarding the hope of a future life, what if instead of the final purpose we had to accomplish in conformity with the precept of the moral law, we ask of our theoretical faculty of cognition a clue for the judgment of Reason upon our destination (which clue is only considered as necessary or worthy of acceptance in a practical reference). Then with this aspect, Psychology, like Theology, gives no more than a negative concept of our thinking being. That is, none of its actions or of the phenomena of the internal sense can be explained materialistically; and hence of its separate nature and of the continuance or non-continuance of its personality after death absolutely no applicative determinant judgment is possible on speculative grounds by means of our whole theoretical cognitive faculty. Here then everything is handed over to the teleological judging of our existence in a practically necessary aspect, and to the assumption of our continuance as a condition requisite for the final purpose absolutely furnished by Reason. And so this advantage (which indeed at first glance seems to be a loss) is apparent; that, as Theology for us can never be Theosophy, or rational *Psychology* become *Pneumatology*—an applicative science—so on the other hand this latter is assured of never falling into *Materialism.* Psychology, rather, is a mere anthropology of the internal sense, *i.e.* is the knowledge of our thinking self *in life;* and, as theoretical cognition, remains merely empirical. On the other hand, rational Psychology, as far as it is concerned with questions as to our eternal existence, is not a theoretical science at all, but rests on a single conclusion of moral

108 Schwaller de Lubicz, René *Esoterism And Symbol* [1947] p. 48.

109 Basarab Nicolescu, Recorded interview Paris, December 19, 2011.

110 The less centered an element is (the weaker its radial energy), the more its tangential energy is shown through powerful mechanical effects. Between strongly centered particles (high radial energy), the tangential becomes "interiorized" and to disappear, in the eyes of physics (Teilhard 1999, 30; the * designates a footnote by Teilhard).

Teleology; as also its whole use is necessary merely on account of the latter, *i.e.* on account of our practical destination [COJ].

NICOLESCU: The question of Materialism—and its end would be a good place to begin our conversation next time. Let's all meet again soon. Can I call anyone a cab?

Chapter 5. Art as Research:
Scale of the Life Work of Helen and Newton Harrison

We, of the Harrison Studio assert
As do others somewhat differently
That the Force Majeure, framed ecologically
Enacts in physical terms outcomes on the ground
Everything we have created in the global landscape
Bringing together the conditions that have accelerated global warming
Acting in concert
With the massive industrial processes of extraction, production and consumption
That have subtracted forests and depleted top soil
Profoundly reduced ocean productivity
While creating a vast chemical outpouring into the atmosphere
Onto the lands and within the waters that altogether comprises this Force Majeure.
HELEN AND NEWTON HARRISON

Helen and Newton Harrison, finalists for the *Buckminster Fuller Prize* in 2014, are pioneer eco-artists. Highlights of their forty-five year career include: two Venice Biennales, two Sao Paolo Biennales, Documenta 8, the Museums of Modern Art in Chicago, San Francisco, Bonn (Germany), Aachen (Germany), Toulouse (France), Ljubljana (Slovenia), the Museum of the Revolution in Zagreb (Croatia) as well as Kasteel Groeneveld in Holland. They won Second Prize at the Nagoya Biennale in 1991 in Japan and they received the Groeneveld Award for the Dutch Landscape in Holland in 2002. Collectively their life's work epitomizes what Transdisciplinarity means. Concerned with the earth and human survival, at progressively larger scales, their co-evolutionary engagement has manifested through collaborative dialogue with architects, biologists, ecologists, and urban planners. Their artistic research uncovers ideas and solutions that support biodiversity, sustainability, and community education.[111]

The Harrisons' joint professorship and land-based art projects fuse disciplines when addressing the dynamics of co-evolutionary environments. After defining how they envision public land art, this chapter reflects on the attributes of (1) Art as a research-based practice that is, (2) philosophically generative and principled on keeping harmony with Nature while attempting to solve "noble problems," no matter how big or small, using (3) language (dialogue, poetry, and narration) that succeeds not only through metaphor, but actual public discourse, what they call *the ecological argument*. And finally, I place emphasis on (4) their experience working together that brought evidence of a third force—a third guiding (invisible) surrogate hand, from which an individual sense of self emerged, at the same time as a new collaborative artistic identity.

5.1 The Land Art Movement

Beginning in 1969, the Harrison's work was unique from the start. Though associated with other Land Art artists, they were, with their strong ecological values, an exception. To be working on large-scale, site specific, systems-based installations, their principles regarding environmental reclamation were meant to absolve co-evolutionary contradictions rather than perpetuate them. Projects by other land-artists of this same era, who claimed to abandon elite "white cube" gallery spaces for artistic-political reasons, ironically fell toward *scaping* the land, rather than *nurture* of land. Michael

111 See Ann Trautman's Cornell University's Johnson Museum Catalog raisonné for a complete chronology of the Harrisons' career up until 1985 pp. 99-104 and/or http://theharrisonstudio.net/

Heizer, Dennis Oppenheim and Robert Smithson artworks radically countered the Harrisons' as they had no intention, in their art practice, to restore or preserve niche habitats—they were "not interested in soil, as a farmer would be."[112]

The Harrisons define Public Land Art as Art with a generative purpose. For them, "Teach-ins" and slogans like, "Earth First," "Love Your Mother," and Pogo's sage cartoon: "I've seen the enemy and he is us!" were more than bumper stickers. Participating in the first national Earth Day (April 22, 1970), the Harrisons thought reflexively as to how they might creatively influence ecological governance on a mass level. This was the year that President Nixon signed the *Clean Air Act*, the *Occupational Safety and Health Act* and the *Endangered Species Act*, despite his mistaken investment in the Vietnam War. In the prior decade, Rachel Carson's *Silent Spring* shocked millions by her truth-telling of the effects chemical spraying had on food, water and topsoil supply. In 1968, Stewart Brand founded *Whole Earth Magazine* with the subtitle: "access to tools." Posing a basic question to culture Brand asked: "How can we begin to see the earth as it is, as a finite resource?"[113] Did a single satellite photograph of the Earth, which NASA astronauts experienced with their own eyes, effectively reframed human consciousness? Brand placed this satellite image on the first cover of *Whole Earth*. And, on the inside cover page, quoting Harold Morowitz, he printed the key principle of thermodynamics. The cryptic message was: "The energy that flows through a system acts to organize that system" (Morowitz, 1968 p. 2). These were significant historical moments for a world in flux during the 1960's.

The effect of this image was actually predicted in 1948 by British astronomer and science fiction writer, Fred Hoyle. He foretold, "Once a photograph of the earth, taken from outside, was available to see, a new idea, as powerful as any in history, would be let loose."[114] This photograph "happened" Christmas Eve, 1968, when Apollo 8 went to the moon. They didn't land, but circled. One of the cameramen, astronaut William Anders, casually said to the crew in Houston, "We are going to turn the camera around now and show you the earth."[115] Philosopher David Loy has remarked, "It was the first time anyone had seen the earth just hanging there—it produced a shock, as there wasn't any preparation for how it might feel to have such a perspective seeing the earth suspended."[116] The effect, a life changing moment for Astronaut Frank White, was later published in his book *The Overview Effect—Space Exploration and Human Evolution* (1987). In 2000, looking back on the "Earth Rise" image, Apollo 8 Commander Frank Borman contributed, "It was the most beautiful, heart-catching sight of my life, one that sent a torrent of nostalgia, a sheer homesickness, surging through me. It was the only thing in space that had any color to it. Everything else was simply black or white. But not the Earth."[117] Astronaut David Beaver, co-founder of the Overview Institute, was interviewed in a short film the Institute released in 2012. Still in awe, he said: "Though we were on a journey to see the stars and moon, it may have been that looking back at the earth was the most important reason we went."[118]

Originally New Yorkers, after college, the Harrisons went to Florence to study art and the Montessori school system for three years. In 1965 they settled with four children

---

112 "Discussion with Heizer, Oppenheim, Smithson," *Avalanche*, Vol. 1, Fall 1970 p. 48-70.
113 Stewart Brand and Earth Day: http://us.arevablog.com/2010/04/20/stewart-brand-and-earth-day/
114 Quote from: http://www.huffingtonpost.com/jamie-henn/can-art-save-the-climate_b_782878.html
115 Overview Institute: http://www.overviewinstitute.org/
116 Ibid.
117 Quote from: http://www.huffingtonpost.com/jamie-henn/can-art-save-the-climate_b_782878.html The Overview Institute has continued to support art as a way of communicating to the public what is needed for climate change. EARTH embodies the word ART. Environmentalist Bill Mckibben, head of 350.org, designed an art project called 350.EARTH to raise consciousness around the globe.
118 Overview Institute: http://www.overviewinstitute.org/

and jobs at the University of New Mexico. In 1967, they moved to La Jolla, California. As Assistant Professor at University of California, San Diego, Newton became one of two founding members of the Visual Arts Department. Helen, trained in psychology and literature, became Director of Educational Programs at University of California, Extension. In the early 70's, Helen chose to join Newton at UCSD. She said she walked into Newton's painting studio one day with Rachel Carson's book. "I told him: from now on we are going to work on this issue."[119]

While at UCSD, working with the notable Art Department team of Allan Kaprow, David and Eleanor Antin, and the poet Jerome Rothenberg, the Harrisons applied for research grants outside their discipline to engage in collaborative projects with scientists, biologists, and oceanographers. Their first project was a map of endangered species around the world for an exhibition called "Fur and Feathers," at the Museum of Crafts in New York City. From there on, they made a pact to "do no work that did not benefit ecosystems." They began their *Survival Series*.

An early distinction of the Harrisons' Earthwork projects from others was their use of dirt. For them, it was not simply living material, but a "primitive" example of an ecosystem. In the context of ecological art, they demonstrated the key concept of niches.[120] Their *Lagoon Cycle* meditations (1974-1984), *Sacramento Meditations* (1977), *Green Heart of Holland* (1994) and all future projects anticipated the greenhouse effect; ocean rise and drought. Their arrow was pointing without doubt in concern for global warming planetary issues and the necessity for biodiversity in urban, suburban and agricultural communities. Today, this arrow is called *Eco-revelatory design*.[121]

On the ground, during Nixon's administration, with a surge of economic interests in land exploitation, it was courageous for artists to become activists and make public art for citizens of cities whose communities were permanently changed by never ending real-estate developments. Especially, that is, if your metaphors for making art cried for harmony with the earth. In the short view and in the long view—by the measure of what was true then and more so today—Nature needed a voice to draw and educate culture toward understanding how eco-systems were endangered. Rather than compound its exploitation and disruption, the Harrisons art taught the science of system's theory to city planners, and created solutions for mostly urban settings and scales. Other artists who "defiled" and "displaced mass" by bulldozing the landscape ironically competed with road construction and mountain top removers. A number of earthwork artists, self-consciously aware they couldn't artistically rival natural phenomena, had chosen instead to embody and express human domination and control of nature. Claiming to be "breaking boundaries" of the "white cube" striking capitalism's agenda, their art of rebellion disregarded nature's eco-systems.

Since humans were already at great odds with nature, ironic "art" practices like Robert Smithson adding chemicals to water to make his *Spiral Jetty* turn red or Michael Heizer's digging deep caverns into the earth seemed unaffordable to the Harrisons. Living-out an existential death wish, many of that generation turned to protest of the Vietnam War, and other social divides of that era. If the Land Art movement wished, as a whole to bring public awareness to nature's virgin open space, contemporaries of the Harrisons contradicted their raison d'être. Their use of machinery only amplified the greed and

119 Interview at the Harrisons' home in Santa Cruz, July 2009.

120 Craig, A. "Conversational Drift: Helen and Newton Harrison," *CAArt Journal* Sum. 1992; Vol. No.52

121 ***Eco-revelatory design***—an ecological design concept of landscape architecture that attempts to enhance a sites' ecosystem as well as engage users by revealing ecological and cultural phenomena, processes and relationships affecting a site.

violence of capitalism.[122] Dennis Oppenheim in an interview with Avalanche magazine described how they first came to use earth as a sculptural material:

> **Avalanche:** "Dennis [Oppenheim], how did you first come to use earth as a sculptural material?" **Dennis:** "Well, it didn't occur to me at first this was what I was doing. Then gradually I found myself trying to get below ground level." **A:** "Why?" **D:** Because I wasn't very excited about objects, which protrude from the ground. I felt this implied an embellishment of external space. To me a piece of sculpture inside a room is a disruption of interior space. It's a protrusion; an unnecessary addition to what could be a sufficient space in itself. My transition to earth materials took place in Oakland a few summers ago, when I cut a wedge from the side of a mountain. I was more concerned with the negative positive process of excavating that shape from the mountainside than making an earthwork as such. It was just a coincidence that I did this with earth."[123]

I asked Newton and Helen what they made of this misperception of disrupting and cutting into the earth. They replied: "We were walking around UCSD at that time. One day, our path crossed with Herbert Marcuse who wrote *One Dimensional Man* (1964), a treatise that basically expresses how the negative is absorbed by the positive, which obscures and cancels out the data of human experience. We came to the conclusion we were just going to skip this whole approach and work with scientists and ecologist."[124] Since the following decade celebrated postmodern artists, I have often wondered if the trend in Land Art to "dematerialize art," wasn't a source of detriment, perpetuating loss of the environment. As postmodern artists continued to undermine capitalism and big banks—they ironically (perversely) induced bankers and technology as well, to join in the degradation of the economy.

If the purpose of Art is to lead Culture, by contrast, it was rather the environmental activists who walked the Grand Canyon—where the geological drift of time and space was already there to behold—that protected land-rights, which we as a culture were in political peril of loosing. Of course the Harrisons are also activists in this regard. But, their challenge to the dominant discourse went beyond aesthetics and politics to reveal ecological processes—the inner workings of the landscape—that in turn would encourage humans to restore and preserve their co-evolutionary habitat. In other words, if we subtract the transdisciplinary nature of the Harrisons' work and the work of land-protection activists, one only has to think for a moment to realize that the land art movement for the most part came to nothing more than "white cube" mentality or worse.

---

122 Much has been written on supporting this "taste" in Art. One essay well worth reading is by Eva Cockcroft: "Abstract Expressionism, Weapon of the Cold War," *Art Forum* Vol. xii, No. 10, June 1974 pp.39-41.

123 Ibid.

124 Phone conversation with Newton September 12, 2015.

5.2 Watersheds to World Oceans

In the early 70's, the Harrisons' work focused on small-scale urban farming. Recognizing that one of the two most endangered ecosystems was topsoil; they made dirt right in San UCSD's parking lot and exhibited it by growing strawberries. Helen's strawberry jam was the best because Newton made a nutrient filled soil. They also "constructed fish farms, portable orchards and flat pastures in unheard of places like the Hayward Gallery in London and the New National Gallery in Berlin, the Houston Museum of Contemporary Art and the Los Angeles Museum of Contemporary Art."[125]

By the late 1970's, their poetry, dialogues, mappings and meditations opened to a wider scale and public. Creating the field of *Artists as Citizens* they brought a sense of purpose to Art for both environmental and community benefit. Their whole system-based installations, too numerous to list, can be found fully documented on their website: http://theharrisonstudio.net/. These mostly commissioned projects are community collaborations that were often later adopted into a city or region's ordinance. They worked on watersheds such as the Sacramento San Joaquin River Basin, the Sava River in former Yugoslavia, and the Santa Fe River. In the case of *The Santa Fe Watershed: Lessons from the Genius of Place* they envisioned the river's restoration as well as the restoration of the arroyos leading to the river. Other, less well-known early projects are urban works in Baltimore, Atlanta, Santa Monica, Pasadena, Cergy Pontoise (France), Frankfurt, Bonn and Kassel (Germany). In 2001, with grants from the European Union and the German Government, like yeoman farmers, they created *Peninsula Europe: the High Ground: Bringing Forth A New State of Mind*. Embedded in this project is a unique way of seeing the peninsula of Europe as a single physical entity. This work, in four languages, has been broadly exhibited and is ongoing.[126]

The Harrisons' research several large-scale global warming projects a year. In the Fall of 2016, Random House will publish their entire forty-five year history in one large volume with numerous color plates, including essays by scientists, landscape architects, and art curators. Three of their current projects, included in the monograph, address the high grounds of Europe and the island of Britain. All pay attention to ocean rise. They look not only at the necessary upward movement of people, but also food, animals and shelter. Rather than approaching the problem through disciplines, they ask, what knowledge is needed for coming to a solution? Of course, they find their answer through understanding how complexity emerges and restores itself. As Macro-evolution generates the autocatalytic functioning of the Micro-evolution, humanity takes its place in preserving its exchange with our environment.

As others join the Harrisons today in what they forecasted, imagined, and framed as the social future, climate change is of course less and less an invisible matter. The tip of time's future for the planet, which challenges human survival, now shows greater numbers connecting to empathy as a sustainable ingredient. With more of the human population becoming involved, the Harrisons care for 'the other' stance of Earth First, is now a legacy of consequence.

125 Conversation at the Harrisons' home in Santa Cruz, July 2009.
126 http://theharrisonstudio.net/

5.3 The Third Hand[127]

We were teaching each other to be each other, but not completely each other.
HELEN HARRISON, 2016

A major work of the Harrisons is *The Lagoon Cycle*.[128] This ten-year project (1974-1984) illuminates a number of points in this dissertation, one being collaboration through dialogue—in this case an imaginary dialogue between two characters. In 1999, I was an MFA student at San Francisco Art Institute. In the lovely small library there, I came across *A Compendium of Possibilities: Helen and Newton Harrison, The Lagoon Cycle.* This book was the Cornell University catalog (Ratcliff, 1982), which illustrates each phase transition of the *Lagoon Cycle*. I sat on a dilapidated couch, more comfortably than at home, reading lagoon by lagoon, chapter by chapter. By "Lagoon Six" I was in tears. Certainly the build up from all the prior lagoons contributed to the flood that came at the sixth. The words between the Lagoonmaker and the Witness were:

> Pay attention to the flow of waters
> and the mixing with the earths
> *Attend to the integrity of the discourse*
> *between earth and water the watershed*
> *is an outcome*
> Pay attention to the discourse between
> earth water and men interruption
> is an outcome
> *Pay attention to the meaning of the nature*
> *of such discourse and the nature of the*
> *meaning of interruption After all*
> *a discourse is a fragile transitory form*
> *an improvisation of sorts*
> And anyone may divert a discourse of any
> kind into another direction if they do not
> value its present state
> *Pay attention to changes of state*

Ten years later (2009), having never forgotten the experience, I chose to celebrate my Fiftieth birthday by offering to work for the Harrisons for a year—as a gift to the earth.[129] It was a fulfilling year in a number of ways. I absorbed details of their working process, which had touched me so deeply in the library. Their practice of dialogue, beautifully stated in *The Lagoon Cycle*, was alive. They invited me to join in family meals and unexpected events. There were numerous trips back and forth from Santa Cruz to Berkeley to prepare the Kala Gallery *Greenhouse Britain* and *Force Majeure* exhibition.[130] Some of my Berkeley neighbors were mutual friends, allowing more gatherings and conversations. As closure to the year came, on my fifty-first birthday I invited the Harrisons for lunch at my apartment on Cedar Street. The day also marked the first-year anniversary of my landlord's death. Moving from Cedar Street was imminent.

---

127 Charles Green wrote a book called *The Third Hand* with a chapter on the Harrisons in 2001.
128 Centre Pompidou, Paris, owns this complex "photo mural," 360' long in 60 parts.
129 As a gift to the earth, for my 50th birthday, I pledged to work for the Harrisons for one year. On September 12, 2009, I arranged their meeting with Stanford University Special Collections' curator Roberto Trujillo. The Harrisons' archive is now available to researchers all over the globe.
130 Kala Art Institute in Berkeley, California: http://www.kala.org/exhibitions/past/2010/harrisons.html .

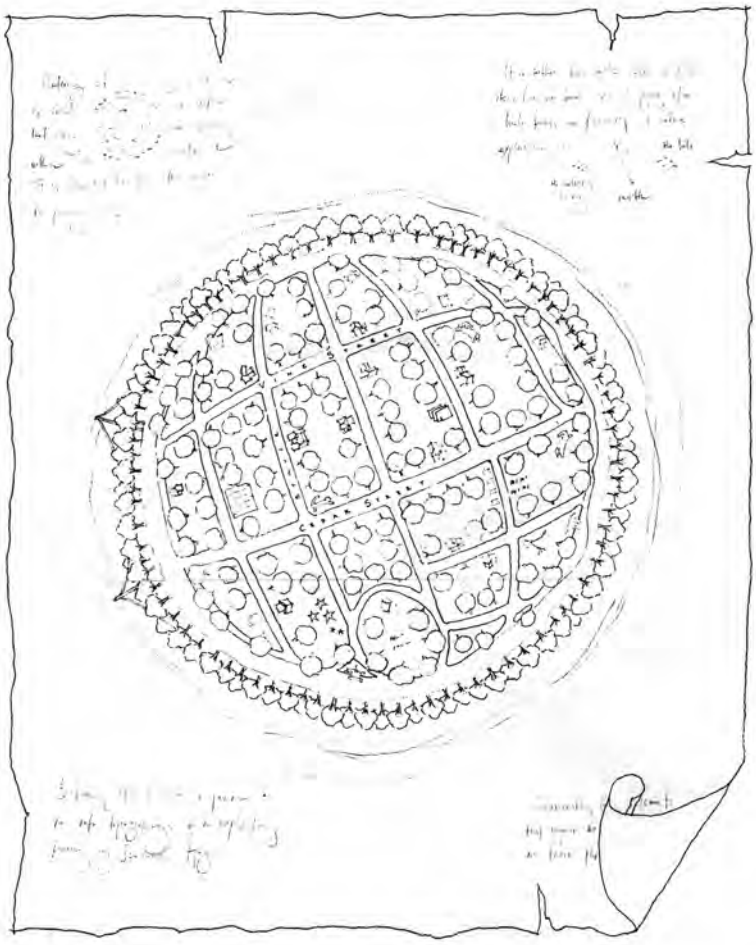


Fig. 5.1 *Between Cedar & Vine* (Susannah Hays 1998-2008),
Pencil Sketch by Stefan Pellegrini, 2001.

Our year together represented a "haibun"—a poetic form of autobiography first used by the Seventeenth-century Japanese poet Bashō.[131] The loss of a cherished river/watershed place of my childhood had been recast toward the Harrisons' worldview. All along, since 1974, their actions for social change had paralleled my search to understand the incomprehensible human actions against nature.

Our separate "first works" had both begun by marking a circle path around "home base." (Fig. 5.1) I, like they, but differently could not faithfully attribute single authorship to *Between Cedar* & *Vine*.[132] I was aware something *unknown* had functioned in the space of listening to my neighborhood.

131 The haibun form combines prose and haiku. Compositions devoted to travel focus on character sketches, landscape scenes, anecdotal vignettes and writings that honor a specific patron or event. Basho wrote haibun as travel accounts during his various journeys, the most famous of which is *Narrow Road to the Interior.*

132 *Between Cedar & Vine* is an artist book dedicated to the unknown writers of fragments collected on a daily circle walk—to get a cup of coffee. Stanford University Special Collections Green Library owns all iterations of this project.

Fig. 5.2 *San Diego as the Center of a World* (Harrisons, 1974)

San Diego as the Center of a World was first shown as part of an exhibit they called, "Decentering." The year 1974 marks the point where Helen and Newton came to the realization that, "single authorship seemed an absurdity. Rather, a third artist, operating in the space between us had been born, and that third artist was doing the work."[133]

Projects that followed were all performed with the engagement of working selflessly for the earth, their client. The questions—What would be enough? and How big is here?—guided the ever expanding scale of their outreach. They recall,

> *San Diego as the Center of a World* made the argument that we were in an interglacial period and depending in some part on human behavior it would become warmer or colder sooner than later. Soon being a mere 500 years. But in either event, vast forces were at work and we had better begin planning about what to do. In retrospect this kind of planning or attitude toward planning was the first step in later works that pointed toward adaptation to systems change at great scale. The question "would it be enough" was slowly becoming a metaphor for systems wellbeing and "no" speculative planning by itself would not be enough.[134]

133 Quoted with permission from the Harrisons' forthcoming monograph, Random House, Fall of 2016.
134 Ibid.

Because Transdisciplinarity requires collaboration between fields of research and practitioners, it seems valuable to mention how the Harrisons experienced unifying their skills—foregoing what they had first set to accomplish independently. They recall,

> This new form of collaboration had begun with both of us making the decision that we would no longer do any work that did not benefit the ecosystem. The one of us—who had been an artist from early adolescence on—had to change completely to do this. The other of us — who had been a lifelong teacher, researcher, educational philosopher, and student of psychology and literature—had to change completely do this. We were convinced that neither of us had the capability to become eco-systemically empowered without the help, encouragement, and dramatically different talents, experience, and tolerance for ambiguity of the other. We began to imagine that there was a third party, a unique co-creator, and that we were assistants to this entity—the real artist, visible only to us. In retrospect, we were also generating a very personal form of metaphorical behavior. [135]

As we perform the cycles of our lives, we extend the echoes of our ancestors from whom we inherited both our lives and the earth as our home. Generation after generation, as we witness the drastic human alteration of the earth—we take and make financial profit off the earth's resources. We do this without cognizance of the co-evolutionary functioning necessary to complete the cycle of that which we inherited. In my own confusion of trying to grasp where to begin, (the vortex being so strong), it was a revelation to realize I was already "in it" and could begin again from exactly where I stood. "To see a world in a grain of sand," as William Blake wrote, or understand why the Japanese paint their landscapes—without horizon lines—is to comprehend the position of the augur.[136] The Harrisons' micro and macro worldview underscores that the niche of each of our neighborhoods is good place to begin and begin again. Their holistic worldview is to revise what is possible to renew, now, and in the present future of each day. They start at the breakfast table each morning, with a conversation.

135 Ibid.

136 ***Augurs***—in equilibrium, augurs are those who decipher omens and the will of the Gods. Though some modern historians link the act of observing Auspices to the Etruscans, Cicero accounts in his text *De Divinatione* several differences between the auspicial of the Romans and the Etruscan system of interpreting the will of the gods. Cicero also mentions several other nations, which, like the Romans, paid attention to the patterns of flying birds. (Wikipedia).

5.4 Model of Understanding:
Center for the Study of the Force Majeure U. C. Santa Cruz

The concept behind the *Center for the Study of the Force Majeure* was established on the University California Santa Cruz campus in 2009. It began with the legal civil term Force Majeure,[137] which in their words means to:

> designate the co-evolving set of circumstances that work against the well-being of both the human cultures and the eco-systems as we know them, thereby imperiling the survival of both. [It] references the nature of the global environmental stresses imposed by humanity's overuse of planetary resources and the resultant contribution to climate change. Force Majeure, when framed ecologically, delineates human accelerated global warming that is acting in transaction with the vast industrial processes of extraction and CO2 production. These processes have resulted in destroyed forests, depleted topsoil, a severe lessening of ocean productivity and a vast chemical outpouring into the atmosphere in the earth and the water.[138]

A core aspect of the Center is the engagement in studies of "adaptation at scale", a perspective they maintain by examining the likely outcomes from glacial melt on the Sierra Nevada, the Tibetan Plateau and the trans-European mountain ranges. They write,

> A number of tipping points have already been passed. The most obvious, but by no means the only, example is the rising atmospheric CO2 level—now above 390 ppm. Although 450 ppm atmospheric CO2 looks likely to be reached well before the end of this century. We will be lucky if atmospheric CO2 levels stop rising at 600ppm.[139]

Ocean rise, drought, erratic weather, and temperature increase are happening already—particularly in the high grounds. Newton and Helen hypothesize overall outcomes—that is, not only through measuring, but also envisioning what this means for large and small populations and their survival. They advise,

> Complexity theory suggests that multidimensional problems do not yield or find resolution with simple cause—and effect—solutions, such as putting iron filings in the ocean, algae upwelling systems, burying CO2 underground, substituting atomic energy for coal, and the like. We have come to believe that problems of the kind that humanity now faces, such as the reformatting of the global weather systems from the predictable Holocene to the unpredictable Anthropocene, must be met by a whole—systems approach. We believe that human well-being in our shared and uncertain future will require adaptation on a vast scale, both ecologically and culturally. The formation of the Center manifests this belief in physical terms. The following question goes beyond the issues of art and science, regional planning and eco-structural

137 ***Force Majeure***—French legal term for "superior force" also known as *cas fortuit* (French) or *casus fortuitus* (Latin) "chance occurrence, unavoidable accident."
138 http://artsresearch.ucsc.edu/force-majeure
139 http://theharrisonstudio.net/

> design and can only be accepted and supported at policy levels: Are there ecologically available responses that will, in good part, replace the value provided by the disappearing glaciers to the river systems and to the human cultures they support (Harrison Studio, 2009)?

Toward answering this question in several geographies, the Center includes:

1. The location of sites in mountain ranges where receding glacial melt will, in the near future, negatively affect the constant flow of waters into rivers. The research will address the selection and the balancing of plant species from the region that can adapt to the new climate conditions biased toward generating topsoil and enhancing the Sponge phenomenon in the earths available.

2. Paleo-botanical research that will locate species that lived in the affected region prior to glaciations at a time when the climates were equivalent to those projected.

This research has two intentions:

> To locate species in the region that might not have been considered as part of a viable plant palette.
>
> To suggest close relatives that might now exist in other locations that, after appropriate testing, would niche into the new environmental conditions beneficially; that is to say, without behaving as exotics.

3. An examination of newly revealed glacial earths and to inquire about what a first succession might be like. One important question is, "Is this enhancement possible?"

4. A more careful exploration of the hydrology reflected in carbon sponge dynamics, with the intention of adding value to the system.

5. Looking at the potential for carbon sequestration over great scale, e.g., how much carbon would be sequestered were the Tibetan Plateau to be significantly regenerated by using the evolving principles of the Harrison's Studio?

Last August, I corresponded with Newton about strategies he and Helen have considered regarding reducing levels of entropy. He wrote, "How to drop entropy requires extraordinary changes in how we think and deal with ecology and the great diversity of human behaviors tuned to the sciences that Fritjof Capra talks about. Capra's four categories of events—energy, economics, climate change, inequality—collectively add up to what he calls "systems thinking" closely parallels how we think. The argument that puts together entropy and empathy requires extraordinary changes in how we as humans function in society."[140] The Center was formed to begin implementing what resources and strategies humans will need in order to adapt—primarily their food supply.

The Center for the Force Majeure Studies has four primary goals:

> **1)** Botanical explorations and experimentations that will assist the migration of species upward to compensate for species loss, flood and drought due to accelerated global warming in the high-grounds particularly mountain areas. The Center will be examining the possibility of generating eco-systemic design directed toward

140 Email correspondence with Newton Harrison, August 15, 2015.

> adaptation at great scale. **2)** The center is presently working with personnel at the University of California Berkeley research station located in the 8000 acre Sagehen Watershed. **3)** Generating a Paleobotanical Library with special emphasis on utilizing information gained from the Eemian period in paleo-history approximately 115,000-130,000 years ago when temperatures and weather conditions were similar to those predicted within the next 50-100 years particularly in the Sierra Nevada. **4)** A parallel form emerging is an eco-logical game structure based on the concepts embedded in the ecological definition of the Force Majeure. The Center will utilize resources at UCSC, which is one of the four principal academic game generating institutions in the US.[141]

Though the Harrisons have a number of recommendations, vis-à-vis Transdisciplinarity, they haven't explicitly included the complex issue of human-brain and autonomic nervous system development. Indirectly, however, they contribute this prospect as they advise university researchers in multiple fields to work in tandem with high caliber creators and scientist, gradually assisting the process for establishing a strong co-evolutionary curriculum. They recommend universities create collaborative ateliers of transdisciplinary research, free from any ideological, political, or religious control. They also suggest university authorities (presidents, heads of departments, etc.) all devote 10% of their discipline teaching time to Transdisciplinarity.[142]

The Harrisons' archive, housed at Stanford University, is an invaluable resource for informing Transdisciplinarity's future. While their life's work supports individual and small group proposals like "Mode 2's" (4.2), they have foremost established an integrated language whereby art, science, and public policy can advance an actual transdisciplinary model. Since they themselves began their work long before there were agencies within universities, they were free of constraints. While their guiding light was based in part on being good landholders—their "client" being Nature itself—today they believe stewardship itself is insufficient. "Rather, we have to change ourselves, our culture and in so doing assist nature so that all may continue in the face of what appears to be the beginning of the sixth mass extinction."[143]

141 http://artsresearch.ucsc.edu/force-majeure
142 http://artsresearch.ucsc.edu/force-majeure
143 E-mail correspondence with Newton Harrison, March 23, 2016.

Chapter 6
Two Transdisciplinary Courses taught at San Francisco Art Institute

While intelligence treats everything mechanically, instincts proceed, so to speak, organically. If we could ask and it could reply, it would give up to us the most intimate secretes of life.
HENRI BERGSON

There is at least one philosophic problem in which all thinking men are interested. It is the problem of cosmology: the problem of understanding the world—including ourselves, and our knowledge, as part of the world.
KARL POPPER

Art and Environmental Design programs of higher education have traditionally offered students critical and contextual studies for making art and environmental public spaces. As a faculty lecturer at the San Francisco Art Institute (2002-2012), my interests included bringing empirical study of human evolution. By providing co-evolutionary concepts of systems theory with neuroscience, student projects envisioned how humans experience place and space within macro-micro scale. When intellectual and emotional balance is achieved between theory and studio practice a student learns to articulate theoretical perspectives in accordance with a viable creative solutions.

Subjects taught under this rubric generally include histories of art and design, film and media histories, critical theory, aesthetics, and, more recently, curatorial and creative writing practices. In most graduate programs, technical ability is assumed, but graduate students may take undergraduate technical courses to enhance or learn new skills. At SFAI, I taught a number of technical courses. The most valuable teaching I did, however, focused on interdisciplinary Special Topic electives. I designed two courses, one that centered on cartographic modeling (*Topologies*) and the other focused on the body (*Embodied Camera*). These courses embraced complexity as they engaged full spectrum transdisciplinary issues. Critical theory and studio hours were jointly structured in sixteen-week modules, a period in which an independent project is completed.

Fortunately, SFAI endorses innovative thinking and has adequate enrollment to offer electives for students to participate outside their discipline. If *Topologies* and *Embodied Camera* were taken in sequence, students benefited from performing research in urban and rural spaces, while including inner experiential perspectives. By engaging one or two disciplines in addition to Art and Environmental Design (i.e., philosophy, art history, phenomenology, triune-brain and autonomic nervous system functioning), student projects effectively raise social/cultural discourse in relation to co-evolutionary discourse.

6.1 Teaching Philosophy

So what would the schools be teaching
but how nature survives
and grows and flourishes
through not charging a profit
but by infinitely improvised processes of exchange
With teaching, learning and doing
becoming the fun the high excitement
of participating directly in the work done by
all life on the planet
that is going about the business
of becoming, continuing and being.

HELEN AND NEWTON HARRISON

If contemporary art engages its audience critically within the context of present day issues and historical traditions, it must include co-evolutionary discourse with our common environment, the earth and biosphere. My primary role as a teacher is to open to the unique histories, ideas, and creative instincts of students and assist their discovering what worldview lies underneath their individual interests.

Young artists are at crossroads where understanding the spirit of present and past must be gathered before visions and forms of those visions are realized. While knowledge grows through experiential practice, critical thinking co-exists with "reading" the work of established artists and writers. By offering a diverse body of visual, historical, literary, scientific, and philosophical texts, students have the opportunity to delve and discern a coherent perspective from a range of domains and principles.

What initially brought me to teaching was the enriching experience I encountered in the creative self-discovery process. One can visibly mark feedback loops of investigation, discovery, and resolution, which in turn guide individual and collective processes. For these opportunities to occur, I cultivate conditions that balance three nested ways of working: 1.) Contemplative space/time to engage with materials and act on intuitive knowledge. 2.) Development of technical skills through demonstrations and short assignments. 3.) Articulation of forces shaping perceptions and artistic goals through critical debate.

6.2 Topologies[144]

The great challenge of our time is to build and nurture sustainable communities.

FRITJOF CAPRA

Topologies is a studio/theory seminar providing critical thought within the broad range of cartographic possibilities topologies suggests. While inquiring first into the historical forms of pictographs or picture writing, the course moves quickly into the complex territory of contemporary issues—namely the varied structures of topologies, their possible groupings, subsets, distortions or transformations. Given the speed of current (radical) social, economic, environmental and technological change, we ask: if we become aware of our individual patterns, how may we as citizens effectively contribute to the quality of future global community life?

With an emphasis on research and personal mapping, students guide their work by tuning to the reciprocal exchange and relative scale between "listening in" and "looking out." Course praxis, employing any visual media, is based on (de) scribing experiential representations of interior and exterior spaces. Environments can include natural/manmade places or imagined/symbolic representations of the world. The influence modes of transportation have (i.e., walking, car, bus or train) must also be accounted for, as velocity and systems of movement impact perception and cognition.

Since maps are miniature in scale (a scale that relates to the human body), maps inherently become stand-in-sites for referencing the physical and psychological spaces we inhabit and navigate. By exploring a city on foot, without an official map, physical experiences are relayed and amplified throughout the body. Often evoking associative memories and desires, these sensations coalesce and create a sensitive film-like substance where perceptions and feelings merge. These subjective representations can then be (re) imagined, openly questioning: How do we navigate and possibly transform the terrain and conditions of specific places in which we define ourselves as passing through, belonging to or departing from?

A range of topological map forms and short assignments initiate the process for locating and collecting fragments, tracks and traces. Final projects engage and enlarge the intrinsic qualities found within complex, organic, biological, non-linear and self-making systems, which (re) cycle or (re) generate over time. Two required texts, Fritjof Capra's *Web of Life* and Italio Calvino's *In/Visible Cities*, and a comprehensive reader provide topical insight from varied genres.

144 ***Topologies***—is a mathematical term used here in the sense of topological spaces and possible transformation through one-to-one mapping. Sets and subsets are collected and revised through creative (isomorphic) elasticity.

6.3 Embodied Camera

Even when something is understandable to the mind, it isn't easily grasped because the mind is merely a small part of us.

G.I. GURDJIEFF, 1973 p. 232

Perceptual differences in methodology have historically kept the sciences apart from artistic practice. Artists and scientists who inquire self-reflexively *how am I observing?* And *what is doing the observing?* probe the edges of seventeenth-century Cartesian limits. Transforming empirically based methodologies in a conscious, humanistic way requires asking biological, experiential questions such as *what is the Tri-Cameral Brain doing?* in order to discern more precisely the potential purpose of our creativity.

John Szarkowski, in *Looking at Photographs,* describing the camera-less work of Man Ray said: "Actually, the word 'photography' stands for a family of processes united by the fact that they produce images through natural energies." While in science photography makes visible skeletal, cellular, and microscopic structures of the body through technological processes, in Art, the medium is more than apparatus. In Art, camera and lens serve only as an extension of the human body's ability to see and preserve memories. Making images that resonate requires coming in touch with our physical, emotional and intellectual energies.

Embodied Camera investigates the original human camera, the Tri-cameral brain. It relates human *perceiving* and *receiving* as one whole perception. It tracks a wide range of syntactical and technological devices employed to express conceptual notions or scientific discoveries visually. Select readings and discussion illuminate how photography's technical processes, since its invention, has both recorded and constructed the interplay of verbal and visual communication between subject and object.

We look at contemporary projects by artists whose intuitions are artistically bound in experiential forms of observation—embodiment, containment, interiority—in contrast to the hegemony of ocular vision, which "progress" in technology commands. In photography's scientific employment, we look to new imaging technologies (i.e.: X-ray, MRI, CT scanning and other digital recording devices) used in medical practice for examination of the body. To develop a corporeal understanding of photography, a research/lab journal for observations and project ideas is kept. By juxtaposing body and camera, a position between the physical body (experiential practice) and mind (scanning of systems and theories) is explored.

Documentation of experiential praxis in relation to materials and methods is encouraged. Journal sketches reflect findings—as a lab notebook might function for a scientist or technician. Final projects morph directly from the evolving shape of journal entries and a variety of short essays.

Both *Topologies* and *Embodied Camera* are project-based courses where informed research manifests into a final project. Students from all areas of the visual arts may collaborate in critical thinking and work within their chosen materials/methods. Selections from the course reader support short exercises. Final projects morph directly from studio practice, journal entries, readings and short essays. Over a 6-year period, these two courses went through several pedagogic iterations and related topics.[145]

6.4 The Problem of Language

> *So, these are our three brains. The first two operate unconsciously—we do not know what they have us do. These are the instinctive urges, cultural reflexes. The third brain gives us an explanatory language, which always provides an excuse, an alibi, for the unconscious functioning of the first two brains.*[146]
>
> HENRI LABORIT

> *We must be clear, when it comes to atoms, language can only be used as poetry. The poet, too, is not nearly so concerned with describing facts as with creating images and establishing mental connections.*
>
> NIELS BOHR

Co-evolutionary engagement identifies language as one channel for widening the focal field of human perception. The physical experience of constructing symbols, metaphors, dialogues and improvisations bring immediacy to whole mind/body processes. An artists passage between knowledge (gathering) and understanding (embodying knowledge) can be seen in many great examples of twentieth and twenty-first century art and environmental design. Genres chosen specifically for their ability to make visible anthropomorphic to cosmological levels of perception, within the context of human evolutionary development, may even be analyzed through the conceptual structure of CIRET's model. However, how do levels of learning evolve from mental to visual concepts? What are the limits of language and how does the capacity of aesthetics assist our understanding the tensions between art and nature?

Because CIRET's model employs the common core language of evolution, examples of creative principles embedded in language would be valuable study. How do forms of thought become words? Of course semioticians study this formally. And, this is important due to the inherent complexity of both visual and verbal language expression. If language is not understood on a biological level, the fullness of human nature is not addressed. While a philosophy of nature helps mediate dialogue, art embodies and effectively evolves the natural resistances individuals experience when moving beyond former "lived" states or levels of reality. Because language (visual or verbal) itself speaks to identify, reference and replicate states of emergence, some form of adaptation is occurring through the process of feeling one's thoughts or thinking one's feelings. This process taps into the bidirectional "top-down"/"bottom-up" hierarchal brain-gut system that Porges and MacLean discuss on a phylogentic basis. Transition states that advance neuroceptions toward perceptions come through this visceral corridor. Whatever is said, written, drawn or acted creates a "marking" point from what evolved in that moment of mark-making. If these moments are not consciously observed, forces of automaticity—as Goethe warned—make efforts "aimless and purposeless" (3.3).

---

145 I co-taught *Visual Autobiography* with Hertha D. Sweet Wong at U. C. Berkeley through the auspices of a California Humanities Grant between 2000-2002. *Constructions of Space, Visual Translations* and *Photography Degree Zero* became related topics to *Topologies* and *Embodied Camera* taught primarily at the San Francisco Art Institute and Leuphana University in Lüneburg Germany.

146 See Henri Laborit's 1980 film: *Mon Oncle d'Amérique*.

Because the word trans carries implicit meaning—going beyond what the subject/object knows—the language of human evolutionary principles can assist making explicit what inner processes are working toward making the implicit explicit. These words may be, for example, descriptive of the differences between emotion, feeling, or physical sensation. If articulated, with others who explore similar ranges of experience, resonances occur. Agreement assists verifying what is common/natural to experience and transition through. This form of gathering verification balances emotional fear that might otherwise overwhelm the nervous system.

Through the language of human evolutionary principles, students can also evaluate real world experiments. From science's methods of observation and psychology's ways of learning through verification, text and context are brought together. While language plays a vital role in synthesizing thought, art and environmental design give form to thought. To define how the question of space operates within these fields, I argue that reconciling mental space (space of philosophers) and real space (the physical and social spheres in which we all live) is what we actually mean when we speak of synthesis or the "embodied mind." Environmentalist Richard Norgaard recently underscored the baggage attached to metaphoric language. He wrote,

> Words are integral to thinking and communicating. Words also carry old baggage. The Anthropocene necessitates new thinking and communication at the human-nature interface. Words like progress, natural, and thresholds are pervasive in both scientific and policy discourse, but carry baggage that will likely slow understanding of the Anthropocene and appropriate adaptation. The dynamic systems thinking with emergent properties of ecology needs to replace the efficiency and growth framework of economics. Diversity and resilience are productive and less historically burdened words (Norgaard, 2015 p. 1).

To imagine a future language is, in other words, a feature of what will sustain our future. In the history of writing itself, Heidegger's *Poetry Language and Thought* is a formidable resource for understanding how words envelop us like quicksand. Gurdjieff also took the problem of language seriously—as both an empirical study as well as in a literary sense. I highly recommend his preface to *All and Everything*, entitled: "The Arousing of Thought" (Gurdjieff, 1950 pp 3-50). In this introduction he presents to his readers, in his inimical, lively, careful, and sincere a way, a description of the "laws of association." Knowing full well such an effort is not required of individuals in order to live their lives, he urges humans to make a conscious effort to escape associative automaticity.

If we look to movements in the history of art, which used language as a medium for possible artistic, political or social change, a collection exists that has, overall, faded, if not failed. By employing specific tactics, visual and performing artists worked superficially on engrained issues, attempting to counter-act dualistic Cartesian/mechanistic thought. Whether it was Dada, the Italian Futurist, the Russian Futurists, avant guarde theater, situationism, et al., linguistic devices such as: mixing-up, spinning, punning or associative wordplay, simply turned edges of social discourse temporarily upside down. One-liners or time-space détournements diminish, serving nothing more than propaganda or satire. On the other hand, empirical devotion to literalness only serves to closes off nature's natural novelty of expression and creative forms.

When researching Hughlings Jackson's 1884 Croonian lecture series, I discovered a paper he gave on the subject of language. In 1887, he presented to the medical society of London, "An Address on the Psychology of Joking" that stated why, in language use, both parody and literalness fail within the context of human evolution. Punning,

joking and play on words, he said, comes from stereoscopic—diplopic—mentality as humans trace resemblances and difference (Jackson, 1887 p. 870). He further stated that, "aesthetic sentiments originate from the play impulse"—a fact that demonstrates that our minds have "a surplus activity for greater ends," which he describes as "the dawn of aesthetic feeling." In his address, Hughlings Jackson takes a minute to be sure his audience does not walk away thinking that humor is not in part a sign of health, for "this tendency is inherently there." He says, "Punning is only a caricature of, and therefore, for the psychologist, a valuable experiment on, the process of normal mentation" (Jackson, 1887 p. 871).

What is valuable to gather from Jackson's empirical analysis of "play of mind," comes at the end of his talk. His main point is that all mentation is stereoscopic because we, in our lower state, naturally link dissimilar mental states. He says,

> The process of all thought is double, in degrees from stereoscopic unity of subject and object to manifest diplopia (two objective states for one subject). The process of all thought is tracing relations of resemblance and difference, from simplest perception—to say what a thing is, is to say what it resembles and differs from—up to most complex abstract reasoning.

Continuing his analysis he describes stereo view in relation to dissolution of the higher center. A visual and mental confusion proceeds, that carries the following action:

> In the symptomology of a patient who has paralysis of an ocular muscle, there are many elements. There is morbid visual diplopia; in insanity there is morbid mental diplopia. The ophthalmologists' "true" and "false" images have their analogues in the "true" and "false" mental states in the cases of epilepsy mentioned. When the divergence is great, diplopia ceases (the patient, the ophthalmologist says, "neglects" the false image); in the case of epilepsy, upon deeper dissolution that that with which there is the "dreamy state," the actions are considerably coherent. The "erroneous projections" of the former have their clear analogues in the hallucinations of many cases of insanity. Believing that all diseases are to be looked on as flaws in different parts of one Evolutionary system, I urge the "Comparative Study of Diseases of the Nervous System" (Jackson, 1887 p. 871).

From Paul MacLean's research (2.3) we understand how a third-brain, the cerebral cortex, overlays the first two. In Henri Laborit's studies, he expresses the development of this third brain by calling it, "the association cortex." Laborit asks rhetorically, "What does this mean? It means that this third brain associates the underlying neural pathways, which bear the trace of past experiences, and combines them differently from the way they were imprinted by the environment at the time of the experience itself. Humans, that is, are able to create, to generate imaginary processes" (Kunz, 2014 p. 116).

> Through language humans have been able to transmit from generation to generation all the experience they have acquired over millennia […] In other words, our instinctive urges and our cultural reflexes will be masked by language, by a logical argument. Language therefore helps hide the cause of dominance, the underlying mechanisms, and the establishment of dominance. It makes the individual believe that by working for the common

> good he will experience his own pleasure. Whereas, in general, all he does is to maintain hierarchical situations that are obscured by linguistic alibis, which in a way serve him as an excuse. […] (Kunz, 2014 p. 116)

Because humans have the inner capacity to evolve, I provide exercises for my students where it is possible to imagine and re-imagine what else things could be other than their first reaction/response. Surrealist games, like "Exquisite Corps" and "Chance Operation" help to deconstruct subjectivity. By visually and linguistically playing with fixed orders, an inner action takes place where mixing-up, reversing, and inventing a newly imagined visual/verbal language moves through energetic sources of imagination, humor, and physical movement. In *Topologies* or *Embodied Camera* students avail themselves of the opportunity to render maps and patterns of place, thoughts and habits, all which take place linearly and non-linearly in the physical body. I provide walking exercises that allow them time to account for both explicit and implicit experiences of walking. In city/urban environments, where the typical motive for travel is to arrive, I ask them to study what occurs during transit—in the space between space/time of travel. In contrast, rural/nature environments are about "slow time" and open spaces where time slowly unfolds bringing entirely different sensations.

It becomes visually clear that the use of symbols or signs take the place of spoken words. A self-reflexive picture is drawn in an exercise called, "Four views of self" and in another called, "Circle of influences." Mapping points of view exercises thought patterns that connect internal/external sensibilities. Walking, meandering, derive, drift—non-linear movement—physically challenges linear conditioning when students observe, pass through and arrive in time/space places of memory.

During my years of teaching photography, *Topologies,* and *Embodied Camera* I observed patterns students experience as natural passage points. Levels of participation become distinct around three stages of gaining insight.

> 1. "Getting the picture": a constellation of images is gathered in order to find a pattern of interests (unconscious to self-conscious seeing and contemplation). The collection is an archive that stands in reserve for finding interconnections.
>
> 2. "Being in the picture": including self, others and topography. Perceptions evolve through play, visualization and performing relationships—experiencing both concepts and forms.
>
> 3. "Transforming the lens": objects and subjective views are materially examined with an eye to what else they might become. Skills are refined in order to visually resolve concepts 3-dimensionally. Translations are realized through a process of exchange between materials and methods.

Every accredited school has a set of approved required credits. For a beginning core sequence in most photography departments there is the need to learn analogue and digital skills in order to for students to achieve making higher levels of complex-layered images. Courses also examine syntactical/cognitive differences and process/research methods (i.e., students search for origins in their art making vs. becoming a DJ that simply appropriates). The mainstay of an undergraduate program is providing experiential space. Students use photography's indexical power, for framing values, making a path visible and for its prosthetic ability in getting underneath first impressions. Undergraduate students are primarily sorting and distilling information

and ideas. They attend to a metaphysical process, something photography is particularly good at. When searching for the sense of being and belonging in the world, a wider parameter emerges from balancing inner subjectivity with outer awareness—learning how others see "the world."

One natural direction, when studying art and environmental design, is in consciousness studies. How the camera functions technically, as a prosthetic device within this realm, is a meaningful exploration. *Embodied Camera* successfully engages the medium's capacity to transform and transcend human perceptions, memories, or "lived spaces." These spaces can include somatic expressions of the mind/body environment, bio-chemical sensations, architectural spaces, rural/urban landscape and dreamscapes. Visual and written articulations are related, following aesthetic limbic engagement.

6.5 Model of Understanding: EQUIPOISE

Nature creates similarities. One need only think of mimicry. The highest capacity for producing similarities, however, is man's. His gift of seeing resemblances is nothing other than a rudiment of the powerful compulsion in former times to become and behave like something else. Perhaps there is none of his higher functions in which his mimetic faculty does not play a decisive role.
On the Mimetic Faculty,1933 WALTER BENJAMIN

We have to remember that what we observe is not nature in itself, but nature exposed to our method of questioning.
WERNER HEISENBERG

The following description reflects on my intuitive play with the physical and chemical properties of the photographic medium. This pursuit produces a third philosophical space in which new concepts may form. By moving beyond preconceived ideas or learned histories, thoughts about objects develop a life of their own. The "magic" therein is subsequently embodied in unforeseen implicit/explicit visual expressions.

VEILS OF LONGING

Making photographs "works" on two levels in relation to my search for essence and being. At the first level, the camera serves as a recording device, allowing human *reflections* to be transferred to a film archive, clearing space for new reflections. This practice of transferring reflections from the physical body to the archive has a different emphasis than Cartier-Bresson's capture of *decisive moments.* His method of finding equilibrium in a photograph points to mine only on the surface. I employ the medium of photography to clear away moments of coincidence, attraction, and association so that a position of seeing beyond organized social/cultural limits or personal/subjective bias—finding nature's way—may be distinguished.

The second level is cameraless experimentation, where no more than gelatin-silver paper is used to record light *refractions*. By exposing silver-halides through select translucent objects, crystallized patterns are "fixed" in the nexus of their development. A cameraless method is not meant to be reductive, quite the contrary. One result of working intuitively with darkroom processes is the fluid cross-pollination of disciplines.

Fig. 6.1 Bread for Sale Ladder Conversation

While the easily recognized fields are Art, Science and Technology, my underlying motivation is to investigate philosophical pathways, where the nature of epistemological features within the medium might also be expressed.

When camera and cameraless processes of experimentation are both explored, a deeper understanding of photography as syntactical medium is achieved. In the moments of witnessing an object render itself, my position of seeking essence through making images asks: What, in what I observe, describes the human condition? (Fig. 6.2) ? If I allow such a question to circulate in me, what is alive responds and separates from that which is synthetic. Approached this way, photography is a medium that naturally intertwines philosophy, art, and chemistry. Being of it, I search to be, as Roland Barthes desired, "a primitive without Culture."[147]

One day, without foresight, camera and cameraless ways of producing "proofs" of intangible things inexplicably merged into each other. The images represented in the *In/Visible Cosmos* archive are primarily black and white gelatin-silver prints, with the exception of my sun prints.[148] Sun printing—outside the darkroom—became an

Fig. 6.2 Bottle No.3 Bottle No. 5 Bottle No. 15

147 Barthes, Roland [1980] *Camera Lucida: Reflections on Photography*, Hill and Wang, NY 1982; p. 7
148 Stanford University Special Collections purchased the In/Visible Cosmos archive in 2009.

Fig. 6.3 Three Skeletal Leaves (1998) Vandyke brown silver-sunprints on Torinoko Gampi paper

additional means for precognitive instincts to draw themselves. Sun prints require hand-coating iron salt emulsions to a surface, for which I chose Gampi, a delicate translucent paper. Enlarged skeletal leaf films are then placed in contact, under glass, and exposed to sunlight. (Fig. 6.3)

Working in this way, with both inorganic and organic objects, detailed qualities become observable. In the *Empty Bottle* photogram series, exposed silver-halides rendered magnified forms. To my surprise, inorganic **Bottle No. 3** displayed an organic cell pattern.[149] In the Vandyke sun printing process, UV-rays oxidize iron salts, the conversion moving from yellow to brown or from ferrous to ferric state. Somewhat metaphorically, cellular respiration, fused with sunlight (energy) and water (H20), permanently traced the leaf's form. While the leaf and bottle photograms are iconic symbols in their own right, a chemical equation of cellular life nearly mirrors the very similar cycle of photosynthesis, as I explain next.[150]

PHOTOSYNTHESIS: CO_2 + energy + water => glucose + O_2
RESPIRATION: glucose + O_2 => CO_2 + energy + water

While respiration and photosynthesis systems are central to all breathing plants, animals, and humans complexity in human-brain dynamics increases the number of receptor sites, well beyond plant and animal worlds. What in these reciprocal dynamics causes cell tissue to grow? How do mirror dynamics resonate with the origination of photography and the development of human consciousness?

To learn more, I returned to using a 4 x 5 camera, one that was attached to a microscope. I photographed magnified cross-sections of plant cells and contact printed the negatives

149 Bottle No. 3 (Fig. 2) is a typical Depression era glass bottle with rows of quarter size convex circles, each one capable of magnifying as eyeglass lenses do. In the light-drawing, a diffused expression of the bottle brought a flattened two-dimensional plane. Light, refracting and bending, selectively recorded details in and around the circles, making a hexagonal cellular pattern. The experiment showed that glass circles write a pattern in much the same way bubbles tessellate when gathered under pressure. In nature, bees construct honeycomb cells this way. Leaves also tessellate their membrane tissues, cell by cell. See F. Capra *Web of Life* p. 86 for reference to this ordered pattern that emerges only in a *far-from-equilibrium state*.

150 Photosynthesis produces oxygen and glucose. Used in the set of reactions called cellular respiration, photosynthesis consumes CO_2 and gives off O_2, while (aerobic) cellular respiration consumes O_2 and gives off CO_2, making the two a perfect complement. The net effect is turning sunlight into potential energy for the chemical bonds, which comprise plants and animals. Reciprocal by nature, they are interdependent on each other. Likewise, humans breathe O_2 and exhale CO_2, in a similar mirror exchange process.

Fig. 6.4 Three microscope images (2001) p.o.p. gold-toned sunprints

onto gold-toned printing-out-paper. It was possible to then compare how emerging leaf patterns hold the integrity of their form, from genesis until death. (Fig. 6.4)

So, attempts to consciously *reflect* and press the shutter preceded physical cameraless *refraction* experiments. How the first step made way for the second was a natural progression, as the letting go of handheld devices resulted in direct access to subtler materials. Working strictly with alchemical physical properties refined a material sensibility. And, by continuing to ask: *what can be seen* and *what is veiled* in ordinary sight, an Art, Science and Technology of *living media* evolved into a transdisciplinary study.[151]

MIRROR-LIKE FORCES

Photograms (cameraless light-drawings) are intriguing to read. A unified seamless trace results from this lens-less approach. Deciphering negative/positive, three-dimensional space is visually confounding when viewing the final flat, two-dimensional print. While achieving effects through chance experimentation, an inquiring mind, probing beyond the magic, garners something of the forces at play, as a newly blended "visual thought" emerges graphically and, sometimes, poetically.

It can be argued that all photographs are "mirror-like," for inherent in the camera's mechanical structure is either a mirror shutter or an electronically censored apparatus geared to throw back what "it" sees through the focal plane of a single lens. In cameraless images, light touching an object on sensitized paper casts a silhouette or a detailed drawing, if the object is transparent. For the human observer, a similar "mirror-like" function is internally summoned when assimilating an impression through "the mind's eye." Light touches a veil of tears, which coats the front and back of the eyes, directly influencing mind/body receptors. An electrochemical message is sent to the brain for interpretation. Something sees and remembers.

Though the capacity for humans to see is regulated by any number of additional physical factors, the process of sensing and feeling ocular perceptions always begins on the surface of this reflective watery substrate that then precipitates light and crystallizes an image.

151 Transdisciplinarity is a research strategy where efforts to solve problems cross the boundaries of two or more disciplines. See *Manifesto of Transdisciplinarity* 2002, for further description of this methodology.

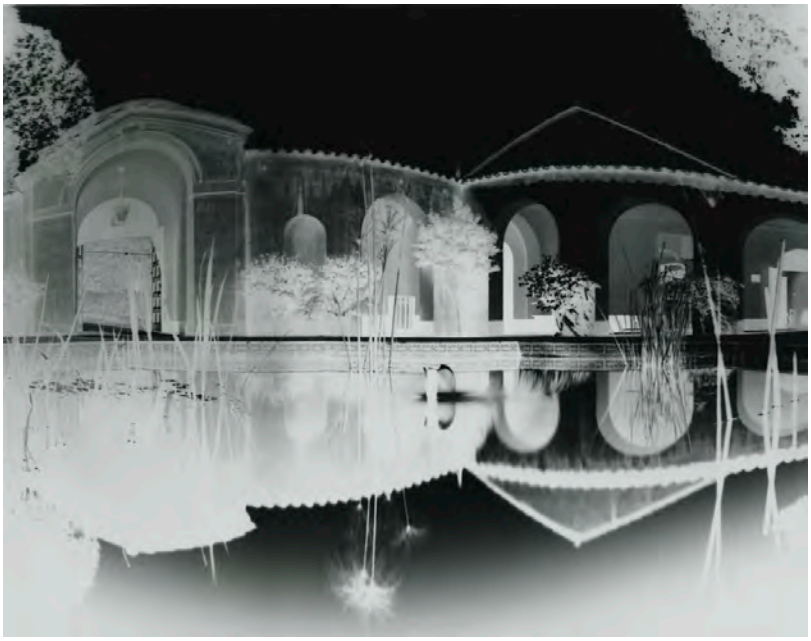


Fig. 6.5 Illuminated Garden (2002) pinhole light-drawing on gelatin-silver paper

My first attempt to create a lens-less mirror image "in the field" was a gelatin-silver pinhole light-drawing. A large Illy espresso coffee can, found in a recycle bin, served as a perfect 11 x 14 drum shaped camera obscura. The exposure, 10 minutes in length, drew a negative symmetry by way of a slight stream of light, passing through a tiny hole, positioned in the center of the container. (Fig. 6.5)

Investigating 'mirror-like' surfaces further, I began creating images that transmit how the surface of the eye looks, when it subsequently sends a signal to the brain. In **Fractal Tree** (Fig. 6.6) the mirror-like surface was a wet piece of glass found lying in the landscape on one of my walks. Digitally capturing the dual reflection, the reality of an eidolon image emerged, resonating with the quality of light refractions I achieve in my photograms. How qualities of "photogram" like images appear in nature was now an experience no longer limited to a darkroom experiment. I could sense nature drawing them all around me. While I attribute learning to see forces at play in relation to my choice of objects, psychological energies and metaphysical relationships contribute a

Fig. 6.6 Fractal Tree (2014) FujiFlex Light Jet print

subjective human understanding. The medium of photography has taught me to see what would otherwise be an imperceptible dynamic layer in Nature.[152]

One value of making images on a mirror-like liquid surface is their power to replicate substrates found in the human eye. The *Mirror Landscape* series, as a whole, intends to convey what human impressions undergo, prior to being "digested" by the mind.[153] The process of seeing follows this medical description:

> In order to see, there must be light. Light reflects off an object and—if one is looking at the object—enters the eye. The first thing light touches when entering the eye is a thin veil of tears that coats the front of the eye. Behind this lubricating moisture is the front window of the eye, called the cornea. This clear covering helps to focus the light. On the other side of the cornea is more moisture. This clear, watery fluid is the *aqueous humor*. It circulates throughout the front part of the eye and keeps a constant pressure within the eye. After light passes through the aqueous humor, it passes through the pupil. This is the central circular opening in the colored part of the eye — also called the iris. Depending on how much light there is, the iris may contract or dilate, limiting or increasing the amount of light that gets deeper into the eye. The light then goes through the lens. Just like the lens of a camera, the lens of the eye focuses the light. The lens changes shape to focus on light reflecting from near or distant objects. This focused light now beams through the center of the eye. Again the light is bathed in moisture, this time in a clear jelly known as the vitreous. Surrounding the vitreous is the retina. Light reaches its final destination in the photoreceptors of the retina. The retina is the inner lining of the back of the eye. It's like a movie screen or the film of a camera. The focused light is projected onto its flat, smooth surface. However, unlike a movie screen, the retina has many working parts. . . Signals sent from the photoreceptors travel along nerve fibers to a nerve bundle, which exits the back of the eye. The bundle is called the optic nerve. The optic nerve sends the signals to the visual center in the back of the brain. Now light, reflected from an object, has entered the eye, been focused, converted into electro-chemical signals, delivered to the brain and interpreted or "seen" as an image.[154]

In **Equipoise Tree** (Fig. 6.8) pure elements of water organize the liquid mirror-like image of a landscape. How do moist eyes receive a reflective surface made of a similarly

---

152 A similar revelation occurred when I made **Fallen Sky** (2001). After making the *Empty Bottle* series and microscope images, my eyes became acutely aware of how particulate matter would refract through the mechanics of lens and shutter in and outside the darkroom. In **Fractal Tree,** the difference was that I understood the effect of distortion—the physical scatterings of light—keeping in mind how the cornea, iris and retina are structured. My book entitled: *Between Cedar & Vine* show further metaphysical experiences, which I discuss in two self-published essays: "Enacting Perception I & II" (Hays, 2009–2010).

153 R.A. Schwaller De Lubicz beautifully traces how human organs conduct and coordinate higher levels of perception in *Esotericism & Symbol*, Inner Traditions, 1960; page 48. "The animal is a freely moving plant because all the phases of its gestation are fixed in organs—in specific individualizations—because the root has become intestine, the leaf has become lung, the taproot has become stomach, the circulation of sap has become blood and veins, and the flower has become sex. This totality has been linked together by the marrow to form a conductive organ, the brain, and through that has become cerebral intelligence, which is conscious memory, and makes possible the expression of the innate consciousness that generated instinct. The faculty coordinating ideas is still lacking in order for man to exist."

154 http://www.webmd.com/eye-health/amazing-human-eye

saturated, teary-like wetness? What does the organic image instill, for the viewer, if the reflection is privileged over the referent? In **Equipoise Tree**, the tree is made explicit from its implicit form. Not concerned with completing symmetry, it asks: In what space do reflections exist as part of real world fluctuations? How does the medium of photography lend itself toward preserving equilibrium in inert spaces of uniform motion? Imbued with a magical aura, Nature's sublime beauty is suspended.

ACTS of TRANSUBSTANTIATION

Photographic representation, as an act of transubstantiation, has its origins in the search for truth and meaning. While "having your likeness taken" refers to the mirror-like results portrait studio artists achieved in the mid-nineteenth century, Scientists Psychologists and Philosophers of the same era, not knowing exactly what to call this wondrous phenomenon, defined the action of light on chemical properties variously. William Henry Fox Talbot and Sir John Hershel, two inventors of the medium, initially chose the terms *Sciagraphy*, *Photogenic Drawing* and *Physiognomic Trace* to articulate what they saw as being "cast off" the actual object, onto paper. Also heard was the enigmatic phrase: *That which leaves an impression*. This phrase, particularly poignant, pointed to invisible elements, tacitly present. And further, not only present, but also lasting—sometimes haunting—in an indescribable way. Disrupting the possibility for a photograph to make visible all of what one feels to be there, the expression *leaving an impression* implied there are forces that include not only the viewer's sight and ability to name objects, but also the human capacity to lay bare pressures of the unknown—*self consciously*.

The complexity in reading a photograph seems to have always been tied to the corresponding complexity of being emotionally moved by them. Like impressionist painting, photography opened doors beyond the retention of symbols and their meaning. In *Camera Lucida* Roland Barthes describes a photograph as a representation and something else, where the referent adheres. He writes,

> The photograph is literally an emanation of the referent. From a real body, which was there, proceed radiations which ultimately touch me, who am here; the duration of the transmission is insignificant; the photograph of the missing being, as Sontag says, will touch me like the delayed rays of a star. A sort of umbilical cord links the body of the photographed thing to my gaze: light though impalpable, is here a carnal medium, a skin I share with anyone who has been photographed.
>
> It seems that in Latin "photography" would be said "imago lucis opera expressa"; which is to say: image revealed, "extracted," "mounted," "expressed" (like the juice of a lemon) by the action of light. And if Photography belonged to a world with some residual sensitivity to myth, we should exult over the richness of the symbol: the loved body is immortalized by the mediation of a precious metal, silver . . . to which we might add the notion that this metal, like all the metals of Alchemy, is alive.[155]

Photography's effect of mimesis—being inseparable from its referent—depends on some difference between the thing and its reproduction. While Barthes, a brilliant semiotician, covers many of the paradoxes and conundrums that photography

155 Barthes, Roland [1980] *Camera Lucida: Reflections on Photography*, Hill and Wang, NY 1982; p. 80.

markets to us as a culture, his treatise speaks to my search not only for understanding *photography in and of itself*, but the genesis and future of my own being and becoming.

TRUER ILLUSIONS

When an observer sees an object as a photograph an otherwise ephemeral moment is arrested. While a photograph's rays are evidence of an event *happening* externally, photographs draw us simultaneously toward encountering our inner *self-conscious selves*. When we attempt to describe what we see reproduced, we return to look again and again, often seeing more. When it's observed that we do not see all there is to see at first glance, assumptions are less easily overlooked. We become self-aware of our lack of attention and appreciate Barthes' distinguishing the hedonist's eye from the universal eye that generates his recantation, his metaphoric palinode.[156]

When first making distinctions between original and copy, I stripped the process bare of all apparatus, relying strictly on the alchemical laws of the medium. The immediacy of making photograms transcended all past images. By blackening and rendering permanent particles of silver, objects exposed directly to light gave way to seeing objects in and of themselves. As dense thick areas receive less light than subtler thin layers, patterns pronounced themselves in seamlessly real chiaroscuro tones in relation to exposure times. Touched by experimentation inside this closed field of examination, a shift occurred in my vision when walking in nature. While my first images of *Egypt* (Fig. 1) drew their importance from associated memory, the experience of pursuing a natural unmediated refraction process, imposed on translucent objects, moved me closer toward *seeing things for what they are, in and of themselves.*

But, by what endless number of possible experiments does light penetrating through a substance produce a deeper experience of reality? In learning the ways light penetrates, separates, filters, and diffuses the medium, more than the surface of things becomes visible. These temporary forms, marked by the forces of light and medium interacting, offer revelations of the unknown. What are these images really?

From this place—this position of not projecting but questioning and receiving impressions, the ontological nature of a "mirror-like" process raises and affirms pictorially truer illusions. In a final example, a photograph I was directed *how to make* depended on my re-imagining the flight of a bird, at the same time as being aware of the exact angle in which I physically stood.

Fig. 6.7 Icarus (2010) Archival pigment print

156 Ibid. page 60. ***Palinode*** is a term poets employ when they retract a view or sentiment expressed in a former poem. In *Camera Lucida*, Barthes makes a recantation, effectively dividing his treatise into two parts.

To "see" **Icarus** (Fig. 6.7) it was necessary to move around to detect how and if this something (of startling beauty) was actually there.[157] To capture what was only visible in raking light, I moved quickly, for access to the image lay contingent on the sun illuminating the windowpane, also moving moment by moment. If a spectacle was ever glaring, this mark on the glass appeared as an encapsulated existential moment. It was just as much a gift as discovering the photogram sealed in **Bottle No. 3** (Fig. 6.2). In every way, **Icarus** was also a photogram—the positive and negative already one. "—The windowpane and the landscape, and why not Good and Evil, desire and its object, dualities we can conceive but not perceive (I didn't yet know that this stubbornness of the referent in always being there would produce the essence I was looking for.)"[158]

I let objects render themselves because the *punctum* (Barthes' term for the element in a photograph, which pierces the viewer) or Tuché (as Lacan says the THIS) are "proof" to me that we are discussing living forces, which leave a "mirror-like" impression. Like an arrow, impressions strike electrical nerves in the body. For organic truths to emerge, it matters exactly how an object is simulated. To perceive the nature of *how* a mark is made is essential to receive. Only then does the mark become a penetrating sign. For the viewer, a clear conscious representation brings the capacity to transmute signs of the outer world, from inside. But then, I am a photographer in search of making Ariadne's thread In/Visible (as Art.)

Fig. 6.8 Mirror Landscape 5 FujiFlex Light Jet print

157 In Greek mythology, Icarus was the son of the master craftsman Daedalus who escaped from the isle of Crete using wings his father constructs from feathers and wax. But, failing to heed his father's instructions (to be ware that if he flew too close to the sun, the sun's heat would melt the wax in his wings), Icarus fell to sea. In the photograph, a city pigeon, not seeing the glass from the reflection of the sky, crashed into the windowpane leaving a perfect chalk-like trace of its body.

158 Barthes, Roland [1980] *Camera Lucida: Reflections on Photography*, Hill and Wang, NY 1982; p. 6.

Chapter 7
Conclusion

We have been drawn from the earliest times to ask what our purpose is, but here again we are in danger of anthropocentrism. Perhaps it is better to make the question one of function: What function do we serve in nature, or in the universe? Are we, and all life, simply a chance event, an anomaly? Biologists might claim that nature permits nothing extra; mathematicians have a profound love for parsimony—it is order and not only chaos that we sense in the universe around us.
DAVID WOOTEN, 2008 p. 54

As I am completing this dissertation in 2016, scientists, environmentalists, and activists are calling urgently for us to reverse the treacherous cultural and environmental standards of the past. After publishing encyclical, *Laudato Si'* (Praise be to You) in April 2015, Pope Francis came to Washington, D.C. to address the United States Congress and the United Nations about the reality of climate change and the need for immediate transformative action. In September 2015, Alabama unanimously agreed that schools are now required to teach evolutionary theory as well as the facts of climate change. This ruling overturns a ninety-year controversy initially marked by the Scopes Trial case of 1925.[159] In March 2016, children in Oregon and Washington State won a major court decision over the federal government's negligence on climate issues. I wish to add an appeal for cognitive epistemic responsibility in human evolutionary development. Ecoliteracy and the move from psychology to psyvolution together would enhance co-evolutionary systems thinking on a micro-macro scale.

A 1997 Charter written by UNESCO stated: "Sustainable development is widely understood to involve the natural sciences and economics, but it is even more fundamentally concerned with culture: with the values people hold and how they perceive their relations with others. It responds to an imperative need to imagine a new basis for relationships among peoples and with the habitat that sustains human life." In UNESCO's Executive Summary (Article 36) in the same document, Federico *Mayor concludes:* "Promoting sustainable development, whose close interrelationship with democracy and peace is increasingly recognized, is one of the key challenges of our time; and education in all its forms is vital to addressing it successfully. UNESCO believes education is the force of the future—which cannot be other than a sustainable future—and is committed to maximizing its efforts and multiplying its partnerships for the development and deployment of this force in the cause of peace and human betterment."[160]

In contrast to these pronouncements about the value of education, this dissertation indicates why little change will occur in the social/cultural cycles that repeat themselves (Howe and Strauss, 1991). Unless humans learn to develop their higher potential, the imperative for sustaining human evolution cannot be met. This is the significance and condition of what's at stake in our required co-evolutionary relationship—the phenomena embedded in nature's discourse. If we agree, nature is not a separate reality outside ourselves, but integral to cultural discourse, education in human nature—bio-social-physiological interactions—is vital. Transdisciplinarity is the appropriate methodology for advancing these principles of *psyvolution*, an action that produces a conscious flow of biological connectivity in human-brain dynamics. In human

159 ***Scopes Trial*** was a 1925 legal case in which a substitute high school teacher, John Scopes, was accused of violating Tennessee's "Butler Act,"that declared it unlawful to teach human evolution in any state-funded school. Harold Morowitz was a key witness who defined the laws of thermodynamics for the judge.

160 http://www.unesco.org/education/tlsf/mods/theme_a/popups/mod01t05s01.html#pre

biological processes, it is the cognitive re-blending of substrates that innervates our *psychic organs* in relation to processes of exchange between energy and matter in human/global environments.

Manifestos are written in times when individuals or groups directly sense epochal change in many centers of thought. For a new visionary paradigm to become rooted in culture an inclusive and pragmatic vision of human evolutionary adaptation would be required. If divisions of teaching in the Western Academy are starting to fold back on themselves, institutions of secondary and higher education have the opportunity to move onward from epistemological errors of the past. This dissertation has explored those possibilities in several different ways—namely, my recommending an epistemic complementary approach to transdisciplinarity's overarching theoretical model. Though the model emphasizes moving beyond the antagonism of either/or thinking, it hasn't yet identified the inherent, biological source of this perilous conflict.

As a document, the *Manifesto of Transdisciplinarity* serves as a model through which cultural and social institutions may develop co-evolutionary perspectives toward a reasonably sustaining, co-evolutionary worldview. While schools of higher education may continue the study of disciplines, forums for transdisciplinary investigation need to be established. Transdisciplinary leaders need to coalesce scientific and social discussions of human evolution. A forum that addresses human brain and autonomic nervous system dynamics would allow schools to adopt developmental steps specifically attending to a bio-psychosocial-ecological paradigm.[161]

Such calls for developmental neuroscience education are coming from both empirical and contemplative wisdom traditions. For example, agencies like The National Institutes of Health and the Mind and Life Institute (an organization working directly with the Dalai Lama on cross-cultural educational practices) are conducting neural behavioral studies, which will translate, on a more complex level, what it means to be human. Due to these new biological/neural studies, a major achievement of my research may show how a "recursive or ecological epistemology" (Bateson, 1988), is now realizable in academic learning environments. Because we humans evolved, is it not comprehensible that our continued existence requires we take responsibility for developing our potential? Having quoted Teilhard de Chardin at the outset, I rephrase his words in the context of human development. Teilhard de Chardin reasoned that since we humans are aware of our evolution, we are alive to a new dimension that is not a hypothesis, but a condition of all experience. In this dissertation I have attempted to provide what this new dimension of experience amounts to—that is, I have identified what particular experience of *being* evolves human beings.

Viewed through Transdisciplinarity's levels of reality, we as individuals and we as a culture can now attend to an education that strives to build and apply higher-levels of cognitive complexity. This entails not gathering more facts, but finding consilience within the disciplines, which E. O. Wilson called for in 2010. While a unified sense of education's purpose may return to an old teleological debate, science and the humanities together can better understand mind/body complexity when identifying meaningful solutions to complex issues that matter in the world. To this end, school curriculum planners could incorporate co-evolutionary principles in general and human brain and autonomic nervous system functioning in particular.

161 In November 2010, The National Institutes of Health called for a new foundational theory for medicine, based on a bio-psychosocial-ecological paradigm. http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3071421/

A macro-micro scale is best taught through both empirical and intuitive/participatory methods. For example, I have shown that a combined understanding of systems theory with art and environmental design practices, in university settings, establishes how art practices and biological processes may cooperate to raise levels of human perception. Chapter 3 outlined the importance for humans to discover the world of difference between neuroceptions and perceptions. This stage of human development deepens our understanding of involuntary and voluntary, preconditioned and conditioned dynamics. Schools that teach how external sensory experiences relate to internal states of digestion and respiration are needed for human development because, as David Wooten writes, "Much of what motivates us in our decision making and estimation of what is important and true is not rational thought, but reflects much older systems of emotional mentation and protomentation, prototypical of mammals and reptiles" (Wooten, 2008; MacLean, 1990; Porges, 2011). We as humans are not what we think we are, unless we have learned to respond to our mind/bodily based subjectivity.

This form of education emphasizes an experienced self, which is more complex than a explicit/implicit memory of self. It's necessary for humans to know, for example, how an atomistic mindset naturally defaults to a devolving rather than an evolving potential. For all intents and purposes, self-regulation of triune autonomic and triune-brain dynamics need to be taught for the sake of individual growth. Cross-cultural transdisciplinary practices, such as the fields of art and environmental design, are particularly accessible to this co-evolutionary learning capacity because art and environmental design work to synthesize inner and outer connectivity. Given the urgent need for sustainable communities, these fields need to also include developmental steps based on bio-psychosocial-ecological systems.

Because the Transdisciplinarity movement brings levels of reality into scale with three levels of human perception, educators can employ this formal structure when relating innate biological complexity in both an objective/subject context. For example, curricula that emphasizes the epistemic nature of triune systems over dichotomies and other categories of epistemological thought help establish a basis for transforming human potential. As I have argued, for humans to meet higher norms of perception, a new set of questions must be asked in relation to epistemology. Ideally, the Transdisciplinarity movement would bring emphasis on the need for self-knowledge into its epistemological discourse. How will the movement otherwise ensure that we as a culture adapt and evolve our neo-cortical and visceral organs of perception?

As Chapter 2 outlined, an extensive body of empirical evidence exists on the phylogenetic development of Homo sapiens. Since the day of John Hughlings Jackson (who credits Herbert Spencer and Charles Darwin), followed by Paul D. MacLean (who initially worked with James Papez) and now Stephen Porges (who benefited from both Jackson and MacLean) we, as a culture, have known, since 1884, that the source of conflict in humans lies within our innate phylogenetic structure. For humans to evolve they must learn to inhibit their fight/flight reactivity, which naturally predominates given our inherited bicameral ancestry. In relation to Teilhard de Chardin's statement, this is the one fact humanity can no longer afford to overlook, if our species is to survive. Human beings carry the responsibility to understand how their triune brain and autonomic system functions, especially since we have empirical evidence (not just raw data), from the science community.

If constraints on teaching human brain and autonomic nervous system functioning are lifted, co-evolutionary discourse would have a greater opportunity to lift the historically predominating principles of authoritative "divide and conquer atomistic tactics." As the record shows, these predictable outcomes have placed relentless pressure on the

environment and human society. Adopting epistemic measures for participatory practices in education would bring as profound a change to humanity as the Industrial Revolution. On a macro scale, scientists and environmentalists keep careful watch of the universe's clock. On a micro scale, humans must learn how human cognition functions in their being. An epistemic emphasis in schools would address the development of both macro/micro scale as human pro-social potential is a key component for raising co-evolutionary systems thinking.

As I see it, the human dimension is presently the first order of ethical responsibility. The science community plays an important role enhancing both the Transdisciplinarity-ecoliteracy movement by making their long-term findings accessible. UNESCO and CIRET are two forums already established that are well suited for adopting epistemic measures in their charters. A range of embodied practices, which teach humans how to evolve their psychic organs, is the next level of curricula for Transdisciplinarity and ecoliteracy education to achieve. As that happens, we will be liberated from the fear engendered by mechanistic thinking. Methods for supplying human needs, within a desired quality of life, may also then come with much lower environmental impact per individual. In other words, if consilience is a realizable goal beyond disciplines, such an education will produce a broader epistemological transformation in human consciousness—raising humanity to a new level of norms.

Outside the university system, organizations such as The Center for Ecoliteracy (CEL), The Entropy/Consciousness Institute (ECI), and the Center for Force Majeure Studies (CFMS) have demonstrated, through their long-term community outreach programs, how holistic approaches to education attend to sustainable worldview goals. All three organizations began their call to action from a sense of scale and collective recovery from ecological disaster. Each has succeeded in establishing frameworks for a new normative level to take form and practice. CEL teaches systems thinking in relation to participatory actions in the dynamic field of ecoliteracy. ECI teaches adaptation practices, which our three natured mind/body functioning requires in order to endow human consciousness. CFMS has mapped world ocean sea rise that will in the next decade greatly impact ecocivility. Having promoted research and dialogue that incorporates systems perspectives (cellular, biological, socio-cultural and ecological systems) and research methodologies (i.e., first, second, and third-person approaches), their forward thinking leaves a record as to how the gap between academia and real-world applications can be bridged, community by community.

Alongside our ethological past, empirical evidence shows the need for a conceptualization of the implications, which we, as a species, have not yet realized. We instead live by chance and accident, greed and profits, even though empirical knowledge, case studies, and trails of destruction are well documented. We are no longer innocent. The *crisis of perception* Capra announced in 1975 is a natural human crisis—one that is due to the structure of our phylogenetic emergence—one that requires our continued persistence in apprehending the natural laws of our potential evolution. Organizations that assist schools and communities to prepare and adapt coherent systemic evolutionary frameworks can play a role in translating future discoveries in science, art, and environmental design research into curricula.

References

Note on Historically Layered References

Emphasis in this bibliographical section is on layering the references such that the cite date is the date *within the lifetime of the author* when the text was composed (in most cases the original publication date.) Note is made when the actual work cited differs from the primary citation date.

APOSTEL, L. Berger, G., Briggs, A., and Michaud, G. editors
1972. *Interdisciplinarity: Problems of Teaching and Research in Universities* (Paris: Organization for Economic Cooperation and Development).

AUGSBURG, Tanya
2014. "Becoming Transdisciplinary: The Emergence of the Transdisciplinary Individual" in *World Futures* 70 Issue 3& 4, pp 233-247.

ARENDT, Hannah (1906–1975)
1958. *The Human Condition* (The University of Chicago).

BALE, Lawrence
1992. *Gregory Bateson's Theory of Mind: Practical Applications to Pedagogy* [November] (Down'n Out Press, 2000).

BARTOFT, Henri
1996. *The Wholeness of Nature: Goethe's Science of Conscious Participation in Nature* (Hudson, NY: Lindisfarne Books).

BATESON, Gregory (1904–1980)
1972. *Steps to an Ecology of Mind: Collected Essays in Anthropology, Psychiatry, Evolution and Epistemology* (San Francisco: Chandler).
1979. *Mind and Nature: A Necessary Unity* (New York: E.P. Dutton).

BERGSON, Henri (1859-1941)
1907. *Creative Evolution* (tr., Arthur Mitchell, New York: Dover, 1998).

BERTANLANFFY, Ludwig von (1901–1972)
1968. *General Systems Theory* (New York: Braziller).

BOHM, David (1917-1992)
1980. *Wholeness and the Implicate Order* (Boston: Routledge).
1996. *On Dialogue* (Boston: Routledge).

BOHR, Niels (1885-1962)
1958. *Atomic Physics and Human Knowledge* (New York: Wiley).

BRINGUIER, Jean-Claude
1977. *Conversations with Piaget* (Univ. of Chicago Press *tr* 1980).

BRENNER, Joseph E.
2010. "The Philosophical Logic of Stéphane Lupasco" in *Logic and Logical Philosophy*, Volume 19, pp. 243–285.

CAPRA, Fritjof (1939-
1975. *The Tao of Physics* (Boston: Shambhala).
1982. *Turning Point* (New York: Simon & Schuster).
1993. *Guide to Ecoliteracy* (Berkeley CA: Center for Ecoliteracy).
1996. *Web of Life* (NY: Anchor Press).
2007. *The Science of Leonardo* (NY: Anchor Press).
2014. *The Systems View of Life: A Unifying Vision* co-authored with Pier Luigi Luisi (Cambridge University Press).

TEILHARD de CHARDIN, Pierre. (1881–1955)
1951. *The Phenomena of Man* (Harper Perennial; 23rd edition 1976).
1968. *Science and Christ* (New York- Harper & Row).

DA VINCI, Leonardo
1952. *Leonardo on the Human Body: The Anatomical, Physiological, and Embryological Drawings of Leonardo da Vinci* (NY: Henry Schuman) pp. 222, 344.
DAMASIO, Antonio
1999. *The Feeling Of What Happens* (New York: Harcourt).
2010. *Self Comes To Mind: Constructing The Conscious Brain* (Pantheon).
DE FRIETAS, L., E. Morin and B. Nicolescu
1994. http://ciret-transdciplinarity.org/chart.php#en. *The Charter of Transdiciplinarity* Accessed July 20, 2013.
DEWEY, John
1932. *Art as Experience* William James Lectures Harvard (New York: Minton, Balch *repr* NY: Perigee Books, 1980).
DROSTE, Magdalena
1990. *Bauhaus: 1919-1933*, (Berlin: Taschen) pp. 24-32.
EHRLICH, Paul R.
1964. "Butterflies and Plants: A Study in Coevolution" co-authored with Peter H. Raven, in *Evolution*, Vol. 18: pp 586-608.
ETLIN, Richard A.
2000. "Louis Sullivan: The Life-Enhancing Symbiosis of Music, Language, Architecture, and Ornament" in *The Orchestration of the Arts-A Creative Symbiosis of Existential Powers* ed. Marlies Kronegger (Boston: Kluwer Academic Publishers), pp. 165-182.
FAIRLEY, Barker
1957. "Goethe's Last Letter" in *University of Toronto Quarterly*, Vol. 27, No 1, October (Toronto: University Press) pp. 1-9.
GIBSON James. J.
1969. *The Senses Considered As Perceptual Systems* (NY: Houghton Mifflin).
1979. *The Ecological Approach To Visual Perception* (NY: Houghton Mifflin).
GIRI, Ananta Kumar
2002. "The Call of a Creative Transdisciplinarity" in *Futures* 34 Vol. 1 pp.103-15.
GOETHE, J.W. von (1749–1832)
1793. "The Experiment as Mediator between Object and Subject" in *Natural Science in General; Morphology in Particular,* Vol. II, No. 1 (1823).
1820. *Goethe: Scientific Studies* D. Miller, ed. and trns. (NY: Suhrkamp, 1988; reprinted by Princeton University Press, 1994).
1957. *Letters From Goethe* Translated by Dr. M. von Herzfeld and C. Melvil Sym, (University of Edinburgh Press), p. 537.
1948. "Maximen und Reflexionem," No 1061, in *Werke: Hamburger Augsabe*, edited by E. Trunz, 14 vols. (Hamburg: Christian Wegner, 1948-1960, XII514, abbreviated form is used: HA).
1988. *The Metamorphosis of Plants* in Douglas Miller, ed. (NY: Suhrkamp Press).
GREEN, Charles.
2001. "Memory and Ethics: Helen and Newton Harrison" in *The Third Hand* (Minneapolis, University of Minnesota Press), pp. 97-121.
GREENBLAT, Stephen
2011. *The Swerve: How the World Became Modern* (NY: WW Norton).

GURDJIEFF, G.I. (1866–1949)
1950. *All and Everything* (New York: Harcourt Brace).
1969. *Meetings with Remarkable Men* (New York: Dutton).
1973. *Views from the Real World: Early Talks as Recollected by His Pupils* (New York: E. P. Dutton).
1975. *Life is Real Only Then, When 'I Am,'* 1935? (London: Penguin).

GROF, Stanley
2008. *A Brief History of Transpersonal Psychology* in International Journal of Transpersonal Studies Vol. 26 [January] p. 46-54.

HARRISON, Helen Mayer & Newton Harrison (1932 –), (1929 –)
2007. "Public Culture and Sustainable Practices: Peninsula Europe from an eco-diversity perspective, posing questions to Complexity Scientists Structure and Dynamics" Journal (2,3) [online] ed. Douglas R. White. http://escholarship.org/uc/item/9hj3s753
2011. personal (unpublished) conversations [6.12.11- 9.12.12]
2012. "The Harrisons: Talking and Remembering," recorded interview with Peter Selz/Susannah Hays in *Leonardo Journal* Volume 45, Issue 1.
2016. *After 45 years of Working A Force Majeure Becomes Clear: A Counter Force is on the Horizon* (pend. pub. N Y: Random House).

HEIDEGGER, Martin
1971. *Poetry Language and Thought* (NY: Harper Collins)

HOWE, Neil
1991. *Generations: The History of America's Future* co-authored with William Strauss (New York: William and Morrow Company).

HUSSERL, Edmund (1859-1938)
1929. *Cartesian Meditations* trs by Dorion Cairns 1960, (Haag, Martinus Nijhoff Publishers).

JACKSON, J. H. (1866-1911)
1884. "The Croonian Lectures on Evolution and Dissolution of the Nervous System" in *The British Medical Journal*, pp 591-593 and 660-663.
1887. "An Address on The Psychology of Joking" in *The British Medical Journal* October 22nd pp 870-871.
1958. "Evolution and Dissolution of the Nervous System" in: Taylor, J., editor *Selected Writings of J. H. Jackson*, (London: Stapes Press) pp. 45-118.

JAMES, William (1842-1910)
1907. *Pragmatism* (*repr* New York: Longmans, Green and Co. 1946).

JANTSCH, Erich (1929-1980)
1970. *Inter-And Transdisciplinary University: A Systems Approach To Education And Innovation Policy* Sciences (American Elsevier Publishing Company, Inc) p.403-428.
1975. *Design for Evolution Self organizing and Planning in the Life of Human Systems* (New York: George Braziller).
1980. *Self-Organizing Universe: Scientific and Human Implications of the Emerging Paradigm of Evolution* (Oxford: Pergamon Press).

KANT, Immanuel (1724- 1804)
1790. *Critique of Judgment* translated with Introduction and Notes by J.H. Bernard (2nd ed. revised) (London: Macmillan, 1914).
1871. *Critique of Pure Reason* translated with Introduction and Notes by J.H. Bernard (2nd ed. revised) (London: Macmillan, 1914).

KANEKO, Yoshimasa
2003. *Japanese Painting and Johannes Itten's Art Education* The Journal of Aesthetic Education, [Volume 37, No. 4, Winter] pp. 93-101.
2004. *Johannes Itten's Design Education and Japan* Kochi University 2-5-1 Akebono-cho, Kochi-shi, KOCHI, 780-8520, Japan. [April 19].
KUHN, Thomas
1962. *The Structure of Scientific Revolutions* (Chicago: Univ. of Chicago).
KUNZ, Edward, MD
2014. "Henri Laborit and The Inhibition of Action," *Dialogues in Clinical Neuroscience,* Vol.16, No. 1. pp. 113-117.
LABORIT, Henri (1914-1995)
1963. "The Need For Generalization in Biological Research: The Role Of The Mathematical Theory Of Ensembles (Alfred Korzybski Memorial Lecture 1963)" in *General Semantics Bulletin* No. 30 & 31.
1968. *Biologie et Structure* (Paris: Gallimard).
1980. *Mon Oncle D'Amerique* a film directed by Alain Resnais (DVD 2000).
LÁSZLÓ, Ervin (1932–)
1972. *The Systems View of the World* (New York: George Braziller).
2004. *Science and the Akashic Field: An Integral Theory of Everything* (Rochester VT: Inner Traditions).
2008. *CosMos* co-authored with Jude Currivan (UK: Hay House).
LEHAR, Steven
2004. *Gestalt Isomorphism and the Primacy of Subjective Conscious Experience: A Gestalt Bubble Model* Behavioral & Brain Sciences Vol. 26, number 4, pp 375-444, [March].
LINDAHL, Terry (1931 –)
2004. *Logosophy* (San Francisco: Trioctave Editions).
2010. *Signals from the Vegas Gyre* (San Francisco: Trioctave Editions).
2011. *Harmonics of Unity* interview with Peter Selz and Susannah Hays (San Francisco: Trioctave Editions).
pend. *Einstein-Darwin-Gurdjieff: The Trilemma Of Three Brained Beings* (San Francisco: Entropy/Consciousness Institute).
LOHREY, Andrew
1997. *The Meaning of Consciousness* (University of Michigan Press).
MOHOLY-NAGY, Laszlo (1895-1946)
1938. *The New Vision, from Material to Architecture* preface by Walter Gropius (New York: W.W. Norton & Co.).
MARCUSE, Herbert
1964. *One-Dimensional Man* (Boston: Beacon Press).
MARTIN, Agnes
1991. *Writings* (Germany: Cantz Verlag).
MARTINSON, Steven D.
1996. *Harmonious Tensions* (NJ: Associated University Press.
MACLEAN, Paul D. (1913–)
1962. "New Findings Relevant to the Evolution of Psychosenual Functions of the Brain" *Journal of Nervous and Mental Disease* Vol. 135 No. 4 p. 289-301.
1967. "The Brain in Relation to Empathy and Medical Education", *Journal of Nervous and Mental Disease*, Vol. 144, Issue Five: p. 374-382.
1969. "Clarence M. Hincks Memorial Lectures" in *A Triune Concept of the Brain and Behavior*, ed. T.J. Boag MD and D. Campbell PhD. (Toronto and Buffalo: University of Toronto Press, 1973) p. 1-66.

1988. *L. N. Irwin Comparative Neuroscience and Neurobiology* (New York: Springer Science+ Business Media) pp 126-128.
1990. *Triune Brain in Evolution: Role in Paleocerebral Functions* (New York and London: Plenum Press).
1998. *Paul D. MacLean* in The History of Neuroscience in Autobiography Ed. by Larry Squire; Vol. 2 (San Diego: Academic Press), p. 244-275.

MASLOW, Abrahm (1908-1970)
1969. *The Farther Reaches of Human Nature* (New York: Viking).

MERLEAU-PONTY, Maurice (1908-1961)
1945. *Phénomenologie de la Perception* (Paris: Gallimard).

MEADOWS, Donnella
1972. *The Limits to growth: A report for the Club of Rome's Project on the Predicament of Mankind* co authored with Jorgen Randers, Dennis L. Meadows, William W. Behrens (NY: Universe Publication).

MOLESWORTH, Helen
2015. *Leap Before You Look: Black Mountain College 1933-1957* (New Haven CT: Yale University Press).

MOUFFE, Chantal and Ernesto Laclau
1996. *Democracy, Power and the Political* (Princeton Univ.) p. 245-6
1998. "Hegemony and Socialism," ed. by Benhabib Seyla in *Democracy and Difference: Contesting the Boundaries of the Political* [November].
2001. "Hegemony and Socialist Strategy: Towards a Radical Democratic Politics" in *Verso*; 2nd edition [June]
2007. "Artistic Activism and Agonistic Spaces" in *Art & Research*, Vol. 1 No.2

MORIN, Edgar
2008. *The Reform of Thought, Transdisciplinarity and the Reform of the University* in Transdisciplinary Theory and Practice ed. B. Nicolescu, (NJ: Hampton Press) p.23-32. (*trs* K. Voss).

MOROWITZ, Harold J. (1927–)
1968. *Energy Flow in Biology* (Cambridge MA: Academic Press).
1992. *Beginnings of Cellular Life* (New Haven CT: Yale University Press).
1996. "Complex Adaptive Theology" in *Annals of the New York Academy of Sciences*; Vol. 879 [June], pp.122-128.
2002. *Emergence of Everything: How the World Became Complex* (Oxford: Oxford University Press).
2005. "Looking Again at Teilhard, Tillich, and Haugt: Teilhard's Two Energies" in *Zygon*; Vol. 40 No. 3 [September], pp. 721-732.
2012. Harold Morowitz, Terry Lindahl, Susannah Hays (unpublished) recorded interview, [March 15] George Mason University.

NEEDLEMAN, Jacob (1934-)
1992. "G. I. Gurdjieff and His School" in *Gurdjieff International Review*, Fall 1999, Vol. III http://www.gurdjieff.org/needleman2.htm

NICOLESCU, Basarab. (1945–
1987. Moral Project: http://ciret-transdisciplinarity.org/moral_project.php
1991. *Science, Meaning and Evolution: The Cosmology of Jacob Boehme* (New York: Parabola Books).
1992. "Gurdjieff's Philosophy of Nature" in *Gurdjieff: Essays and Re-flections on the Man and His Teaching*, ed. Bruno Panafieu (Paris: Editions l'Age d'Homme *trs*. NY: Continuum 1998) p. 37-69.
1996. *Manifesto of Transdisciplinarity* (Albany: State University of New York Press *trs* 2002). English version of La transdisciplinarité: Manifeste (Editions du Rocher) translated by Karen-Claire Voss.

2002. *Transdisciplinarity And Complexity: Levels Of Reality As Source Of Indeterminacy* Centre International de Recherches et Études Transdisciplinaires. http://perso.club-internet.fr/nicol/ciret/
2007. Transdisciplinarity: Basarab Nicolescu Talks with Russ Volckmann in *Integral Review* Vol. 4; pages 73-90.
2008. "In Vitro and In Vivo Knowledge—Methodology of Transdisciplinarity" in *Transdisciplinarity: Theory and Practice* (NY: Hampton Press).
2010. "Methodology of Transdisciplinairty: Levels of Reality, Logic of the Included Middle and Complexity" in *Transdisciplinary Journal of Engineering & Science* Vol. 1 No: 1 [December] pp. 19-38.
2011. *Basarab Nicolescu and Terry Lindahl* personal (unpublished) interview Paris [December 19].
2014. *From Modernity to Cosmodernity*: *Science, Culture Spirituality* (Albany: State University of New York).

NOË, Alva
2004. *Action In Perception* (Boston: MIT Press).
2009. *Out Of Our Heads: Why You Are Not Your Brain, And Other Lessons From The Biology Of Consciousness* (Farrar, Straus and Giroux).
2015. *Strange Tools: Art and Human Nature* (Farrar, Straus, + Giroux).

NORGAARD, Richard B.
1994. *Development Betrayed: The End of Progress and a Coevolutionary Revisioning of the Future* (New York: Routledge).
2016. "Watch Your Language: Power Words at the Human-Nature Interface" *Earth's Future Journal* Vol. 4. Issue 1; (doi: 10.1002/2015EF000344).

ORAGE, A. R.
1978. *Commentaries on G. I. Gurdjieff's All and Everything*, ed. C. S. Nott, (Aurora: Two Rivers Press).

OUSPENSKY, P.D., (1878-1947)
1949. *In Search of the Miraculous: Fragments of an Unknown Teaching* (New York: Harcourt Brace and World).
1954. *The Psychology of Man's Possible Evolution* (New York: Knopf).

PANKSEPP J.
1998 *Affective Neuroscience: The Foundations of Human and Animal Emotions* (New York: Oxford University Press).

PENTLAND, John (1907-1984)
1997. *Exchanges Within: Questions From Everyday Life Selected from Gurdjieff Group Meetings with John Pentland in California 1955-1984* (New York: Continuum).

PERT, Candace (1946-2013)
1985. "Neuropeptides and Their Receptors: A Psychosomatic Network", with Ruff, M.R., Weber, R.J. and Herkenham, M. in *Journal of Immunology*, 135: 820s-826s.
1997. *Molecules Of Emotion:* (NY: Scribner).

PIAGET, Jean (1896-1980)
1964. "Development and Learning" in R.E. Ripple & V.N. Rockcastle Eds. Piaget Rediscovered: A Report on the Conference of Cognitive *Studies and Curriculum Development* (NY: Cornell University) pp. 7–20.
1970. "Main Trends in Inter-disciplinary Research in the Social and Human Sciences" edited by UNESCO (Paris: Mouton–UNESCO) Chap. 7, Part 1.

1972. "The Epistemology of Interdisciplinary Relationships" in Apostel, L., Berger, G., Briggs, A., and Michaud, G. *Interdisciplinarity: Problems of Teaching and Research in Universities*. (Paris: Organization for Economic Cooperation and Development), pp. 127–139.
1972. *The Psychology of Intelligence* (Totowa, NJ: Littlefield).

PIERCE, Charles Sanders (1839-1914)
c. 1906."*Pragmatism*" in *The Collected Papers of C. S. Pierce* ed. Charles Hartshorne and Paul Weiss (Cambridge: Harvard University Press, 1931-35), Vol. 5. 464-496.
1966. "Values in a Universe of Chance" in *Selected Writings* edited with an introduction by Philip P. Weiner (New York: Dover).

PIQUERAS, Mercè
1998. "Meeting the Biosphere: On The Translations of Verdansky's Work" in *International Microbiol* 1:165-170 (Springer-Verlag Ibérica).

PRIGOGINE, Ilya (1917-2003)
1971. *Thermodynamic Theory of Structure, Stability and Fluctuations* Co-authored with P. Glansdorff (New York: Wiley).
1980. *From Being to Becoming* (San Francisco: Freeman).
1984. *Order Out of Chaos* with I. Stengers (New York: Bentam).

PORGES, Stephen.
1998. "Love: An Emergent Property of the Mammalian Autonomic Nervous System" in *PsychoNeuroEndocrinology*; Nov; 23(8) pp. 837-861.
2011. *The Polyvagal Theory* (New York: W. W. Norton).
2013. The National Institute for the Clinical Application of Behavioral Medicine http://stephenporges.com/images/nicabm_2013.pdf

RAVINDRA, R.
1999. *Heart without Measure* (Halifax NS: Shaila Press).

RATCLIFF, C. Ratcliff, Carter, De Certeau, Michel and Trautman, Ann.
1985. *A Compendium of Possibilities Helen Harrison and Newton Harrison, The Lagoon Cycle* (Ithaca, NY: Herbert F. Johnson Museum of Art).

SALZMANN de, Jeanne (1889 – 1990)
2010. *Reality of Being* (Shambhala Books).

SEAMON, David and Zajonc, Arthur editors
1998. "Goethe, Science, and Sensory Experience" by Herbert Hensel in *Goethe's Way of Science,* (New York: SUNY) pp 71-81.

SELZ, Peter (1919–)
1996. "Installations, Environments And Sites" in *Theories and Documents of Contemporary Art: A Sourcebook of Artists' Writings* edited with K. Stiles (Berkeley: Univ. of California) p. 499-576.
2011. *Harmonics of Unity* recorded interview with Terry Lindahl and Susannah Hays (San Francisco: Trioctave Editions).

SCHRÖDINGER, Erwin (1887–1961)
1944. *What is Life? With Mind and Matter and Autobiographical Sketches* (Cambridge: Cambridge University Press 1992).

SCHWALLER DE LUBICZ, René A. (1887-1961)
1947. *Esoterism And Symbol* (Inner Traditions: VT 1985).

SHUSTERMAN, Richard
2008. *Body Consciousness: A Philosophy of Mindfulness and Somaesthetics* (Boston: Cambridge University Press).
2000. *Pragmatist Aesthetics: Living-Beauty-Rethinking Art* (Rowman & Littlefield Publishers).

SPIEGELBERG, Herbert (1904-1990)
1960. *The Phenomenological Movement: A Historical Introduction*, 3rd ed. 1982, (The Hague: Martinus Nijhoff) pp. 78-80; p. 109.
TART, Charles
1992. "The Dynamics of Waking Sleep" in *Gurdjieff: Essays and Re-flections on the Man and His Teaching*, ed. Bruno Panafieu (Paris: Editions l'Age d'Homme *trs*. NY: Continuum 1998) pp. 116-126.
1975. *States of Consciousness* (New York: E. P. Dutton).
TEILHARD de Chardin, Pierre (1881 – 1955)
1968. *Science and Christ* (New York Harper & Row).
1951. *The Phenomena Of Man* (Harper Perennial; 23rd edition; 1976).
THOMPSON, D'Arcy (1860–1948)
1917. *On Growth and Form* (New York: Macmillan, 1945).
THOMPSON, Evan
2007. *Mind in Life* (Belknap Press Harvard, Cambridge Massachusetts).
TRACOL, Henri
1992. "Let Us Not Conclude: Some Reflections on the Specificity of This Teaching" in *Gurdjieff: Essays and Re-flections on the Man and His Teaching*, ed. Bruno Panafieu (Paris: Editions l'Age d'Homme *trs*. NY: Continuum 1998) pp. 427-430.
VARELA Francisco J., Evan Thompson and Eleanor Rosch
1991. *The Embodied Mind* (Cambridge MA: MIT Press).
VERNADSKY, Vladimir I. (1863-1945)
1926. *The Biosphere* (D. B. Langmuir trans.1997) Annotated Edition. A Peter Nevraumont Book, (NY: Copernicus/Springer-Verlag).
WALKER, Kenneth
1957. *Gurdjieff: A Study of His Teaching* (London: Jonathan Cape).
WHITEHEAD, Alfred North (1861-1947)
1978. *Process And Reality* [Gifford Lectures; 1927-28] (The Free Press).
1927. *Symbolism: It's Meaning And Is Effect* (Macmillan Company).
1929. *The Function Of Reason* (Beacon Press: Boston).
WILBER, Ken
1977. *Spectrum of Consciousness* (Quest Books: Illinois).
1995. *Sex, Ecology, Spirituality* (Boston: Shambahla Books).
WILSON, Edward O.
1998. *Consilience: The Unity Of Knowledge* (Knopf: NY).
WOOTEN, David
2008. *Triune Mind In Semiosis* (VDM: Verlag).

APPENDIX ONE

CHARTER OF TRANSDISCIPLINARITY

Adopted at the First World Congress of Trandisciplinarity,
Convento da Arrábida, Portugal, November 2-6, 1994

PREAMBLE

Whereas, the present proliferation of academic and non-academic disciplines is leading to an exponential increase of knowledge which makes a global view of the human being impossible;

Whereas, only a form of intelligence capable of grasping the cosmic dimension of the present conflicts is able to confront the complexity of our world and the present challenge of the spiritual and material self-destruction of the human species;

Whereas, life on earth is seriously threatened by the triumph of a techno-science that obeys only the terrible logic of productivity for productivity's sake;

Whereas, the present rupture between increasingly quantitative knowledge and increasingly impoverished inner identity is leading to the rise of a new brand of obscurantism with incalculable social and personal consequences; Whereas, an historically unprecedented growth of knowledge is increasing the inequality between those who have and those who do not, thus engendering increasing inequality within and between the different nations of our planet;

Whereas, at the same time, hope is the counterpart of all the aforementioned challenges, a hope that this extraordinary development of knowledge could eventually lead to an evolution not unlike the development of primates into human beings;

Therefore, in consideration of all the above, the participants of the First World Congress of Transdisciplinarity (Convento da Arrábida, Portugal, November 2-7, 1994) have adopted the present Charter, which comprises the fundamental principles of the community of transdisciplinary researchers, and constitutes a personal moral commitment, without any legal or institutional constraint, on the part of everyone who signs this *Charter.*

ARTICLE 1:

Any attempt to reduce the human being by formally defining what a human being is and subjecting the human being to reductive analyses within a framework of formal structures, no matter what they are, is incompatible with the transdisciplinary vision.

ARTICLE 2:

The recognition of the existence of different levels of reality governed by different types of logic is inherent in the transdisciplinary attitude. Any attempt to reduce reality to a single level governed by a single form of logic does not lie within the scope of transdisciplinarity.

ARTICLE 3:

Transdisciplinarity complements disciplinary approaches. It occasions the emergence of new data and new interactions from out of the encounter between disciplines. It offers us a new vision of nature and reality. Transdisciplinarity does not strive for mastery of several disciplines but aims to open all disciplines to that which they share and to that which lies beyond them.

ARTICLE 4:

The keystone of transdisciplinarity is the semantic and practical unification of the meanings that traverse and lay beyond different disciplines. It presupposes an open-minded rationality by re-examining the concepts of "definition" and "objectivity." An excess of formalism, rigidity of definitions and a claim to total objectivity, entailing the exclusion of the subject, can only have a life-negating effect.

ARTICLE 5:

The transdisciplinary vision is resolutely open insofar as it goes beyond the field of the exact sciences and demands their dialogue and their reconciliation with the humanities and the social sciences, as well as with art, literature, poetry and spiritual experience.

ARTICLE 6:

In comparison with interdisciplinarity and multidisciplinarity, transdisciplinarity is multireferential and multidimensional. While taking account of the various approaches to time and history, transdisciplinarity does not exclude a trans-historical horizon.

ARTICLE 7:

Transdisciplinarity constitutes neither a new religion, nor a new philosophy, nor a new metaphysics, nor a science of sciences.

ARTICLE 8:

The dignity of the human being is of both planetary and cosmic dimensions. The appearance of human beings on Earth is one of the stages in the history of the Universe. The recognition of the Earth as our home is one of the imperatives of transdisciplinarity. Every human being is entitled to a nationality, but as an inhabitant of the Earth is also a transnational being. The acknowledgement by international law of this twofold belonging, to a nation and to the Earth, is one of the goals of transdisciplinary research.

ARTICLE 9:

Transdisciplinarity leads to an open attitude towards myths and religions, and also towards those who respect them in a transdisciplinary spirit.

ARTICLE 10:

No single culture is privileged over any other culture. The transdisciplinary approach is inherently transcultural.

ARTICLE 11:

Authentic education cannot value abstraction over other forms of knowledge. It must teach contextual, concrete and global approaches. Transdisciplinary education revalues the role of intuition, imagination, sensibility and the body in the transmission of knowledge.

ARTICLE 12:

The development of a transdisciplinary economy is based on the postulate that the economy must serve the human being and not the reverse.

ARTICLE 13:

The transdisciplinary ethic rejects any attitude that refuses dialogue and discussion, regardless of whether the origin of this attitude is ideological, scientistic, religious, economic, political or philosophical. Shared knowledge should lead to a shared understanding based on an absolute respect for the collective and individual Otherness united by our common life on one and the same Earth.

ARTICLE 14:

Rigor, *openness*, and *tolerance* are the fundamental characteristics of the transdisciplinary attitude and vision. *Rigor* in argument, taking into account all existing data, is the best defense against possible distortions. *Openness* involves an acceptance of the unknown, the unexpected and the unforeseen-able. *Tolerance* implies acknowledging the right to ideas and truths opposed to our own.

ARTICLE FINAL:

The present *Charter of Trandiscsiplinarity* was adopted by the participants of the first World Congress of Transdisciplinarity, with no claim to any authority other than that of their own work and activity.

In accordance with procedures to be agreed upon by transdisciplinary-minded persons of all countries, this *Charter* is open to the signature of anyone who is interested in promoting progressive national, international and transnational measures to ensure the application of these Articles in everyday life.

Convento da Arrábida, 6th November 1994
Editorial Committee
Lima de Freitas, Edgar Morin and Basarab Nicolescu
Translated from the French by Karen-Claire Voss

APPENDIX TWO

THE POSITION OF THE ARTIST
Helen Mayer Harrison and Newton Harrison

A MANIFESTO FOR THE 21ST CENTURY

We, of the Harrison Studio, believe
As do others, although differently
That a series of events have come into being
Beginning in the time of Gilgamesh and before
Beginning with agriculture and the first genetic manipulation
Beginning with culture of animals and ongoing genetic manipulation
Beginning with globalization six thousand years ago with the Salt Route
A little later, the Silk Route
And later and later…
Especially with science informed by Descartes' clock
And with modernity recreating the cultural landscape
And deconstructing nature thereby
From the Industrial Revolution to the present
Until all at once a new force has become apparent
We reframe a legal meaning ecologically
And name it the Force Majeure

We, of the Harrison Studio assert
As do others somewhat differently
That the Force Majeure, framed ecologically
Enacts in physical terms outcomes on the ground
Everything we have created in the global landscape
Bringing together the conditions that have accelerated global warming
Acting in concert
With the massive industrial processes of extraction, production and consumption
That have subtracted forests and depleted top soil
Profoundly reduced ocean productivity
While creating a vast chemical outpouring into the atmosphere
Onto the lands and within the waters
That altogether comprise this Force Majeure

We, of the Harrison studio, are grateful
For the opportunity to join in this perilous conversation
Where the discourse in general
Is about time, money, power, justice, sex, politics
Personal well-being and survival
In many combinations and re-combinations
Attending somewhat to social injustice
And somewhat less to ecosystems' injustice
This discourse points to human consciousness
Every day continuously attending to itself
With little attention paid to that which is not itself
Leading to intrinsic value switched for extrinsic value
With human creativity generating technologies
That appear not to like that which are not themselves
Sometimes becoming the reverse of their original intention

There is modest conversation drifting toward green
As industry and people think about doing well by doing good
Good being green roofs green cars
Green manufacturing processes
Green transformation of material
Green production of all kinds
expanding green markets
Green in everyday life
in the frame of sustainability

We, of the Harrison Studio, assert
As do others, as yet, not many
That in the face of multiple tipping points
Passed and near passed
From CO2/methane to nitrates/nitrites
And more and more
All of these efforts and all of this work
Altruistic from the best of people
Greedy and mean spirited from the worst of people
Is better to be doing than not to be doing
But on balance, insufficient
Endlessly insufficient

The Force Majeure, so obvious, even in the now
Is generating ocean rise
Forcing the ocean's food chains to simplify
Compelling glaciers and snow pack to melt
Creating flood and drought at continental scale
Which is the outcome for rivers
As they flow down through Asia from the Tibetan Plateau
And true for many parts of the Americas

The outcomes for the Peninsula of Europe are unfortunate
The numbers have been crunched
Revealing the trajectory of drought predicted to proceed
From Portugal to the southern parts of Germany and beyond
Reducing 2.4 million square kilometers of farmland
That now feeds over 450 million Europeans by almost a third within 50 years
The population will grow the food supply will shrink
The waters will rise
People will need to move upward
The rich will continue to do well
Not true for the middle class
And devastating for the poor

We, of the Harrison Studio conclude
That a counter force is available
But unless put in place well within the next fifty years
Civil society in many places will experience perturbation then collapse
Keeping company with the ecosystems
experiencing perturbation and simplification

A counterforce that is comprised of understandings
Waiting to be internalized and then enacted