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## In Theory, There's Hope: Queer Co-(m)motions of Science and Subjectivity

Cordelia Sand  
*University of Massachusetts Amherst*

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IN THEORY, THERE'S HOPE FOR THE FUTURE:  
QUEER CO-(M)MOTIONS OF SCIENCE AND SUBJECTIVITY

A Thesis Presented

by

CORDELIA SAND

Submitted to the Graduate School of the  
University of Massachusetts Amherst in partial fulfillment  
of the requirements for the degree of

Master of Science in Geography

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Geosciences

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IN THEORY, THERE'S HOPE FOR THE FUTURE:  
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A Master of Science Thesis Presented

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CORDELIA SAND

Approved as to style and content by:

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Eve Vogel, Chair

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Angela Willey, Member

---

Stuart Kauffman, Member

---

Julie Brigham-Grette, Department Head  
Geosciences

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This thesis is a broad and complex investigation. What follows just scratches the surface, a wisp of a white mark on soft slate, prone to vanish on contact with water. This is a very rough draft of thought on matters I would wish to become ongoing prescient considerations of all of us simple humans. We are miraculously fortunate to only gingerly and contingently experience this elegant life and planet, if only for an awkward moment.

## ABSTRACT

IN THEORY, THERE'S HOPE FOR THE FUTURE:  
QUEER CO-(M)MOTIONS OF SCIENCE AND SUBJECTIVITY

SEPTEMBER 1, 2016

CORDELIA SAND, B.A., NEW YORK UNIVERSITY  
M.S., UNIVERSITY OF MASSACHUSETTS AMHERST

Directed by: Professor Eve Vogel

Given the state of the planet at present —specifically, the linked global ecological and economic crises that conjure dark imaginings and nihilistic actualities of increasing resource depletion, poisonings, and wide-scale sufferings and extinctions—I ask *What might we hope now? What points of intervention offer possibility for transformation?* At best, the response can only be partial. The approach this thesis takes initiates from specific pre-discursive assumptions. The first understands current conditions as having been produced, and continuing to be so, through practices that enact and sustain neoliberal relations. Secondly, these practices are expressive of a subjectivity tied to a Cartesian worldview, which, therefore, needs to be interrupted at its foundational roots. Thirdly, the scaffolding that supports this subjectivity draws on Newtonian science and neo-Darwinian narratives deemed to be natural law and, therefore, ontological, immutable reality. Contrary to modernist thinking, I premise that these two strains, subjectivity and science, are neither autonomous nor ontological, but that they are materially and contingently integral. Finally, this thesis presumes that life-affirming trajectories are, in fact, desired.

An integral framing of science and subjectivity provides a productive method of feminist science studies analysis and theorization. Observing the capitalist Western social imaginary through this lens reveals its philosophical and scientific infrastructures to be outdated and deteriorating. Observing how emerging scientific narratives in quantum physics and systems-biology intersect with marginalized theories in process-philosophy and subjectivity reveals a life-affirming imaginary of difference, one that arrests nihilism and sets ethical trajectories in motion. Certain, though not all, percepts of feminist new materialism engage twentieth and twenty-first century sciences successfully to show that ethicality matters. Though many questions remain, this points auspiciously towards the possibility for a transformed politics of justice.



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## INTRODUCTION

*The whole universe depends on everything fitting together just right.  
If one piece busts, even the smallest piece, the entire universe will get busted.  
Mama, is that you? I've broken everything,  
—Hushpuppie, Beasts of the Southern Wild Motion Picture<sup>1</sup>*

### Preamble

When, following a presentation on the vulnerabilities of transcorporeal bodies to toxic environmental conditions—intubated and bubbled people with multiple chemical sensitivities, dissolving shells of marine life in an acidified ocean— a scholar of 19<sup>th</sup> century German naturphilosophie, questioned the speaker, Stacy Alaimo, on how a feminist post-human materiality committed to a Baradian “ontology” of intra-action and flow arrives “naturally” at a leftist politics and political activism, he was drawing lines in the sand. Her talk chafed against his credo, common to Western philosophy, of the implausible rationality of direct connection between theory on one hand and ethics and enaction on the other. His question intended to challenge, to corner, to diminish, to discount, but he was also mystified, for he could muster no mooring in the feminist logics of embodied experience, and found himself uncharacteristically immersed in a strange and intellectually foreign zone with no handholds, no fixed points, where his terra firma was not, instead it moved and undulated without transcendental idealisms of capital N-Nature and capital T-Truth, where queer desires disrupted purities of what he had always known (expansive, essential, and timeless) but was turning out to be seeming passing straight and narrow and largely blind. And this gave rise in him to anger, to fear, but at what? That was the worst part, at what exactly, I cannot say, he thinks, not even knowing the words of his thinking or the object of his rage, just that curious affective mixed-up rise in the chest that must find form, make sound, aim old familiar words at the “catty and indecorous” to wrest the

rules back to those of his own domain and regain the higher ground of composure, control, and authority and find along with Robert Browning again, that “God’s in his heaven, all’s right with the world.” It’s obvious. It was a rhetorical question. A philosophy of materiality does not and cannot unfold a leftist ethics, he knows-knows-knows this, the *thinking* is wrong, for it is not *thinking*, because it is not logical, linear, and deductive like a mathematical proof, all (w)holes barred. And yet there he was, exiled in an abyss of acid radioactive sea of chalky tests, meant to shelter, but disintegrating.

Stacy Alaimo quickly responded, “I have no idea, but it is already happening in the environmental movement and in community economies.” (February 3, 2014 Rice University).<sup>2</sup> Another chafe! She answered that she takes activism seriously academically, that this as an academic practice has been legitimized within cultural theory, and that citizen science engages the politics and ethics of theory. Plastic, formless matter, inorganic biogenic product of millions of years of sequestered decomposed photosynthetic and marine life, once extracted, cause what could not have been predicted, global toxicities (woops, there is no putting it back in the ground, no turning back, no not breathing its airborne forms, no genetic or cellular isolationism, no absencing corpuscular sentience and systemic learning).

Another lacuna gapes, how do feminist post-human and new materialist projects, which rescript the Western thinking about embodiment and the world in their hopeful envisioning of collective ethical subjectivities, anticipate heading off detractors and attackers on various fronts—intellectual, theoretical, structural, and in praxis? How does this radical feminist vision of life-itself (Life) and Earth and world— however soundly reasoned, evidenced, and inspired—confront thousands of years of dualities, hegemonies and exclusions, kept in place to service a status quo of patriarchal and economic power? Could healing the long genealogy of rifts between body and mind, nature and human, adequately lay the foundation for ushering in a new paradigm of affectively grounded life-affirming political values? Would ridding the Western mind of its

compulsion to predictive certainty and obsession with control ease the terrors and shames of the unknowable and uncertain, and make space for ethical enaction? The response cannot be “I have no idea.” As much as the feminist vision for posthuman and new materialist possibility inspires and makes urgent ecological and economic sense, its hopes must also be strategic and tactical, the project must critically engage what it is up against, ivory tower isolation is no shelter. While I have no answers to these questions in this project, nor do I lay out a war room strategy, it is in the spirit of these framing questions that my project reflects on Western *thinking* itself, specifically to arrive at a deeper understanding of the intaglio of scientific thinking and subjectivity in the early twenty-first century, as if all lives depend on it.

The telling interchange between Stacy Alaimo and the scholar of German philosophy encapsulates scholarly tensions both within feminist new materialisms and over its reception in wider academic circles. Critics of new materialism charge that these thinkers fail to show, as they claim, a natural ‘ontological’ link between its theoretical positions and its politics. The ‘material turn’ in feminist theory has been driven largely, but not only, by literary and cultural theory scholars, and these new materialists do suggest this link, but they largely fail to make their case for reasons I will show. I aim to explain the intransigence of this debate, and make a case for how new materialist theoretical positions, if grounded in particular approaches to science, and differently argued, do incorporate ethicality in a way that directly informs possibilities for a transformative politics.

### **Segue: Defining terms (enaction)**

*I'm recording my story for the scientists in the future.*  
–Hushpuppie

Initially, Francisco Varela explains enaction in the context of bioneurology, “perception and action are embodied in self-organizing sensorimotor processes” (Varela, 1999, p. 15). The

body, environment, and consciousness—defined as sentience and awareness as it arises in the interaction of affect and cognition— act and enact in concert to produce novel functional structures.

...the essence of cognitive intelligence...*resides only in its embodiment.*  
When cognitive intelligence is approached from this self-situated perspective, it quickly becomes obvious that there is no place where perception could deliver a representation of the world in the traditional senses. The world shows up through the enactment of the perceptuo-motor regularities (Varela, 1999, p. 59, italics in the original).

Varela here rejects the common view in science and philosophy that ‘nature’ or the ‘world-out-there’ can be represented as one objective reality, a theme also central to fifty years of social and feminist scholarship of science. Varela later develops his earliest strictly science-bound concept of enaction to an expanded sense of enaction as skills-based radical embodiment, whether political, scientific, economic, etc. The delicacy of his stance relates to embodiment. Enaction is a cognitive function of embodied entities living in a ‘context’ (its environment), but, as he emphatically makes clear, the enactive dynamics of radical embodiment are not transferrable to how social systems—which are not autopoietic (living biological entities)—function or should be modeled. Enaction is a cognitive function of the embodied subject, not to be confused with agency. While there is advantage in a metaphoric application of autopoiesis and enactive cognition for understanding the interactions of social and living systems, that is quite different from engaging biological science as a social model.<sup>3</sup> Social living for Varela is a product of epistemology, which is itself a form of enaction, it brings into being forms of social living, and, on that ground, epistemology matters politically. (Protevi in Clarke & Hansen, 2009) By extension, because epistemology is a cognitive function of embodiment, the body, too, is a political event. Enaction projects a subject’s worldview onto a world that responds, and, in a reciprocal dialogic ricorso, subjectivity responds, but its form is not one of call and response. The form of enaction is engagement, improvisation, and emergence (bringing forth).<sup>4</sup> There is no



linearity or cause and effect, there are no hard borders (and thus no categories or binaries), no telos. What emerges does so by virtue of interactive energies without definable origin, cause, or source. Enaction may be envisioned as a dance, not a choreographed dance but a structured improvisation by subject(s) and world, the dance arises as an emergent property that is the whole of the motions of “a network of interactions of components” (Maturana, Varela, & Uribe, 1974, p. 187) “without discrete origin or finite goal” (Angerer, Bosel, Ott, & Gatens, 2014, p. 251).

### **Dear Reader**

This project aspires to be an experiential read, somewhat out-of-the-ordinary. Accordingly, I invite you to adjust your stance as a reader, to rest from disciplinary academic critique, and to suspend expectation, even disbelief. I echo Gibson-Graham in inviting you to read for “difference rather than dominance” (2006, p. xxii). The technique of reading for difference has a number of effects. It produces “interventions that unravel and dissolve this structural power, imagines specific and yet context-shaping dynamics, and enlarges the space of agency of all sorts of actors – noncapitalist as well as capitalist, disorganized as well as organized, non-human as well as human” (2008, p. 626). It produces recognition of the always already diverse, and, by bringing together things from different domains, it “excavates”, “spawns” and “proliferates” possibility (p. 625). Gibson-Graham’s technique of reading for difference borrows from Bruno Latour’s “learning to be affected” rather than to critique (2010, p. 322). I have attempted to embrace these approaches myself in the writing of this project, rather than challenge arguments (which I also do) I pay attention to patterns, I notice errant capillary variations on dominant themes, and wonder about them. Questions emerge not necessarily to be answered but to orient inquiry. The contemplations of this paper cover a large and broad swath of time and themes, it necessarily moves loosely and necessitates a similar looseness in its reader, some give, much like

the tolerances a builder leaves between the meeting of planes, gaps that make space for tools and fingers to twist and shape and create, gaps for coming back later for repairs and changes.

Dynamic interdependence defies precision and requires a bit of mess.

Another invitation for my reader is to go with the jumps and transitions and gear shifts as one might read a poem. The sequence of chapters and their internal organizations might be read as sequences of verse, and to grasp the meanings of the whole demands of its reader to leap alongside the writer. My aim is to evoke in my reader a fresh imaginary, one decoupled, for a fleeting moment, from the 'Cartesian-capitalist' worldview, one that leans into 'bringing forth', inspired by insights of feminist new materialisms. If successful, I see this experiment in reading as a resource for political hope in the confrontations with the global violence being done economically and environmentally to wellbeing. The text on these pages is no more than tactic in a strategy to tease out surprise, to shine a light on what we know and see nothing known. I invite you to take the space . . .

... quiet

... breathing

... and, then, proceed

with imaginative, inquisitive engagement as we 'learn to be affected' together.

## Framing the Context

*Everything is part of the buffet of the universe.  
Anyday now, fabric of the universe is comin' unraveled,  
ice caps gonna melt, water's gonna rise, and  
everything south of the levee is goin' under.  
Y'all better learn how to survive, now.  
—Bathtub Teacher*



Figure 1. Scylla, daughter of Poseidon. She was a many-headed, tentacled monster who fed on passing sailors in the straits between herself and Charybdis.  
Figure 2. Charybdis, daughter of Poseidon. She had once been the beautiful daughter of Poseidon, but she stole some of Heracles' sheep, causing the angry Zeus to turn her into a monster.

### Scylla and Charybdis

Stemming from the social relations and conditions of the nineteenth and twentieth centuries organized around capitalism, anthropogenic harm to the planet proceeds with gruesome alacrity. Unlike at the turn of the twentieth century, humans now understand the myriad anthropogenic violations perpetrated on ecological interdependencies, to such an extreme as to render imaginable and certain the unimaginable, that given its present trajectory, Life, Earth, and humans hurtle towards a pyrrhic *Homo sapien* victory that annihilates that on which many species

depend, and in so doing, also gives witness to its own self-annihilation. This auto-immune behavior refutes any vestigial credibility of the economic axiom of the individual as a rational actor of his own self-interest. Alternatively, these path-to-extinction energies might be analyzed as group selection— a darkly ironic manifestation of altruism played out on a planetary scale, either a Gaian event or, perhaps, some supreme extreme Malthusianism. The twentieth century planet, as an epiphenomenon engaged by humans empirically, experientially, rationally, materially, and affectively, is at stake. The scientific uncertainties surrounding the present and imminent quotidian betrays (or befits) the rapturous promises of capitalist mythologies. An affective subtext, ranging from desperation, urgency, poignancy, exasperation, anxiety, and denial to hope and possibility suffuses multilogues about power, the posthuman, globalization, critiques of capital, embodiment, and the politics of knowledge. Earth provides habitus for much more than the human, a fact that serves to erase the legitimacy of myopic anthropocentric orientations.

A critical social theory asks why hunger, poverty, and other forms of human, animal, and planetary suffering persist despite the technological and scientific potential to mitigate or eliminate them altogether. Seeing freshly, seers abound. According to Theodor Adorno, the root cause lies in how capitalist relations of production have come to dominate society as a whole, leading to extreme, albeit often invisible, concentrations of wealth and power (1973). This nexus of production and power, he states, prevails in an exchange society. In this kind of society, nature as a static given obscures social relations, which, according to Donna Haraway, congeal into decontextualized things-in-themselves (1991). A capitalist exchange society is constructed on a philosophy that insists on misunderstanding relational processes as fixed, simple abstractions (1997), or as Alfred North Whitehead would attribute the error, on the fallacy of misplaced concreteness. This confusion, perhaps conveniently intentional, is not only philosophical, but at the turn of the millennium fundamentally both scientific and ethical.

### **Framing the context: Science**

Relativity and the quantum era have not yet manifested in fundamental change to the social imaginary; paradigmatic intellectual change at the hands of science last happened in the seventeenth century when Copernicus reversed the places of the sun and the earth and Galileo substituted motion for rest as basics in physics. At this particular temporal moment, the ecological, environmental, and biological/genetic sciences have re-described nature as resource-limited, non-linear, messy, and leaky. Advancements in evolution theory and physiology since Darwin have dispelled myths of autonomous individuality and essentialism, replacing them with narratives of emergent and interdependent self-organizing systems that explain and are explained by autopoiesis, symbiogenesis, hybridities, chimeras, cellular biology and genetics, the maintenance of an unlikely atmospheric composition, ocean pH, Earth. “Nature hates a purity” (Margulis aphorism, personal communication). Paleontologists, climatologists, earth and life scientists have redefined brinkmanship according to the limiting parameters of Holocene systems of Earth and life, and they have waved the Anthropocene warning flag, a term of coterminous power and vulnerability that ironically matches human immobilization in response, marking the challenge that accountability presents for our species.<sup>5</sup> We know now what was not known at the turn of the twentieth century, or at mid-century, that the environmental conditions on Earth that make life possible are regulated by living systems, and that life and the environment co-evolve. We know from Darwin that forms of life evolve from other forms of life as fit to environmental conditions, and that Life and matter become other than they once were, these stories of evolution and Earth history are endless. We know that individual protists, plants, animals, and fungi are in fact living co-evolving communities of multiple cell types and bacteria that function indivisibly as an ensemble. Physics and complexity theory have undone certainty, revealing that claims to ‘know’ merely feign false arrogance, while also opening ‘reality’ to contingency and the poised realms of possibility at the edge of Chaos. With the collapse of the

guiding authorities of certainty, rationalism, and reductionist science, what's left is a realm of questions, liminal zones of Life and not-Life without clean boundaries or entire edges. We have learned that categories don't hold up, they dissolve and leave in their wake an affective, becoming-in-community; nature is anything but fixed, but it opens possibilities for actuality if conditions are favorable. Quantum 'reality' with its dark matter, dark energy, quark theories, Higgs boson, etc. is totally different from the 'reality' of 1900 or 1960. We also now understand that Life and environment, as familiar to us now, are at risk of collapse caused by anthropogenics-who-know-better. The paradigm change in science is indisputably well underway, a new set of references re-orient Life and its productions as emergent properties of a historicity, one that becomes in natureculture-context-matter community –contingent, wildly exceptional, and hardly expected.

It is the disjuncture between the above given 'state of affairs' in the social order of advanced capitalism and the above given 'state of affairs' in science that contextualize and premise the political question that motivates my project– *knowing and accountable to all of that, what next?*

**Segue: defining terms (science, imaginary, social imaginary)**

I address 'science' as a particular narrative structure that tells the tale of a modern, Western inquiry-driven practice that constructs particular sorts of knowledge about the objects it studies. It observes, measures, experiments, interprets, and communicates in specialized, discipline-specific languages. Science, for this project, is a highly structured way of thinking and doing, one that has its own history, philosophy, and communities. Applied, it affects all facets of Western worldview, subjectivity, and social life, as well as all facets of Life and Earth systems.

The social imaginary, as theorized by Cornelius Castoriadis, is constituted of an animating web of meanings that “permeate, orient, and direct the whole life of the society” (Castoriadis & Curtis, 1997, p. 7) and of bodily individuals. They form a 'magma' of social

imaginary significations, such as spirits, gods, God; citizen, nation, state; commodity, money, capital; taboo, virtue; thing, tool. The feature that classifies these items within the magma of the social imaginary is that they are posited through creation, and not through the “rational” or “real.” What Castoriadis presents that translates to my meaning of the imaginary in this project is the immediacy of connection between the social imaginary and the human imaginary, tethered by subjects who “are what they are by virtue of [embodiment and] the social imaginary significations that make them that” (Adams, 2014, p. 71). My meaning of imaginary in this context has nothing to do with ‘fictitious’, it has to do with the imaginary as the ‘open interval’ (see Method section of this introduction) that produces the subject as a body, and as a socially defined individual, and as affective (see below), these misleadingly separate phrases in fact describing something heterogeneous and indissociable. The materiality of the imaginary shapes the subject. I follow Castoriadis in his attribution to the imaginary of a capacity for reflectiveness and of will (desire), as a source of creation that ultimately leads to enaction. The imaginary is the initiating source of political enaction:

One must be able to imagine something other than what is to be able to will; and one must be able to will something other than what is to liberate the imagination. ... When one does not will anything other than what is, the imagination is inhibited and repressed; in this case it only represents the eternal perpetuation of what is. And if one cannot imagine something other than what is, every “decision” is only a choice between possible givens—given by life as it existed beforehand and by the instituted system—which can always be reduced to the results of a calculation or some form of reasoning (Castoriadis & Curtis, 1997, 160).

Recent and present history presents horrific cases of the social (political) institution eradicating the last traces of subjects’ secular desire (will of one’s own) and reflectiveness. Castoriadis sees reflectiveness as a key creative project of human subjectivity, to make and challenge itself and, since the social imaginary and subjectivity connect directly, the world brought forth in ‘worlding’<sup>6</sup>. In the absence of engaged and reflective subjectivities, states Castoriadis, “not only

does every attempt at truth and knowledge collapse but every ethical effort disappears, since all responsibility vanishes” (1997, p. 169). Subjectivity and the social imaginary each frame the other, through stories told and experienced, through personal meanings and those structured in social conditions. These narrations function as myth, engaging metaphor to make sense of the world, to make and change (and resist changing) knowledge. For these reasons, the subject imaginary is also the battleground of propaganda and marketing, of military and religious training, of economic coercions, it is a target of persuasion tactics, and so it can be or be made to be vulnerable and shut down. I engage the imaginary of Castoriadis’ vision, the one that questions conditions and laws of closure, and that initiates ethical enaction.

### **What my project does.**

#### **Knowing and accountable to all of that, what next how?**

Similar to how the mechanistic, teleological thinking of 19<sup>th</sup> century science imprinted the 20<sup>th</sup> century social imaginary (Goldman, 2008), the temporal lag between the process thinking of uncertainty and contingency that 20<sup>th</sup> century scientific revelations engender and their as yet largely absent expressions in a revised social order has generated a political and social vacuum where fools and techno-capitalism rush in. How would a different social imaginary, grounded by and inspired by current scientific understandings of Life and Earth, bring forth a world we might hope for? What collective imaginary provokes a subjectivity that makes space for the possible and enacts conditions for ethical practices? Of course, that question embeds its reciprocal, what subjectivity provokes a collective imaginary that makes space for the possible and enacts conditions for ethical practices? I am interested in ethical enaction as a political and transformative strategy, and in the use of narrative and metaphor as one of its tactics.



## **In the literature**

Political and ethical questions of memory and desire have been the mainstay of feminist science studies that focus on critiques of androcentric scientific knowledge used to legitimate social atrocity, and racial and gendered subjugations. Feminist scholars in the humanities and social sciences currently celebrate a ‘new’ and ‘post-human’ thinking beyond binaries, beyond nature-culture (J.K. Gibson-Graham, Vicki Kirby, E. Wilson, Haraway), borne, say more feminist theorists affiliated by a loosely categorized scholarship of ‘new materialism’, which re-conceives matter and bodies (living entities) not as tethered by binaries and essentialized within hard edges and entire boundaries but as ‘vibrant’, ‘becoming’, ‘transcorporeal’, ‘nomadic’, ‘intra-actively entangled’ and transtemporal (Bennett, Grosz, Alaimo, Colebrook, Braidotti, Barad). Issues of subjectivity formation as social and political construction is well-worn feminist territory; a vantage that uses social and political conditions of capitalism as ways to read subjectivity are also present in the literature, but less so (Stengers, J.K. Gibson-Graham, Haraway, Braidotti). Seldom, however, do the literatures of science studies and the philosophy of science cross-pollinate in feminist literatures on subjectivity (at the micro-political scale), while holding a critique of capitalism and the political at center. This is the intersection within which this project works, and I follow Haraway, Barad, Braidotti, and Varela, each of whom put their em-phá-sis on a different syl-lá-ble of the science-social-subject triad.

Epistemological analysis by feminist scientists and scholars of science from Sandra Harding to Evelyn Fox Keller to Donna Haraway and Karen Barad have rightly situated scientific knowledge claims as bearing responsibility, as accountable to the world. With the social relations of science closely yoked to sustaining the power and profitability of global and American capitalism (Werskey, 2007), some material feminisms respond by addressing political change through subject politics. “We need to devise new social, ethical, and discursive schemes of

subject formation to match the profound transformations we are undergoing. That means we need to learn to think differently about ourselves” (Braidotti, 2013, pp. 11-12). The literature of feminist new materialisms extends deeply, and unfolds robust visions and epistemological arguments for those visions, but once it gets to a certain point it stops, failing to ask the “*what, then?*” question, by what pragmatics might visions be made actual and what are they up against? One exception is the academic-activist work of the community economies collective organized around the economic geography scholarship of J.K. Gibson-Graham, and my project is largely inspired by their affective politics of the ethical subject as an intervention on capitalism, however, their project’s focus targets *economic* subjectivity and practices, while I invert that, my project’s focus targets *subjectivity*, the stories that narrate the subject’s and the collective imaginary of Life and Earth, which bear directly on well-being.

**Ricorso: What my project does (asks questions).**

What narratives of what science, then, move subjectivity from affirmative, hopeful theory to strategy and useful tactics, or are we lost? This project interrogates science, in order to re-think its possibilities for a twenty-first century world. What is an affirmative and hopeful politics of the subject up against? What tools are there to use? I claim that questioning the Earth can tell us about the social and the subject, in that it allows us to reflect on how we imagine and question the Earth and cosmos, and to observe how we respond to those questions. As social beings, we question and respond to what we have brought forth and, therefore, to what we are accountable.

**Framing the context: Science as iterative narration**

Wetland ecologist Erik Kiviat’s large study of the New Jersey Meadowlands wetlands restoration project found profit-driven corruption by the academy, NGOs, and political institutions writ large on the landscape of the restoration project. His research as an ecologist and

botanist also found that one taxon does not predict another at any scale. These two facets of his findings, the one experiential and the other ‘hard’ science, demonstrate how teleological and taxonomic thinking, which characterizes both conventional science research and the subjectivities of advanced capitalism, both produces political and economic corruption and is inadequate as an epistemology for explaining ecosystem function. According to science historian Steven Goldman, the contemporary knowledge problem in science over the ontological divide between experience and objective ‘reality’ (the world-out-there) has its roots in the origins of Western philosophy, namely the war between the Gods and the Earth Giants. The Gods are represented by the eternal, good, and just of Platonic realities, and Earth Giants, as represented by the Sophists, are experiential, uncertain, contingent, and particular. This battle over Greek rationalism gets perpetuated in the ambivalences within the scientific community, even as the rhetoric of the community acknowledges its own temporal character, that science is never *done*. To resolve this dilemma, Goldman, drawing on John Dewey, suggests that experience is the “greatest warrant” for both, experience is literally about a “world out there,” which he calls actualities (‘reality’ being too controversial and emotional a term) *and* all experience is uncertain and particular. We don’t experience *necessity* or *certainty* or *truth* or any other intellectual construct. Science— as the *only* truth— cannot be defended, and the same applies to other ‘truth-telling genres’ such as religion, or social construction, or philosophy, etc. No theory ever achieves the status of empirical fact. Science is continually changing at the levels of data, physical instruments, analytic and conceptual tools (Heisenberg used matrix algebra to inform relativity theory), assumptions (e.g. definitions of the atom or matter), and theories. Scientific changes are unpredictable (Kepler did not anticipate Newton, who did not anticipate Einstein, etc.). He underscores Mary Hesse’s dictum that we need to keep in mind that the theories we hold to be true are just as likely to be falsified in the future as the theories that have been falsified up to the present. The overriding message is that claims to scientific knowledge are always influenced by the collective process and

language by which it gets produced, and is always corrigible.

For all these reasons that Goldman articulates, I concur that one of the keys to understanding science as a knowledge-making practice is an understanding of the logics exposed by the history of science, as was the focus of William Whewell, Thomas Kuhn, Marjorie Greene, Lynn Margulis, and many feminist science scholars. The history and development of evolution theory and its progeny, cellular genetics, for example, provide a series of narratives about how humans think about Life, and how lives live with other lives. Evolution tropes— survival-of-the-fittest, descent by modification, competitive struggle, symbiogenesis, inheritance of acquired characteristics, self-organization, emergence— become the descriptive metaphors that saturate political perceptions of whether, what, and why choices and possibilities of Life do or do not exist. These narratives, moving through the imaginary, shape social relations and conditions. What is at stake in scientific method, then, in its premises, assumptions, and expectations, is fundamentally a way of being, the kinds of people we want to be, and the ways we live (Addelson, 1994).

Science provides but one of many stories, and its mode of deductive reasoning obscures its temporal and corrigible character and fosters false expectations,<sup>7</sup> such as for precise certainties relating to the future mechanisms, temporalities, and manifestations of global climate change, or the laboratory synthesis of oil from synthesized bacteria, but, Goldman states, it may be one of the best tools available for dealing with the mysteries and vicissitudes of experience. As much as my project draws on Goldman's scholarly observations about science and society, it lands on one critical disagreement with him. I passionately object to his absolution of scientists and the scientific community from political and social accountability for their work, he places that responsibility instead on an informed democratic citizenry, and in the same breath agrees with the Aristotelian notion that human action is non-rational. Goldman's position does not hold up. Erasing the feminist science literature altogether, this position of his, in odd contrast to many of

his lectured arguments, represents what this project tries to move on from, an outdated and fictitious perception of science that pre-emptively sanctifies its working community with an innocence from social and political influence. Given corporate and state sponsorship of academic scientific research and its commercial applications, given competitive funding and publishing pressures and the risk of skewed and negative results, given that capitalism produces subjects driven by growth and profit motives, and given the uninformed citizenry of an undemocratic American society, Goldman's political stance dangerously obstructs engagement and accountability.

**What my project does (asks questions and makes claims).**

Science incompletely shapes meanings; something is missing. Though, on the largest of scales, scientific knowledge may be considered as one kind of metaphor we use to make sense of the world, the discourse of hard science does not trade in metaphor, and it is metaphor that functions as the catalyst that makes possible shared meanings and imaginaries. If a re-oriented science is to ascribe meaning, to engage and be accountable, then a revised approach to the practice and function of science can no longer pretend to exile metaphor. But do we expect scientists to also be poets? This thesis treats science as narrative, and attempts to weave a story of meanings from scientific theories of embodiment and subjectivity, and therefore my project is also about making metaphor, and never about ontology.

I show how the ethical takes on a scientific materiality that cannot be quarantined from processes of unknowing and a generative world. Can methods and practices and players of a scientific inquiry based on deductive reasoning alone explicitly incorporate ethical accountability into their methods? In other words, can a science based on an Enlightenment ideology, ruled by its conceits of explanatory power, predictive success, and control of nature, accommodate non-

Euclidean insights about nature and reality made since the early twentieth century, or has the time come additional tools for needed for doing science?

This project attempts to imagine what it might be to rethink science in ways better equipped to deal with the mess, confusion, and relative disorder of current global economic and environmental challenges.<sup>8</sup> The phrase ‘better equipped’ refers to the reductionist scientific research methods characteristic of the Enlightenment which seek the definite, and, according to Law, have produced a nature in the image of its limiting methods, because linear determinate thinking and methods fail to capacitate understanding the ‘natural’ world. Though scientific methods, “orchestrate themselves hegemonically into purported coherence” (Law, 2003, p. 6), they cannot describe the complex, impossible, and almost unthinkable world that exceeds our capacity to know it. Law asks how are the social sciences– and I amend this to ask of all the sciences – to represent mess, the “deliberate imprecision ... of private emotions that open us to worlds of sensibilities” (p. 3), what I describe as the realm where affect and sentience and surprise connect in all-of-a-sudden, creative, and indistinguishable ways that elude definition and direct verbal articulation. I look at the interplay, at the co-(m)motions of science and subjectivity, to question the status quo of dominant scientific practice and ways we think about scientific knowledge claims and how those claims imprint subjects. I make a case for demanding a broader epistemic and ethical accountability from the informing and, regrettably, discrete hard and soft science disciplines.

### **Framing the context: Science in terms of the social**

Advancements in science lead slowly to changes in thinking and the collective imaginary; early twentieth century scientific insights have yet to find their analogues in a cohesive new worldview, though as Alaimo points out, as do J.K. Gibson-Graham, there are rumblings in the jungle from ubiquitously dispersed radical environmental and economic movements. Resurgent

faith movements, climate change denial, political and economic opportunism of environmental disasters, and creationism evidence that the former, unquestioned social authority of science has been lost. Is it, perhaps, because the ‘new’ science is contingent, probabalistic, interdisciplinary, and too complex for confident assurances of simple teleologies? Is it because the W.E.I.R.D.<sup>9</sup> mentality of 19<sup>th</sup> century science still prevails to legitimate imperialistic “benefits from atrocity”(Dimock, 2012, p. )? Astrophysics professor Adam Frank observes that in current society, “it is politically effective, and socially acceptable, to deny scientific fact” (2013, p. A27). Referring to the lack of collective consensus and political action on climate change, Slavoj Žižek quotes environmental writer Ed Ayres,

We are being confronted by something so completely outside our collective experience that we don't really see it, even when the evidence is overwhelming. For us, that 'something' is a blitz of enormous biological and physical alterations in the world that has been sustaining us (Ayres, 1999, p. 141). ... In order to cope with the threat, our collective ideology is mobilizing mechanisms of dissimulation and self-deception up to and including the direct will to ignorance (Žižek, 2012, p. 997): ‘a general pattern of behavior among threatened human societies is to become more blinkered, rather than more focused on the crisis, as they fall’ (Ayres). Catastrophic, but not serious .... (Žižek).

Though academic and science communities retire former ‘truths’ when, as Kuhn, observed, anomalies aggregate sufficiently to displace previous ‘knowledge’ with new knowledge, the rate of social change, while directly connected to the scientific, moves independent of revisions in thinking within scientific communities. Even as ‘reality’ may be fundamentally changing for some, dominant inertias persist, inside of which different realities and imaginaries gestate, foment; latent energies find ways to push cracks wider, possibility is actual, that the implicit may transform into the explicit. Bacterial symbionts bring forth the chimeric eukaryotic cell (symbiogenesis). Hybrids, like *Geosiphon periforme*,<sup>10</sup> cyborgs, and the reproducing *Mycoplasma mycoides*,<sup>11</sup> transect biological and technological kingdoms. These gaps

lacunas, foster both creative tension and opportunity to influence the kind of paradigm shift inevitably underway. Rationalism's hard line that had delineated ontological separation between self and other gets blurry. It turns out that what is Life and what is not Life is not so clear-cut; making sense, a new and different sense of these animations demands that humans re-think and re-know life all over again, a project that is as political as it is scientific and technological.

The intellectual legacy of science in the Euclidean-Cartesian-Newtonian-capitalist worldview functions rhizomatically,<sup>12</sup> its reach extends from its origination centuries ago to twenty-first century subjects. This worldview, explored in greater depth in Chapter 3, dominates early twenty-first century Western notions of success and power, and consequently, leaves the larger structures of the neoliberal world bereft of effective means to address the crises it generates. These structures socialize the populace, who in turn are deprived of tools to avert the certain catastrophes at which their trajectories orient. Historically, extinction is a relatively recent concept, it hasn't sunk in; this controversial revelation is at odds with the still-active 19th century understanding, as an example, that *species* are fixed, eternal, and immutable entities of nature. A worldview so enmeshes its subjects as to render its calamitous normativities invisible and without hope for escape, this is the Foucaultian disciplinary power of hegemony that a radical science and politics of collective well-being exposes and destabilizes.

### **More Pre-Discursive Givens (philosophical ricorsos)**

Against this backdrop, and within its context, germinating in relatively obscure niches of the history of natural science and philosophy, another enmeshed narrative quietly unfolds<sup>13</sup>. Going against the reductionist grain of their Cartesian / teleological counterparts, scientific and philosophical energies surface which are based on process thinking that builds on contingency, relations, indeterminacy, and sentient experience. This minoritarian narrative, explored in Chapter 4, also constitutes a legacy that the late twentieth century inherits, however nascent and scattered.



It finds new form in some ideological structures of late 20th century science, philosophies of science, and feminist critical theory. Accordingly, I pay attention in Chapter 5 to the historicity of concepts that posthuman / new materialist discourse (they are not synonymous but there is significant overlap) puts forth, because ideas come from somewhere (e.g., see Chapter 4), and significantly, the social and intellectual context of a particular scholar or philosopher gets embedded in the meanings of his (the usual gender) ideas. Periods of history engender particular affects. When relocated to new theory, the idea's initial import, as well as the thinking style and conditions that originally contextualized it, continues to reverberate in the meanings of its new engagement. The originating philosopher's mark remains a presence critical to the locus of its new life (e.g. Hegel in Žižek, Spinoza's monism in Braidotti's new materialism), requiring a scholar's sensitivity to the former setting and disciplined practice in its re-engagement.

**Segue: Defining terms (affect / affective).**

The “affective turn” has proliferated a great deal of literature exploring the connection between affect and politics that cuts across post-structuralist, materialisms, and technology and media studies thinking, initially re-energized, perhaps, largely by a conversation between Brian Massumi and Eve Sedgwick in the early 1990s. But times are different now. Inspired by Francisco Varela's neurobiological explanation of cognition, I locate affectivity in the autopoietic flux of the organism.<sup>14</sup> I understand thinking and feeling and creating as affective practices. I reject the Massumi/Sedgwick framing splits between experience and processes of materiality, between perception and experience, between sensation and sentience, between sentience, cognition, and consciousness, between affect and emotion. Instead, I engage affectivity in this project more in the interest of what affect does politically and less about what affect is (Bargetz, 2014, p. 302), although I like Kathleen Stewart's open-ended understanding of affect as “individual and collective forces that have gathered to a point of impact to instantiate something”

(as cited in Bargetz, p. 302). Brigitte Bargetz distinguishes between a “politics of feeling” and “*feeling politics*” (italics in original) to “make explicit how power and politics materialize affectively within subjectivities and everyday practices and, therefore, how they affect political agency” (Bargetz, 302). Mark Hansen’s material approach to affect effectively, for me, pulls together my affinities with Varela and Braidotti, that affectivity is “the fundamental mode of operation of the energetico-material universe in itself” (and of experience in individuated living entities)... Affectivity, in short, is the relational force of process as such” (Hansen in *Timing of Affect*, 86). I pay attention to affect, as one element of materiality by which to reflect on imaginaries and subjectivities that either impede or potentiate meaningful interventions and destabilizations to hegemonic practices of neoliberal power.

**Ricorso: what my project does (makes claims).**

I argue that these perpetuated inflections (monism) in newer theory (new material feminisms) by its old meanings, associations, and affects risk sustaining the very conventions that ‘posthuman new materialisms’ wish to end, and, rather than lending support, they serve to undermine important projects. I claim that an open interval directly connects scientific thinking with subjectivity and operates through the imaginary, both of the subject and the social. I take the imaginary seriously as that which generates and challenges processes of ethical subjectivity and power. This space is, therefore, a fiercely contested political site. Discourses in support of what Hannah Arendt called the ‘love of the world’, however, are not enough to effect fundamental political change. Visionaries of new theoretical models of ethical subjectivity must also think strategically, and in terms of tactics and trainings.

How we think and imagine and act on this connection between science as narrative and subjectivity affects (pun intended) lives and environment, and, therefore, demands ethical accountability. This feminist critical theory looks at the processes by which subjects are

“environmentally based, embodied, embedded, and in symbiosis with each other” (Braidotti, 2011, p. 92) and reflects qualitatively on the politics and poetics of these inter- / intra-actions. I explore how dynamic, process understandings of science and subjectivity matter in a feminist politics that aspires to the transformation of planetary productions of inequality and toxicity through ethical relations of collective care and well-being.

**Segue: Defining terms (subjectivity, politics, poetics, and ethical)**

Subjectivity is a process of materiality, an epistemological, not ontological, process of the imaginary. It is a dynamic, constantly becoming embodied relation to, in, by, of, and with worlds, it references the subject’s experience, actions, narratives, the social imaginary, and discourses that generate and are generated by the subject, inclusive of worldview, affect, beliefs, and desires. The subject enacts. Enaction is affective. Rosi Braidotti carries subjectivity further, to mean the historically contingent “conscious, willful form of political resistance” (2011, 157).

To build a theory of subjectivity specific to my project, I follow Francisco Varela’s lead, starting with his concept of the autopoietic, enactive entity and of cognition, which is topologically connected (see Method section of this introduction) to Lynn Margulis’s concept of symbiogenesis and to quantum notions of consciousness; drawing on Varela, Margulis, and others, I re-orient a material meaning of ‘self’ (or ‘subject’). I then layer this with J. K. Gibson-Graham’s politics of affect. These foundations provide for an enriched understanding and critical analysis of subjectivity in Braidotti’s critical theory of the posthuman, zoe-nomad. It requires all the chapters of this paper to construct this palimpsest of subjectivity, to allow the foundational ideas to be explained, contextualized, and built up. It comes together in the end in Chapter 5.

It is this extensive and politicized feminist sense of an expanding subjectivity that I look at in conversation with sciences and scientific thinking. I call the reciprocal dynamics between science and subjectivity, each already independently dynamic on their own terms,

‘co-(m)motions’, full of contingent, unpredictable, improvisatory movement that generates pattern and shape.

By politics, I mean the space of tension in the development of ideas and practices that impact collective life, a space open to deliberation and questioning and struggle in working through choices, innovations, transformations, practices, and reproductions. Gibson-Graham write that “politics is a process of transformation instituted by taking decisions in an undecidable terrain” (2006, p. xviii). Effects of anything that affect others, Life and Earth, as such are, thereby, political and demanding of ethical accountability, such as knowledge.

By ‘poetics’ I mean structures and points of view. I apply the term to science as a way to look at it in terms of narrative function and metaphoric devices that provide a way to interpret science and its history qualitatively. Qualitatively framed, it becomes possible to look at science as operating in the imaginary and at its discursive strategies. By looking at science as a poetics, it becomes possible to question and re-narrate scientific thinking, its practices, findings, and effects, its subjects, its social context, and its scientific objects.

To explain what I mean by the ethical, here I simply follow Gibson-Graham, “ethics is the continual exercising in the face of the need to decide, of a choice to be/act/think in a certain way. Ethics involves the embodied practices that bring principles into action” (2006, xxviii). By this definition, ethics is active; like a verb, it moves, as in its own motion and as in other things. It does things in a context of relationality, like thinking, feeling, writing, and creating, becoming with others. In these ways, the ethical is closely tied to affect, with the added action of decision making in the face of choice for a “certain way”. The ethical, then, in the context of post-Cartesian process and new materialist thinking emerges, it is brought forth through skilled practices. The ethical, then, is not a feature of dogma, command, control, or power-over, it is a feature of possibility.

## The Stakes

*If you can fix the broken piece, everything can grow right back.  
It didn't matter that the water was gone.  
Sometimes you can break something so bad that it can't get put back together.  
When you're small, you gotta fix what you can.  
Everybody loses the thing they're made of.  
That's even how it is in nature.  
—Hushpuppie*

The question of how to enact ethical becoming-in-community gets much attention from practicing Buddhists Francisco Varela, a scientist, and J.K. Gibson-Graham, feminist economic geographers. They are theoretically joined by feminist theorists committed to an unknowing that fosters a collective well-being by relinquishing control and committing to processes of emergence. Nothing could be less Cartesian, less Kantian. There are many forces that resist these directions. If cultivation of ethical subjectivities that resist a dominant context of advanced capitalism's "blissed-out, techno-sublime euphoria" (Haraway, 2004, p. 324) is serious, then theory and possibility alone, while constituting a necessary form of activism on their own terms, are insufficient and lack tools to generate fundamental social change. A counter-hegemonic politics of possibility necessarily invites and engages struggle; to effect new and particularly visioned subjectivities requires skills, training, and assessment;<sup>15</sup> as a social movement it must prepare strategically and enact tactics, however unconventional and resourceful these may be. The initiative must be deeply informed about the thinking behind what it takes on, what it is up against.

One presenting challenge is the politics of a global response to climate change, for example, what imaginary does the subject's attachment to life and extinction get measured against, 3.5 billion years of life on Earth, 600 million years of eukaryotic life, or a few human lifespans? Each of these possibilities shapes a response to the driving anthropocentric desperation that, perhaps, in the grand scheme, 'my life' may mean nothing? Humans are not so wise – "Next time no big brains" (McHarg, 2005) – we will not be here forever. From a posthuman Gaian perspective, that

human life has no more meaning than the life of an amoeba is not necessarily highly threatening or a source of terror. Living, then, in relation becomes a matter of ethics. I propose that there is value in mobilizing a deep time perspective to look at narratives of past crisis, change, and emergence that arrive at current and foreseeable Earth conditions and social relations. The natural sciences constantly reveal realities-out-there that surprise and exceed our capacity to imagine (Levin, 2014).

### **Motion**

From the perspective of geologic time, *Homo sapiens* occupy a momentary blip of time, yet the change to planetary conditions proceeds at an unprecedented, anthropogenically-induced exponential rate, too extreme to remain within the set points (or ‘tipping points’) by which life regulates environmental conditions conducive for life, and too rapidly for co-evolutionary processes, by which Earth and life systems produced over a span of 3.5 billion years the planet as we now know it, to adapt. How and why these pieces –Life, Earth, geosphere, biosphere, noösphere (see Chapter 2)– move potentiates radical forces and energies. In the current quantum age, both science and subjectivity are in rapid motion. I am interested in how we, as Western subjects, might choose to embody these transitions. A response to the ‘what next’ question hangs on affect.

If we accept, as I suggest in this project, that we may now be enmeshed in a transition away from a fundamental set of dominant paradigms, then we understand that we are living within the cracks and fissures of an historical transformation; this may be a threatening place of terminal fear and it may also be a space of creativity, a place of temporal/ spatial gaps from which shadow stories, new meanings and possibilities come to light.

### **What my project does not do.**

Outside the scope of this project is an envisioning of what a radical revolution to the Western imaginary might look like. While the abstractions I outline in this project deserve translation to strategic practices and tactics, I get as far in this project as to provide a context for this next phase. I do not make claims as to what might be the skill-set of this new imaginary, or where such skills and practices that would cultivate or (re)train subject imaginaries might already be modeled. Nor do I make claims as to how a change from marginalization to substantive power might come about temporally (saltation, gradualism, catastrophic, etc.), materially (activism, violence, attrition, collapse, emergence, etc.), or affectively. I make no claims of *how* a new subjectivity might perform new social conditions, or be performed by new political practices of ethical secularity and difference. Transformed social realities are not to be defined in advance, only might emerge from conducive, fostering conditions.

I hope that issues I identify here may be explicitly interrogated and leveraged in work that recognizes various praxes that develop skills of a new subjectivity, such as those exemplified by alternative community economy practices, the young farmer movement, environmental activisms, and the training of fine and performing artists, that these might become more effectively and meaningfully interconnected in strategic and skilled movements. Conceivably, an exploration of this phase of the project could follow later! Accordingly, I stay with the co-(m)motions between science and subjectivity as a politics and philosophy with critical effects, to which feminist scholarship is particularly qualified to advance.

## Methodology

*Oil rig ferry driver: Want a chicken biscuit? It's good for ya'.  
I've been eating these all my life. I keep the wrappers in the boat  
cuz they remind me who I used to be when I eat each one.  
The smell makes me feel cohesive.*

*Hushpuppie: I want to be cohesive.*

John Law's description of the goals for alternative methodologies initiate from his premise that method is performative, it enacts and produces realities, and so he addresses both their process and politics:

Other possibilities can be imagined, for instance if we attend to non-coherence" (2004, p. 85). The task is to imagine methods when they no longer seek the definite, the repeatable, the more or less stable, when they no longer assume that this is what they are after (p. 6). ... We need to unmake our desire and expectation for security (p. 9) ... to find ways of living with uncertainty... ways of making methods without accompanying imperialisms (p. 12).


Law romanticizes in theoretical sloppiness, overlooking the performative problems he creates by dividing method, defined by him as the 'enaction of boundaries', from the emergence of 'realities of presence, manifest absence, and Otherness'. Ultimately his slippery and imprecise language cannot support his arguments, and though, in contrast to a premise of my thesis, he separates relational assemblages from materiality, his objective to foster politically responsible imaginaries elucidates my goals. In this project I experiment with two separate but, nevertheless, paired qualitative methods of my own invention, which I engage as a particular approach to re-narration that, I hope, accommodates movement, unknowing, and uncertainty. I call these two methods topological and technê.



## Topological

I borrow ‘topological’ from the mathematics discipline, but put it to conceptual use metaphorically, dictionary defined as:

to·pol·o·gy

/tə'päləjē/ 

noun

1. **MATHEMATICS**  
the study of geometric properties and spatial relations unaffected by the continuous change of shape or size of figures.
2. the way in which constituent parts are interrelated or arranged.  
"the topology of a computer network"

Figure 3. Definition of topology

While I embrace both meanings metaphorically, the specific reference to patterns of computer and artificial intelligence networking has no application within my use of the term. To explain how I engage topology as a methodology in this project, I begin from an elementary description of its mathematical meaning. In a topological imaginary, if a cube gets pulled askew, it is still a cube, a sphere that gets dented, twisted, or deformed is still a sphere. A circle is topologically equivalent to an ellipse, gender differences would be topological equivalences, too. Topological edges and points, whether in two dimensions or three, potentially, may be flexibly defined, variously constituted, and multi-functional, depending on the shared features that contextualize an entity's structure and relations. Depending on the situation, light behaves either as a wave or a particle. The bioluminescent endosymbiont *Vibrio fischeri* mimics moonlight in dark waters to mask the shadow of the night-feeding bobtail squid, *Euprymna scolopes*, from shadow-seeking predators, the same endosymbiont's luminescence in the fish *Monocentris japonicus* functions to attract mates. The bacterium's systems of quorum sensing (bacterial cognition) allows *V. fischeri* to recognize whether it is in the open sea waters, inside the *M. japonicas*, or inside a light organ

of the bobtail squid, and its behavior changes accordingly. Topology is always, necessarily about interrelatedness.

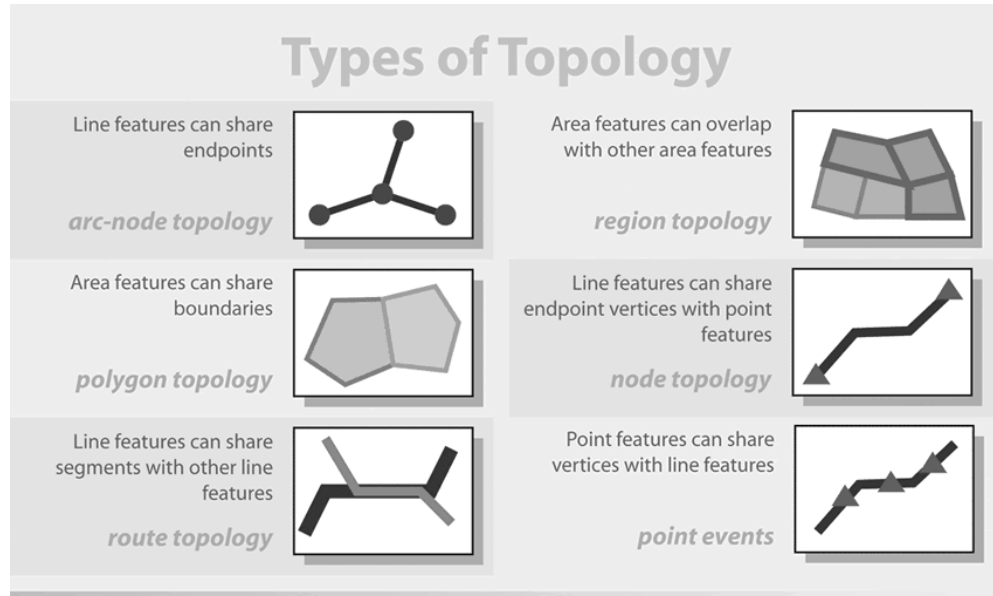


Figure 4. Types of topology.  
<http://www.esri.com/news/arcnews/summer02articles/summer02gifs/p1p2-lg.gif>

A strip of paper with its ends joined with a twist becomes a Mobius strip, two planes becomes only one continuous surface. But it does have edges. A three dimensional Mobius with no edges is a Klein bottle, the inside is the outside, a form with no volume. The marketing brochure of the Acme Klein Bottle Company calls it "the finest closed, non-orientable, boundary-free manifolds sold anywhere in our three spatial dimensions".<sup>16</sup> Not being a mathematician, following is the description of topology from Wolfram Math World:



Figure 5. Klein bottle. image credit: Torolf Sauerman, Bathsheba, Satgnu: darkroastedblend.com

Topology has to do with the study of spatial objects such as curves, surfaces, the space we call our universe, the space-time of general relativity, fractals, knots, and manifolds (which are objects with some of the same basic spatial properties as our universe), phase spaces that are encountered in physics. ... Topology can be used to abstract the inherent connectivity of objects while ignoring their detailed form (Weisstein, 1999-2016).

One of the ways topologies may be built up is from open intervals, the space between  $a$  and  $b$  that does not include its end points  $a$  and  $b$ :

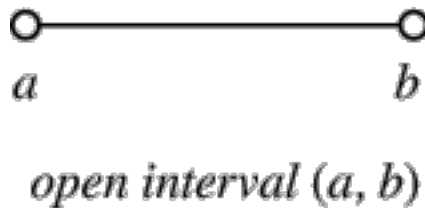


Figure 6. Open interval.

An open interval is an interval that does not include its end points (Weisstein, 1999).

To me this concept is significant in providing a conceptually clear tool for focusing on the gap as a material potentiating space of change and innovation, of epigenetic sentience and regulation, of consciousness, of synaptic leaps, of creative enactions liberated from (un-anchored by) node-

centric thinking.<sup>17</sup> It is not Bergson's or Massumi's temporal, affective space. I think of the open interval as a phase space or as Kauffman's space of the poised realm of the adjacent possible (to be explained later), and as Vico's chaos (explained in Chapter 4), and as the empty spaces for breath and juxtaposition and complexity by which poetry structures and evokes its can't-be-put-into-words meanings. The open interval is the realm of limitless possibility that pre-exists actuality. For my methodological interests, then, topology is about the connectivity of qualitative properties and characteristics across spaces (inclusive of temporalities) and their inter-/intra-relationships.

I engage this topological method by analyzing qualitative traits, both descriptive (e.g. deterministic, conflicted, iconoclastic, linear, diffractive, patriarchal, minoritarian, conforming to dominance, unpredictable, etc.) and affective (e.g. melancholic, hopeful, anxious, caring); noting these, I observe the patterns they form as a sort of connective (or disconnective) tissue across the organs and fluid systems and skeletal structures of thinking about biosphere, noösphere (explained in Chapter 2), and geosphere, and across the historicity of living / once-lived / and to-be lived bodies. As a method, topology allows for porosity, layering, a closure that is open (or v.v.), for paradox and self-dilation, for interaction, for motion.

### **Technê**

My second methodology, *technê*, the Greek word translated usually as 'craft' or 'art', works in tandem with my topological method.<sup>18</sup> In this project I engage one specific mode of *technê*, weaving, as a process to assemble and pull apart identified topologies in order to create something new, a life-affirming ethical subjectivity, and/or deconstruct something old, Cartesian-Newtonian thinking. This methodological weaving, as *technê*, draws metaphorically from the literal practice of the craft, the skilled process that makes (poiesis) one fabric from many disparate threads in science, philosophy, and feminism.

Technê is the know-how (as opposed to knowledge, in this case the topologies) that brings into existence products separate from the technê itself, the carpenter builds a table, the weaver makes a cloth. As a methodological technique technê breaks down the divide between theory ('theôria'-looking) and practice, to dismiss from right out of the gate any pretense to value-free philosophies of knowledge and reality. While my project finds problems with the teleologies and binaries of hegemonic Western thinking that were seeded by classicism, I find Aristotle's sense of technê in the Nichomachean Ethics, the praxis (or action) that deals with change and everyday contingencies, and Plato's sense of technê, that which accounts for and seeks the welfare of its object, to be consonant with a contemporary feminist politics of care and well-being that places value in what gets brought into existence, whether that be the health of humans or animals, laws for the ethical governance of a city, or a garden. From technê, something advantageous to collective well-being emerges. Technê refers to the achievement of a skill that gets taught and practiced. My engagement of this concept as a feminist methodology by which to evaluate contemporary contexts and possibilities allows me to identify ethical enaction as an embodied and skilled form of materiality. I incorporate in my methodological precept of technê what the Stoics integrated into the concept: technê expresses and generates feelings that lead one to act, and to be held accountable, and so technê deals with the subject's affect, described by Zeno as, for example, the love of music and the arts. Technê is the skill that makes possible creating and innovation. For Zeno technê represented the "systematic collection of cognitions unified by practice for some goal advantageous to life" (Stoicorum Veterum Fragmenta I, 73). Plotinus develops Zeno's affective technê further, similarly found in process thinkers, as the capacity to enact paradox, the skill of blending contrasting elements of the universe, commonly practiced, as Plotinus notes, in dance, music, drama, and as I note in Chapter 4, in Vico's Chaos. As a topological trait, paradox characterizes Karen Barad's onto-epistemologies (Chapter 4),<sup>19</sup> Francisco Varela's autopoiesis and 'ethical know-how' (Chapters 4 and 5), Rosi Braidotti's zoe-

nomadic subjectivity (Chapter 5), and quantum physics. (Newtonian physics works, but the more accurate quantum physics proves energy and matter to be controvertible.) Transecting the chapters of this project, I intend the reader to follow such tropes as paradox, monstrosity, tensions, affect, motion, and bringing forth.<sup>20</sup> These form the long threads of material for this weave, that in its weaving traces rickshaws, layerings and knottings that lengthen, fold back, repeat, change, and which, along with unravelings, mark new patterns, new fabric in the becoming of shifting topologies, like Penelope at her weaving and unweaving to stave off the offending, predatorial interests and effects of a too-long patriarchy.

### **Motion**

The methodological pairing of topology with technê reveals movement and energy, creative-unchoreographed-emergent-observable motions. If one imagines this dance of rhythms and events placed on a proscenium stage, observed against a backdrop of chronological moving images (in reverse) of the historicity of the moment, patterns emerge that inform a task of this project, the political and ethical radical act that asks, *how and why do we come to know, and by what worldview?* How different was the male bourgeois subject of Victorian England (Darwin) from a Žižek or a techno-savvy American urban millennial? How different was the planet Earth in 1950 from Earth in 2015? The atom in 1900 was a very different particle from the atom after the Higgs boson. Genetic determinism as understood in 1960 bears little resemblance to the understandings after 2000 of the cellular mechanisms of genetic modification by either epigenetic processes or laboratory synthesis. Tensions between convention and change characterize transition, and the old adage—the more things change the more they stay the same—shows up. Craig Venter, credited as the inventor of a bacterium with a computer-synthesized genome, exemplifies neo-Darwinism taken to a digital extreme; frighteningly, he defines Life as “DNA software-driven machines” (Freeman, 2013). This we know not to be true, life is not a machine,

but myths retain great power long after their origination. Stuart Kauffman points out we will need new myths, new narrative resources, new imaginaries.<sup>21</sup> Ultimately, transformations of the imaginary change social and economic conditions, and in another grand ricorso change subjectivities. These dynamic timespace topologies between context and entity equally pertain to the micro-political level of the affective subject. Such transitions, though, are not neat or necessarily permanent.<sup>22</sup> As research methodologies, topology and technê may be engaged as tools in the navigation of the perilous, life-threatening channel between Scylla and Charybdis,<sup>23</sup> between environmental and economic cataclysms, between neoliberal utilitarianism and patrimonies of power.

### **Picking a course between Scylla and Charybdis**

*Hushpuppie (in chair next to oil rig ferryman, looking out at the gulf):*

*Which way we goin'?*

*Ferryman: It don't matter, baby.*

*This boat'll take you exactly where you need to be.*

*It's that kind of boat.*

A self-reflexivity that considers *How and why do we come to 'know' what, and by what worldview?* opens space for ambiguity, flexibility, complexity, and for changes to worldview. Such curiosity drives the spirit, if not the practice, of scientific, philosophical, and feminist inquiry. Serious attempts to respond to the question immediately render disciplinary divides between politics, science, philosophy, feminism, and art moot, and inevitably break with the norms of institutionalized academic inquiry, for the discursive productions that result can only be unwieldy and incomplete, and these traits certainly characterize this project. My retort, however, is that large questions still need to be asked, and the judgmental expectations of academic convention, which effectively serve to sanction reductionist inquiry, must be resisted, however partial and incomplete the product. Large questions lead to expansive and interconnected

discourse, which in a frame of feminist desires gives access to and hope for fundamental change to normative Western subjectivities.

Much like sending a stone (flat, weighted, edges soft and rounded, slate is best, not larger than your loosely cupped hand, not too small) jettisoning across a vast liquid plane, a large flat plane-of-immanence lake just after a hard rain, skipping first in large leaps, progressively smaller, until it just skims along the surface tension, then appears to float momentarily before it gently sinks from view, I have had to pick my narrows to manage broad dangers. Because my incentive is to study the co-(m)motions between science and subjectivity as a matter of political and ethical significance, even as a process of materiality, I steer clear of psychoanalytic and psychological dimensions of subjectivity in my analysis. This choice has caused me to steer clear, as much as is feasible, of post-structural thinkers, because the “linguistic turn” of this ‘school of thought’, which privileges language over embodiment, draws directly on psychoanalytic theory and on the metaphysics of representation and the sign, and in so doing reinforces a gendered Cartesian split I don’t accept, namely between body/substance and mind/thought/form (in word as deed). This means that I do not take the path of Althusser, Lacan, Freud, Saussure, Butler, Sedgwick, Irigaray (less post-structural as essentialist), Grosz, and Elizabeth Wilson. And while Vicki Kirby positions her arguments about the body as framed to enable possibility and to deny such discrete splits (nature/culture, matter/representation, self/other), her allegiance to a Saussurian post-structuralism leaves her in the awkward position of having to modify metaphors of the body as inscribed by culture by inverting the claim, presenting an awkward pseudo-biological metaphor that flesh and matter speak to us (Kirby, 1997). I reference J.K. Gibson-Graham more for their attentions to the politics of affect in cultivating post-capitalist ethical practices than for their post-structuralist positioning in, for example, performativity. The post-structural privilege given to verbal text necessitates the wearing of blinders that channel and center its academic gaze on humans, leaving thinking about the subject and Life as all life entities, as the phrase ‘more-than-



human' suggests,<sup>24</sup> corporeality, and the non-verbal as remainders relegated to the margins, to the effect of constraining the imaginary within anthropocentrism; the human, like the sun, centers others' orbits. While a full evaluation of human subjectivity could not be complete without an acknowledgement of the psychoanalytic, many scholars do this work, and I needn't. Additionally, I have intentionally steered clear of what is also important work that focuses on the co-(m)otions between technology, specifically, and subjectivity, and the related cyborgian, formalist, and computational questions that go along with this. Luciana Parisi does this well. She argues based from her sophisticated understanding of computational algorithms to make claims congruent with what I argue here about uncertainty as a material space of possibility for political change.<sup>25</sup> The stakes for my project concern planetary processes of Life, in its broadest conceptualization, from bacterium to complex eukaryotes. While technology and Life admittedly are neither functionally discrete nor autonomous, the field opens a vast forum of investigation that is also already done well by others, setting it aside allows me to constrain my thematic focus to matters of Life, which at this point in the history of science and technology, according to the definition of Life that autopoiesis provides, computers and laboratory syntheses are not.

Another criteria by which I have limited my scope in order to make a point, is that I am primarily concerned in this project with pursuing questions of Life, materiality, and subjectivity as framed by the philosophy of science and science, as opposed to by anthropology, sociology, political philosophy, cultural studies, and contemporary literature. That, too, is well-covered terrain by the impressive likes of Myra Hird, Butler and Grosz (again), John Protevi, Carey Wolfe, Claire Colebrook, and Vicki Kirby (who also grounds her work in psychology). This does not mean that I reject the relevance of the concerns of such disciplines, and I especially embrace the qualitative emphasis of these modes of inquiry, and I find they importantly contribute to a re-conception of what science does, only that a focus on their literatures would hijack and confuse my look at the generation and assimilation of narratives from the history, philosophy, and

practices of science. That said, to emphasize the contemporary political relevance of my topic, I do engage the work of interdisciplinary scholars whose works transect critical, philosophical, scientific, and feminist scholarship in critiquing capitalism and/or locating affirmative, embodied and embedded political possibility. After all the filtrations mentioned above, the primary models I engage come from Giambattista Vico, Charles Darwin, Francisco Varela, Lynn Margulis, Stuart Kauffman, Suzanne Langer, Karen Barad, and Rosi Braidotti. I also take great fun in using the Hegelian Slavoj Zizec as my poster child of affective despondency and *Waiting for Godot* that the conventions of three hundred years (minimally) of patriarchal capitalist domination produce. By setting these limiting parameters, my project becomes not as unwieldy as it might at first seem. Surely I have missed some critical contributors and threads [I still need to incorporate Sara Ahmed], and simply chosen not to take on others,<sup>26</sup> in the way fine silk textiles in India or fine Turkish rugs might leave sections of its base fabric unadorned, imperfections are expected and obligatory.

### **What my project argues.**

*This's the most important thing I can teach y'all.  
You gotta learn how to take care of people  
smaller and sweeter than you are.  
—Bathtub teacher*

I argue that, having debunked the myths of objectivity, the legitimacy of patriarchal power, rational individualism, and the divine exceptionalism of the human (a euphemism for the white European male), we need to reinvent science and discover for the first time secular thinking. Current planetary conditions mandate that scientific practice come out of its reclusive refuge in the timelessness of solitary confinement and acknowledge its relationality and embeddedness in a complex, embodied world. Knowledge, being of, by, about, and in the world, is inherently political, it has real effects in the world and on others, and so all knowledge

obligates accountability. The ethical is at the center of, entangled in, knowledge practices. This premise of feminist epistemologies exposes the thinking of the scholar of German naturphilosophie looking for a linear deduction that would legitimize feminist theory of materiality (he used the same argument to object to Barad's argument for an ethical politics), as archaic, patronizing, defensive in its offense, and melancholic<sup>27</sup> about the obsolescence of intellectual power structures that had 'brought him forth'. One of the most salient and to-be-celebrated properties of science as a discipline, irrevocably established by Thomas Kuhn, is that scientific revolutions reflect and generate fundamental changes in worldview and philosophy and change how worlds get lived. Acknowledging that we may be in the midst of some sort of transition, a quantum/techno-scientific revolution, contemporary debates about embodiment, subjectivity, life-itself, and materiality are not idle concerns of the elite, but integrally entangled, politically prescient practical issues.

### **Outline of thesis to come**

*I see that I'm a little piece of a big big universe and that makes things right.  
When I die, the scientists of the future, they're gonna find it all, they're gonna know.  
Once there was a hushpuppy and she lived with her daddy in the bathtub.  
—Hushpuppy*

I observe stories told by the interaction of science and worldview, which reveal patterns not only of domination but also of radical possibility for change to Western subjectivity and its collective imaginary. To contrast the modern tale of Cartesian dichotomies and teleologies, I also trace patterns that reveal a paradigmatic move in the offing, one that moves toward self-organization and possibility, a shadow story that is rich in political possibilities for gathering a movement that resists economic hegemonies and environmental utilitarianisms integral to advanced techno-capitalism. Tracing these stories is useful for making sense of current

conditions, processes, and hopes, and sheds light on how the historicity of contemporary energies either inspire or immobilize, depending on which narratives incite what actions.

Chapter 1, *Why Žižek Is Miserable and Rosi Is Not*, establishes the significance of affect and intellectual moorings to a subject's worldview. By contrasting Žižek with Braidotti, I emphasize the subject's imaginary as a critical site of political contestation. At issue in the contrast between these two subjectivities are very different narrations of how imaginaries of life and materiality interconnect to either foster or foreclose political possibility. At stake are the human praxes that such opposing subjectivities confer, which make critical differences to a planet in crisis as inscribed by twin anthropogenic events, ecological and economic.

Chapter 2 *What is Earth?* looks more closely at these stakes in scientific terms of the planet as a scientific object of study, as a system of systems that provides the habitus of life-itself. This chapter responds to the question, *What is Earth in the twenty-first century as a scientific object of new and politicized knowledge practices?* as simultaneously a question of science, subjectivity, the imaginary, and ethics. I connect the systems-thinking by Vladimir Vernadsky (biosphere, geosphere, noosphere), Lynn Margulis (Gaia, symbiogenesis), and Francisco Varela (enactive cognition) to the embodied process feminisms of Alaimo's transcorporeality, Baradian intra-actions, and Haraway's beings-as-relatings. The intended function of this chapter is to contextualize the need for an expanded imaginary of the planet, and to deepen an understanding of the interconnections at play in articulating the stakes of a Western subjectivity incited to account for a human ethics of life and planet.

Kant asked, *what may I hope?*, and this question frames the explorations of Chapters 3 through 5. In Chapters 3 and 4, *Memory I and II*, I look separately at two opposing scientific/philosophical genealogies of a contemporary Western subjectivity: the organizing premise of the first is that science narrates subjectivity, the premise of the second is that subjectivity narrates science. The first, Chapter 3, focuses on the philosophical assumption of

telos as the expression of a patriarchal and deterministic worldview tied to Cartesian-Newtonian convention; the second, Chapter Four, uses the trope of Vico's Chaos to trace an anti-Cartesian minoritarian thread of process-thinking. These two orientations set the stage for my analysis in the last chapter of recent feminist (mostly) scholarship on science and subjectivity as mattering political hopes.

The merger of Enlightenment science with Cartesian rationalism in the 17th century continues, in my opinion, to narrate the contemporary "genetic social imaginary," a phrase used by Sarah Franklin (2000) to describe advanced capitalism and its Western subjects. Chapter 3, *Memory I: The Monster in Our Midst, science narrates subjectivity*, looks at the historicity of what I see as explaining this contemporary immobilization. To make this argument I put Kant and Darwin in conversation on the topic of telos. I show two things simultaneously. I show that the dogmatic precepts and qualities of monotheistic church power were merely appropriated by the men and institutions of so-called secular science, and, secondly, that these constraints imposed a great weight of social normativity on Kant and Darwin, to different effects. In the end, Kant got stifled and Darwin broke free, but neither Kant nor Darwin resolved what for them was an a priori dichotomy of reason and the imaginary. While the dominating charismatic of monotheism remains a monster in our midst, and largely explains what an alternative politics is up against, Darwin's contributions to scientific thinking may be just coming into focus.

Because of the negative effects associated with the subject positions produced by the Cartesian/ rationalist/ reductionist genealogy of the genetic social imaginary, process thinkers prior to the late-20th century attract renewed attention. Chapter 4, *Memory II: Vico's Chaos* looks back to a counter-hegemonic memory that contrasts the tale told in Chapter 3. With the displacement of telos and objectivity by process and engagement, whole new approaches to science open, other worldviews are made possible, and subjectivity, in the not-always explicit richness of its social, cultural, political, and gender attachments, narrates scientific inquiry.

Understanding life-itself, the imaginary, cognition, and experience as embodied processes of materiality fundamentally affects subjectivity. I negotiate this vast terrain thematically by using Vico's science of history, the Ricorso, like Ariadne's thread to guide a way through crosscurrents of chaos, myth, the social, and the scientific in an Other twentieth century subjectivity.

Chapter 5, *Desire: The Queer Co-(m)motions of Science and Subjectivity*, puts into conversation new work in theoretical and evolution science and feminist theories of matter and subjectivity. These are not distinct one from the other. The theoretical constructions of new materialist feminisms articulate new understandings of matter and politicized visions of subjectivity, drawn from Memory (the contrasted thinking styles, telos and process, presented in the previous two chapters) and from more recent scientific and technological developments, in imagining the bringing forth of an Other and ethical world / planet. After introducing new thinking in science, I look at how the works of scientists and theorists Varela and Barad illustrate a very different paradigm in which scientific understandings of 'natureculture' inextricably entangle the social and the subject. Rosi Braidotti explores from her perspective as a critical theorist the political implications and possibilities of this radical change to the imaginary through a focus on her theory of nomadic subjectivity. I review and critique Braidotti's work in light of her aspirations for new materialist feminisms as a political project of transformation within academia and for subjectivity in an era of advanced techno-capitalism.

## Notes

1 Hushpuppie, a character in the film *Beasts of the Southern Wild*. Each epigraph in the Introduction has been taken from this film.

2 This exchange bears striking resemblance to Lynn Margulis' response to Richard Dawkins: Dawkins: "[The standard story for (the evolution of) ordinary animals (by selection pressures)] is highly plausible, it's economical, it's parsimonious, why on earth would you want to drag in symbiogenesis when it's such an unparsimonious, uneconomical-?" [35:01] Margulis, "Because it's there."

3 Varela was extremely conscious of the political dangers of this in leading to eugenics, war, and fascism. He analyzed the Chilean civil war as a "wrong epistemology" (recording, 1978).

4 Varela does not love the word *emergence*, saying we need a new one. He prefers *bringing forth*, as a whole that leaves behind no parts.

5 Lynn Margulis reminds that *Homo sapiens* are irrelevant and superfluous<sup>10</sup> Gaian function.

6 My surprise neologism, I kind of like it so I did not delete it. Subsequently, I've discovered the neologism has been coined by the likes of Heidegger, Spivak, and many others.

7 Goldman lectures, *Science, Technology, and Social Progress*, 1989.

8 This statement is an adaption of sociologist and STS scholar John Law's *After Method: Mess in Social Science Research* (Routledge, NY 2004).

9 White European Intellectual Rationalist Democratic

10 A fungus (a eukaryote with intracellular motility) latches on to a cyanobacterium, *Nostoc*. They merge; the fungus engulfs the *Nostoc*. This parasexual fusion produces a little green bladder organism.

11 This is a bacterium generated by transplanting a computer synthesized laboratory genome into, and replacing the genome, in an existing living cell. Craig Venter gets the credit for this accomplishment in the field of 'synthetic genomics', his reward being a \$300 million deal with EXXON for research and design of an algae that produces diesel fuel. Industrial techno-life-capitalism at its finest.

12 Rhizomatic growth is a mechanism of cell motility. It potentiates indeterminate growth of a genetic monoculture, it is not a mechanism of reproduction. It is a common motility mechanism of invasive species, such as in phragmites and Japanese knotweed in the Northeast of the USA.

13 from the Greek, evolve

14 This is also quite Whiteheadian.

15 The military and religions have long understood and modeled the effectiveness of skills training.

16 Read more at <http://www.darkroastedblend.com/2013/05/topological-marvel-klein-bottle-in-art.html#Tm2smR5IQRVaZKrE.99>.

17 Node-centric thinking characterizes both the agencies of an actor in terms of what I consider to be the limiting but very popular actor-network theory, and ‘ontologies’ of the performative subject in Gibson-Graham’s post-capitalist politics that is at odds with their visions for cultivating stances that produce embodied “new affective relations with the world” (2006, p. 7).

18 I am indebted to Mary Ingle for this insight into technê as weaving, and to Steven Smith for his reminder that without technê, there is no poiesis. The following is informed by: Parry, Richard, "Episteme and Technê", *The Stanford Encyclopedia of Philosophy* (Fall 2014 Edition), Edward N. Zalta (ed.), URL = <http://plato.stanford.edu/archives/fall2014/entries/episteme-technê/>.

19 Varela anticipated Barad in this concept, but she coined and popularized the term.

20 Bringing forth, less accurately referred to as emergence, is a post-Cartesian theme underscored by Varela through neurobiological research, by Karen Barad in quantum field theory, and in the zoe-nomadic subjectivity of Rosi Braidotti’s critical theory.

21 Given my objection to the lack of secular thinking in the sciences, explored in Chapter 3, I feel Kauffman goes too far in calling for a reinvention of the sacred.

22 Pernicious books that argue for genetic explanations for racial behavior, Western exceptionalism, and Caucasian supremacy still find mass-market publication, such as *A Troublesome Inheritance, Genes, Race and Human History*, 2015. Perhaps equally horrific is that its 19<sup>th</sup>-century-style British author, Nicholas Wade, was recently a long-term science writer for two powerful publications journal *Science* and *The New York Times*, reflecting the newspaper corporation’s five generations of 19<sup>th</sup> century style dynastic control by the Sulzberger family.

23 Perhaps the metaphor reaches too far or, perhaps, about right. Ulysses’ crossing suffered great losses, the ship destroyed, but a few survivors, clinging to a raft, made it through alive.

24 The phrase itself— more-than-human—is case in point.

25 I wonder whether the “blissed out techno-euphoria” of contemporary quotidian computing is explained, in part, as a holdover of [reassuringly familiar] deterministic, linear teleologies that buffer the disorienting nature of actuality that new insights in physics and biology narrate.

26 I talk about ethics, but leave off at the gate of power, again because its discussion would swell this body of themes beyond what could be managed. Discourses of power are significant to subjectivity dynamics, and extensively covered in the larger literature.



27 Walter Benjamin describes 'left melancholia' as "attachment to a past political analysis or identity that is stronger than the interest in present possibilities for mobilization, alliance, or transformation" (Brown 1999, p. 20). As opposed to mourning, which frees a subject to move on, melancholia is stuck and isolated (Gibson-Graham, 2006).

## CHAPTER 1

### WHY ŽIŽEK IS MISERABLE AND ROSI IS NOT

How different worldviews manifest different and particular affects in its subjects may be shown by contrasting the subjectivities of two critical theorists of advanced capitalism, Slavoj Žižek and Rosi Braidotti. The writings of the former, Žižek, are framed by the legacies of patriarchal privilege that follow an education in Western philosophy (e.g. *Less Than Nothing, Hegel and the Shadow of Dialectical Materialism*); the latter, Braidotti, is allied with a radical feminism built on Continental process philosophy (Bergson, Deleuze & Guattari). Exemplifying feminist claims regarding the affective productions of advanced capitalism, Žižek is melancholic (Gibson-Graham, 2006) while Braidotti remains affirmative and hopeful. At issue in this contrast are, respectively, their very different narrations of how life and materiality interconnect in the social imaginary either to foster or to deny political possibility. The juxtaposition of the different affects in Žižek and Braidotti illustrates the imaginary, both the subject's and the collective social imaginary, as a contested site of political struggle; where Žižek identifies dialectical conflict, Braidotti identifies engagement and paradox. At stake in their opposing stances is nothing less than an ethics of human praxis as Earth encounters current twin anthropogenic crises, ecological and economic.

In making my case I figuratively engage two representations, one of Žižek as the most intelligent of dinosaurs, the *Dromaeosauridae*, whose fossil remains are found in Slovenia (Žižek's home country), and the other of an Australian (Rosi Braidotti's home country) lichen, the *Baeomyces heteromorphus*. Putting Žižek, as extinct dinosaur, and Braidotti, as lichen, in contrasting relief depicts the clash of intellectual cultures these two critical theorists represent. I make the point here that an embodied worldview that embeds transformation and emergence

produces a fundamentally different subjectivity and affect than that schooled to the linear binaries and taxonomy-driven traditions of Cartesian thought. Both Braidotti's and Žižek share a desire to reform or end unfettered neoliberal capitalism by tilting theory towards radical contingency and emergence. Unlike Žižek, Braidotti's project is not centrally one of philosophy; Braidotti engages theory to support her centrally ethical project, which is one of political activism and feminism. The 'cartographic' method Braidotti engages to define her ethical subject is far removed from the oppositional methods of Žižek's Hegelian-inspired dialectical thinking. Hers "is a map that draws the trajectory of changes, transformation, and becomings ... for these are strange times, and strange things are happening" (2012b, p. 22).

## Philosophers' Affect

Žižek is miserable.



Figure 7. Dromaeosauridae, a Slovenian dinosaur. Illustration by Michael Skrepnik (2005)

*The dromaeosauridae (meaning "swift lizards") were small (wolf-sized) to large (up to 30 feet long!) theropods which had specialized features such as a well-developed slashing talon on their second pedal phalanx (toe), a stiffened tail which possibly functioned as a dynamic stabilizer, and large grasping manus (hands). They were well-equipped with claws, muscular toothy jaws, and agile bodies. These dromaeosaurs have been assumed to have been active, fierce predators ...Truly an example of evolution producing a killing machine (jrh & Smith, 2006). They were the most intelligent group of dinosaurs (Dinosaurs and Paleontology Dictionary, 2005-2016). Fossil remains have been found in southwest Slovenia (Debeljak, Kosir, Buffetaut, & Otonicar, 2002).*

**Rosi is not.**

Lichens are formed from a combination of a fungal partner (mycobiont) and an algal partner (phycobiont) growing in symbiotic association on a solid surface (as a tree or rock).

baeo – small

hetero– a combining form meaning “different,” “other” (dictionary.com, 2002);

origin: combining form of Greek héteros: the other of two, other, different

morph– 1. Biology. an individual of one particular form, as a worker ant, in a species that occurs in two or more forms. 2. to be transformed

(dictionary.com, 2016)



Figure 8. *Baeomyces heteromorphus*, an Australian lichen. Photographer: Heino Lepp  
*green thallus and apothecia atop 2-3 millimetre long stem (2011)*

*thallus*: a plant or plantlike body (as of an alga, fungus, or moss) that lacks differentiation into distinct members (as stem, leaves, and roots) and does not grow from an apical point (Merriam-Webster Science Dictionary, 2016).  
*apothecium*: a fungal reproductive structure, in which the fungus reproduces itself through the production of spores. These spores will disperse and germinate into new fungi, but they will not produce new lichens. For a lichen to reproduce, the fungus and alga disperse together (Regents of University of California, 2016).

A lichen may absorb certain mineral nutrients from any of these substrates on which it grows, but is generally self-reliant in feeding itself through photosynthesis in the algal cells. Lichens growing on rocks, though, may release chemicals which speed the degradation of the rock into soil, and thus promote production of new soils. Lichens are hardy creatures able to survive in scorching deserts and frosty tundra. Their secrets of success are not well understood however. Two key features suggested as having important roles are (1) their ability to survive drying and (2) their complex chemistry.

Lichens manufacture a host of chemicals that presumably serve to reduce attacks by predators. The most serious threat to the continued health of lichens is not predation, but the increased pollution of this century (Lepp, 2011).

## Žižek and Rosi

My intention in engaging Slavoj Žižek, my favorite and entertaining provocateur of theory, to initiate my project is not so much to critique or reject his work, nor to set him up as a straw-man, but to illustrate the impossibility that a theory of transformative radical politics might emerge from a subjectivity (e.g. Žižek's Hegelian) that has been trained and disciplined, in the Foucaultian sense, to Newtonian/Cartesian thinking conventions. Such logics of transcendent causality, as I will show, engender not hope, but a fatalism that incapacitates action, aptly described by Francisco Varela and Evan Thompson as "Cartesian anxiety" and ambivalence (1992, 140). Žižek's political affect as expressed in *Less Than Nothing* and in his 2013 article *Trouble in Paradise* reveals him to be an exemplary victim of his own backfired education. Rosi Braidotti's project, too, is overtly political. Her intent for her project is that it be seen not only as "the creation of new ways of thinking" (2011a, p. 63) but also as a form of "ethical and political practice of subjectivity suited to the task of actualizing qualitative dissonances to late-capitalism" (2011b, pp. 20-21). In response to the treacheries of late-capitalism, both Žižek and Braidotti seek a way out. To get there, Braidotti focuses on practices of subjectivity, while Žižek focuses on the task of global structural transformation which, I claim, cannot both find form and simultaneously sustain the logics of the Western worldview of, loosely, the last three hundred or so years. I do not presume to say that Rosi's vision, which eschews conventions of a Western worldview, stands a more likely chance of success in transforming capitalism. Žižek's reasoning, however, provides a portraiture of radically-intentioned political *impossibility*, which I show in Chapter Three to be a trope of modern Western patriarchy. Braidotti, on the other hand, locates political *possibility* and hope by drawing from a different philosophical genealogy grounded in process thinking, as well as in recent feminist critical theory, with a dash of science thrown in. Their respective

worldviews fundamentally condition their subjectivities differently. As a result, Žižek gets stuck in misery, while Rosi emerges hopeful.

### **Trouble in Paradise**

In his article *Trouble in Paradise* published in the London Review of Books (July 18, 2013), Slavoj Žižek is up to his old quagmired tricks. The politically brilliant Slovenian intellectual revolutionary, whose own Marxist politics position him in opposition to global capitalism, commenting on the phenomena of promising but failed global protests between 2012-2013, abandons the sympathetic reader to wait for Godot in that timeless purgatory of *No Way Out*. The reader is not alone, Žižek is there in Purgatory, too, abandoned and companioned. None of the 2010-2012 protests in Greece, Turkey, Brazil, Europe, and the Middle East, nor the Occupy Movement, he states, can be reduced to the pursuit of a single issue; rather they reflect a “fluid feeling of unease and discontent that sustains and unites various specific demands” (2013, p. 11). Collectively, they react against global capitalism as a system, which inherently produces the excesses that its ideologies, cannot contain structurally. For Žižek, the “hegemonic ideology of today” (Žižek, 2011, p. 408) is materialism. He supports that these protests resist the capitalist marketplace where value gets located. But this is where Žižek gets tangled up. On the one hand, he recognizes this kind of ‘materiality’ as the translation of universality and necessity to the “monstrous mixture of living subjectivity and dead automatism” that produces capital, a subject of alienated substance (2011, p. 222). At the same time, in his closer investigation of materiality, he merges that of Karen Barad’s quantum field theory with his psychoanalytic attachment to the vulgarity of the Lacanian Void of Reality (2011). This corroboration produces, for Žižek, a conception of matter that conjoins Lacan’s conception of the death drive of impossibility as the “immortal compulsion-to-repeat” (2011, p. 409) with “the much-decried ‘dissolution of matter in



a field of energies' in modern physics" [that] a true materialist should fully embrace" (p. 407). Non-reductionist matter opens up to immaterial phenomena, "a specific positive non-being (p. 407)...material reality *is non-all*, not 'material reality is all there is' is the true formula of materialism" (p. 408, ital. in the original). What Žižek's blending of a Barad-ian 'non-all' materiality with a Lacanian "ultimate Void of Reality" produces for Žižek, is an Hegelian dialectic, an ontologically incomplete paradox characterized by the death-drive of impossibility. In his efforts to resolve this death-driven material Void with his political desire to thwart neoliberal capitalism within a frame of Hegelian immortality and universality, Žižek can only arrive at unsatisfying conflict.

This philosophical background helps to explain the affective stance Žižek brings to his analysis of the globally distributed local resistances to the capitalist order of the 2010-2013 protests. What in the hands of economic geographers J.K. Gibson-Graham provides the grounds for possibility and hope of a post-capitalist politics of the subject, falls into the domain of impossibility and defeatism in the hands of a Žižek.

He strategically identifies cracks in the *system* where resistance might incubate...

To demand consistency at strategically selected points where the system cannot afford to be consistent is to put pressure on the entire system. The art of politics lies in making particular demands which, while thoroughly realistic, strike at the core of hegemonic ideology and imply much more radical change. ... (2013, para. 9). This may mean coming to see that democracy can itself be a form of un-freedom, or that we must demand more than merely political democracy: social and economic life must be democratised too (para. 13).

but that subjects cannot overcome their own identification with ideology, described as...

...the misapprehension of the condition of possibility ... as the condition of impossibility– the ideological subject is unable to grasp how his entire identity hinges on what he perceives as the disturbing obstacle... the immanent antagonism which generates the dynamic of the social system's instability (2011, p. 208).

and yet Žižek radically states (in what might be good advice to new materialists), ...

...after a true historical break, one simply cannot return to the past, one cannot go on as if nothing happened – if one does it, the same practice acquires a radically changed meaning (2011, p. 202).

He does imagine a way out for Greek and Turkish protesters,...

Leave behind the two countries' historical enmity and seek grounds for solidarity. The future of the protests [*Žižek's desire*] may depend on it. (2013, p. 12).

... but despite this radical imaginary that initiates the political movement, Žižek explains why this will never come about:

Such demands, while feasible and legitimate, are de facto impossible. ... Humanity poses itself tasks it cannot solve, and thereby triggers an unpredictable process in the course of which the task itself is redefined ... This realization—that failure may be inherent in the principle we're fighting for — is a big step in political education (2013, p. 12).

Žižek may desire political and social/economic democracy, but he is unable to lend hope to its possibility. Why does Žižek back off from auspiciousness into resignation?

In Žižek, desire and memory uncomfortably come together to produce an affective futility.

Taken out of his Hegelian context, Žižek might be misread as supporting the same political hopes for transformative radical subjectivity as found, for example, in the affirmative posthumanism of Rosi Braidotti. Each look to radical contingency, which Žižek locates in Lacan and Braidotti in Deleuze, and emergence as the material framework within which to reform or end the ravages on collective well-being of neoliberal capitalism writ large. For example, Žižek grounds hope for a transformative politics as analogous to Stephen Jay Gould's post-neo-Darwinian punctualism; Žižek states “eminently ‘historical’ moments are those of great collisions when a whole form of life is threatened, when the reference to the established social and cultural norms no longer guarantees the minimum of stability and cohesion; in such open situations, a new form of life has to be invented” (2011, p. 211). In the same interview, ironically reflecting his tendency to get

stuck amidst irreconcilable tension, Žižek also references the science he misinterprets, evolution as gradualism, not realizing that the theories of gradualism and punctualism are at odds scientifically. In another reference to science, specifically quantum field theory, Žižek adopts a non-reductionist philosophy of ‘non-all’ matter, and, in good Margulisian spirit, he spoofs the hierarchical assumptions that humans engage to rationalize their own break from the animal domain. In spite of these sympathies with feminist discourses, Žižek’s entrenchment in Hegelian-Lacanian ideology prevents the theoretical realization of the radical theory of his desires, unlike for example, Braidotti and feminist economic geographers Gibson-Graham. Where their responses look to the affectively affirmative and to diverse, distributed micro-political practices, Žižek asserted in an interview with Julian Assange that a strong, centralized, superpower wards off the dangers of a Deleuzian multi-centered world (2012). He locates desire as externalized in the marketplace, identified by Lebrun as the object of consumption that “contains the desire of an other” (as cited in Žižek, 2011, p. 209). Žižek thus skirts the edge of transformation, and as much as he would like, he just can’t bring himself to jump. Žižek’s political thought remains mired in traditional categories rather than finding the radical space that opens by challenging the categories themselves. Reluctantly he steps back from the edge, committed to the memories of dialectical determinism and preformed necessity. He states that “classical change no longer works” in today’s late-capitalist world (2012, p. 1010), but in Hegel’s words, “things become what they are” (2012, p. 212); echoing Pythagorean and Aristotelian preformationism, Žižek extends Hegel’s statement, “nothing emerges that was not already there” (2012, p. 220). The Hegelian dialectic, in Žižek’s self-ascribed unconventional reading, fails to free him from, at best, his own affective paralysis and, at worst, his commitment to the futility of action.

In his political analysis of the 2010-13 protests as necessary but ultimately abject, Žižek (unconsciously?) voices the personal and political defeatism that his own ideological constraints prove, and which conclusively lead to his view that war is necessary, and that:

...every social reconciliation is doomed to fail, that no organic social order can effectively contain the force of abstract-universal negativity. This is why social life is condemned to the ‘spurious infinity’ of the eternal oscillation between stable civic life and wartime perturbations (2011, 223).

Žižek’s own negativity and passivity careens not towards novel and innovative democracies, but towards self- and other- annihilation. It is no wonder that Žižek despondently concludes his recent tome, *Less Than Nothing*, with a nod to the history of all radical-egalitarian rebellions as lost causes, and a quote from G. K. Chesterton’s *What’s Wrong with the World*, “the lost causes are exactly those that might have saved the world” (p. 1010).

In a virtual self-mockery, Žižek claims that the “‘great underlying problem’ is how might subjectivity fit into reality. We need a theory of the subject which is neither that of transcendental subjectivity nor that of reducing the subject to a part of objective reality” (2011, p. 415). The pre-discursive framing of the subject within the Lacanian Void of Reality constitutes the conflicted imaginary of Žižek’s political and historical subjectivity, such that there can be no possibility. “Know[ing] that his thought already is the form of reality, so it can renounce enforcing its project on reality, it can let reality be the way it is” (2011, p. 209). Žižek can’t help but equate the “very core of modern subjectivity” to his own positionality, an entitlement ordained by a white European male educational legacy, a dominating hubris he coyly structures as the hero’s heterosexual conquest between the “drink before” and the “cigarette after.”<sup>1</sup> This androcentric and cultural context also serves to frustrate and obstruct Žižek’s capacity for hope. His subjectivity of impossibility is the emergent property of a historicity that privileges dialectics over embodied becoming, of knowledge as certainty over affect and uncertainty. Žižek embodies this Cartesian legacy, which finds one form in his particular worldview that sees as universal and necessary the equating of the reproduction of life to the death-drive’s compulsion-to-repeat. Žižek’s representation of Hegel describes himself, ‘contradiction’ is the core of ‘pure’ [self-] identity (2012, 411). For Žižek, the “highest contradiction” is Being/Nothing, which gets resolved by “Becoming, into oscillation between the two poles” (2011, p. 411), and by “the *becoming* (the

gradual contingent emergence) *of necessity itself*" (2011, p. 217, ital. in original). Žižek begrudgingly abandons himself to a purgatory of conflict and necessary misery.

This is in dramatic contrast to Braidotti, who emerges within the continental tradition of Bergsonian/Deleuzian philosophy, and for whom Becoming dissolves fixed forms in an affirmation of possibility. Deleuze bluntly states, "what I most detested was Hegelianism and dialectics" (1995, p. 6). It is against the "gloomy and pessimistic" energy devoted to Thanatos<sup>2</sup> and the technological propulsions of bio-power that Braidotti's affirmative vitality of life rebels (2006, p. 39). She rebels against the dialectic that "myopically" positions what we call life at "the liminal state of non-life", "the horizon of death", and the "never-dead" ... death is over-rated" (p. 40). Braidotti envisions subjectivities that reject dualisms and displace capitalist norms.

I take the posthuman predicament as an opportunity to empower the pursuit of alternative schemes of thought, knowledge, and self-representation. The posthuman condition urges us to think critically and creatively about who and what we are actually in the process of becoming (2013, p. 12).

Braidotti means to extract linear, deterministic models from her understanding of life, being, and change, reconceived, instead, as 'forces' of emergence, or processes of becoming. Where Žižek is marooned in impossibility, Braidotti locates possibility.

Her vision of the subject as embodied, embedded, and non-unitary develops Deleuze's nomadic theory.<sup>3</sup> The non-unitary subject renders the category of the "other" irrelevant, because the subject is "a moving horizon of exchanges and becoming, towards which the non-unitary subjects of postmodernity move, and by which they are moved in return" (2011, p. 246).

"Nomadic theory's main contribution to this debate rests on the concepts of radical immanence and nondeterministic vitalism, which unfold onto an affirmative ethics of bioegalitarianism" (2012, p. 331). Here Braidotti ascribes to and derives from a non-centric, non-hierarchical view of biological life an ethics that practices engagement, rather than confrontation. Vitalism, as 'life-force' displaces melancholia. Braidotti's subject is a situated 'transformer' of complex affects,

non-linear temporalities, memories, and flows of desires and imaginings. I show in Chapter five that feminist thinkers, perhaps precisely because of their long-if-quiet objections to the social structures of their exclusions and oppressions, have gained a better purchase from which to break free of the deterministic confines of Western thought than is available, for example, to a Žižek. Setting Braidotti as lichen and Žižek as dinosaur side-by-side, Braidotti attributes Žižek's negativity to his having given up on intellectual theory as socially productive, instead opting for "violent antagonism if necessary" (2013, p. 5). Both theorists do, however, remain stalwart, if reluctant, in desiring activism; if Žižek is the theorist of lost-causes, Braidotti pins her hopes for economic and environmental change on feminist theories of desire and materiality. The tone pervading each registers impatience, frustration, and urgency. Žižek, mourning a past "desperately attached to the conditions of [his] own impotence" (2013, p. 189) responds with intellectual defeatism; Braidotti responds with an insistence on the affirmative as a catalytic strategy to mobilize change. In doing so, Braidotti foregrounds subjectivity.

The lesson to be reminded in reading Žižek in this way, though, is that, to some degree, he is us too, us being any progressively thinking, radically inclined Western subject. By happenstance of our 20th century births, you my reader, Žižek, Rosi, and myself are enmeshed in a web of relations necessarily defined in large part by the hegemonic ideologies of growth and profit that drive unfettered Western capitalist aspirations. We are similarly situated. We steep in the same historicity of a dominant narration of the world in which we live. Keeping that in mind, we more personally attend to how Žižek's affect models the 'melancholia' ascribed by J.K. Gibson-Graham (2006, p. 4) and by Rosi Braidotti (2012) to the ruling ideology of a dominant capitalism. We see Žižek's emphatic but defeatist political philosophy modeled in Braidotti's characterization of advanced capitalism as 'schizophrenic'. Here she echoes Deleuze's *User's Guide to Capitalism and Schizophrenia* to seed her affective analysis of neoliberalism as

conditioning psychiatric dysfunction, which within the context of a sociopathic society gets made legitimate – even inevitable.

Žižek acknowledges that he is at a loss, painted into his own despondent corner. Though he would like to make a break with the confines of his own subjectivity, he can't because he is it, an out-of-reach a priori of loss and melancholy. What Žižek embodies is indeed on the brink of collapse, disintegration or extinction. Rosi is not Žižek, a lichen is not a dinosaur. Misery is not a necessary a priori condition. There are choices, ways of becoming un-knowing. Lichens are perfectly cast for the job.

## Notes

1 The structure of Žižek's work, *Less Than Nothing*, begins with a section entitled *The Drink Before*, and ends with a section entitled *The Cigarette After*. These serve as bookends on two sections entitled *The Thing Itself*.

2 In the ancient Greek, Thanatos is the personification of death.

3 Nomadic subjectivity is a "pursuit of practices of hope, rooted in the micro-practices of everyday life, as a simple strategy to hold, sustain and map out sustainable transformations" (Braidotti, 2012, p. 24).



**CHAPTER 2**  
**WHAT IS EARTH?**



Figure 9. Surface of the Earth during the Hadean eon.  
An artist's illustration of the Earth of 4.5-4 billion years ago (Trappman, 1994)

**BIG** questions must be asked over and over. What is Life? What is Earth? What is Mind? The conventions of modern Western thought have scribed these as discrete ontological categories. However, prior to the establishment of those conventions, things were not so clear-cut. Ironically, at the cusp of the 21st century, hard science itself reclaims –and points forward to –blurry post-

categorical space. Reductionism itself now mandates a holistic approach to the big “What Is” questions. So to ask in the early twenty-first century, “What is Earth?” also necessarily asks “What is Earth-Life-Mind” as a scientific object?. In doing this, I take as my premise Vladimir Vernadsky and Lynn Margulis’s argument that the geosphere, life, and the noösphere (the sphere of the mind) are functionally indistinguishable, even if these categories discursively help to make provisional sense of a world fundamentally in transition.

### What Is a Scientific Object?

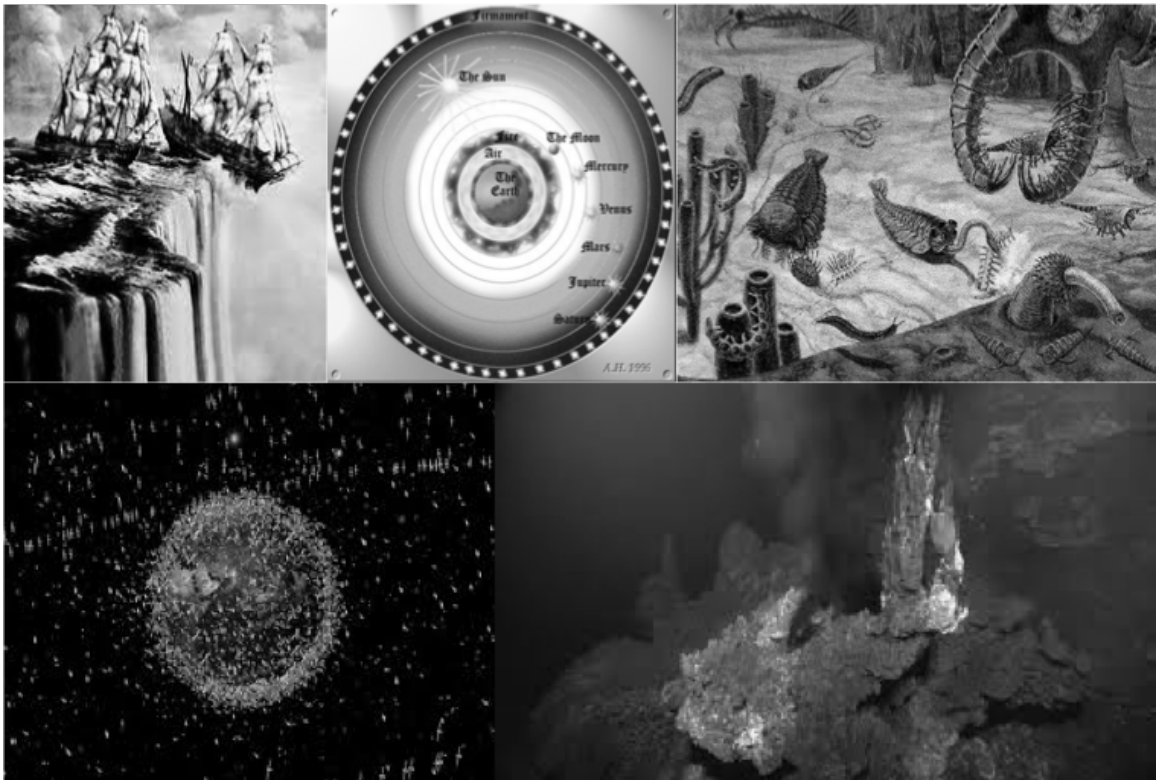


Figure 10. Conceptions of Earth.  
clockwise from top left: flat Earth (<http://s158.photobucket.com>); the geocentric universe (A.H., 1996);  
ediacaran fauna 600-545mya (<http://sciencesoup.tumblr.com/>, 2013);  
deep sea hydrothermal vents ([livescience.com](http://livescience.com), 2012);  
Earth and its satellites (European Space Agency, NASA, 2013)

Let me clarify why I approach the question of “Earth” as a “scientific object.”

At the start of the third millennium, science as an academic discipline, is no longer bound within its prior Cartesian / Laplacean comfort zones. As an epistemological social practice, we now understand science to be historically and culturally situated—necessarily partial, conjectural, and fallible (refs). This consensus of the later twentieth century compounds the early twentieth century challenge from quantum field theories of energy and light to the intelligibility of how science corresponds to reality. As energy and matter have come to be understood in radically new ways, the determinist ‘God’s eye view’ of an ‘objective’ science, as a discipline, gets questioned and starts to shift. Twentieth century physicists reveal a nature that is neither causally predictable nor necessarily continuous, but discrete. Physicist Niels Bohr argued that science redefines ‘Reality’, not as “an observation-independent object, but [as] a phenomenon” (Barad, 1998, p. 94) in which we are embroiled.<sup>1</sup> Classical science—based in material determinism—gives way to a science of experience, which sees matter as emergent from processes of uncertainty, probability, relationality, and self-organization. What remains unresolved in the practice of science, according to Science and Technology Studies scholar Steven Goldman, are the different conceptions of the criteria for the intelligibility of experience. In effect, these challenges to the intelligibility of science claims amounts to an attack not only on traditional science, but on Western rationality itself, and thus, as several critical feminist science scholars have established, on the master epistemologies of ontological certainty.

Against this backdrop, a ‘scientific object’, such as the Sun, or atoms, or black holes, ceases to be a fixed entity but, rather, exists as an object of knowledge whose terms change with each iterative narration. In the 1400s, for example, the Earth was known to be the center of the universe; in the 19<sup>th</sup> century the Earth was known to be between 20 and 400 million years old, in the early 20<sup>th</sup> century, Earth’s continents were known to be fixed in place, and in late twentieth

century theory J. Marvin Herndon hypothesizes a nuclear fission georeactor at Earth's core, a theory that meets ridicule in the geosciences establishment. So it is in this shifting of the light that I ask: What story of Earth is 21st century science telling? Of course, there is more than one.

British literary/cultural theorist Timothy Clark in his paper *What on World is Earth?: The Anthropocene and Fictions of the World* (2013) challenges and questions the intelligibility of planet Earth as a 'whole'. The 1968 Apollo photographs of Earth— that lone blue dot floating without mooring in that vast darkness of a cold universe— functions for humanists as the 'one world' emblem of the Anthropocene. The image, according to Clark, challenges the capacity of both human knowing and the human imaginary. Each, he writes, is necessarily inescapably constrained to anthropocentric terrestriality, which sets the scalar limit of 'conceptual articulation' (p. 11) to inside the geographic 'finitude of the biosphere' that we "cannot genuinely perceive from elsewhere" (p. 15). His perspective on Western knowing, then, situates an essentialist context that cannot be either transgressed, transcended, or transformed; it pegs how humans experience the 'world', in a conflation with 'planet Earth' to the narrow temporal frame of one modern human's life expectancy. That these limits are part and parcel of what Derrida calls the necessary 'fiction of the world' — "the condition of meaningful life and communication... arising from 'the irremediable solitude without salvation of the living being'" (as cited in Clark, p. 19)— prompts what Clark astutely identifies as the anti-Copernican stance of the humanist tradition. This newly revealed Earth, in philosophy scholar David Wood's description tends "towards certain forms of self-organization and boundary formation over aeons of evolutionary time, a complex causality unlike that of caricaturing naturalism (linear, fully determinate, and with certain automatism)" (as cited in Clark, p. 10). The Anthropocene, then, performs the humanist's taboo in exposing Earth, the taken-for-granted planet that suddenly intellectually astonishes and frightens, as contingent. It also exposes humanism's fictions, and in so doing, makes a mockery of its acolytes.<sup>2</sup>

The obvious question arising here is who does Clark think is being astonished and why does he read this as the ‘anti-Copernican’ surprise to Western normativity? Certainly not the subject of, say, Donna Haraway’s late twentieth century vision, who seeks new and ‘blasphemous’ narratives that dismantle the binaries and totalizations that maintain systemic practices of domination (1991). Clark dismisses meaning-giving micro-political ‘localisms’ as the superficial construction of human possibility that is delusory, even a form of denial (2013, p. 12). Clark’s response to the Apollo-inspired ‘whole Earth’ that prompts his demarcation of what lies beyond the outer limits of the human imaginary and, thus, beyond its access, perfectly conforms to the structuring default parameters of ‘unity’ that Haraway observes being faithfully maintained by the “offspring of militarism and patriarchal capitalism” (1991, p. 151). Is it, as Yaakov Jerome Garb states “a fantasy that we can somehow contain the Earth within our imagination” (as cited in Clark, p. 15)? Is that fantasy, as Clark seems to suggest, part of Derrida’s fiction of the world? I ask, rather, do we even need or want to imagine a contained, whole Earth in order to change how we live in/on/with it? As a trope, the Apollo images, as Clark explains, represent the humanist ‘un-prethinkables’; he tries to push back against them, but in my opinion does so unsuccessfully because he relies on Derrida’s equally barren charge, that the ‘unity’ of a shared world between organisms is never “given in nature ... sentient life is in effect the temporarily self-sustaining artifice in an economy of the non-living” (as cited in Clark, p. 19), a neutral non-event. Derrida describes life, “the ‘material logic of boundaries’ according to Clark, as constituted in the finite movement of temporalisation, of the would-be self-presence of living intentionality as an emergent effect of the difference engine of a metabolism, the economy of the non-living”(p. 11). Leaving aside that ‘intentionality’ and ‘emergence’ are contradictory, in reading this statement out of context, it is not clear exactly what Derrida means, of note, however, is the way Clark presents it. He does not grapple with notions of the materiality of boundaries, emergence, self-presence, difference, or metabolism – standard fare for critical feminist science scholars, new

materialists, posthumanists, and notably, scientists like Lynn Margulis and Francisco Varela.<sup>3</sup> Instead Clark's presentation emphasizes the life's function as secondary to and operating in the service of inert matter. Observed 'intentionalities' belong not to life but to the 'economy of the non-living'. Clark claims this admittedly dark ground conditions a fresh questioning by humans on ethics. Though essentially estranged from meaning and recognition, except through fictive constructions, humans share with other organisms the same planetary climate-change threats to life. Apparently for Derrida, as Clark presents his stance, the shared threat of non-existence—even if existence is necessarily a fiction of the imaginary—grounds an otherwise inaccessible—if also fictive—ethics after all. Clark reads this narrative of the foreseeable vanishing of species not in literary terms that accede the significance of 'reality' to fiction, but merely, as 'uncanny' – as a

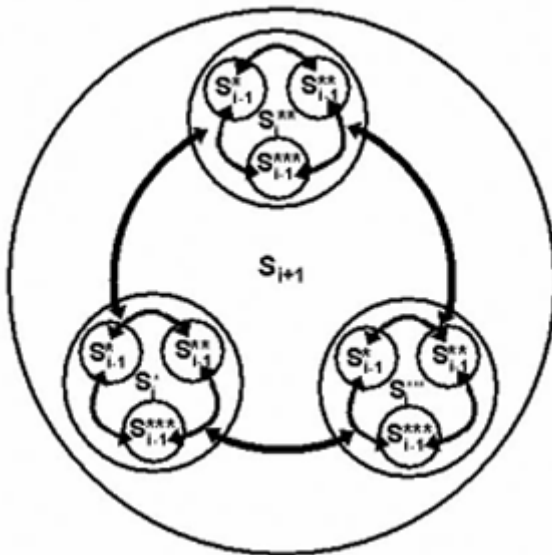


Figure 11. Organism as a system in balance with chaos. The organism is an organizational closure of interacting subsystems. Depending on the dynamics of its mutually embedded systems, the identity of a system is always “operating at the edge of chaos. Identity is intrinsically precarious and intrinsically fragile” (Rudrauf, Lutz, Cosmelli, Lachaux, Le Van Quyen, 2003).

peculiar affective event that is not one's “own” and also not with others’, nor with the world (p. 21), merely an unremarkable event that happens (like rain or air) but can't get told. Like Žižek, Clark, too, abandons and is abandoned, and he, too, companions his own abandonment with others-in-general.

A feminist reading responds quite differently than Clark or Derrida (as Clark reads him) to the provocations to the imaginary by the Anthropocene that the blue-dot-whole-Earth image represents. Rather than reading it as subverting the epistemologies of terrestrial scale and boundary, and I include Francisco Varela and the putatively feminism-recalcitrant Lynn Margulis in my alternative reading, recent feminisms imagine the Earth as uncontained, contingent, not-whole (at least in Clark's sense), not-all, discontinuous, and undecidable in its difference. In the science of Margulis and Varela and in the feminisms of Haraway, Barad, Gibson-Graham, and Braidotti, the imaginary, knowing, and ethical subjectivity are untroubled, even inspired, by disjunctions and porosities in boundaries and scale. This I move to in greater detail in later chapters. For now, to demonstrate by contrast that Clark's 'whole Earth' narrative illustrates how thinking in the confines delineated by a legacy of rationalist science conjoined with intellectual humanism brings forth a despondent and passive affect, I turn to Francisco Varela's work.

Varela was a Chilean biologist and neuroscientist interested in cognition and subjectivity; though schooled (not only) in the Western canon, his work extends well beyond its conventions, to quite different and more lively result. Varela's iconoclastic notion of a 'whole' living system understands the living system as autopoietic, that is, its defined 'unity' as a 'system' is 'brought forth' autopoietically. Its apparent 'wholeness' is the illusion presented an observer outside the system; 'wholeness' is the resulting (or emergent) stability of a co-dependency of parts in ongoing particular processes that transform matter to self-produce its own organization of operation. "Thus, it is more than a question of specific chemical components (carbon, hydrates, protein, lipids, nucleic acids, etc.), but is fundamentally one of the relations which the components must satisfy in order to constitute a living system" (1979). 'Wholeness', as in Clark's constrained imaginary of the Earth, though pedagogically informative, is scientifically misleading, for it describes the interpretation of an observer outside the system and overlooks the 'effective subjacent processes', wholeness cannot describe a living system, and therefore, I would

add, cannot inform either ethical or political praxes concerning it. What to Varela is critical in envisioning a living system is that it be understood from the perspective of its operation, which always unfolds in the present (1979), as enactments of immanence. Varela calls this ‘radical embodiment’, which by definition negates any purpose, function, or intentionality. “The whole is not the sum of parts; it is the operational closure of its parts” (Varela and Goguen, 1979, p. 35). For Varela, organizational closure, such as of the Earth, a cell, the brain, or of the nervous system is not incompatible with openness. Closure highlights the power of endogenous spontaneity and self-organization between multiple ‘mutually embedded systems’ (Thompson & Varela, 2001). In understanding living systems, dualisms of inside and outside, endogenous and exogenous fade into nonsense, as do for Varela any material grounds for dividing objectivity from subjective experience, or reductionism from holism, or cognition and consciousness from embodiment. “The mind,” he would say, “is not in the head” (Rosch, Thompson, & Varela, 1992, p. 299). The mind is a non-substantial, coherent whole that is “nowhere to be found. Because of its radical embodiment, the mind neither exists nor does it not exist ... it is and it isn’t there” (1992, p. 28)(1996b).<sup>4</sup> Enactive cognition is the distributed autopoietic operation of mind and environment, which is a structural, dynamic coupling of radical embodiment and its immanent way of being in the world that continuously *brings forth* mind and world into consciousness, and to the subject’s experience. This will become clear later in this chapter.

### **Thinking Noösphere, Sensing Consciousness**

Brilliant iconoclast of his day, geologist Vladimir Vernadsky introduced his concept of the noösphere in 1938 to account for the transformation of the lithosphere, atmosphere, hydrosphere, and biosphere by human thought, inclusive of technologies. To the two elemental units of biogeochemical process—energy and matter—he appended a third: that of human



thought, which he synonymously refers to as consciousness, or reason. *Not being energy*, Vernadsky asks, *how then can thought change material processes?*

Vernadsky's response is that of a determinist, he champions that "Human reason, the directed and controlled will of social man," (2014a, p. 69) [is] "inextricably linked with the totality of all biogeochemical energy of living matter" (p. 13) and has become a large-scale geological force. He thus triumphantly celebrates the human introduction to the biosphere of new, unknown chemical compounds and forms of animals and plants, seeing this as an early stage in the evolutionary trajectory of humans from heterotrophs to autotrophs. He writes, "Through agriculture, man was liberated – in his nutrition – from the natural living environment. ... Relying on this great conquest, man has annihilated 'virgin nature'" (2014b, p. 76). Although his use here of violent sexual imagery as an engagement of the virgin-cure myth in his utopic teleology suggests Vernadsky's blindness to gender oppression, he was a political activist on other fronts. He actively critiqued resource depletion, racism, hunger, the unequal distribution of wealth, and the barbarism of war. These he understood as global ethical failings that express how history, philosophy, ethics, and biosphere intersect in one conceptual order of scientific practice.

More recently, another brilliant iconoclast, microbiologist Lynn Margulis, has also asked, "How does living matter relate to evolving mind?" (2011, p. xv). Where Vernadsky saw utopian possibilities in man's exceptional mind (gender intended), Margulis's perspective is staunchly anti-anthropocentric. Human thought need not be privileged with a separate, independent category, as Vernadsky does. She sees no hierarchy among species and admonishes human arrogance, even suggesting that humans are of little significance to life on Earth. For Margulis, who also thinks from a systems perspective,<sup>5</sup> consciousness is always already an inherent component of Earth's biosphere, because life by definition is sentient. By 'consciousness', Margulis means fundamental biotic sentience, which has evolved from bacterial sentience (for water, salt, minerals, and touch) into a diversity of forms across all organisms. As a component of

all life in the biosphere, consciousness is hardly exclusive to, but includes, humans. Endemic to life, consciousness constitutes the most basic of life's biospheric processes that produce and sustain biospheric conditions necessary for life. In a refinement of Vernadsky's noösphere and of his theory of the co-evolution of life and Earth, Margulis incorporates into James Lovelock's Gaia theory her premise that biological life is an autopoietic geologic, lithospheric, and atmospheric force. Her distinctive contribution to Gaia theory is the emphasis on 3.5 billion years of microbial interaction between life and environment. In other words, Gaia theory— that the Earth's biosphere is a dynamic, emergent ecosystem of complex feedback loops between subsystems of living and inert matter (e.g. climate, oceans, atmosphere, etc.) such to produce and sustain environmental conditions necessary to life— hinges on biotic consciousness. In the language of autopoiesis, the theory by which Margulis' frames her empirical work on Gaia and symbiogenesis, Earth and consciousness are 'structurally coupled'.<sup>6</sup> To further explain Margulis' response to the question, "How does living matter relate to evolving mind?" requires first a review of autopoietic sentience.

### **Autopoiesis and Some Other Science**

Varela explains autopoiesis as the process by which the 'unity' of a living 'system' is 'brought forth' by virtue of:

the organization of the network of processes of production (transformation and destruction) of components that produces the components that: 1) through their interactions and transformations continuously regenerate and realize the network of processes (relations) that produce them; and 2) constitute [the living system] as a concrete unity in the space which they exist by specifying the topological domain of its realization as such a network" (Maturana & Varela, 1979).

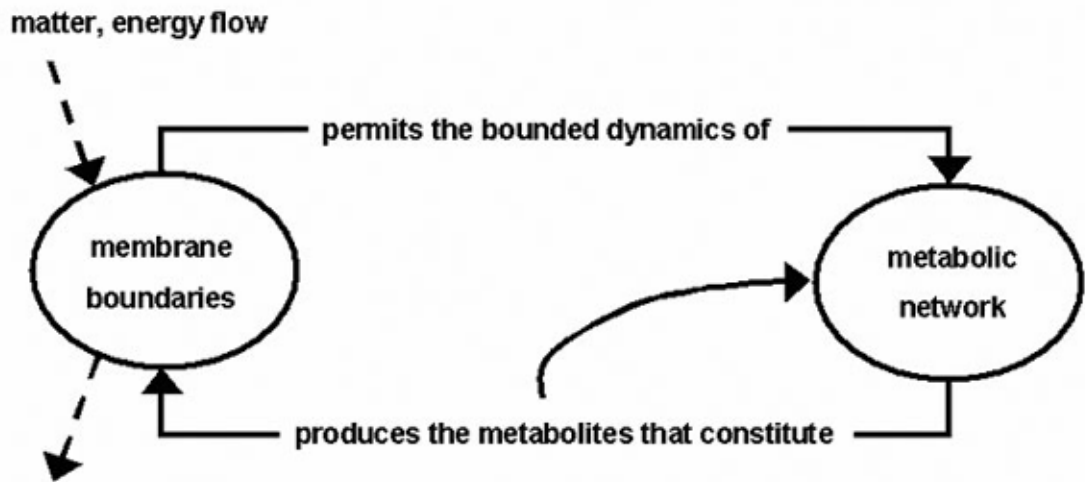


Figure 12: The autopoietic machine. (Rudrauf et al., 2003)

Autopoiesis is a creative, responsive, self- making, self-maintaining recursive process that continually self-produces and maintains its ‘self’ as ‘itself’ (more on that later). Autopoietic sentience, then, drives motility, for example toward or away from sugars or magnetic poles, in an open interaction with its environment to regulate flows of matter and energy. It is also the

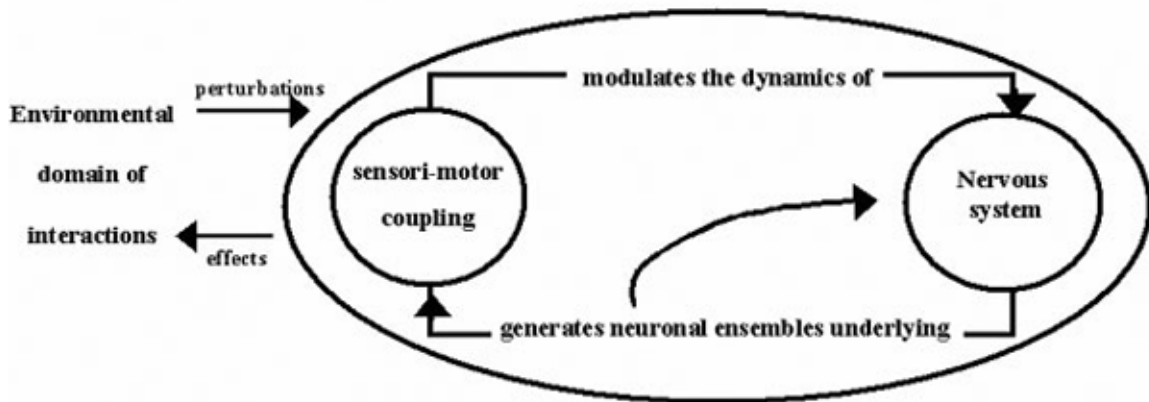


Figure 13. The operational closure of the embodied system. (Rudrauf et al., p. 10)

*Aliveness invents a mode of being which is inseparable from movement, going towards, seeking in movement (Varela and Depraz, 2000).*

*“The body is the place of intersection...” (Varela and Cohen, 1999).*

means by which living matter organizes its own networks within its closed system. What biologist Humberto Maturana and neuroscientist Francisco Varela named “autopoietic sentience” explains life’s capacity to perceive and to act. This capacity of the autopoietic sentient ‘self’ assimilates and is assimilated by others through symbiosis, endosymbiosis, and

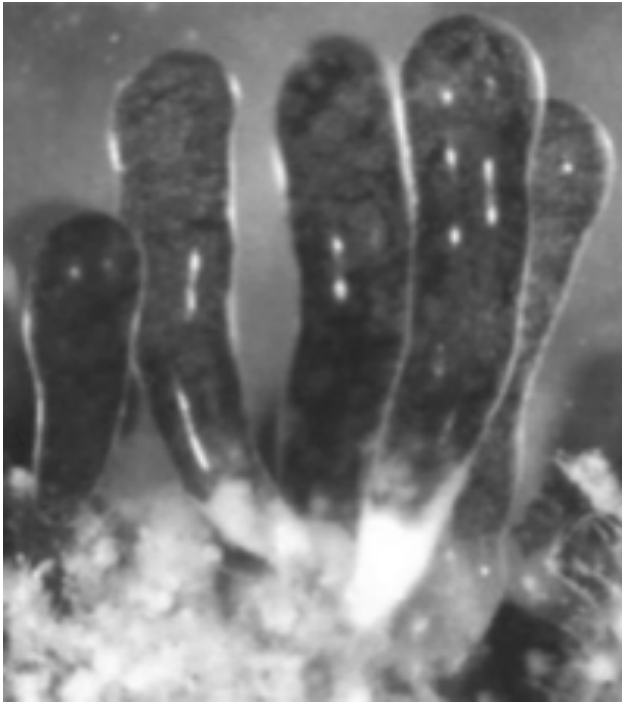


Figure 14. *Geosiphon periforme*. (Schuessler, A.,2005)  
A fungus (a eukaryote with intracellular motility) latches on to a cyanobacterium, *Nostoc* (a protist).

symbiogenesis. Margulis writes, “The world as we know it, and sometimes love it, joins forces, goals, and genes. ... We merge chromosomes and chemistries within species, bodies and minds” (2011, p. 4). Life, then, is conscious and chimeric. Far from the monadic, pure self of the Cartesian individual, the sentient ‘self’ is, in scientific terms, a community, defined by Margulis as, “a unit in nature composed of populations of organisms of different species living in the same place at the same time” (Margulis, Matthews, & Haselton, p. 310). Understanding that community constitutes the embodied and embedded ‘self’ illuminates, likewise, that

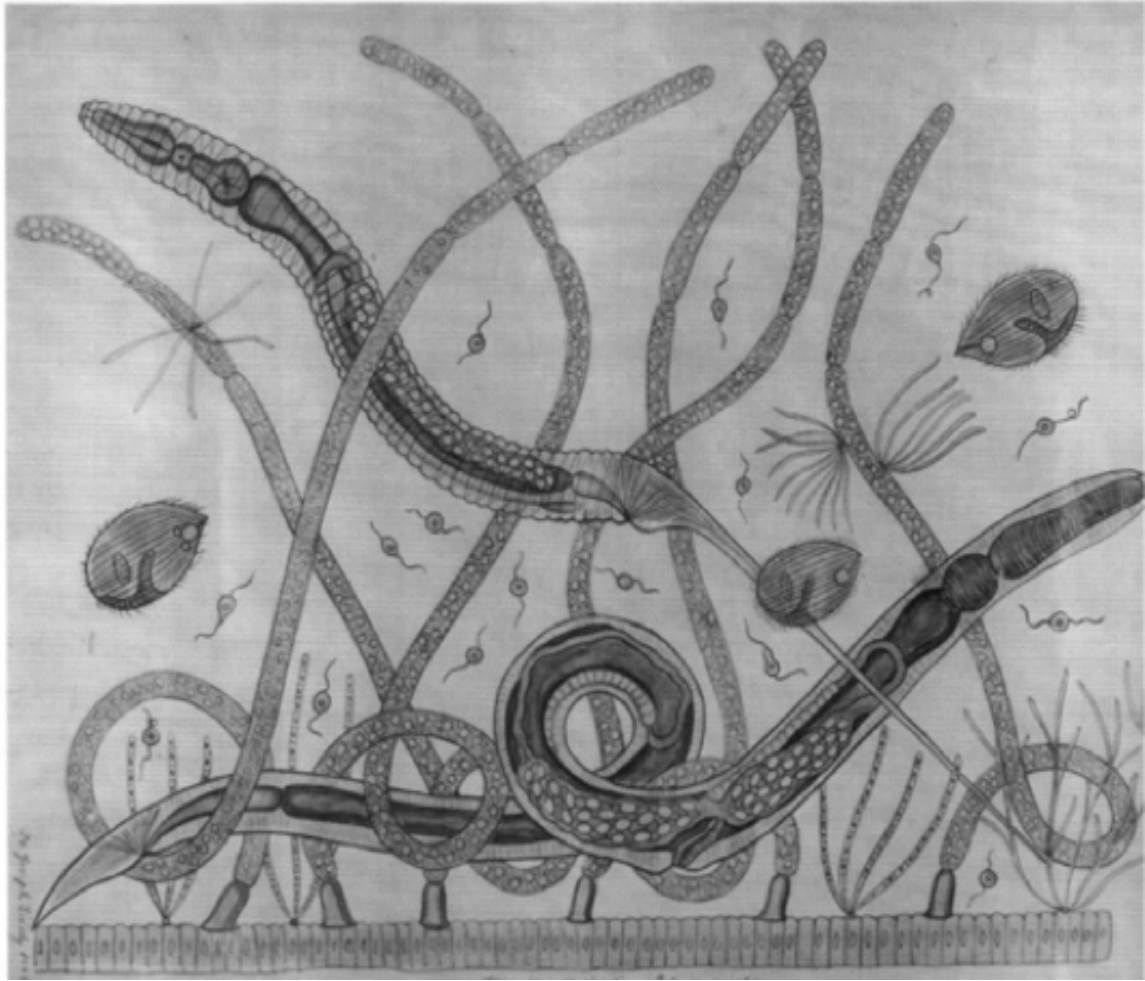


Figure 15. Visual definition of *community*. A millipede gut community includes bacteria, arthropods, fungi, nematodes, mastigotes and ciliates (Leidy in Margulis et al., 2000)

consciousness is collectively sentient and symbiotic. Thus, Margulis's consciousness, like Vernadsky's noösphere, is a significant force of evolution, though having emerged ubiquitously over vast stretches of time in over thirty million types of organisms distributed through myriad, complex networks, hers is without teleologic agency or determinism.

Margulis' death in 2012 cut short her work-in-progress in the area of consciousness. She had just begun exploring Whiteheadian philosophy and her antecedent edited volume, published in 2011, *Chimeras and Consciousness*, extended beyond her usual comfort zones, even into human psychoanalytic space! Interestingly and unbeknownst to her, though, the way she co-

imbricated consciousness, organisms, and environment resonates with some pre-modern philosophies and posthuman critical theory notions of the subject. Also unbeknownst to her, but not surprising –for they were personally acquainted– is how Varela’s theories of enactive cognition and neurophenomenological subjectivity amplify the direction she was heading. His work remains largely unexplored, except superficially, in the critical feminist science literature.

Over the course of his career, Varela developed autopoiesis into a robust theory of human cognition and consciousness altogether different from Vernadsky’s ‘noösphere’, though it responds to the same question, “How does living matter relate to evolving mind?” Following in Margulis’ example, and prefiguring both feminist biologist Donna Haraway (“beings do not pre-exist their relatings (2003, p. 6)– and feminist physicist Karen Barad (given that ‘agential intra-actions’ bring forth, or ‘enact’ iterative changes to particular practices that may or may not involve humans, inherent characteristics of an object cannot precede its intra-action (2003), Varela states,

The world is not something that is given to us, but something we engage by moving touching, breathing, and eating. This is what I call cognition as enaction, since enaction connotes this bringing forth” (1999, p. 8). Cognitive intelligence resides only in its embodiment (pp. 59-60).

One of the sentient behaviors he associates with cognition and scientifically explores is “responding to the needs of others” (1999, p. 23). Perception and enaction, being inseparable, demonstrate great flexibility and no central supervision in generating neural narratives in ways largely dependent on contingency and improvisation. As such, Margulis and Varela both contend that ‘consciousness’ cannot be scientifically explored by “a science that emphasizes only ‘objective reality’, ‘incontrovertible evidence’ and ‘absolute truths’” (Margulis, 2011, p. 13).

Vernadsky, Margulis, and Varela refute Cartesian knowledge as adequate to describe and explain current Earth. Margulis opens science to a view of evolutionary novelty as a process of sentient, creative immanence, though she would not have used those exact words. Her chimeric-

symbiont-symbiosis-community driven scientific perspective on the charade of individualism and autonomous consciousness serendipitously hails the process philosophies of Bergson, Deleuze and Guattari that undergirds the feminist new materialisms hailed by Rosi Braidotti's nomadic and Karen Barad's diffractive thinking practices. Ideologically, these iconoclastic scientists and feminisms are all of a set.

Embedded in these particular scientific configurations that narrate Earth— inclusive of inert and all forms of conscious living matter— as an autopoietic Gaian object, very human politics of global and local economies and environment critically play out. Vernadsky and Varela, Haraway, and Barad model how to question scientifically the inter-/intra- enaction of consciousness and Earth leads to reflections of human ethics and subjectivity. Given the current state of global affairs, what's at stake in matters of biospheric transformation are political matters of life as currently familiar, and unfamiliar, to human observation—its persistence, distribution, vanishings, and extinctions. These are the ethical contests the Apollo photographs of blue-dot Earth put to the test of the human imaginary.

## Re-narrating Earth

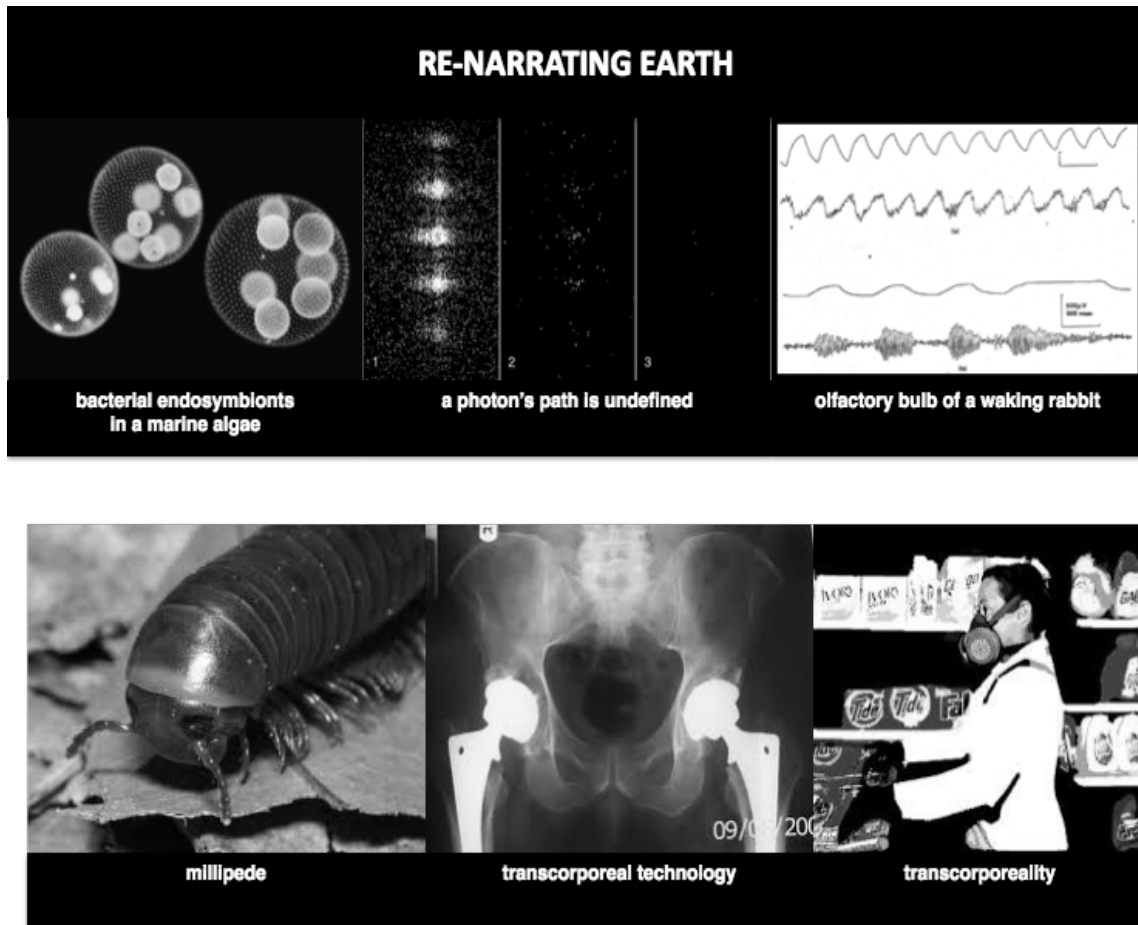


Figure 16. Re-narrating sentience and entities.  
Sentience is indeterminate; entities are transcorporeal communities.  
(upper L to R: Margulis et al., 2000; Page, 1998; Freeman, 1978.  
lower L to R: Malik, 2014; clean ambiente.com, 2016.)

In light of post-human, post-natural, post-modern contexts of 21<sup>st</sup> century science, Earth as an object of knowledge, demands to be re-narrated. Margulis, Vernadsky, and Varela establish that conventional science is not up to the task. However, the convergence of stories told by these and other scientists with those told by certain feminist science scholars suggests that the search is under way for adequate new knowledge practices, and thus new stories of the Earth that as, Braidotti emphasizes, are accountable to the times (2006, 2013). It is illuminating to consider



how the consonant understandings derived by Margulis from evolution and microbiology, by Varela from neuroscience, and by Barad from physics dovetail, for example, with Donna Haraway's notion that "beings do not pre-exist their relatings" (2003, p. 6). It is illuminating to consider how Vernadsky's post-natural noösphere eerily presages the post-human of Stacy Alaimo's transcorporeality and Haraway's cyborg. It is illuminating to note that process philosophy undergirds the thought of hard scientists like Margulis and Varela, and, for example, the nomadic thinking practices of Deleuze, Guattari, and Rosi Braidotti as well. It is illuminating to note how Varela's embodied inseparability of ethics, perception, and action stands him on common ground with new material feminisms of Haraway, Barad, and Braidotti. In light of such currents of thought, I propose that "what the Earth is" as a scientific object is this: it is an emergent and dynamic phenomenon of contingent relationships, collectively enacted according to the diverse and mutually embedded practices of biotic and abiotic matter. While the criteria by which scientific experience becomes intelligible are themselves fluid, (Goldman, 2008), Karen Barad notes that because science makes the world intelligible through certain practices and not others, humans are in part responsible for the existence of Earth. How Earth exists for humans is largely a product of human consciousness, which also suggests that to a millipede, or to a marine microbe, the Earth might exist quite differently. Indeed, we are in desperate need of new narratives—to help transform and guide how we look at and live in the world, fully aware that this, too, will change.

## Notes

1 Note the correlation to the significant influence of phenomenology on Francisco Varela's work.

2 They (mostly male) populate sundry university departments and they are none too pleased, responding accordingly by professionally dismissing upstart academic initiatives, such as feminism, feminist science, and new philosophies and critical theories such as new materialism, object oriented ontologies, etc. But this goes beyond the focus of this chapter.

3 Others include geneticist Steven Shapiro, physiologist Denis Noble, Antonio Lazcano.

4 The reader might note here that this sounds not unlike superposition in physics, or even Clark's literary 'uncanny', except that rather than being experienced as bleak, is kind of exciting.

5 In contrast to reductionism, systems-thinking looks at interactions between components of dynamically complex systems with multiple internal or external feedback loops, over time, and in relation to other systems.

6 Humberto Maturana's and Francisco Varela's concept of 'structurally coupling' correlates to the feminist vernacular, 'embodied and embedded'.

## CHAPTER 3

### MEMORY I. THE MONSTER IN OUR MIDST: SCIENCE NARRATES SUBJECTIVITY

*To address the past, to speak with ghosts, is not merely to entertain or reconstruct some narrative with the way it was, but to respond, to be responsible, to take responsibility for that which we inherit, for the entangled relationalities of inheritance that we are.*  
Karen Barad

Both feminist theorist Clare Hemmings and particle physicist Karen Barad, when speaking of temporality, speak of hauntings, ghosts, and imaginings. Hemmings does so in the context of an analysis of feminist academic literature, Barad does so in a material context of quantum field theory and entanglement (hint: there is no erasure, no time outside of spacematter). Hemmings and Barad intervene in standard, accepted constructs of the past to refuse a politics of foreclosure, of immobilization and im-possibility. Both engage different narratives of past, present, and future to re-vision ‘political grammars’ that ‘unmoor the here-now and there-then’ and the when-then of billiard-ball causality. Material discontinuities, in rupturing the before-after, do not undo heredity but undo identity. “The past is always-already open to change” (Barad, 2014).

The term hauntings, as engaged by Hemmings, refers to that which is precluded by dominant citational practices– ‘absent presences’, ‘affective investments’, the ‘half-forgotten’–; ‘imagining’ is her technique to open these hauntings to analyses of their ‘otherwise’ occluded textures and affective states, to ‘otherwise’ excluded yet significant citations. Hauntings and imaginings matter to the re-membering of patterns in historical claims and political possibilities in telling those stories differently. She attaches such “attention to memory” as “central to feminist practice and radical politics.” Qualitative methods crack open academic structures of critique and collective knowledge production in order “that new formations might emerge between the cracks

of what we think we already know (and feel) about one another” (2011, p. 26). Haunted imaginings engage memory to put bodies of work back together again differently, to tell the old stories in new ways with new meanings.

Barad, too, engages imaginings, and while her definition is strictly material– electrons passing through synapses in the nonlinear enfolding and dis-continuities of different temporalities– she, too, arrives at the significance of imaginings in reconfiguring bodies and politics. The ‘hauntological past’ (“simply not there to begin with”) marks bodies, *is* memory, *is* the material reality of the world we inherit. For Barad, memory and imagining entangle and temporal im-possibilities may rework materially.

Only by facing the ghosts [those that are not yet born or who are already dead] in their materiality and acknowledging injustice without the empty promise of complete repair, of making amends, finally, can we begin to move towards justice (Barad, 2014).

And so it is in this hopeful light of ghostly imaginings, the material iterative dynamic rupture and reconfigurations that might move toward justice, that I make this inquiry into the collective Western memory to find cracks and tangles in the familiar. Whether that be monotheism, enlightenment philosophy and science, or the surfaces of current advanced capitalism, a smooth topological trace connects each one to the other. Specifically, I identify some tell-tale qualities indicative of a monster in our midst, an assemblage of traits that constitute teleological thinking, the implication being that these properties qualitatively measure the monster’s powers; the move towards justice hinges on denaturalizing these monstrous powers.

In this chapter, after locating the ‘genetic imaginary of advanced capitalism’ within the Western legacy of telos, I put two of its still influential voices, Kant and Darwin, in conversation on the subject, a conversation that encapsulates the philosophical problems that have long attracted the focus of philosophers/ scientists belonging to the canon of Western, educated, industrialized, rich, and democratic (WEIRD) societies. The tensions and struggles found in and

between Kant's and Darwin's thought reveal complexities that undermine the very teleologies by which the WEIRD world naturalized its own right to authority. These tensions also suggest nascent cracks in the dominant that mark inherited spaces of possibility, hauntings for recently-burgeoning narratives, memory's ghosts of imagined futures that may yet unfold a different political grammar.



Figure17. Other worlds. Grassland #127 (Underdown, 2005)

*Other worlds, that before they become into the new, wait in the interstices, stealthy growth within the cracks of what will render as bizarre the outdated normal of before. Soaking up and soaking in whatever nourishments fall into these recesses, here hope sustains hope; the possibility of a life lived well, holding out for needed conditions, expending minimal energy, gathering.*

## Advanced Capitalism and the Genetic Social Imaginary

In her use of the descriptor *genetic* to explain the *social imaginary* of advanced capitalism and its late twentieth century subjects, feminist anthropologist Sarah Franklin summons not only the cultural flights of fancy inspired by the biotechnological capacity to make ‘life-itself’ in the laboratory, and the neo-Darwinian neo-preformation concept of inherited recombinant biological traits that, coded in DNA, function to absolutely pre-determine the future individual, but also, and less acknowledged by her, the whole of the long narrative of telos in Western natural philosophy and science. Franklin emphasizes only the top layer of this palimpsest, biotechnology’s commodification of life-itself, e.g the capacity to ‘modify’ the genetic blueprint for desired effects, such as synthetic insulin production or weed and bug resistant crops, Dolly the sheep, transgenic animals, patented genomes, gmo crops, animal husbandry/breeding in the industrial food production, human reproductive technologies, the list goes on. Building on Arjun Appadurai’s concept of *the imagination as social practice*, which he means not in a way related to any psychoanalytic sense, but the imaginary as “central to all forms of agency, is itself a social fact, and is the key component of the new global order” (as cited in Franklin, 2000, p. 223), Franklin argues that the new genetics of ‘life-itself’ reimagine borders of reality, and that this represents a redefining of the natural, the global, and the future in the collective social imaginary of Western subjects:

...the borders of the undead and the unborn recede into an indeterminate horizon of enhanced technoscientific potency, the challenges to the imagination beckon irresistibly, *uncannily*, hopefully, and with enormous popular appeal” (2000, p. 198, italics added).

The haunts of novelist Nicholas Royle’s ‘uncanny’ used by Timothy Clark, who engages environmental criticism as a form of literary theory, resurface in Franklin’s identification of the

imagination as beckoning (who and/or what?) ‘uncannily’. While Clark applies this descriptive property to his narrative of the foreseeable vanishing of species, Franklin applies the term to her Vernadskyian evolutionary narrative of the redefinition of nature /life-itself/ the world/ the Earth (she is unclear how these terms do and do not conflate categories). As held true for Clark, Franklin, too, experiences an affective peculiarity that is not one’s “own” and also not with others’, nor with the world, merely an inevitable event that in its happening can’t get told, and which prompts great social anxiety. This ambiguity only compounds the anxiety with which advanced capitalism already infects its subjects (Braidotti, 2011).

I argue the importance of attending to an archaeological history of the ‘genetic’ character of the social imaginary; in important ways, the biotechnological story of life-itself at the turn of the millennium, which Franklin narrates as new, is not, but fulfills the trajectory of ‘business as usual’ of, in the least, the last two hundred years. It is in this linear, determinant sense of causality that the genetic social imaginary indelibly marks its progeny, advanced capitalism and its subjects, with what Franklin describes as the “Baconian ur-text of the masculine philosophy” (2000, p. 220). The traits and properties, and tensions, embedded in and stemming from this Western intellectual history of telos, characterize what Franklin (mis)interprets as a reimagined world reality. I claim that Franklin’s new world realities actually express the familiar telos of an unchanged imaginary.

The term *genetic* that Franklin engages to modify a millennial social condition gained clout as a scientific discipline in the postwar, mid-twentieth century, when telos, as a philosophical concept found its penultimate material expression in neo-Darwinism, in the genetic theory of evolution based on processes of recombinant cellular DNA as the blueprint or mechanism of inherited traits and randomly accumulated mutations; this theory provided the mechanism by which to explain Darwin’s evolutionary descent by adaptation, acted upon by natural selection. The dominance that Neo-Darwinism achieved in the scientific community in the



mid-twentieth century extended into social sciences, economics, political communities, and remains ascendant in the popular concept of – in an also a misnomered, oxymoronic colloquialism– scientific truth.

An interesting analysis of millennial Western subjectivity emerges from the exercise that reads the phrase *genetic social imaginary* in terms of the properties and traits ascribed to the gene in neo-Darwinist theories of evolution.<sup>1</sup> This translation essentializes the subject imaginary of advanced capitalism as inevitable, pre-determined and pre-determining; it functions and reproduces virginally, that is in isolation and unaffected by conditions beyond the borders of its cell wall. To describe subjects of advanced capitalism in the language of the neo-Darwinist metaphor, the bearer of the *Homo sapien* genome holds the most superior of hierarchical positions in the kingdom of animals (and, it goes without saying, life). Richard Dawkins accomplished with the gene what Vernadsky performed with technology, the atheistic invocation of the virgin-cure myth, but Dawkins' narrative of the gene explicitly and, equally dogmatically, models the Christian-narrative, by the power of the selfish gene vested in Richard Dawkins, it holds within and bears "immortality" (2006, 2012). The purity and absolute control of Franklin's laboratory petri-dish gestations perfectly mirrors the purity and absolute control of the neo-Darwinist gene, and the invisible hand of a Christian God. The neo-Darwinist gene resurrected the body of the past, and the life of the world-to-come. Like the gene in its passivity to a utilitarian, mechanistic nature, advanced capitalism becomes the WEIRDly fashioned expression of a triumphant reductionist science. Dawkins' universalization of an anthropocentric ethological bias, reflects the logos of capitalism, which, in turn, mirrors genetic material determinism in an eternal return of, for example but not limited to, limitless growth and profit passed down through the determining genetics of the immortal individual, understood as extending to its current legal sense, inclusive of the corporation/ institution). These genetic logics for the survival and reproduction of advanced capitalism function like a policing panopticon – ironically, in

opposition to the initial aspirations for the wedding of science to society—to foreclose possibility of social change, especially and particularly at the level of the subject’s imaginary. J.K. Gibson-Graham observed that capitalism totalizes the late 20<sup>th</sup> century’s monocultural economic imaginary, to the effect of a foreclosure of economic possibility, diverse community alternatives, and subjectivities other than those produced by capitalism (Gibson-Graham, 1996). These underlying homogenizing compulsions that drive Franklin’s biotechnological imaginary, and that Gibson-Graham’s economic imaginary resists, connect in a Fleckian thought style of 19<sup>th</sup> century ‘god-trick’ science that sees everything from nowhere (Haraway, 1988), and naturalizes the worldview of a mechanistic, linearly causal, controllable Earth that sustains advanced capitalism. These foundational narratives of the WEIRD-world discipline subjects to a telos that silences, banishes, manipulates, and controls imaginaries of diversity and change.

It is not surprising then, given the co-(m)motion between science, subjects, and society, that public education and popular media would be deaf and blind to alternative narrations that work against the logics on which are founded the ever-ascendant capitalist marketplace. Its most significant product, the colonized imaginaries of the progress-aspiring sub-altern citizen, sustains its ongoing operations in a Fanon/Foucaultian paradox. The subaltern enact their own marginality, reinforcing the very systems and practices that structure their own subordination. To rebel would be a monstrous act of violence and self-annihilation, crazy. Normative scientific methodologies and research funding procedures produce normative scientists with normative skills and observations. Science-making produces both its subject and its object. Subject-scientists and their institutions display an addiction to the profits that commercial applications of advanced technologies and biotechnology offer (Goldman, 2007). Many of these are based on advancements in quantum physics and cellular biology, which, ironically, perpetuate the mandated machinations and clockwork movements of a Newtonian-capitalist culture. While the Newtonian and neo-Darwinian science that provides a foundation for the twentieth century zeal

for ‘progress’ has since been eclipsed, the nineteenth century worldviews that generate the structures and relations of the current social order have not. Neoliberal teleologies unseat advancing scientific research as the limiting factor of social authority (e.g. the urgencies of climate change do not, and it seems cannot, incite political action adequate to its impending, gruesome realities). The lesson here is that any 21<sup>st</sup> century political/ social/ economic/ environmental movement for fundamental change must confront what it is up against, namely, the push and pull of a long history of the West’s attachment to telos.

It becomes crucial to dig into the archaeological layers of meaning embedded in the term ‘genetic’. Its prior meanings, infused with the traits of their contemporaneous temporal and cultural situations, have their own genealogies that mark subsequent narratives (like Franklin’s) that move through the collective imaginary. The noosphere that situated the nineteenth century imaginary, as I will show, and the Appadurai/Franklin millennial *genetic social imaginary* are replete with tensions between forces of memory and forces of desire, between ‘business-as-usual’ and radical change. Situated connotations, associations, signifiers, meanings, and genealogies do not so easily “fade far away, dissolve, and quite forget” (Keats, 1819).


### **Telos as Memory**


*And though she take a hundred lying forms, let her  
not escape you, but hold her close, whatever she may  
be, until she take again the form she had at first.  
(Ovid, Metamorphoses 11.250)*

To dig down to the philosophical roots of telos, “an ultimate end” ((Merriam-webster.com/dictionary) eposes the push and pull of concepts that as an ensemble display a restlessness, an inquietude, a shape-shifting, monster-wrestling of traits; when one settles another rouses. For thousands of years, but to this project’s interest, for the approximately three hundred years of the Enlightenment from the 17<sup>th</sup> century through the 19<sup>th</sup> century, the forces of tension between reason and experience and the imaginary, between the creative and the mechanistic, between living and inert matter, between theology and science duke it out, twisting and writhing into one big tangled knot that defies the tidy nomenclature of its categorical threads. To pull on one or two is to push on all the others, their constellations shift according to the particular mix of attributes and meanings ascribed by each given thinker of a given time. The driving theme, however, remains constant: to what constellation does human life belong, and how can this tale be told<sup>2</sup> in a way that conveys explanatory sense and motivates social justice?

In what follows, I argue that the Enlightenment and Rationalism, as the dominant foundations of the modern era and of 19<sup>th</sup> century science, failed in their project to establish intellectual secularity, by which I mean a thought-style that is free of the structures and confines that characterize monotheism. There is much literature by those qualified to make this point, which I am not, but I remind my reader that I present this argument as a premise and a situating of the ensuing chapters. The creation of the secular stretches back to the Royal Society of London in the 1660s to 1670s; I argue that the project failed, divine authority was not displaced by 18<sup>th</sup> - 19<sup>th</sup> century science, but was merely replicated in British men of means, for they alone could be trusted to be objective<sup>3</sup> —to be God, the scientist speaks for nature and then modestly disappears (adaptation of Law, 2004). Nature, as revealed by a universal and pure deity, became the universal and pure nature that men of science revealed. I evidence here, if simplistically, that the qualities that mark monotheism also mark the beliefs and attributes of the philosophers and scientists who turned away from church doctrine.<sup>4</sup> Notions of universality, essentialism,

materiality, singularity, immortality, humanism and morality, monism, reason, and human exceptionalism converge in the rituals and social practices that sustain(ed) the hierarchical and patriarchal powers of theological institutions. While there is no need here to analyse ecclesiastical doctrine, as pieces of a larger puzzle, these elements comprise a larger ideology of deistic telos, end-directedness. Though the scientific worldview of the 19<sup>th</sup> century extracted deism from telos, science, to which philosophy also belonged, held to the same ideology of telos, comprised of the same theistic elements, reformulated in shifting relations and balances. The adhering monotheistic thinking that a vestigial Western determinism propagates failed to dissolve. Interestingly –or not–, as modern science took hold as the go-to discipline of authoritative knowledge, its players assumed the patriarchal mantle of hierarchical power. I suggest that this is no mere coincidence, but a direct effect of a link between monotheism and capitalism, arbitrated by the ‘objective, reductionist’ science that neatly channels telos into its methods and taxonomic thinking.<sup>5</sup> The same descriptors and dynamics that characterized church hegemonies –naturalized, lawed, the one truth, certain, necessary, sufficient, benevolent, ‘for the good of’, hierarchical, singular, essential–have also been discursively engaged by the WEIRD to herald the social and political products of material determinism, such as the global proliferation of colonialism; exploitation of natural resources and labor; discriminatory racial and gender policies; neoliberalism, regulation of poverty; i.e. the ‘coherence of effects’ in Edward Said’s terminology which produces the unitary stable category. The subject imaginary of advanced capitalism could hardly help but be trapped within the disciplining domains of a very long history of patriarchal dogmas, whether of faith or of ‘scientific reason’, even if it may have wanted out.

**tel·e·ol·o·gy**  *noun* \,te-lē-'ā-lə-jē, tē-\

**Definition of TELEOLOGY** Cite!  +1


**1 a :** the study of evidences of design in nature

**b :** a doctrine (as in vitalism) that ends are immanent in nature

**c :** a doctrine explaining phenomena by final causes

**2 :** the fact or character attributed to nature or natural processes of being directed toward an end or shaped by a purpose

**3 :** the use of design or purpose as an explanation of natural phenomena

— **tel·e·ol·o·gist**  *noun*

**Origin of TELEOLOGY**

New Latin *teleologia*, from Greek *tele-*, *telos* end, purpose + *-logia* -logy — more at WHEEL

First Known Use: 1740

Figure 18. Definition of teleology. (Merriam-webster.com/dictionary)

## Slouching from Bethlehem

*Fichte, Schelling, Hegel, Feuerbach, Strauss –  
all stink of theologians and church fathers.  
Nietzsche*

This tension between processes of convention and processes of innovation bears out in the Enlightenment and Rationalist thinkers who resisted church domination of social and scientific thought, such as Francis Bacon, Rene Descartes, David Hume, Isaac Newton, Immanuel Kant, Baruch Spinoza, Charles Darwin, the list goes on. In short, the names that anchor current hegemonies were the heretics of the social orders in their day. Here I explore these tensions and dynamics in the making of the Western worldview through an emblematic focus on Kant (1724-1804) and Darwin (1809-1882) on the topic of telos, to show how in the end, despite their inclinations, the irresistible charismatic of monotheism trumped Kant's intellectual secularity, and haunted Darwin's.

The spectre of telos since Aristotle (see chart if I get to it) informed what both Kant and Darwin confronted in the course of developing their concepts, respectively, the 'purpose of nature' and the theory of evolution by descent from a common ancestor by modification and natural selection. Kant and Darwin demonstrate, like Žižek, the depth of difficulty that faces subjects, particularly men, of breaking free from the patriarchal, deterministic thinking conventions to which they were trained and of their lived experience. Both Kant and Darwin introduced contingency, that which eludes determinism, to the biological literature, though Kant's telos also contradicted his tentative dabbling with contingency.<sup>6</sup> Both Kant and Darwin do away with the divine maker, Kant, however, keeps the divine as the unknowable authority, while Darwin wrestled to deal with intersections of the theological and social for decades before ultimately abandoning his church attendance in favor of taking walks.

The 18<sup>th</sup> century world understood telos as the hierarchical systematicity of a *cause*; “the end, that for the sake of which a thing is done” was universally for the good, as ‘nature does nothing in vain’. The end purpose preceded and explained the formation of the organism. In Kant’s time, the ultimate end of nature was mankind. To this commitment, Kant appended his own and, according to John Zammito (2014), Locke’s and Hume’s, heretical concept of an a priori limitation to human knowledge of the world.

Humans cannot determine either efficient or final causes, or how even a mere blade of grass is produced. Human beings cannot have the insight into mechanical principles of nature or how organized beings are even possible (Kant & Pluhar, 1987, p. 409).

Organized beings are the only beings in nature that, even when considered by themselves and apart from any relation to other things, must still be thought of as possible only as purposes of nature. It is these beings, therefore, which first give objective reality to the concept of a purpose that is a purpose of nature rather than a practical purpose and which therefore gives natural science the basis for a teleology. (Kant & Pluhar, 1987, pp. 375-6).

Introducing an interesting twist on ecclesiastical telos, as represented by Thomas Aquinas, the teleological principle, for Kant, laid both within a Newtonian paradigm and beyond the capacity of the human to distinguish between necessity and contingency; it was a heuristic construct that aided making whole sense of experience: telos and ‘the emergent sciences’ (biology), were not scientific knowledge (philosophy and physics).<sup>7</sup> Uncertainty belonged to the human while certainty marked the sacrosanct domains of religion and science. In this move, Kant displaced the pre-categorical universality of Aristotelian teleology with a ‘regulative’ (pure, abstract, theory based) systems-thinking of objective reality which unfolds according to an unknowable, yet purposive telos. Kant differentiated between the ‘regulative’ and the ‘constitutive’ (subjective, empirical, experience based) role of the discerning naturalist, in what I see as a gesture to the Platonic conception of matter as residing in an idealized exemplar form while the individual object or organism was merely its imperfect, idiosyncratic and distant



representation. Scientific claims stemmed from the naturalist's observation of commonalities between this ideal form (the 'regulative') and the merely 'constitutive'.

Kant navigated the Scylla and Charybdis of telos as contemporaneously theorized, steering a course between mechanistic materialism and animistic vitalism (Zammito, 2014), which was the dominant theory of his day to explain development in living matter. The problem with vitalism for Kant was that it could not explain hybridity and that it competed with what he supported, Harvey's theory of epigenesis, a developmental model of the organism. Kant steered a middle ground, he complemented the pre-existent germs and predispositions of the whole natural organism with a concept of interactions and environmental contingency which constituted the 'potential state', and which preformed the individual (Grene & Depew, pp. 96-7). In Kant's 'generic preformationist' view, the individual organism's form arose gradually in a process of complex interactions between the constants of the germ and the variables of its inner and environmental 'dispositions'. Generic preformationism aligned with 'purposiveness': everything the organism contained was determined a priori, development in organisms was both goal-oriented and part-whole 'fittingness'.

The Kantian system was definitively taxonomic, reason was classified in opposition to the imagination (Morris, 2011). In reaching beyond its own organismal limits, reason "finds a system like itself that organizes itself in face of something beyond it, through a passive/active relation to place that echoes the imagination as receptive/spontaneous." Kant, according to Morris, explained his categories as arising from a "system of the epigenesis of pure reason" (p. 187). In an odd, perhaps accelerated, yet interesting phenomenological reading, philosophy scholar David Morris interpreted this to mean that in Kant's categorical logic, systems (reason and organisms) are inherently and dialectically open to something beyond their limit in a way that involves the play of imagination that opens at the limits of organisms; the organism forms itself

out of a place beyond itself, beyond reason. Imagination and the epigenesis of reason co-constitute in the a priori of Kant's natural purpose.

In another navigation between Scylla and Charybdis, Kant's natural purpose preserved the all-important divinely-constituted purity of 'species', and with it the hierarchical exceptionalism and moral destiny of man. This allowed Kant to evade the concept of organism as artifact, to evade the charge of atheism, and to evade what was immoral, heretical, and outrageous – the dreaded charge of materialism. As a self-identified transcendental idealist, Kant objected to romantic observation and experience, traits aligned with materialists. Natural purpose, though, introduced a concept of the contingent interactions of living matter, implicating surreptitiously another taboo, cyclicality, in an ever-so-soft whisper towards a radical systems- and process-thinking.

Between a rock and a hard place to preserve the certainty and universality of the theological domain while simultaneously extracting the theological from science (philosophy), Kant squirmed into an ambivalent reconciliation. He stated that the investigation of biological matter comes about by means of an idea; natural purpose is the object of a concept that situated human reflection within a context of the divine ephemeral of the living, ontologically divided from the rest of the living. Though he distanced 'the emergent sciences' from Newtonian laws of physics, he maintained the obligatory divine gulf between the human and other life; his generic preformationism conforms to the linear (when-then) mechanisms of a universal telos to nature's purposes. Kant does away with the divine maker but keeps the divine – embedded in the unknowable, determinant, purposive force that equates human morality with nature's destiny. The strictures of monotheism (the divine universal and certain, the natural purpose of man, the transference of hierarchical thinking to taxonomic thinking pervaded Kant's work. Like Žižek, he leaned into the jump, but ultimately stepped back from the edge and couldn't make the leap. The combination of linear, mechanistic reason that endowed man with the divine autonomy to guide

teleologic living-matter with a universal and deterministic ‘purposive nature’ resounded with the chords of monotheistic dogma.

In summary, the configuration of ontological and methodological commitments that constitute the standards of ‘objectivity’ for early modern physical sciences explicitly relies on religious beliefs (Lloyd, 2008, p. 180).

Alfred North Whitehead, an ordained minister who had wandered away from Christian dogma into the philosophy of science, had also expressed this sentiment in 1925. He suggested that the concept of a personified, rational, and universal God laid the foundation for the “scientific” conviction of unifying principles of nature that were universal and discoverable through reason and empirical method (Tauber, 1997).

Kant’s thought also prefigured the obscure ideas of recursivity of subject-object relations, the excess of boundary delineations, contingency, and the free-play of the imagination that later came to the fore in feminist continental critical theory, but the Kantian naturalization of the disembodied exceptionalism of patriarchal reason eliminated any chance of supporting citations of his philosophies by feminists.

This did not inhibit Francisco Varela from citing his legacy in connection with autopoiesis, nor Stuart Kauffman’s engagement of ‘Kantian wholes’ in support of his philosophy of biology.<sup>8</sup> Curiously, the Kantian legacy can be leveraged in support of conflicting arguments, e.g. the universal, lawed imperative of transcendent moral duty *and* self-organization, a dynamic metaphysics *and* the fixity of scientific taxonomies, the abstract purity of regulative reason *and* constitutive contingency. A taxonomy of binaries allows for cherry-picking; Kant takes his swim and does not get wet. John Zammito, whose explicit project is the rescue of empiricism and scientific practice from the ‘fashionable discipline of postmodern science studies’ (2004) asks “What was Kant’s philosophy of science?” (2014, p. 39).

Surely Kant was cognizant of having to tread a thin line strategically, as Darwin also did, in presenting his ideas in a way that would be taken seriously, rather than summarily dismissed.

Still, Kant's philosophy of science expressed his subjectivity; embedded in and by the conditions of his 18<sup>th</sup> century, Kantian thought genuflects to the monotheistic divine, even as it meekly gestures in new and errant directions. Ultimately a Kantian teleology that ascribed rigid taxonomies to nature strains under the pressures of explanation coming from advancing biology, chemistry, and mathematics. Even within its own terms, Kant's telos equivocated, even collapsed, as it pushed beyond its own limits. Nonetheless, Kantian thought lays the groundwork for the full transplant of the properties of the divine to men-of-science that took hold in the 19th century conception of objective reality, which became, as Elisabeth Lloyd notes the standard for knowledge itself (*Science, Politics and Evolution*, Cambridge University Press, New York, 2008).

Though Kant's categories don't hold up, the tenacity of taxonomic thinking he modeled explained, according to philosopher of biology David Hull, the concept of teleological progress (as cited in Grene & Depew, p. 289) which, though flatly refuted by Darwin (1887, p. 315), persist into the current twenty-first century. Kantian precepts neatly illustrate what John Law summarized as five Euro-American assumptions of ontological reality (2004):

1. There is a reality out-there beyond ourselves;
2. This external reality is usually (except as our actions affect parts of external reality) independent of our actions and especially of our perceptions.
3. Anteriority: external reality precedes us.
4. Definiteness: external reality is composed of a set of definite forms or relations. "The world is more or less specific, clear, definable, and decided" (p. 25).
5. Singularity: the world is shared, common, the same everywhere.

Law concurred with scholars in the discipline of science studies, Latour and Woolgar, that this "something beyond" of the anteriority and independence of reality crucially deleted subjectivity in order to construct a reality of determinacy.<sup>9</sup> It also echoed the subject-God relation of

monotheism, and described what the scientific method produced, “a reality that is independent, anterior, definite, and singular” (p. 37).

The Kantian noösphere situated the historical/social context that Charles Darwin entered and eventually, ruptured.<sup>10</sup> It also fostered the Hegelian world that Žižek inhabits, along with his enamored lost-causes and Franklin’s advanced capitalism.

“ We need no further evidence to shew that the presence of Coal is, in an especial degree, the foundation of increasing population, riches, and power, and of improvement in almost every art which administers to the necessities and comforts of mankind. And, however remote may have been the periods at which these materials of future beneficial dispensations were laid up in store, we may fairly assume, that, besides the immediate purposes effected at, or before the time of their deposition in the strata of the earth, an ulterior prospective view to the future uses of man, formed p  
which they w s ago

admirably adapted to the benefit of the human race.” \*

Such then, are the evidences of designed adaptation to the benefit and condition of mankind, which result in the examination of this great storehouse of the ancient vegetation that clothed our planet. But

Figure 19. Coal depositions exist in order to benefit the human race.  
(William S. Gibson, 1840, p. 257)

## Darwin's Subjectivity

*Cousin to the amoeba, how can we know for certain?*  
Donald T. Campbell

Darwin's narrative style, if not his thinking, straddled the conventions of his day and his compulsion to have his radical concepts taken seriously. He explicitly acknowledged tension between reason and imagination; understanding that his theory of descent and natural selection would strike his times as unreasonable and beyond the imagination, and citing the complex organ of the eye as an example of natural selection "insuperable by our imagination" (Darwin, 1859, p. 187). He cautioned against a dismissal of the unimaginable that may turn out to be reasonable, "reason ought to conquer imagination" (1859, p. 373). 'Ought' suggests any of a tension, a Kantian duty, a criticism, a conditional probability. This verb may also have pointed at Darwin's own struggle with his own Victorian subjectivity, initially to remain loyal to the dictates of his wife's devout Christianity and the beliefs common to his class, without alienating either, while publishing his findings to the contrary that the evidence of his own research presented. Perhaps this helps to explain why, though Darwin felt he had accumulated sufficient material evidence to support his theories twenty years prior, *The Origin of Species by Means of Natural Selection* was not published until 1859, after his colleague and competitor Alfred Russell Wallace published "*On the law which has regulated the introduction of new species*" in 1855. In the first edition of *Origin*, Darwin was consistently cautious and deprecatory, repeatedly engaging such phrases as "for the good of" and "goodly nature," phrases that would have reassured believers in an Aquinas' exceptionalism of the individual Man and in the parsimony of a causal Aristotelian nature "that does nothing in vain," or perhaps to buffer the sacrilegious rupture he struck to the divine divide between Man and animal species. Indeed, it seemed that at the time of this volume's first publishing, Darwin was unsure himself how he fit into these considerations. Acknowledging that his interpretations were still in flux, Darwin's first publishing of *Origins* smacked of a

hybridity wrought from his own natural science practice mixed with the mores and philosophical inheritances of his English education and class, clearly present in the definition of natural selection:

Whatever the cause may be of each slight difference in the offspring from their parents – *and a cause for each must exist (Aquinas/Kant)*– it is the *steady accumulation (Lyell’s uniformitarianism)*, through natural selection, of such differences, when *beneficial to the individual (Aristotle/Adam Smith)*, that gives rise to all the more important modifications of structure, by which the innumerable beings on the face of this earth are enabled *to struggle with each other, and the best adapted to survive (Malthus)*.

Darwin 1859, p. 10 (parentheticals and italics added).

At first Darwin integrated the ideologies of his class; by the mid-nineteenth century, the classical economic theory of John Stuart Mill, Adam Smith, and Malthus pervaded English intellectual thought, showing up in Darwin’s initial theory of natural selection and later in Richard Dawkins’ selfish gene {AND WHERE ELSE O WELL] as nature described as parsimonious and competitive. Darwin mentions in an 1838 notebook entry the “oeconomy of Nature” having “a force like “100,000 wedges ... forcing gaps by thrusting weaker ones” as a kind of “final cause” (Notebook D 135, 1838-9). Economics, religion, and science conjoined such that what had been God became material in the WEIRD market; Adam Smith’s invisible hand bore little difference from Aquinas’ divine archer who created the human hand, birds’ wings, and the seal’s flippers as modifications of a single plan and from the Creator’s invisible hand of Cuvier’s conditions of existence (“pour le role que l’animal doit jouer dans la nature”). In November of 1859 when *The Origin of Species* was first published, Great Britain prepared for a joint Anglo-French expedition that would lead to the occupation of Beijing and the burning of the Yuanmingyuan summer palace. In 1862 Karl Marx remarked in a letter to Engels on the parable of capitalist modernity of Darwin’s publication:

It is remarkable how Darwin has discerned anew among beasts and plants his English society, with its division of labor, competition, elucidation of new



markets, “inventions,” and the Malthusian “struggle for existence.” It is Hobbes’ *bellum Omnia contra omnes*, and it reminds me of Hegel’s Phenomenology, wherein bourgeois society figures as a “spiritual animal kingdom,” while in Darwin the animal kingdom figures as bourgeois society. (Marx, as cited in Jones, 2011, p. 6)

Scientific, economic, and religious doctrine heavily influenced Darwin, and though he ultimately broke away, it was not without ambivalence. Well after the publication of *Origin*, in a personal exchange on the matter of God the intelligent First Cause and Kant’s ‘natural purpose’, the Duke of Argyll reported the following,

... in the course of that conversation I said to Mr. Darwin, with reference to some of his own remarkable works on the 'Fertilisation of Orchids,' and upon 'The Earthworms,' and various other observations he made of the wonderful contrivances for certain purposes in nature—I said it was impossible to look at these without seeing that they were the effect and the expression of mind. I shall never forget Mr. Darwin's answer. He looked at me very hard and said, 'Well, that often comes over me with overwhelming force; but at other times,' and he shook his head vaguely, adding, "it seems to go away" (1885, p. 244).

The Kantian conscience weighed on Darwin, and found voice in a direct challenge to Kantian principles, “Have we any right to assume that the Creator works by intellectual powers like those of man?” (Darwin, 1861, p. 208). In a letter to Asa Gray dated May 22, 1860 on how the role of chance in his theory of evolution directly contradicted the dominant and accepted notion of deterministic natural law, he admitted “not that this notion [of chance] at all satisfies me! I feel most deeply that the whole subject is too profound for the human intellect” (1888, p. 312). In this might be heard shades of Kant, applied not as Kant did as a way to preserve a universal God, but in a way to explain Darwin’s ongoing personal conflict between his research findings and the noösphere of his own political and social world.

Darwin remained ever the deferential Victorian English gentleman. He intended to soften the blow to his readers by using hierarchical language, even as he insisted on their simian

ancestries and of the relation of the ‘barbarous savage’ to ‘civilized man’ with the ‘god-like intellect’.

The heroic little monkey, who braved his dreaded enemy in order to save the life of his keeper, ... man with all his noble qualities, with sympathy which feels for the most debase, with benevolence which extends not only to other men but to the humblest living creature, ... man still bears in his frame the indelible stamp of his lowly origin.  
(1871, pp. 404-5).

With one hand Darwin removed the boundaries between humans and animal species, and with the other hand he quickly reassured his reader of human exceptionality.

That disinterested love for all living creatures, the most noble attribute of man, was quite beyond [the fellow-apes] comprehension. ... Senses and intuitions, the various emotions and faculties, such as love, memory, attention, curiosity, imitation, reason, etc., of which man boasts, may be found in an incipient, or even sometimes in a well-developed condition, in the lower animals (1871, p. 105).

The subtext is unclear to me as to whether Darwin really believed in human exceptionality, or whether these allusions to hierarchy were rhetorical devices of double-entendre, or expressions of Darwin’s own ambivalence. Darwin attributed the development of morality in the human species, specifically, to the evolution of language, by which the ‘general good,’ for humans, was expressed in the golden rule and by natural duty, a logic that Darwin completes in an affirmation of a Kantian instinctive moral sense in humans, and quoting Kant, Darwin writes, “I will not in my own person violate the dignity of humanity” (1871, Chapter III, 86), or was he facetiously playing it safe? Writing to himself in 1838, Darwin ridiculed such natural hierarchy, “It is absurd to talk of one animal being higher than another” (Darwin, March 1838, as cited in Grene & Depew, 2004, n.33, p. 183). His egregiously polite rebuttal to Dr. Abbott’s case for the enormous importance of the ‘greatest of men’ represents Darwin’s reluctant, gentle resistance to the mores of his England. “I have been accustomed to think second, third, and fourth rate men of very high importance, at least in the case of Science, ... having done and doing more for the progress of

civilization than you seem inclined to admit” (1871, p. 316). Darwin gently ridicules Abbott’s equivalence of ‘civilized’ with Caucasian races with the modest approbrium of the inserted modifier, *so-called*, to describe ‘civilized’. Other frustrations with the dominant thinkers of Darwin’s Cartesian education (Locke, Hume, John Stuart Mill, Lyell, Kant) surfaced. In his 1838 notes he wrote, “the mind of man is no more perfect than instincts of animals to all and changing contingencies, or bodies of either,— Our descent, then, is the origin of our evil passions!! — The Devil under form of Baboon is our grandfather!(1838, n.. 289). ... “He who understands baboon would do more for metaphysics than Locke” (1838, n. 84).

Whether explained by the inclinations of the Victorian English gentleman or by the self-discipline and curiosity of the natural scientist, or both, or ambivalence, Darwin, never quite fully or easily accepted even his own findings as certainties. Darwin acknowledged that at the time he wrote *The Origin of Species*, he could rightly have been called a theist. In a letter to Dr. Abbott (Nov. 16, 1871) Darwin wrote “I gradually came to disbelieve in Christianity... but I was very unwilling to give up my belief” (1887, n.309). Ultimately asked to explain his agnosticism, Darwin demurred on atheism, opting for the more respectable agnosticism, and reverting to the classed language of the elite versus the masses, stated that there was no evidence to support the existence of a God. "Is anything gained by trying to force these new ideas upon the mass of mankind? It is all very well for educated, cultured, thoughtful people; but are the masses yet ripe for it?" (as cited in Aveling, 1883, p. 5).

Later in his life, Darwin became less conciliatory to political-correctness. Admitting that he’d placed too much emphasis on Malthus’ survival-of-the-fittest in his first publication of *Origin*, in his 1871 publication *The Descent of Man* Darwin applied his natural science lens to *The Comparison of Mental Powers of Man and the Lower Animals* (Chapter 3). Here Darwin cites evidence found in multiple species for altruism and the ‘social instinct’ that benefits the general good of the community.

The term, general good, may be defined as the means by which the greatest possible number of individuals can be reared in full vigour and health, with all their faculties perfect, under the conditions to which they are exposed. As the social instincts both of man and the lower animals have no doubt been developed by the same steps, it would be advisable, if found practicable, to use the same definition in both cases, and to take as the test of morality, the general good or welfare of the community, rather than the general happiness... (1871, 98).

In a footnote reference Darwin directly refuted John Stuart Mill's school of utilitarianism that attributed morality to a form of selfishness, euphemistically called the Greatest Happiness Principle. In the fifth edition of *Origin* published in 1871, Darwin acknowledged additional driving forces of evolution such as group selection, altruism, sexual selection, adaptive changes of structure, and the sudden appearance of vestigial organs (Geison, 1969); he questioned but did not dismiss Lamarckianism, and he discredited the notion of 'species' as anything other than terms to conveniently classify variation (Darwin 1859, p. 52). These were fighting words. In Victorian England species were immutable and immune from extinction, the Creator's separate creations of instantaneous perfect adaptation. Most importantly, there was deep fear of materialist metaphysics and theories of transmutation, such as Lamarck's, which reduced the distance between man and animal, this distance being the foundation of civilized society and the rock of moral norms. Regardless, species for Darwin were without fixed "essence" but in constant flux, and instead, species were arbitrary conceptual constructs used by naturalists and, therefore, void of natural purpose.

Having dismissed design and divine sovereignty, as well as the concept of species as located in nature, Darwin also ejected the Aristotelian good of 'final cause' from his earlier theory of natural selection.

I probably attributed too much to natural selection or the survival of the fittest. I have altered the fifth edition of the *Origin* so as to confine my remarks to adaptive changes of structure. I had formerly not sufficiently considered the existence of many structures which appear to be, as far as we

can judge, neither beneficial nor injurious; and this I believe to be one of the greatest oversights as yet detected in my work (Darwin, 1871, p. 152).

In sum, by the end of his life Darwin had rejected the properties of monotheism: hierarchy (perhaps), anthropocentric exceptionalism, linear causality, determinism, naturalized morality. Darwin's theories threatened 18<sup>th</sup> and 19<sup>th</sup> century worldviews of science as the political basis for social reform, they were incommensurate with deterministic and predictive Newtonian laws. They directly threatened the sanctity of mankind, reason, morality, even civilization itself. Descent by modification and natural selection "dethroned God" (Mayr, 1988, p. 179), whether he be Cartesian, Newtonian, or Christian, and there can be little doubt that Darwin was well-aware of the stakes of his project.

It is not surprising, then, that such an attack on dominant ideologies provoked a responsive wrath that called up a monotheistic God's methods of reward, sin, and retribution, a justified condemnation for committing the unthinkable: threatening telos with uncertainty, chance, contingency, process, chaos, and complexity, a condemnation that has hardly paled since. "A teleological force in nature was so firmly anchored in the thinking...that this belief had more followers in the first eight years after 1859 than did Darwin's theory of selection" (Mayr, 1988, 59). It is not surprising, then, that Darwin's ideas did not hold sway in the scientific community until Mendelian genetics provided natural selection with a mechanism, and until statistical probability gained favor amongst evolutionary biologists in the mid-twentieth century, until a confluence of conditions, euphemistically labeled neo-Darwinism or the Modern Synthesis, would extract secular radicalism from Darwin's work leaving in its place a new dogma of natural selection consonant with ingrained monotheistic thinking. Darwin's support for group selection would be eradicated by the determinist genetics of neo-Darwinism.

Certainly by close of his career, Darwin had upended the legacy of telos, introducing uncertainty and chance where, in a sort of war of the ghosts, 100 years later neo-Darwinist

genetic logics would later take them away, and 50 years after that cellular biology and epigenetics would restore to scientific canon what Darwin had begun. Presaging findings in evolution science and cellular genetics of the late twentieth century, for Darwin, affects impelled conduct, and this he saw as central to group survival. In processes of hauntological evolutionary innovation environment, variation, and heredity coincide. Ultimately, as Darwin's thought became less and less an expression of the patrimonies of his station, he seemed to never settle on the subject of telos, or else it is the literature that cannot discern whether Darwin emerged from his doubts with clarity on the topic. Writing in his journal between 1836-1839 what was never meant for public reading, and posthumously published in 1887 by his son, Francis, Darwin rejects religion's appropriation of telos as divine design, "there seems to be no more design in the variability of organisms, and in the action of natural selection, than in the course which the wind blows" (1887, p. 309). Yet in an 1874 letter to Asa Gray, commenting on his published statement that Darwin had brought biology "back to teleology," Darwin wrote, "What you say about teleology pleases me especially" (1887b, p. 267). It is impossible to know what may have been his ambivalence over telos, and there is much evidence in Darwin's literature to support this. In the context of his later and private thought, and I would argue for this, Darwin's remark might also be interpreted as Darwin's pleasure over a displacement of religion by biology, and thus an implied redefinition of telos, as a concept, along the lines of natural selection as process philosophy. That said, Darwin struggled to explain and differentiate his notion of natural selection within the languages of causality, beginnings and endings, within the conventions of telos.

### **Putting Kant and Darwin in Perspective**

*The science of evolution [is] a child of the nineteenth century ...  
this theory has now become the sure foundation of our whole world-system.  
—Ernst Haeckel, Die Weltrathsel (1900)*

The disruption of telos subverts determinism, but Darwin struggled to find language that explained natural selection without the use of teleological or mechanistic vocabulary. This struggle with existing language to explain radical thinking continues to face philosophers and critical theorists who attempt a radical non-gendered process philosophy of emergence. Words like ‘create’, ‘produce’, ‘higher’, ‘lower’, ‘function’ MORE show up in the work of Deleuze, Elizabeth Grosz, William Connolly, Jane Bennett, and many more. Darwin’s theories routinely get misunderstood and misinterpreted, even by these scholars. The English language itself structures hierarchical, teleological thinking, challenging any project to release the concept of ‘progress’ from evolutionary thinking.

Monist interpretations of Darwinian evolution, such as Herbert Spencer’s social evolution, Ernst Haeckel’s ‘cellular state’, and T.H. Huxley’s *Evolution and Ethics*, subsumed the notion that the law of evolution singularly explained all phenomena, human and otherwise. As an ideology, evolution remained entwined with economic progress and capitalist growth.

...Simplified into developmental thinking, [it] became a privileged way of knowing and narrating the world and its history, ... [as] unfolding according to a set of universally applicable laws. ... Colonization [and the] extermination of native is understood as the playing out of the logic of nature itself, and justified by way of examples from the animal and botanical worlds. ... Primitive life-forms are likened to “primitive tribes” and the complex global division of labor characterizing nineteenth-century capitalism is naturalized as the inevitable product of biological development. ... Evolutionary timescales and laws of heredity render our historical agency moot. (Jones, 2011 p. 20).

The ‘objective’ science of pre-Darwinian thought conveniently co-opted a misreading of Darwin to fit imperial progress narratives. Following on its heels, ultra-reductionism triumphed in the neo-Darwinian gene, seeing it as the causal agent of change driven by statistical molecular biology. Teleological narrations of scientific determinism stand at a remove from bodies, from accountability, from affects and effects. The prevailing science of the late nineteenth and

twentieth centuries ostracized ecologists and natural historians, and delivered on Darwin's gruesome prediction, "Looking to the world at no very distant date, what an endless number of the lower races will have been eliminated by the higher civilized races throughout the world. But I will write no more..." (1871, p. 316).

Neither Kant nor Darwin resolve an a priori dichotomy between reason and the imaginary. Reason as mechanistic telos was held in highest value, while attributes of the subjugated described the imaginary –irrational, crazy, feminine. The Kant-Darwin tension is emblematic of the absence of conceptual consensus about telos throughout western history: is telos purposive, end-directed, linear cause, cyclical cause, final cause, social construction, emergent, a variable of physics? While the philosophical relevance of the telos question to biology came to the fore as part of the 17th century Enlightenment reaction against the immutable knowledge authority of the Church, by the late nineteenth and twentieth century this initially minoritarian science movement enjoyed hegemonic authority. At the turn of the twenty-first century, tension over telos remains unresolved, categories have gotten messy, lost their antiseptically drawn boundaries. The metaphysics of telos has become a material issue of temporality, of life and well-being that is fundamentally consequential to a planet in trouble, despite how Western science narrates the denial and othering of subjectivity, and to do so sustains the ontological bifurcation of the imaginary and reason.

Marking that this hauntological past, represented by Kant and Darwin as 'half-forgotten absent presences', brings into focus one of the meanings of the contemporary genetic social imaginary, the organism as technological object emerges as an unsurprising telos of its own history encapsulated in Kant's commitment to objective reality, i.e. nature's purposive 'organized beings' which, in his view, gave science the basis for a teleology (Grene & Depew, 2004, pp. 104-5) and framed his systems-thinking of natural purposes. This served his larger discursive project of providing scientific validation for mankind's moral destiny according to God's design



and nature's ultimate end. Kant vehemently opposed atheism and defended monotheism, accordingly his natural purpose preserved hierarchical law. Taxonomic thinking, monotheistic thinking, and teleological thinking wove together in a Kantian whole, the monster in our midst, typical of 'objective' reductionist and economic narrations by dominant figureheads of Western noosphere, of which Kant was one.

These stories slam into their own negative effects and subsequent contradictory advancements in science; logics of ecology, care, interdependence, the posthuman, global climate change, diverse and local economies, classed distributions of health and wealth, community well-being lay either outside or subservient within the purposive Kantian whole of man's 'objective reality' and the systemic nihilism of othered subjects. Science narrated subjectivity, and its erasure.

Neo-Darwinism successfully resurrected within molecular and evolutionary biology a nineteenth century atomistic, 'objective' worldview that conjoined economic theory (capitalism) and 'hard' science as an agent, or engine, of social change in the name of 'progress' (civilizing the uncivilized, imperialism, industry, commodification, more research, applied technoscience, profit). Twentieth century society responded to this nineteenth century promise, as science historian Steven Goldman explains (1989), by proliferating vast networks of educational, governmental, military, and business institutions to translate scientific ideas (distinct from the former practical know-how, apprenticeships, fieldwork, and craftsmanship). Funded by government and private investments, the age of techno-science took off with centralized electricity, the textile industry, meat-packing, cheap penicillin, and—lest we forget—the military. Having begun modestly (the first engineering schools with a core curriculum in the 'hard' theoretical sciences were few until their post-WWII explosion), the cross-fertilizations of universities, business, government, and hard science rapidly opened the door to the profit potential in commercial applications of science. Further, the commercialization of technoscience

continues to play out an addiction of economic profit to scientific innovation (Goldman, 2007, lecture 27).

The grip of telos on biological thinking from Aquinas through Dawkins demonstrates the tenacity and ferocity of what I see as an irresistible charisma of monotheism by which claims to knowledge about life and nature, in filling discrete, absolute, and autonomous categories serve political and social ends to assert power 'over'. In a WEIRD conflation of ethics, applied science, and economic power politics, the negation of secular thinking (free of monotheistic traits) deletes and others subjectivity, a trait that describes and fosters neoliberalism. Even as stakes get higher globally, this conflation sustains the status quo of power relations.

Kant's living matter, understood as operating according to lawed, if unknowable, purposive causality contradicts Darwin's process theory of descent by emergent modification and natural selection. The scientific method, by which claims to objectivity are legitimized by consensus within the scientific community, presumes a priori that its object of study— the research question— exists in the Kantian world of an external nature governed by autonomous, causally-functioning laws. Grounded in an Enlightenment conception of the workings of natural law, do the standards of the scientific method inherently conflict with Darwin's extraction of telos and singularity from natural law, does the scientific method conflict with a theory of variations due to differences in conditions and environments, contingency, and unpredictability. Darwin's science more closely resembles the properties of quantum uncertainty than of Newtonian physics. In a thought experiment that privileges the scientific method, natural selection, then, is either not natural or not scientific. On the other hand, however, accepting Darwin's theory of natural selection to be scientifically accurate prompts doubt on whether the scientific method imposes standards incommensurate with natural processes, and, consequently, are possible knowledges rendered invisible and inaccessible?

Other philosophers and communities of ostracized scientists recognized the tyranny of systematics and the limits of reductionism, and I briefly review some of these in the next chapter. In many ways, the elder Darwin was one of these. Darwin self-identified as a materialist, though only privately in his *Notebooks*, so heretical were the Romantics to the science of his time and class. As Darwin observed in a letter to Charles Lyell in 1860, well in advance of Thomas Kuhn, “Without the making of theories I am convinced there would be no observation” (1887, p. 315). Observations must be tested against a theory, model, or hypothesis.

### **The In-between**



Figure 20. Earth swallows up and transforms. Grassland #466 (Underwood, 2005)

*The practices may be to pave over, and to cut, and 'yet it still moves'. Earth swallows up and transforms the crust that will have had been the visible, and what had been is no longer hidden. The outside becomes the inside. The particularities of how this turnover happens to take place will be surprising, unpredictable, and apparently random.*

What gets overlooked in tugs-of-war over ideology are the tenuous ephemeral dark matter of the in-between— of the actor and the network nodes, of the conditions that mark the cusp, of what’s gestating inside the gaps, of the teeter between legacy, lived experience, and desires, of spaces that cannot be reified or quarantined, measured or predicted— the spaces of the imaginary. Given the imaginary’s capacity to weave new narratives of reality, and given the potential of recent scientific practices and biological innovations to effect fundamental social change, the narratives at work in the imaginary best be scrutinized, and their affective potencies tended. Capitalism and patriarchy, the progeny of long histories of militarism and theology, colonized the space of the imaginary.

As attached to Appadurai’s concept, the *genetic* social imaginary, that Franklin described, defined a local/global practice of science that reimagined, and, then, (re)made a reproductive reality. Put another way, Franklin’s exploration of the social imaginary as *genetic* argues that the collective social imaginary directly enacts a reproductive telos of a previously nonexistent and not yet narrated world. But does her ‘reimagining re-define’ and bring-forth an unfamiliar world or, as I argue, continue the world as it had already been declared as a man-directed engine of teleologies? The meta-interpretation of her cultural analysis accurately frames one premise of my project: science and the social coalesce in the imaginary of the noösphere-embodying millennial Western subject.<sup>11</sup> The imaginary, then, locates where and how subjectivity becomes constituted and conditioned; it locates the field (meant in the quantum sense) of narrative flows; spatially, the imaginary is a heterotopia; it is the imaginary where reserve holds of potentialities, possibility, and bringing-forth consolidate; both stasis and transformation require a mobilization of the imaginary; as such, the imaginary sites political battle and ethical struggle, inspiring fear in the power centers of the status quo, and hope in the radical desires for transformation.

The challenge to contemporary science is to explain this space, acknowledging its political and temporal materialities, a challenge taken on by Karen Barad and other marginalized voices in science; theirs, too, briefly reviewed in the following chapter, follows from a legacy of former narrations that haunted and queered the dominant of this chapter's review.<sup>12</sup>



Figure 21. Paradigm shift. Grassland #394 (Underdown, 2005)

*How long does it take for the drawn out effects of a paradigm shift to show? There won't be crisp edges to mark the end of one and the start of another, but we can take note that it is in the process of ensuing, this mark of time and movement, is becoming altogether different than what will be that which had been.*

## Notes

1 While the topologies of the social imaginary that emerges from my brief, simplistic exercise here might appear sophomoric, well-researched and scholarly-presented affiliations with my description are found in recent critiques of advanced capitalism as tied to subjectivity in the work of, for example, Margulis, Gibson-Graham, Haraway, Barad, Alaimo, Braidotti, and more.

2 ...by whom and to whom become the obvious secondary questions that follow.

3 Women can't be trusted because they are dependent on men, the judgment of men who needed to work for a living also make unreliable witnesses (Shapin and Schaffer on Boyle's air-pump, as cited by Law, 2004, p. 120).

4 This is not a new idea, Richard Rorty critiques rationalism as "a secularized version of the Western monotheistic tradition" (as cited by Braidotti, 2013, p. 175). There would be more references for the same idea were I to do that research.

5 Philosopher of biology, David Hull, lays responsibility for the wars in 'directional' evolution between cladistics, phenetics, and evolutionary statistics in the 1960s and 1970s to taxonomic thinking (1988, pp. 32-33); these computational methods are not Darwinian, they are neo-Darwinian.

6 Richard Rorty: Nietzsche's charge that the philosophical tradition which stems from Plato is an attempt to avoid facing up to contingency, to escape from time and chance. Nietzsche thought that the test of human character was the ability to live with the thought that there was no convergence.

7 "Now whatever lacks knowledge cannot move towards an end, unless it be directed by some being endowed with knowledge and intelligence; as the arrow is directed by the archer. Therefore, some intelligent being exists by whom all natural things are directed to their end; and this being we call God" (Aquinas, 1485 Article 3, Question 2).

8 In a co-authored, posthumously published paper *Life After Kant: Natural purposes and the autopoietic foundations of biological individuality* (2002), Francisco Varela acknowledges that parallel directions in scientific ideas around autopoiesis and the philosophy of biology around complexity converge in Kant's introduction of the term 'self-organizing'. Both Varela and Kauffman (1995) acknowledge Kant in the genealogy of the idea of *immanent teleology* as a biological feature of the living process. The notion of a Kantian 'whole' is difficult to pin down. On one hand, "Kant's precept that the organizing principle of a complex whole could not be derived from analysis of the functional interactions among its parts" (Newman, 1995, p. 213) confirms Kant's limit to human understanding. Kant's language suggests an intrinsic linear hierarchy, "parts are possible only through their relation to the whole," and parts are "there for the sake of the whole (Ginsborg, 2014, p. 373)". To my reading, this is a very different meaning than

Kauffman's citation of the Kantian whole as an organism whose cyclic functioning is without hierarchical privilege: "the parts exist for and by means of the whole; the whole exists for and by means of the parts" (2010, p. 58). Regardless, Kant is clear on the point that the qualities of this latter formulation he saw as properties of 'constitutive reason', which he negatively identified with materialism. In my opinion, expressed with a nod to Clare Hemmings' language, the narrative strand that serves as an invocation of authority— the inherently ambiguous Kantian presumptions— reproduces a gendered monotheistic habit that does no favor to the scientific and philosophical story innovations that Varela and Kauffman secure.

9 Ironically, Latour and Woolgar's explanation of their claim sounds a lot like Kant's description of the concept/object order of living matter, but that observation falls tangentially to my point here.

10 Ernst Mayr states that Charles Darwin's theory of evolution does not find consensus in the scientific community until the 1940s (1988).

11 Having already established this paper's acceptance of the Varela/Margulis erasure of the differentiation between entity and context, between self and community, and of the Gibson-Graham notion of the dispersed ubiquity of subjects as, collectively, the local/global social, the imaginary, then, as I use it, refers at once to that of both the subject and the social.

12 Another challenge that confronts the capacity of independently-thinking subjects to break free of their own socially- and culturally-situating intellectual milieu, and to remain uninfected by the blinding normativity that the noosphere to which daily life tunes, may to some degree explain the twentieth century co-optation of scientific authority by economic power.



## CHAPTER 4

### MEMORY II. VICO'S QUEER CHAOS: SUBJECTIVITY NARRATES SCIENCE

*If we would have new knowledge, we must  
get us a whole world of new questions.  
Susanne Langer, Philosophy in a New Key (1941)*

The structure of language structures thinking. To think differently, to think away from a presenting paradigm, radical theorization requires leveraging existing vocabulary to explain and move towards something new, it's always awkward. To revise thinking itself, to undo ideological norms and subjectivities ensconced in culturally dominant habits requires a new language, or new uses of language suitable to innovation on a fundamental level. Only ideas that can be 'language'd' in some form of text, whether verbal, imagery, movement, etc., can be thought. For Susanne Langer "language is intrinsic to thinking, imagining, even our ways of perceiving" (1974, p. 318). Absent a language corresponding to new imaginaries, existing language can at best only approximate, unsatisfactorily, new thought, or only gesture towards ineffable meanings, and in this way "we beat on, boats against the current, borne back ceaselessly into the past" (Fitzgerald, 1925, last page) that "was simply not there to begin with, and the future is not simply what will unfold" (Barad, 2014). In Giordano Bruno's language, the past and future are a coincidence of contraries, "iteratively reworked and enfolded through the iterative practices of spacetime mattering...All are one phenomenon" (Barad, 2014, 53:40). Bruno, burned at the stake in 1600 for his anti-Catholic beliefs, objected to the Aristotelian tradition of Final Cause and monotheism. He was a pantheist, his coincidence-of-opposites<sup>1</sup> was less a unity of binaries than a dissolution of the borders of duality, since each property coincides with, is equal to, its contrary (minimal heat is also minimal cold). In Bruno's philosophy the coincidence of contraries unites

the rational and the irrational, and it prefigured what physics located materially four hundred years later in quantum tunneling, entanglement, non-locality, and dis-continuity. It may be no coincidence that Bruno's thinking was influenced by 15th century Nicholas Cusa, whom 20th century quantum physicist David Bohm cites, and whom, in turn, Karen Barad cites in her quantum field theory of matter, history, and temporality. In Bruno's materiality opposites are not binaries, but co-constituting properties, "all things are everywhere in change and motion..." (as cited in Singer, 1950, p. 109).

Our philosophy ... maketh contraries to coincide so that there is one primal foundation both of origin and of end. From this coincidence of contraries, we deduce that ... contraries are within contraries; wherefore it is not difficult to compass the knowledge that each thing is within every other -- which Aristotle and the other Sophists could not comprehend.  
(Bruno, as cited in Singer, 1950, Chapter 3)

Bruno's coincidence of contraries influenced Vico's *Scienza Nuova* published in 1726, in which he rebelled against the dominant trajectories of Cartesian rationalism and Lockean empiricism, and against the strictures on science imposed by Enlightenment methods. Vico objected to the linear 'progress' narratives presented by evolutionary theories. *Scienza Nuova* is a cyclic science of history; his vision was political— the eradication of rank and privilege.

The history of dominance (and its undoing) embeds shadow-stories of nascent movements of resistances to power. The Enlightenment, that began as a heretical movement engaging science to defraud the church of its doctrinal belief systems and social power, produced its own radical elements. Analogously, current nascent social movements, having roots, might possibly flourish. Indeterminate, unpredictable, but possible. Present meanings get carved from genealogy, the past imprints its future in forms of memory that, like proteins, unfold and refold, in the "materiality of imagining" (Barad, 2014). Political hopes for transformations ground on such possibilities for noospheric and subjectivity/social transformation.

An anti-Cartesian thread stretches from the Milesian monists to the recent new materialist feminisms. Leading voices of minoritarian memory have been largely overlooked or dismissed by an over-confident mainstream that 'doth protest too much. Due to the negative effects, conspicuously pronounced economically and ecologically in advanced capitalism, produced by Cartesian/ rationalist/ reductionist subject positions, those who boldly queered their social order, still largely overlooked, garner renewed attention. Heraclitus, Giordano Bruno, Giambattista Vico, Jean Baptiste-Lamarck, Charles Darwin, Henri Bergson, Alfred North Whitehead,<sup>2</sup> William James, Merleau-Ponty, Michael Polanyi, and Susanne Langer, are some of those whose philosophical thinking now finds support in recent advancements in the sciences (evolution, cellular genetics, integrative biology, quantum physics).<sup>3</sup> It makes for uncanny, out-of-linear-time affiliations between academic disciplines and scholars. What distinguishes this group as an assemblage is a notion of science and experience as indivisible, impacting and impacted by notions of ethics, politics, and justice. In this lineage,<sup>4</sup> affect figures centrally in knowledge production, to scientific claims, to life-ing and nature. Concepts of materiality organize around not telos but process, and by so doing the bifurcation of reason and the imaginary dissolves. My entry point into this curious continuum of renegades is Giambattista Vico, one voice whose echoes, temporal diffractions, resonate as overtones to voices that challenged objectivity and transform concepts of subjectivity and materiality in science, science studies, philosophy, and critical feminist theory. Their common denominator is a process systems-thinking, as opposed to reductionism. Vico's concept of Chaos, particularly, provides a thread by which to make tracings of this counter-hegemonic worldview.

**Ricorso: Vico's Chaos**

*One of the results is the downgrading of poetry itself.  
The idea of the poet as seer or prophet now seems a distant memory.  
Harry Eyres, 3/15/2014,  
referring to the "objectivist, scientific view of the  
world that still holds power almost everywhere."*

Influenced more by Egyptian than Western thought, Vico put forth a societyhistoryscience<sup>5</sup> theory of human civilization as a recursive pattern (ricorso) of three consecutive stages, which historian Isaiah Berlin called a 'science of mind', each stage corresponding to a political structure and to a linguistic trope by which that stage comprehends phenomena.

VICO'S RICORSO: STAGE THEORY OF THE CYCLE OF HUMAN HISTORY				
TRANSITION	HISTORICAL AGE	THOUGHT STYLE	SOCIAL STRUCTURE	LINGUISTIC TROPE
<b>CHAOS</b> 	Theocratic (divine)	Hieroglyphic (sacred)	Gods	Metaphor
	Heroic / Aristocratic (idealized figures)	Poetic	Feudal (incessant conflict)	Metonymy / Synecdoche
	Human (civilized)	Philosophical (abstraction, genrealisation)	Democracy (no rank and privilege)	Irony

Figure 22. Vico's stage theory of the cycle of human history. (Sand, C, 2015)

Each phase of the cycle returns historical life to begin the "seim anew" (Joyce, 1939, p. 215, l. 23), and retains in memory the previous cycle. The return to the Theocratic stage from the Human stage constituted Vico's Chaos, a "barbarism of reflection" he associated with disorder and

liberty, reminiscent of the Middle Ages, as contrasted to cosmos, to which he associated order and rules as envisaged in the medieval Christian tradition.



Figure 23. Menelaus capturing Proteus. (<https://s-media-cache-ak0.pimg.com>)

Vico described Chaos as a shape-shifting Protean pattern of forms:

1. its earliest “confusion of human seeds in the period of the abominable sharing of women,” to
2. the misshapen monster that devoured all things and swallowing men into its void, to
3. the physicists’ prime matter of natural things, to
4. the hybrid of beast and man in the mythic god Pan, to

5. the philosophers' symbol of the formed universe, to
6. the poets' matter in the sense of Proteus, the mythic form-shifting monster wrestled by Menelaus.

Chaos ultimately collapses irony and the rational into poetic wisdom and metaphor.

Poetic wisdom, the first wisdom of the gentile [non-Biblical] world, must have begun with a metaphysic not rational and abstract like that of learned men now, but felt and imagined, as that of the first men must have been, who, without power of ratiocination, were all robust sense and vigorous imagination... This metaphysic was their poetry, a faculty born with them (for they were furnished by nature with these senses and imaginations); born of their ignorance of causes, for ignorance, the mother of wonder, made everything wonderful to me who were ignorant of everything...; they, in their robust ignorance, did it by virtue of a wholly corporeal imagination. (Vico, Book II, Chapter I, para. 375-376 in Bergin & Fisch, 1948).

For Vico, the imaginary *is* memory, expressed in wordless thinking ('mute language'), poetry, and language. "Imagination is nothing but the springing up again of reminiscences, and ingenuity or invention is nothing but the working over of what is remembered" (as cited in Rickard, 1999, p. 264). Nothing is divinely ordained. Men make (there is no poesis without technê [craft/art]) their own histories and their own categories by which they apprehend the world according to the poetic wisdom and poetic physics of their historical stage. Myth and memory and language merge in an embodied imaginary<sup>6</sup> of the subject and in the code of history's ricorso, without telos. In this ricorso of language—not dissimilar from Haraway's and Barad's—men *bring forth* 'nature' and 'gods'. What they can know is only what they have made.

The nature of things is nothing but their coming into being (nascimento) at certain times and in certain fashions. Whenever the time and fashion is thus and so, such and not otherwise are the things that come into being. (Vico, XIV, para. 147, as cited in Bergin & Fisch, 1948)

Amplifying Herodotus and Heraclitus, and as a harbinger to Bergson, Whitehead, Deleuze, Haraway, and Braidotti, Vichian matter *becomes* according to the situated possibilities of

historical stage and its memory. Vico sets a standard for an indivisibility of cyclic temporality, materiality, and the imaginary languaged in an historical ricorso of becoming of the subject and event.

### **Echoes: Ricorso in Chaos**

*chaosmos presided over blankdeblank, god of all machineries*  
(James Joyce, 1939, p. 253, l. 33)

The recovery of history as a methodology to de-stabilize the linear and the dominant, which Nietzsche and Foucault and post-structuralists perform, traces back to Vico's *Scienza Nuova* and the entangling of myth, language, narrative, science, society, and history. Vico's Chaos, emergent from / between / to / before and after order, takes on iterative multiple meanings across historical stages of artsciencephilosophy that diffract across post-modern and post-structuralist thought, as well as in the modern science of chaos (turned complexity) theory. Post-colonialist Edward Said appropriated Vico's heuristics, as did Derrida (another favorite reference of Karen Barad's). Vico's influence on James Joyce yielded the novelist's origination of the term 'chaosmos' in *Finnegan's Wake*, subsequently taken up by Gilles Deleuze.

Because, Soferim Bebel, if it goes to that, (and dormerwindow gossip will cry it from the housetops no surelier than the writing on the wall will hue it to the mod of men that mote in the main street) every person, place and thing in the chaosmos of Alle any way connected with the gobblydumped turkery was moving and changing every part of the time ...the continually more and less intermisunderstanding minds of the anticollaborators, the as time went on as it will variously inflected, differently pronounced, otherwise spelled, changeably meaning vocable scriptsigns. (Joyce, 1939, p. 118, l. 18-28).

While a deep discussion of *chaosmos* lies beyond the focus of this project, one observation (consistent with the linguistic trope that Vico attaches to the democratic 'human' phase of history's cycle – ironic) rates mention. That Deleuze's source for his term *chaosmos* (by way of

Joyce) was Vico, not Spinoza (Vico's contemporary rival and the oft-praised textual authority of Deleuzian liberatory monism), informs one of my central critiques of new material feminisms that I trace in the next chapter. Vichian diffractions spread to hard science (e.g. the chemistry and complexity theory of Isabelle Stengers and Ilya Prigogine) and from hard science (ecology of Gregory Bateson) to philosophy (e.g. Merleau-Ponty, William James), and, by way of those influenced by Deleuze, to the new materialisms and feminist critical theory of Rosi Braidotti covered in the following chapter. These examples illustrate the breadth of Vico's diffractive, if little acknowledged, significance to efforts to defeat the Euclidean-Newtonian-Cartesian-Enlightenment-neoDarwinian tradition.<sup>7</sup> Taken together as a time-traveling assemblage, this amounts to a counter-hegemonic movement in science, philosophy, and feminist critical theory, to describe an altogether different model of world-view-making-becoming, one that I summarize, for the convenience of a shorthand, as an embodied becoming without beginning or end in constantly changing conditions. We are not in Kansas anymore.



Figure 24. Munchkin land. (<https://thebestpictureproject.files.wordpress.com/2011/07/wizardofoz1.jpg>)



Paul Klee's 1920 painting *Angelus Novus*, which Walter Benjamin compared to "the angel of history" in the ninth thesis of his essay *Theses on the Philosophy of History* presents a Klee painting named *Angelus Novus*. "The painting shows an angel looking as though he is about



Figure 25. *Angelus Novus*. Paul Klee, 1920, the angel of history.

to move away from something he is fixedly contemplating. His eyes are staring, his mouth is open, his wings are spread. This is how one pictures the angel of history. His face is turned toward the past. Where we perceive a chain of events, he sees one single catastrophe which keeps piling wreckage upon wreckage and hurls it in front of its feet. The angel would like to stay, awaken the dead, and make whole what has been smashed. But a storm is blowing from Paradise; it has got caught in his wings with such violence that the angel can no longer close them. The storm irresistibly propels him into the future to which its back is turned, while the pile of debris before him grows skyward. This storm is what we call progress" (Benjamin, 1969, pp. 257-258).

### **Echoes: Ricorso in Language**

*For the last three hundred years the progress of science has increasingly controlled the outlook of man on the universe, and how [CHECK] profoundly modified (for better or for worse) the accepted meaning of human existence. Its theoretic and philosophic influence was pervasive.  
(Michael Polanyi, 1969, p. 64)*

“The springs of European thought,” Susanne Langer wrote, “have run dry—those deep springs of imagination that furnish the basic concepts for a whole intellectual order” (1942, p. 293). The conceptual forms that will emerge to replace them are still “in the mythical phase, the ‘implicit’ stage of symbolic formulation”, a particularly Vichian echo. For Langer, philosophy “is mythical in origin and scientific in destination” (p. 178) –Vico interpreted language as signals, poetics, and science– a description that her friend and former teacher, Alfred North Whitehead, subsequently shared— that philosophy, like mysticism, affords “direct insight into depths unspoken (1938, p. 174). “All men enjoy flashes of insight beyond meanings already stabilized” in language. It is the role of philosophy—along with literature and the sciences—to find “linguistic expressions for meanings as yet unexpressed” (1933, 291).

Langer believed what was required was “a new conceptual vocabulary—not a metaphysical use of old vocabulary—to make a new frame” (1967, p. 316) for thinking about “the problems of life and mind in nature” (1967, p. xvii). Navigating between actualities and possibility, the philosophical and biological cannot be separated:

Whenever an act is induced by a change in the vital situation, such as the life process itself constantly engenders (thereby motivating an endless stream of acts), it is likely that not only the impulse of that act, but also one or more conflicting impulses or alternative potential acts are formed, which are doomed to speedy abrogation. This play of impulses forms the dynamic matrix of life, a plexus even more involuted and compounded than the metabolizing, differentiating, ever-changing structure that is the material organism, because the latter consists only of actualized events,<sup>8</sup> but the life comprises also all the potential acts which exist only for milliseconds or less.

(1967, p. 304)

Though known primarily for her contributions to theories of art and language, Langer also gave extensive, if overlooked, attention to the philosophy of science and biology, directly connecting the relevance of language to temporal concepts of materiality. Anticipating the late twentieth century science wars over objectivity, Langer acknowledged the challenge of putting into words a revisioning of biological systems, “the subjective aspect of experience, the direct feeling of it,” is an “aspect of the intricate web of life [that] defies discursive formulation, and therefore verbal expression” (1957b, *Problems of Art*, p. 22). In *Laboratory Life: the Social Construction of Scientific Facts*, Bruno Latour and Steve Woolgar (1979, 1986) argue that logistical procedures in conducting experiments dealing with equipment and data require multiple subjective decisions, to such an extent that scientific facts are, in large part, culturally constructed. They observe that inscription devices in scientific research have empirical results of their own. Analogously, Steven Goldman states mathematical theories, such as those pertaining to structures of molecular relationships, function like languages. The meanings of their terms are a contingent function of the relationships internal to the theory. Latour’s and Woolgar’s and Goldman’s observations appropriately impute the language as an inscription device that produces its own empirical results. Daniel Lehrman shows this to be true in his comparison of the effect on opposing scientific claims in animal behavior, pathology, evolutionary biology, genetics, and evolution of various and imprecise meanings of words as innate, acquired, inherited, learning, normal, abnormal, experience (1970). One of the results of this semantic and conceptual disarray are battles between scientists over matters of teleology and preformationism, largely organized according to whether the scientific discipline’s point of view privileges mechanisms that move toward functional form or an ontogeny from a preceding stage. Despite a conceptual transformation of biological life and quantum materiality as process, the methodologies of research in the biological sciences

reproduce a linear model of Cartesian thinking, even though this has been proven inadequate to deliver descriptions of phenomena, and often delivers ‘knowledge’ that is flat wrong.

### **Echoes: Ricorso in Poetry**

*If they could be surprised on the higher side of the said,  
would they not reveal another meaning?  
(Levinas, 1991, p. 35)*

*I shall reconsider human knowledge by starting from the  
fact that we can know more than we can tell.  
(Michael Polanyi, 1967, p. 12)*

According to Bruno, Western science began with the emergence of the definite article in the grammar of early Greek language. The placement of the definite article with an adjective or verb, (*the* cold), (*the* good), (*the* act of thinking), transformed a property to a substance, and afforded abstraction. Heraclitus spoke of *the* universal and *the* logos, which served as stable objects of thinking. *The* horse, *the* thought, and *the* just afforded concepts of the generic and permanent. The abstract noun, Snell says, “references the non-physical – alive, animate, intellectual, dynamic.” Swaying between Platonism and a Heraclitus’ view, with a dash of exceptionalism thrown in, he states “Both the metaphor and the personification necessarily put an anthropomorphic of physiognomic interpretation on the non-physical, i.e. they present it as a product, or an embodiment, of animate reality” (p. 231). The definite article defines the abstract and connects a particular to the universal, generating an object of thought about which we make knowledge claims. The new product for the early Greeks was the rational, i.e. the logical expression of thought. New modes of using prepositions (through, because), not only to connect parts of speech as designations of time and space, as causality gave way to the “abstract conception of the human mind or spirit as it was brought to fruition by Heraclitus” (Snell, 1960, p. 235). Though his reading of Heraclitus is conveniently partial (Heraclitus, early author of the

concept of ‘becoming’, was dismissed by historians of a science defined by LaPlacean parameters of objectivity), Snell credits the early Greeks with the linguistic ancestries to Cartesian-Newtonian humanism, the mind/body split, and the grammar of scientific thought.

Might grammatical structures of the English language serve to embed linear causality and substance metaphysics in Western thinking, structuring bias and inequality into scholarship and leadership, to real and disastrous effects for the daily living of world and planet? Might we need a function of language precluded by correct scholarly structure to express a process worldview? Snell’s grammatical trope that explains the rational mind is the definite article and the use of causal prepositions; for Vico metaphor, synecdoche, and irony constitute tropes for apprehending phenomena in a becoming world. Have we come stutteringly full circle, from the early Greek that seeded substance metaphysics to the awkward phrasings of process sciences of immanence and emergence found in the recessed corners of discourse at the start of the twenty-first century? To step aside from the bifurcations, binaries, dichotomies, teleologies, and dialectics of the intervening two thousand four hundred years, do we have a language to not-think categories and telos, instead to think co-becomings and co(m)-motions? According to the dictum of Italian linguist Giuliano Bonfante who followed Vico’s influence, “all language is poetry” (Larissa Bonfante, personal communication, 2012); language is always-already ever-not-quite becoming. Theoretical physicist of non-locality and quantum potential, David Bohm, writes in 1980:

Thus the ‘atomistic’ attitude to words has been dropped and instead our point of view is rather similar to that of field theory in physics, in which particles are only convenient abstractions from the whole movement. Similarly, we may say that language is an undivided field of movement, containing sound, meaning, attention-calling, emotional and muscular reflexes, etc. ... The word ceases to be taken as an ‘indivisible atom of meaning’ and instead it is seen as no more than a convenient marker in the whole movement of language ... (This means that giving attention in this way to the components of words is not primarily an attitude of analysis but, rather, an approach that allows for the unrestricted flow of meaning).  
(p. 52).

By reading scientific terms and philosophical concepts as a form of poetry, might “the strange fact that language means something” (Polanyi, 1967, p. 192) foster a more capacious stance towards knowledge- and meaning-making in science, one that relaxes the border controls of acceptable ‘academic writing’ and makes space for thinking improper ideas that bolt from academic corrals?

Alfred North Whitehead’s process metaphysics responded to his criticisms of Cartesian foundations of scientific materialisms as inadequate to account for the nature of things given advancing scientific realities. “Time, space, matter, material, ether, electricity, mechanism, organism, configuration, structure, pattern, function, all require reinterpretation” (1925, p. 16). Compelled in part by the development of quantum theory, Whitehead stated in 1925 that the scientific ‘situation’, having become too narrow, especially in biology and psychology, needed “to revise all our notions of the ultimate character of material existence” (1925, p. 35). This had been happening within physics since the late 19<sup>th</sup> century when discoveries of electromagnetic fields, the aether field, and field theories of gravity undermined the discipline’s own own LaPlacean worldview.

Contrary to substance metaphysics, the intangible became material, and the initiation of modern process metaphysics ushered in a fundamental challenge to material determinism (Goldman, 2007). A cascade of ‘immaterial realities’ was discovered – radio waves, cosmic rays, x-rays, gamma rays, neutrinos, dark matter, dark energy. I mention here only a very few of the many milestones that contributed to a repositioning of the discipline of science from that which *reveals* external and passive laws of natural truth, to the discipline by which a particular sort of inquiry leads to a particular sort of *explanation*, or failing that, *depiction* of phenomena. With the discovery of intangible forces and fields, science described an *experience* of nature, but *how* energy acts, for example, defied explanation.

In the late 19<sup>th</sup> and early 20<sup>th</sup> centuries with the discovery that spatial arrangements of atoms within molecules determined molecular physical and chemical properties, *relationships* became physically real. Molecular biology decoded DNA; in network theory and information theory the properties of relationships, independent of the terms they related, caused their own effects. Relativity and quantum mechanics redefined causality. In mathematics symbolic logic broke from Euclidean-Newtonian confines, making possible Claude Shannon's founding of digital computer design theory. Differential geometry and topology, the study of freeform spatial relationships, became important to quantum theory, cosmology, and biology.

In mid-century algorithmic information theory reduced physical objects to *information* representations. Genetic research discovered that the sequence of bases differentiated one life form from another. Information as *sequence* took on 'insubstantial' material reality. The idea that information structures constitute black holes and the entire universe took shape, for example, in the holographic principle. The quintessential science of process, evolution, established *time* as a fundamental feature of reality. Regardless of Darwin's articulation that causative processes of individual variation were 'spontaneous' (as opposed to random), his physicist contemporaries and evolutionary biology descendents interpreted 'spontaneity' to mean 'random chance'. Ironically to the exclusion of spontaneity, *chance* and *statistical probability* became inculcated into the list of rational attributes of nature.

Reality had ceased to mean material 'thinghood', instead it referred to structures and relationships, and information, identified according to intra- and interactive properties and processes. This revision to scientific reality opened up to new applications of systems-thinking to such phenomena as weather, climate, atmosphere, Earth. These complex systems interact, modify, and adapt, in a quasi-Darwinian sense of fitness, in interaction with other systems (examples: hurricane, living entities, cells, genomes) and were found to be exquisitely sensitive to small variations in critical parameters (the 'butterfly effect'). Complexity theory described these

stable non-linear systems that, far from equilibrium, bore none of the prior identifying traits of 19<sup>th</sup> century reality: autonomous, passive, deterministic, and predictable. Matter itself emerged as complex, dynamic, and self-organizing.

The discipline of explanation was forced, again, to re-articulate its function. Scientific knowledge became a particular sort of *depiction* of phenomena, in the sense of Vichian poetics and phenomena. “Poetry always has to have both content and memory, without describing it too explicitly” (Libbrecht, 2007). Vico’s poetics argued that science/history could not be dissociated from the subjects or from the culture of its historical setting in which science and subjects are embedded, a concept with energies for long temporal diffractions.

### **Echoes: Ricorso in the Social**

While the early history of Western science was one of the subversion of authority, an aspect of the scientific revolution supported by Vico (if not its Cartesian and Rationalist terms), by the early twentieth century the whole outlook of man on the universe was conditioned by an implicit recognition of the authority of scientific opinion (Polanyi, 1969, 57). The project, then, as one might imagine Vico’s analysis of modernity, would be the subversion of Cartesian/LaPlacean science, specifically, as wielding political authority, and, if seen in terms of his theory of historical ricorso, inevitable. Interestingly and ironically, that destabilization initiated from within the conventions of authoritarian science. This pattern emerged from the many disruptions to material determinism, and contributed to the rejection of pure objectivity in scientific research as either viable or rational.

The effect of quantum theory and relativity on shifting the language of science from its prior status as revealing nature’s truths to, ultimately, the depiction of *phenomena*— definitionally the object of what the senses or mind of a person observes— necessarily opened scientific practice



to scrutiny as a social practice of sentience and experience. With that began the unseaming of the politically conjoined Newtonian twins of modernity, authority and objectivity.

Inspired by the quantum revolution in physics, Ludwik Fleck published a series of papers in the 1930s based on medical 'ways of thinking' that claimed scientific 'facts' get constructed by collectives that exchange ideas within a frame that conforms to a shared and particular thought style, and this epistemological social process constitutes 'objective reality'. The publication of Thomas Kuhn's *Structure of Scientific Revolutions* in 1962 cemented the notion that scientific 'truths' reify social processes of consensus within the scientific community. All 'objective conclusions', he states, are ultimately founded on subjectivity and worldview. Lynn Hankinson Nelson, too, affirmed that social beliefs and values inform theory, but she argued her point politically, from a feminist perspective on knowledge as produced by dominant community processes (1993). Sandra Harding, also sounding much like Vico, observed that the content of scientific thought is shaped (but not determined) by its historical location, and that throughout the modernist history of science, the scientific worldview is in fact a view of dominant groups' modern western society, and that (1993). These voices echoed with new meanings, not only Vico's insinuation, but also Darwin's assertion that without theory, there would be no observation, a premise supported by historians of science such as Thomas Kuhn (1962), Israel Scheffler (1967), Michael Polanyi (1969), and Lynn Margulis (classroom refrain), with an important distinction. This clarified understanding of theory, that the values and subjectivities of a time inflect the theories of that time, and that theories are value-laden, exposed the political underbelly of scientific knowledge, a facet especially explored in feminist scholarship, and posed a risk to science that undermined its authority. Polanyi observed that one danger of a value-laden authority was that it caused science to argue against theoretical possibilities that would not appear scientifically conceivable" (1969, 95). Another danger was that attacking objectivity in science

amounted to an attack on the very trait that legitimized the authorization of power to institutions and structures of Western society.

To be a member of the scientific authority meant to submit to its values. Evelyn Fox Keller (1985), Donna Haraway (1988), Nancy Tuana (1989), Ruth Hubbard (1990), Sandra Harding (1991) demonstrated that claims to scientific knowledge reflect the values and biases of those who ‘make’ science happen. Feminist scholarship revealed an androcentrism as the ‘normal’ default status of scientific claims. Exposure of gender bias and a masculinist orientation inherent to the historiography of science and to standard research methodologies further challenged scientific ‘objectivity’ [Audre Lorde (1982), Evelyn Fox Keller (1978, 1985), Nancy Hartsock (1983), Longino and Doell (1983), Harding (1986), Sandra Harding (1995), Elisabeth Lloyd 1996, Tuana (1996)]. Carol Gilligan (1982) made visible the persistent ascription of amorality to ‘feminine forms of reasoning.’ Evelyn Fox Keller critiqued the “force of the concept of predetermined centralized control as a ‘natural’ model of ‘relationship’ among components of living systems or populations” (1985, pp. 150-157). By virtue of work by minoritarian scientists, social scientists, and feminist scientists, any claim by a scientist-subject or discipline to freedom from values, biases, commitments and ideologies became implausible, but cultural practices fade slowly. Despite the indisputable role of subjectivity in the formation of ‘objective’ knowledge claims, and despite the fundamental revision to the scientific conception of reality, familiar habits of thinking in terms of causal relations get attributed to systems that seem to be complexly interactive, “imposing on nature the very stories we like to hear” (Keller, 1985, p. 187), or, to modify that quote, the very mythologies a former scientific thinking likes to perpetuate.

With the threatened erasure of ‘pure’ objectivity, charges of relativism hovered over its challengers. Israel Scheffler defended ‘objectivity’ in science by redefining the term so as to be unrelated to its Newtonian sense of fixity of observation and meaning. He situated objectivity between the knower and the known in a semantic flux between *meaning identity*, ways science

gets absorbed by different political and cultural frameworks, and *meaning constancy* (1982, viii). Scheffler rejected the inevitability of each. Neither did feminist science and science studies scholars reject ‘scientific objectivity’ wholesale either, nor did they promote the caricatured position of scientific facts as mere constructions of social processes and political interests. Quite to the contrary, but one of the outcomes of feminist insight into science was a demand for paying attention to the embodied, situated ‘ever not quite’<sup>9</sup> processes by which shifts in language and science intra-act, a practice of critical reflexivity sensitive to nuance and complexity. To acknowledge the social and the subjective as inherent elements of ‘objectivity’ advanced not only feminism, but scientific knowledge-making, as well.

### **Echoes: Ricorso in Science and Philosophy**

As Whitehead predicted, the replacement of the Cartesian foundation of scientific materialism by more adequate modes of abstraction “[did] not fail to have important consequences in every field of thought” (1925, p. 36). With the pearly gates of objectivity rent asunder, the dragons of epistemology rushed in. Themes of inquiry in the ‘hard-sciences’ included consciousness, cognition, mind, neuroscience, and experience. Systems science looked at bodymind interactions between organism and environment, self-organization and emergence, immanence, dynamical systems, and complexity. The scientific study of these newly focused realms required hybridization with humanities and social science scholarship and philosophy schools of phenomenology and pragmatism. In a cyclic ricorso, these disciplines fell back on the sciences, such as biology, evolution, cognition, and neuroscience. These disciplinary shifts also mapped to changes in the concept of materiality itself. The resulting discursive re-conceptions of matter, experience, and reality laid bare a long unresolved dilemma: how to articulate the co-implication of materiality and subjectivity scientifically. While my treatment of these patterns in

these chapters is a gross simplification in order to satisfy brevity, given a generous reading, I think, and hope, my summations are not generally inaccurate.

### **Echoes: Ricorso in Prehensions**

*If there is no before and after by which to order cause and effect,  
has causality been arrested in its tracks?  
The open-ended becoming of the world resists  
acausality as much as determinism.  
Karen Barad*

A *prehension*, in Whitehead's terminology, is a coming together of different parts of reality that develops from the present and reaches into the future "like tentacles" (Klose, 2007, p. 9). Modern process philosophy, which conceptually integrated scientific re-imaginings of reality, may be seen as a prehension of subsequent scientific theorizations of systems and materiality, elements of Whitehead's and Susanne Langer's serve as prescient preludes to late twentieth century theories of Gaia, autopoiesis and cognition, complexity, feminist new materialisms, and quantum consciousness. In Langer's philosophy 'Acts' are "articulated elements," distinguishable "within a dynamic whole (i.e., a whole held together only by activity)," which are "indivisible in themselves, and inalienable from the whole, if they are not to give up their identity" (1967, pp. 272-273). Her language prefigures the paradoxical and dynamic autopoietic notion of apparent permanence of a living entity's identity, minus an articulation of the exchange of matter and energy with the entity's context (immediate environment).

[The persistence of a form] "made and maintained by complicated disposition of mutual influences among the physical units (atoms, molecules, then cells, then organs), whereby changes always tend to occur in certain permanent ways" [is] "always, at every moment, an achievement, because it depends entirely on the activity of 'living' [which] "is itself a process of continuous change." Hence, "permanence is a pattern of changes" (1953, p. 66).

Autopoiesis provided the theoretical frame Lynn Margulis adopted to frame her empirical work represented in her 1967 paper *On the Origin of Mitosing Cell*, her 1981 work *Symbiosis in Cell Evolution, Acquiring Genomes* (2002), and for her work on Gaia theory (1974). Writing in the 1940s-1960s, Langer's antecedent philosophy of biology captured more of the nuance, emergence, and complexity embedded in these theories and in Darwin's theory of natural selection than most critical engagements of these concepts grasp. Langer concluded that the principles governing both evolution and development...

“spring from the nature of acts, [for the patterns of developmental and evolutionary processes are] inherent in acts, and in all the complexes they form: lives, populations, stocks, and finally the whole history of life on earth that we usually mean by ‘evolution’ (1967, p. 371). “The causes of evolution lie in the dynamic properties of acts and act-engendered entities. ... [Hence, evolution is primarily] “a pattern of acts rather than of the anatomical changes that form the record of acts” (1967, p. 396).

Like Margulis, contemplation of evolutionary processes led Langer to contemplations of the Earth as a complex system. For Langer, the advancing course of life emerges from

the pressure of billions of impulses, ever pushing to actualization in every single organism, entering or failing to enter the moving stream of acts that constitutes the life of the agent, and beyond the agent, the stock, and enfolding the stock, the whole teeming life process on earth (1967, p. 377). At every level, a living system is seen as “a fabric of burgeoning acts, in literally billions of pressive relations which automatically adjust the elements of that incredibly complex dynamism to each other” (1967, p. 370 in Dryden).

Here Langer is drawing on Whitehead's depiction of becoming as impulse, there is...

“a rhythm to process whereby creation produces natural pulsation, each pulsation forming a natural unit of historic fact. The data for any one pulsation of actuality consist of the full content of the antecedent universe as it exists in relevance to that pulsation (1938, p. 88-89). ... The universe is thus a creative advance into novelty” (1929 in 2010, section V, para. 349).

In Whitehead's becoming as impulse, creative and prehensive affinities with the quantum come together in later applications of Whiteheadian thought to speculative models of reality, as seen put forth by quantum physicists Tomonaga and Schwinger's investigations of the observer and the observed (Klose, 2008),<sup>10</sup> which build on Von Neumann's quantum demonstration showing that an observed event in the external world is directly linked to the brain of the observer of that event. In Whitehead's philosophy,

the perceiving subject does not exist before the perceived events and is not their contemporary. This would mean a new formulation of a concept of substance, of a basis bearing the phenomena. Vice versa, the perceived events are temporal before the objectifying actual entity. (Klose, 2008, p. 9)

In von Neumann's model, the observer signified experience, while the observed was treated as a quantum system. The *event* (in Whitehead's sense of the term) of observation brought physical aspects and consciousness together as two aspects of a rationally coherent, natural whole. The Tomonaga-Schwinger-Surface made quantum adjustments to von Neumann's principle to accommodate, like Whiteheads' becoming, a sequence of instantaneous "nows". The observer (consciousness) chose what question (or attention) to direct in the future to (quantum) nature, which in turn influenced the brain in ways controlled in principle by quantum laws.

"This connection can be found via the quantum Zeno effect, which shows how the choice and timing of questions can influence the course of events in the probed system... Since the question to be posed is supposed to be an experience [consciousness], it would appear that it really ought to be part of the mental [immaterial], rather than physical [material], side of the mind-brain dynamics. Quantum theory has a lacuna that can very naturally be filled in such a way as to allow our thoughts to exercise real, though not absolute, control over the mechanical aspects of mind-brain dynamics." (Klose,2008, 14-15).

Joachim Klose argues multiple points of correlation to suggest a synchronicity between process philosophy and what he calls 'quantum ontology' by which reality and matter are "mind-like". Decades before the Tomonaga-Schwinger experiments, Whitehead's model of reality stated

“These elements of ‘freedom of choice’, on the part of the human participant and nature herself, lead to a picture of reality that gradually unfolds in response to choices that are not necessarily fixed by the prior physical part of reality alone.” Klose then asks, “Is it now justified to argue that quantum events could be counted as sentient? This assertion would equip elementary quantum events with a degree of creativity” (2008, p. 16-17). This is precisely the question that Stuart Kauffman (2014, 2015) and Karen Barad (2007, 2013) speculatively pursue scientifically; Barad describes the capacity of electrons to inscript, via quantum tunneling, a temporal future that is antecedent to an objectifying actual entity. Lynn Margulis integrated Ian McHarg’s thermodynamic theory of creativity (2006) into her foray into chimeras and consciousness as sentience. Coming out of his work in neurobiology and Buddhism, Francisco Varela developed an ethical philosophy of sentience. Some feminist new materialists pursue questions of sentience by engaging ‘hard’ science in order to theorize embodied meanings and implications (Hird, Haraway, Alaimo). Susanne Langer figures again as a prehension to this early twenty-first century trend in feminist thinking. Writing in 1957 on embodiment and agency, she takes seriously the materiality of process,

Embodied life is an intricately textured dynamic form, that is, a form whose permanence is really a pattern of changes, [whose] elements are not independent parts, but interrelated, interdependent centers of activity (1957, p. 52) held together by multiply coordinated rhythmic interactions. An agent is a product and producer of acts; a living being. (1971, p. 317)

Over time (such as it might be), concepts and ways of thinking, like proteins, fold together, unfold and refold in Vichian ricorso. *Becoming* and the complex uncertainty of ‘acts’ and ‘events’ displaced deterministic and preformationist telos. Illustrative of Vichian Chaos, an altogether different worldview started to take shape, greatly changed from, yet ironically synchronous with, the mythic worldviews of antiquity, prior the advent of Platonism, Aristotelianism and monotheism. Another of Vico’s beliefs emerged from Whitehead’s and

Langer's process philosophies of science, and from twentieth century advancements in scientific concepts of reality and materiality, a rejection of anthropomorphism and human exceptionalism. In a materiality of life that becomes, as a creative and emergent property of systemic processes of complexity and Chaos, the uncertainty and dynamic conditions that contextualize and embed emergence and evolutionary innovation have been shown to be responsive to sentient and 'conscious' quantum processes that exchange matter and energy. The explanation of how, to repeat what Vico said, "whenever the time and fashion is thus and so, such and not otherwise are the things that come into being" (Vico, XIV, para. 147, as cited in Bergin & Fisch, 1948) amounts to a politics by which out of many possibilities, an actuality results. Inadvertently, twentieth century science discovered materiality to be inherently politicized.

### **Ricorso: Scienza Nuova and Subjectivity**

*The event illuminates its own past,  
but it can never be deduced from it.  
(Hannah Arendt, 1953, p.323)<sup>11</sup>*

Former ontologies of life, materiality, nature, reason, and experience came up for grabs. Conventional Western academic philosophy and science lost the charade of their former political and social detachments, agnosticism, and authority over 'normativity', prompting new theorizations of scientific knowledge, at least by those who acknowledged the revelations brought to light by social and feminist science studies scholars.

Stating that "a theory of knowledge ... does not require that we purify science of references to mind ..." (1969, p. 157), Polanyi understood scientific practice to be a craft, an art that explored the unpredictable to establish collective meaning, as in art myth, and religion. For Vico, the plural and changing 'truths' of mythic narratives, experience, and consciousness were



‘more true’ and ‘more real’ than Euclidean certainties. Truths were that which is made, ‘verum factum’. Vico saw the truths of consciousness, or uncertain choice, as different but equivalent to the truths of science, each being created by humans through cultural consensus, according to the communal processes that ultimately determine what ‘truth’ is. He believed that what motivated people to “live in justice and to keep themselves in society” (Vico, para. 2, in Bergin & Fisch, eds., 1948) was not rationalism and laws but “emotions, creative imagination, and mythic traditions in which the people believe and live” (Vico, as cited in Mali, 2012, p. 44). The question of social justice circled, through philosophies of the Other, back to the science of consciousness. Hegel’s ethical sin, according to Emmanuel Levinas, was a failure of respect, by recognizing the Other according to his own categories, he deprived the Other of their inescapable ‘irreducible alterity’ or difference (Yar, Majid, 2002). Levinas asked, “What do I have to do with justice? A question of consciousness” (1981, p. 157). Recognition of the Other in Levinas as an ethical consciousness held affinities to Francisco Varela’s analysis of ‘ethical know-how’ based on the bioneurological reflexivity of sentience and cognition, and to consciousness as an evolutionary force as microbiologist Lynn Margulis had begun to advance prior to her death.

Not only did materiality itself turn out to embed the political, feminist science scholars, by interrogating categories of oppression located in ‘scientific’ practices showed ways that the status quo of the disciplinary practices structured power and inequality (e.g. [of many] Ruth Bleier, Anne Fausto Sterling, Donna Haraway, Sandra Harding, Ruth Hubbard, Helen Longino, Londa Schiebinger, Nancy Tuana). Sheila Jasanoff (2005), working in the politics of science, showed science to be inadequate in providing objective authority. When summoned in service of national policy debates, identical studies yielded multiple interpretations, depending on the various political and cultural positions of that nation. Rather than providing objectivity, the ‘interactional co-production’ of scientific knowledge served as an economic resource that shaped national identity. Science became a form of politics, but ever since Galileo’s confinement, Fulton’s steam

engine, the proliferation of engineering schools, and the splitting of the atom, that's hardly news. "The sciences are so intimately tied to political authority" (Lloyd, 1996, p. 224).

Polanyi recognized that these features present in a society "lead to further fragmentation of initiatives and thus increase resistance to any deliberate total renewal of society" (1962, p. 71).<sup>12</sup> This statement underscored Gramsci's observation that hegemony depends upon consent, and hegemonic discourses prop up status quos and certain powers. Perhaps this helps to explain the apparently interminable Western discursive ping-pong match over materiality, between whether opposites are in continual war, or compose a unity, or are different, equal descriptors of a category (the road that goes up goes down). The match extends back to Heraclitus and before, to the Milesian monists Anaximenes and Anaximander, and reaches forward, for example, to Descartes, Hegel, Marx, Althusser, Žižek, Jane Bennett, and Elizabeth Grosz. Why do Western philosophical and scientific conventions of intellectual analysis obsess over binaries, the dialectic, singularity, and ontological unity? Despite the transformation of scientific conceptions of matter being redefined in terms of forces, complexity, indeterminacy, emergence, and self-organization, since the early 1970s the pursuit of the 'standard model' of matter is on-going. This unification theory of matter states that four fundamental forces, the weak force, the strong force, electromagnetic force, and gravity, interact in quarks and leptons to form the basic building blocks of matter. This debate represents another manifestation of the contested political question over subjectivity and objectivity in that way of knowing particular to meta-narratives of an imaginary of science that instructs and restricts. Steven Goldman observed that this perennial pursuit of unification, the compulsion to singularity that drove Einstein to fudge inaccurately his initial formula for the general theory of relativity, is a holdover from monotheism and Greek materialistic monism. (2008, p. 192). Patriarchy resists secularity and equality, forcefully.

Hilary Rose articulated the challenge, to create a "practice of feeling, thinking, and writing that opposes the abstraction of male and bourgeois scientific thought" (1983, p. 87).

Feminist inquiry turned to strategies of intervention on the ‘tyranny of ontology,’ to use Levinas’ (1989) and Lloyd’s (1995) verbiage. Haraway cautioned against the use of social constructivism as a critical tool, because it may maintain rather than deconstruct science. Katherine Hayles re-oriented scientific knowledge claims as True, Not-true, False, or Less-false (1993). Barad promoted “onto-epistemology, the study of knowing in being” (2003, p. 829). Another tactic of intervention has been through various approaches to embodiment, of knowers that embody their social location (Harding 1997) and by the loosely assembled collective identified by the term new materialism.

Maurice Merleau-Ponty, philosopher of how we experience (phenomenology) wrote:

Insofar as, when I reflect on the essence of subjectivity, I find it bound up with that of the body and that of the world, this is because my existence as subjectivity [= consciousness] is merely one with my existence as a body and with the existence of the world, and because the subject that I am, when taken concretely, is inseparable from this body and this world (1962, p. 408).

In short, consciousness is embodied intra-actively with the world, and equally, embodiment is infused with consciousness (in/with the world). Merleau-Ponty disagreed with Levinas’ depiction of the Other as a separate alterity, stating instead that the subject spontaneously slips into the Other, rather self and Other are bodily imbrications intertwined in world; self is also the potential of the Other, and the Other’s potential; seeing someone necessarily involves possibility of being seen. Perhaps, as quantum uncertainty and entanglement suggest, the response to this problem is not an either/or but both/and/sometimes. Perhaps the wrong questions are being asked; perhaps the whole frame has run its course and might better be retired to make space for other frames of existential and phenomenal apprehension. Luce Irigaray (1993) critiqued both modes of thought, because each engaged dualisms –either as total incorporation (Merleau-Ponty) or as reduction to object (Levinas) – that implicate and produce male privilege. Where, she asks, is intersubjectivity as a method of making sense? Irigaray asserted that Western treatment of women and nature

foreclose the ethical, and that nothing short of transforming foundational views of subjectivity, science and religion might alter the situation. This would demand new languages, ones that allow release from the tyranny of Cartesian reason. Though its acolytes may recess kicking and screaming, subjectivity is in motion again.



Figure 26. Obscured transitions. Grassland #027 (Underdown, 2005-9)

*Lacunae, spatial and temporal, pockmark becoming terrains. Multiple paradigmatic and fledgling orders overlap and bleed through to each other, edges blur. Lags between scientific breakthroughs and socio-cultural responses open simultaneously across multiple space-time frames. Temporalities and conditions are complex and dynamic, fast time stretches out slowly. The timespan that serves as a backdrop to and frames human observation may be mismatched to the rate of change, obscuring the transitions underway.*

## Notes

- 1 a simplistic orientation: heat and cold are relative terms, rational and irrational unite.
- 2 Whitehead, in an admission of his own iconoclastic inclinations, credited his wife's thinking as fundamental to his own. Though Whitehead's philosophy remained on the fringes of mainstream philosophy of his day, it has recently directly influenced scholars Isabelle Stengers, Bruno Latour, Niklas Luhmann, Lynn Margulis, and many more.
- 3 Amartya Sen writes on Michael Polanyi; Francisco Varela writes on Merleau-Ponty; Lynn Margulis espouses Whitehead and Lamarck; Karen Barad writes on Levinas; Deleuze writes on Bergson and Spinoza; Elisabeth Grosz writes on Bergson and Darwin (badly); Kauffman writes on Heraclitus; Rosi Braidotti references Margulis, Varela, and Spinoza; Isabelle Stengers references Vico, etc.
- 4 A partial listing of thinkers includes Heraclitus, Giordano Bruno, Giambattista Vico, Henri Bergson, Alfred North Whitehead, Michael Polanyi, Thomas Kuhn, Gilles Deleuze, Bruno Latour, Lyotard, Hans Jonas, Francisco Varela, Evan Thompson, Gregory Bateson, Stuart Kauffman, and a cadre of feminist science scholars, such as Elisabeth Lloyd, Sandra Harding, Ruth Bleier, Helen Longino, Evelyn Fox Keller, Donna Haraway, Isabelle Stengers, Elisabeth Grosz, Karen Barad, Elizabeth Wilson, Vicki Kirby, Myra Hird, Nancy Tuana, and more.
- 5 Societyhistoryscience my neologism, because, for Vico, these were one discipline.
- 6 The theme of the embodied imaginary recurs in Kauffman's 'hard science' of wonder (2006) as well as in Isabelle Stengers' cautionary note about eliminativism in science that precludes wonder (2011).
- 7 Vico's influence extends to the likes of Henri Bergson, Karl Marx, Samuel Beckett, Alfred North Whitehead, C.S. Pierce, Edward Said, Richard Rorty, Marshall McLuhan, Julia Kristeva, Derrida (difference within language), Gregory Bateson (difference as relationship). Also interesting is that the term 'quark' in particle physics was taken from James Joyce's *Finnegan's Wake*, too, "Three quarks for Muster Mark."
- 8 Langer is probably referring to Whitehead's meaning of an 'event': the unit of reality, or entity, that is a concrescence of all available information at the time, according to certain principles, repeating and reinforcing certain patterns, and thereby creating new ones (Seibt, 2016).
- 9 'Ever not quite' is a Whiteheadian motto, which he appropriated from William James, to mean the property of becoming and characterized by possibility and novelty.
- 10 This is a theme central to Francisco Varela's autopoiesis and cognition as well, that rests on the 'structural coupling' of the entity and its context, and the aphorism that "anything said is said by an observer" (Maturana & Varela, 1980).
- 11 Both Whitehead's and Roy Bhaskar's meaning of event inflect Arendt's statement: Whitehead's 'event' is the unit of reality, or entity, that is a concrescence of all available information at the time, according to certain principles, repeating and reinforcing certain patterns,

and thereby creating new ones (Seibt, 2016). Roy Bhaskar's 'conjunctions of events' is the 'ways of acting of things' that does not ascribe necessary causality, teleology, or laws (1978).

12 Michael Polanyi's brother is Karl Polanyi, author of the counter-capitalism socio-economic tome, *The Great Transformation*.

## CHAPTER 5

### QUEER CO-(M)MOTIONS OF SCIENCE AND SUBJECTIVITY

*By historical method I mean every means of examination of conscience, of meditation, of contemplation of vocal and mental speech and other acts by which a person prepares and disposes the self to rid its coherence and integrity of all inordinate attachments to empire, and after their removal, by which he or she creates reciprocity and joins with others in a society of equal historical selves (SOEHS).*

*During the narration of history of any kind, be sure to attend to the sound of reproach in the voices of all the anonymous dead.  
(Dimock, 2012, p. 29 and p. 85)*

In the previous two chapters I pulled on two strands of memory, two different frames of thinking, each permeated by very different theoretical orientations towards science and its explanations, to very different effects on subjectivity and the social imaginary, productive of different narrations of the world. Chapter 3, *The Monster In Our Midst*, recounted dominant social imaginaries contextualized by a Cartesian/ Enlightenment noösphere that views the human subject as a function of a natural and scientifically-knowable telos, a linear and deterministic story told in a LaPlacean / Baconian / Newtonian mode of thinking. Chapter 4, *Vico's Chaos*, recounted a minoritarian social imaginary produced by a process-oriented noösphere that inverts the former model, and premises scientific theory and practice as expressions by and expressive of communities situated by and in their particular timeplace-thinking. Each of these 'categories' of memory reverberate in current feminist theories of subjectivity; looking at these histories reveals strategies, as Clare Hemmings notes, for a politics of the present. "If we can identify the techniques through which dominant stories are secured, through which their status as 'common sense' is reproduced, that political grammar may also offer a rigorous point of intervention"

(2011, p. 20). In this chapter I move from memory, the topic of the last two chapters, to desire, the impelling and organizing drive behind the politics of feminist new materialism.

I argue, through a focus on Rosi Braidotti's theory of the zoe-nomad subject, that while new materialism/posthumanisms extend the work of a long history of process-thinkers, vestigial strains of the linear, deistic model still infiltrate the feminist project to its detriment. In response I argue that Braidotti's cultural critical theory of subjectivity needn't draw on compromising sources for its philosophical grounding, by which I identify Spinozist monism and her over-identification with Deleuze and Guattari. While feminist new materialisms embrace science studies as well as literary and cultural theory, they tend to different tracks, and though these tracks do acknowledge the others and share broad aims and orientations, the arguments take significantly different approaches of reasoning. In Braidotti's case, taking her work as representative of the larger body of Continental-theory derived new materialist political desires, I argue that her theory of the zoe-nomadic subject is better supported by the sciences of desire that her theory, in fact, extends; as a strategy, this would offer the advantage of evading dismissal of the whole project by the halls of conventional philosophical discourse (Rice University, forthcoming) under charges of relativism, solipsism, failed logic, or utopianism) to connect a philosophy of materiality to 'leftist' ethical subjectivity. An approach grounded in the 'new' science could establish this important feminist political project free of residual strains of paradigmatic thinking that the politics of the project seeks to upend. In turn, Braidotti's in-depth considerations of the subject and processes of subjectivity as a micro-political intervention on the processes of advanced techno-capitalism extend the work of, as examples, Varela and Barad in important ways. Barad, Varela, and Braidotti, whom I treat as something of a triptych in this chapter, orient their urgent calls for transformation of subjectivity to praxes of inter-/intra-relations, but leave off on what that might look like.<sup>1</sup> While Braidotti's aim for her theory of the subject, "to become other than what we were defined and programmed to be"(2012, p. 341),



inspires the reader with effective visions that reorient the imaginary, it fails to offer strategies or tactics—what one of her influences, Isabelle Stengers, correctly identifies as the significance of materialism, its relations with struggle against “those who believe and those who know” (2011, p. 369)—for reading and changing the power structures ‘we’ are up against.

In this chapter, drawing on late 20<sup>th</sup> century science and late 20<sup>th</sup> century feminist posthuman and new materialist theory, I present my view of the structuring relations between science and subjectivity, not as a narration by a narrator, but as co-(m)motions of innovation, dynamic inter- and intra-motions by which each indivisibly ‘brings forth’ the other, the ‘two’ become indistinguishable. This approach enables me to explore the extent to which an affective theorization of the ethical, becoming subject, such as Braidotti’s, when entangled to a differently imagined science, provides a platform for the making of new and genuinely secular myths ““worthy of the complexity of our times” (2013, p. 186).

The stakes and goals are one and the same... new foundations of subject and social imaginaries are necessary in order to build and enact political strategies that bring forth economic transformation and the ecological restoration of our Holocene epoch planet.<sup>2</sup> Rosi Braidotti and other feminists<sup>3</sup> modify Kant’s question to ask, *what may we hope now?* I extend the question also to ask, *what skills are needed in the becoming other than we have been?* This chapter is primarily about the “propelling force” of feminist desires, which are “a deep yearning for transformation or a process of affirmation...the affectivity of the imagination is the motor for these encounters and for the conceptual creativity they trigger” (2006, pp.169-170). By virtue of their long outsider-status, as outside the margins of dominating frames of power, feminist theorists (not necessarily female-gendered<sup>4</sup>) and non-Western thinkers and scientists,<sup>5</sup> are well-positioned to model processes of alternative, secular thinking and creating.<sup>6</sup> Accordingly, the late twentieth century feminist literature has brought to bear several challenges and interruptions to western philosophic and scientific convention. Many of these extend process themes discussed in

the previous chapter, with an additional critical element. Feminisms hold knowledge claims and epistemologies accountable for their social, cultural, political, and economic effects; posthuman and new materialist feminisms (I discuss these terms in more depth below) hold central critiques of neoliberalism and its effects. Broadly speaking, these labels, posthumanism and new materialism, loosely cluster the work of feminist thinkers<sup>7</sup> who enact philosophical disruptions on the dominating western dialectics and telos laid forth in Chapter 3. These disruptions may be summarized as:<sup>8</sup>

- a rejection of taxonomic thinking and of the dialectic imaginary,
- critiques of reductionism and deduction,
- an emphasis on affectivity that challenges the exclusively ‘rational’,
- rejection of human exceptionalism,
- rejection of universals and essentialisms,
- challenges to totalizing notions of a stable one-ness,
- exposure of androcentric biases and deterministic tactics of power
- exposure of false ‘ontologies’ as oppressions (for example race, sexuality, gender, class, and nationality).

I bring to this group a discussion of scientists whose work supports in some way the aims of these feminist theorists, Francisco Varela, Manuel DeLanda, Stuart Kauffman, Lynn Margulis, and James Shapiro. The assemblage of these scientists may be simplistically explained by the aggregate of what they offer as a group:

- a thinking-style built on process philosophies of becoming,
- reconceptions of matter, materiality, evolution, and genetics
- a re-integration of the body in matters of ‘mind’, and of the mind in matters of ‘body’
- an acknowledgment that embodiment and possibility are inherently linked to the ethical.

- direct material relation between processes described through science and the social imaginary,

- radical anti-individualist theorizations of the ‘self’ and the ethical subject.

In short, recent scientific insights represented in this group supports a feminist imaginary that fosters possibility for what we, as subjects, may hope now.

A feminist imaginary allows a different knowing than that of rational critique. It is an altogether different logic. The logic I present in this chapter as ‘desire’ bears the marks of the logic presented in Chapter 3, Memory I, but does not, in its dynamics or mode of thinking, align with those logics. The logics of this chapter, Desire, reconfigure those of Memory. These reconfigured concepts come of asking different questions in a different time for different reasons; that is, its fundamental difference can be largely explained by its accountability to a fundamentally different situated-ness. Suspended in the gap space between memory and desire, in-between these perforated and leaking boundaries, a feminist imaginary trolls genealogies and temporalities and hopes and creative possibilities. While the human imagination can “run amok with affectivity and dreams or fictions” (2006, p. 164), a feminist imaginary moves freely outside of social normativity, its enactions subvert and complicate the reigning noösphere, such that we, as human subjects, might become other than we have been.

### **Monster-ous Monstrosities**

*Proteus, of sea-green hue, traverses the mighty main in his car  
drawn by fishes and a team of two-footed steeds.  
Virgil, tr. Lewis, 1940 Georgics 4.388*

*And though she take a hundred lying forms,  
let her not escape you,  
but hold her close, whatever she may be,  
until she take again the form she had at first.  
-Proteus to Peleus, Ovid, Metamorphoses, 11.250*

Affectivity and embodiment precondition the posthuman, ethical project and, thus the feminist imaginary, as I use it, embeds and is embedded in materiality, and therefore does not relate to the ideological imaginaries of a Spinoza, Althusser, or Lacan. It does embrace Varela, Barad, and Braidotti, whom I see as forming a particular triad that forms connections between science (as enaction and innovation—materiality) and ethical subjectivity, in a way that supports a politics of possibility, hope, and life. These “yearning[s] as a radical aspiration to freedom” (Braidotti, 2013, p. vii) also only thinly veil a tone of urgency, an exasperation and almost desperate pleading that simultaneously acknowledges and mourns inevitable, impending losses. But Braidotti does not confront darkness with darkness. Her aim, at its core, is to cultivate “affirmation and joy ... in order to pull out of the end of millennium stagnation” (2002, p. 211). She presents a nomadic theory of subjectivity that is an ethical, impassioned and compassionate location of hope in the ‘here and now’ of possible futures, a hope so ardently placed beyond (though not in contrast to) panic and mourning (affective politics, too, are complex and nomadic) as to suggest a subtle underbelly of disquietude, one which, while understandable, goes unacknowledged, save one admission to frustration. Nomadic subjectivity emphasizes the role of “passions, empathy and desire as modes of relation” (2012, p. 266) that work against nihilism, liberal individualism, and ‘delirious megalomania’. Desire, then, in Rosi’s theoretical frame, reconfigures the subject, it is a ubiquitously dispersed<sup>9</sup> praxis of political resistance embedded in the human body, suitable to memory and to the “monstrous and grotesque imaginary we have inherited from the nineteenth century” (2002, p. 267). The posthuman imaginary of feminist new materialism takes on those monsters, and gets perceived by some as monstrous for its resistance to humanism, and owns its own monsters; monstrosity is in the eye of the beholder.

Feminist biologist Donna Haraway’s monster is a schismed thing with a three-fingered hand, its cut divides subject from object, and its hand unites the digits of science, economics, and social control (1991, p. 8). Haraway laid scholarly foundations that explain how the cultural

monstrosity of advanced techno-capitalism plays the God-trick on ‘nature’, invoking an altruistic ‘calling’ to command-and-control systems of profit, power, and war that exploit non-human resources (1991). Age-old domination finds new expression in control hierarchies such as human engineering, sociobiology, evolutionary psychology, corporate management, and labor practices. Perversely, oligarchic malthusian gods (omg: affluent white Western men with too much power) applied their disembodied, rationalist minds to mitigating the excesses of [neo-Darwinist]<sup>10</sup> competition in their pursuit of a desired, yet out-of-nature, state of harmony. Social harmony, so the story went, offered an improvement over God’s ‘natural laws’ left bare. Western colonial and economic imperialisms of and since the twentieth century self-anointed such acts as acts of altruism in domesticating the ‘wild’, i.e. Other humans, Other life, Other geographies. “The search for the illusive subject paradoxically ends regularly in the discovery of the totalitarian object—nature, the gene, the word” (1991, p. 78). As wielded by the OMG, scientific knowledge operated as an armature of political and social control to wed unnatural, harmonious desires of the mastering mind and the natural, material servile wild.<sup>11</sup>

Rosi Braidotti identifies post-industrial techno-monstrosity in “consumerist liberal individualism” that capitalizes on technologies of biopiracy afforded by information and genocentric economies of hybridity, and which disintegrate distinctions between self and others—the human/animal, life/not-life, the organic/inorganic/technological. She locates a “vampiric” monster in an advanced capitalism that consumes the surplus vital matter of ‘others’,

it is head-less and centre-less, yet hegemonic, mobile and flexible, yet fixed and very local; inherently violent and ruthless, thus prone to self-destruction; as a system, it is illogical and without an endpoint, aiming only at self-perpetuation; ... it is the great nomad par excellence (2012b, p. 17) that has produced the homogenization of commodity culture in terms of consumerist practices, coupled with huge disparities and structural inequalities” (2006, p. 31). “Advanced capitalism acts as the petri dish of a contemporary social imaginary that “swings between euphoric techno-transcendentalism and paranoid technophobia. (2012a, pp. 170-171).

Braidotti locates the center of these scientific and political debates as the life-itself that festers within the bellies of their material and embodied beasts.

Hybridity as monstrosity remains a source of terror and macabre attraction that challenges humanism's notions of the human and nature, and threatens anthropocentric patriarchal autonomy.<sup>12</sup> Haraway published her theory of the cyborg subject— part animal, part human, part technology— at the height of the Cold War. Now, decades later, in times of “blissed-out, techno-sublime euphoria” she has backed off from the misunderstood and misapplied, transhuman interpretations of her earlier cyborg theory in favor of her theory of companion species. Microbiologist and evolution scientist Lynn Margulis champions such hybridity that expresses the symbiotic processes that characterize all living entities as chimeras; symbiogenesis explains the evolutionary resource that has sustained all life, from bacteria to eukaryotic organisms, for 3.5 billion years of evolution. Margulis' lens that looks at ‘life-itself’ in the context of geologic time observes that boundaries and membranes have always been dissolving, transgressing, and transforming, the identity of an entity is inherently transient, provisional, temporary, and in autopoietic process. Paradoxically, constantly renewing metabolic exchanges with flows of matter and energy secure the continuity of form and function of an autopoietic entity, whether cell or organism.<sup>13</sup> Scientifically, the idea that an entity is constitutively autonomous, whether living, inert, or conceptual, has always been a myth (i.e. false). The mark of the definite article on conceptual objects (*the* human, *the* species, *the* ecosystem, *the* mind, *the* body), according to Bruno Snell (see Chapter 4), reveals a fallacy of misplaced concreteness (Whitehead, see Chapter 4). Static reifications and classifications, and autonomy as isolated individuation are but misleading appearances that have no perch in life-itself. Monsters, if they be hybrid and protean, are us, and that's the good news, for it rearranges everything about the now of Western culture and subjectivity. Real monsters, those that end life, may not be hybrids but be

quiescent essences, singularity and certainty, hierarchical and centralized controls without accountability to mess or complexity.

Braidotti locates another affirmative varietal of the monstrous (as in huge) in the “energy of life” that does not respond to our names, but endures through differences and by differing (2012a). This vision reflects a more recent iteration of the posthuman turn, which neither has one voice or definition, but, may be described by its collective consensus that, in rejecting human exceptionalism, sees the hybrid predicament of a world as salaciously and anxiously saturated by technoscientific life as capital, to think it, posthuman scholars fumble for a critical and applicable theory outside of humanism’s universalizing narratives that fix essences, and that acknowledges the crucial play of nonhumans in all processes (e.g. information technologies, in vitro fertilization, mammal and embryo cloning, transgenic manipulations, artisanal cheese-making). But telling the human body being preyed upon by vampiric systems apart from the human body of agential political and ethical transformation, both being modes of ‘becoming other’ flows, is not, as Braidotti notes, readily transparent, and so it is the task of cultural and political theory and practice to make the differentiations (2007, p. 67).

As a critical theorist, Rosi Braidotti sees her task as double-edged, at once to make sense of our present and to dream aspirationally. “It is the dream of producing socially relevant knowledge that is attuned to basic principles of social justice, the respect for human decency and diversity, the rejection of false universalisms; the affirmation of the positivity of difference; the principles of academic freedom, antiracism, openness to others and conviviality” (2013, p. xi). This tone, deliberately engaged, marks a shift from her earlier work between 2002-2007 that focused more on Agamben (2007a, reiterated in 2013 in *The Posthuman*), and on neo-liberal and neo-Kantian thought, to which she countered with Deleuzian ‘becoming machine’ language (2002, 2007b). It reveals an oppositional discomfort, a frustration and anxiety that gropes for a way out. When her focus turns from human to posthuman discourse, which is when she integrates

the inspiration of process-oriented sciences that describe life as a “relentlessly generative force” (zoe)<sup>14</sup> (2006, p. 37) in the midst of this age of “informatics of domination” (Haraway, 1991, p. 162), and when new materialist discourse returns the body of the post-anthropocene subject to feminism—with sufficient weight to re-balance former marginalization of the ‘enfleshed’ body by the discursive—the span of her new materialist/posthuman work comes into better focus. She envisions new generations of ‘knowing subjects’ that “enact principles of community bonding free from the provincialism of the mind, the sectarianism of ideologies, the dishonesty of grandiose posturing and the grip of fear. ... That means we need to learn to think differently about ourselves” (2013, pp. 11-12).

In reframing a politics of the changing nonhuman/living world, the literature takes a couple of paths. Barad makes an important distinction, “posthumanism” “marks a refusal to take the distinction between “human” and “nonhuman” for granted, and to found analyses on this presumably fixed and inherent set of categories” (2007, p. 32). The critical effect of such a refusal is to disable dreams of the “human” and “nonhuman” as materially constituted differentially. Barad’s ethico-scientific materiality of entities would be the ‘ism’ of the posthuman, while Braidotti’s engagement of the ‘perverse’ and ‘paradoxical’ posthuman predicament is less about Barad’s materiality and more about moving beyond European history (the ‘post’ of Humanism). Braidotti’s aim is to use her brand of posthumanism as a navigational tool to explain the ‘profound’ transformations under way in our situated historical location (2013) and its affective dimensions<sup>15</sup> in order to “think critically and creatively about who and what we are actually in the process of becoming” (p. 12). Haraway, noting that the imagined human of Humanism is known to us only through non-innocent translations, perspicaciously asks, “how can humanity have a figure outside the narratives of humanism; what language would such a figure speak” (2004, p. 49).



New ways of thinking difference and subjectivity need new languages. To me, the term ‘posthuman’ suffers from its construction on ‘human’, thereby reinforcing the very thing it means to decenter (here is one place that begs for a new word). I use the term posthuman simply to refer temporally to the late twentieth and early twenty-first century made distinctive by the locking of global advanced capitalism to advancing technolife, and also made distinctive by the biological sciences that explain life’s becoming as a matter of complex flows, self-organizing relations, and material assemblages of diverse organisms that give no privilege to, nor center on the human.<sup>16</sup> Defined these various ways, the term *posthuman* figures frequently in the discursive language of feminist new materialisms, the critical theory that, in response to what was left out by post-structural privileging of performative language and verbal text, feminist scholarship refocuses on the body and materiality. Feminist science studies, having never abandoned the body, informs this shift of focus in cultural theory and humanities scholarship, opening new avenues of transdisciplinarity that integrate scientific and social considerations in new frameworks of natureculture (Haraway), onto-epistemological (Barad), biocultural (Anne Fausto-Sterling) analysis and reflection. Being based loosely on the premise that “cells and culture [and environment (author’s insert)] construct each other” (2000, p. 242), neuroscientist Elizabeth Wilson (2004) argues that ‘gut feminisms’ do the political work of difference that, without the sciences, sociocultural constructions cannot accomplish. By reclaiming objects of knowledge that have traditionally belonged to reductionist modes of explanation, new materialism provides for new thinking around the sciences, nature, biology, the body, and materiality that extends the dynamic process philosophies of becoming found in Bergson and Deleuze (each of whom were inspired by Alfred North Whitehead) to arrive at a political and ethical commitment to life-itself as well-being.

In general, new materialism concerns “an enlarged sense of inter-connection between self and others, including the non-human or ‘earth’ others” (Braidotti, 2008, p. 34), and the barriers of

negativity on the other. Rosi expands Deleuzian philosophy to construct her own vision for an ethical politics of life and subjectivity “worthy of the complexity of our times” (2013, p. 186). I assess Rosi’s vision in terms of what it offers productively to the overall project — the vision and affect to become ourselves (collectively) as ourselves, who will have been fundamentally different from the selves we are, from what the Western master-narratives tell us we are, and from whom we thought we were supposed to have been — and to make note of what her vision lacks and risks.

### **The Sciences of Desire**

*The Universe is not only queerer than we suppose,  
it is queerer than we can suppose.  
J. B. S. Haldane (1928, p. 286)*

The critical theory of feminist new materialist and posthuman process-thinkers is supported by twentieth century developments in science in the fields of physics, biology, and evolution, which, as they seem to me to form an assemblage, I collectively refer to as the *material gap*. This is the science that proceeds outside of organizing assumptions of cause and effect, of telos, of reductionism, linearity, equilibrium, or certainty and universals. I explain here Stuart Kauffman’s concepts of the ‘poised realm’ and, in biology, the ‘adjacent possible’ as cousin to the physics concepts of ‘possibility space’ (aka ‘phase space’ or ‘state space’) as presented by Manuel DeLanda. While Kauffman’s discursive style remains loyal to the linear conventions of his training, put to use, ironically, to undermine those very foundations, DeLanda sees this approach as problematic to changing our way of thinking about the world. He instead presents a non-linear history that represents reality as “different ways in which single matter-energy expresses itself,” (1997, p. 21). Since then, theories (more metaphors) have been put forth —that matter-energy constitutes information, some astronomers analyzing the physics of black holes

suggest that the universe is an information structure, and some astrophysicists suggest negative mass may be possible under certain conditions to an observer (Grant, 2014). Scientific theories, generally, are corrigible metaphors that reflect the participant-observer. Accordingly, I present the ideas of an assemblage of late-twentieth century scientists, DeLanda, Kauffman, Margulis, Varela, and Shapiro, not in order to critique, but to make the point that a different science, a science of material possibility supports the desires expressed in the feminist critical theory of political possibility that I also present in this chapter. I present this science as a way to model a different thinking, to orient a different imaginary, to anchor a different subjectivity, to narrate a transformation to modern Western myths that is underway. These scientists spatially locate a creative dynamic in material gaps as characteristic to processes in both physics and biology, and which make way for these scientists' further musings on the materiality of life-itself. They share in a rejection of the schizophrenic lineage of the Cartesian mind/body and the Hegelian dialectic in formations of the subject. This group understands life to be self-organizing, creatively expressed in flows of matter and energy that embed history and take unpredictable form in the burgeoning of diverse entities. For most of this group, humans do not rate as exceptional. Such scientific positioning lends support to conceptualizations of radical subjectivity that new materialist feminist literature does well at extending and interrogating.

In the course of laying out their spatial configurations of possibility, both DeLanda and Kauffman arrive at redefinitions of causality. DeLanda adopts a complex view by which “causal interactions among component parts... exercise their capacities to affect and be affected, constituting the mechanism of emergence behind the properties of the whole” (2011, p. 385), and in his language can be heard echoes of Latour. Relations between interactive components and between the object and the context in which it is embedded change, without the terms of the object itself, changing. While DeLanda comes to this through his framings in physics, this is nothing if not a topological restatement of autopoiesis. The properties that give rise to an object in

its ‘wholeness’, composed by the functions and forces of its components, don’t matter to the identification of an object as that object.<sup>17</sup> His view of causality draws from a quantitative physics that is without linearity, homogeneity, law, or teleology, but richly complex.

Possibility space, in DeLanda’s usage, is topological, meaning it is the space of all solutions to predictive models of future states of a particular physical process. All tendencies and outcomes in the possibility space are *real*; of these, as if acted upon by natural selection, only some become *actual*. This distinction between the real and the actual that DeLanda emphasizes describes two possible states materiality occupies. And like Darwin’s evolution of descent with modification, “the current actual state cannot be deduced from the equation alone because it depends on the historical path that the process followed” (2011, p. 389). Within possibility space, capacities to affect and be affected are infinite, while tendencies to different types of stability (steady, periodic, turbulent) in dynamic systems are limited. Capacities and tendencies are real (‘virtual’ in the language of Deleuze, to whom DeLanda connects philosophically), even if not actual; they precondition emergence while evading classical norms of mechanistic linearity<sup>18</sup> and ontological commitments to causal ‘law’. “The current actual state cannot be deduced from the equation alone because it depends on the historical path that the process followed. ... Thus, while much of the work on causal mechanisms and mechanism-independent singularities is performed by scientists and mathematicians, the elucidation of the modal status of capacities and tendencies and the enforcement of immanence must be performed by philosophers (2011, p. 389).

Kauffman, however, attempts to do both, to provide through classical deductive, linear, ‘lawed’ argument a speculative, scientific proof of ‘possibility space’, what he analogously, but not identically, develops into his concept of the ‘poised realm’,<sup>19</sup> which in concert with quantum mind and the actual, recovers acausality, and with it an embodied subjectivity that has been lost for 350 years of Newtonian Cartesianism, and rescues a ‘responsible’<sup>20</sup> free will and experience from determinist erasure. The triad of

actuals, possibles, and mind, by which he also means consciousness and experience—there is no discussion of the body in his 2014 paper (although writing in 2008 that, “Embodied in us, human mind is a meaning and doing organic system” (p. 177)); body and mind are adjacent and real, but still separate; stating that “immaterial mind has consequences for matter,” Kauffman accepts the physicists’ language of *immaterial* to mean “not objectively real,” a rock is objectively real (2008, 209); so, by implication, Kauffman of 2008 understands matter classically, as that which has substance—jointly function<sup>21</sup> in a “co-creative becoming” of ‘reality’ (2014, p. 17) that is instantaneous<sup>22</sup> and acausal. If Kauffman’s quantum ‘mind’ were to be understood generously along feminist new materialist lines that undo binaries, as Kauffman wants to do, too, then perhaps it would be reasonable (!) to conceive of his 2014 triad as inclusive of the body as an affective and sentient transect (from the quantum level of the electron on up through the subject’s conscious experience) that crosses through each component of his triad; this is indeed the implication of his 2014 paper, that mind is not solely human; it distributes across all of matter<sup>23</sup> and that the poised realm system is both emergent and material. Matter, and the body, in Kauffman lack clarity, but it seems his thinking may be evolving.

Kauffman approaches this rescue mission of acausality and responsible free will with “hope and skepticism,” (2014, p. 18); interestingly, the words *imagine*, *experience*, *desire*, *metaphor*, and *hope* show up forty-nine times totally in his 2014 paper, so while Kauffman never surrenders the split between ontology and experience, the objectivist inclinations of his thinking are being radicalized by affect and by the quantum world and this brings him smack inside the interface of science and subjectivity. Similar to Barad’s explorations of non-locality, measurement, and

entanglement in quantum physics as grounding a new ethics, Kauffman, too, argues through science for his desire for an evolving global ethics. If his argument is ‘true’ (his language is formalist), then the classical world leaves a record, just as Barad states, “the past is never over and done with” (2014), “we construct the world we think we live in (2014, p. 18). In the poised realm, possibility affects the actual and mind, which in turn create and limit new possibles, and so on as “we and nature jointly ‘create reality’ “ (2014, p. 17).

Kauffman’s renewed focus on quantum physics follows his prior work that focused on questions of biology, in which he asserts that biology cannot be reduced to physics. Quantitative biology cannot describe that always changing space of the ‘poised realm’ of biological emergence of order at the edge of chaos. Like DeLanda’s ‘possibility space’, the poised realm does not reduce to formal methods that ‘prestate’ possibilities, either of pre-adaptations, expressions of pre-adaptation, or phylogenic trajectories. In the unpredictable poised realm of uncertainty, be it of the biosphere, the cell, ecological community, or ecosystem, Stuart Kauffman locates spontaneously ordering energies of ‘life-itself’ that emerge in a grand dance of “transform or die, or both ... each creature evolving as best it can, inevitably creates the conditions of its own ultimate elimination...making way for new forms of life and ways to be” (1995, p.130 and p. 243). Examples of this spontaneous ordering, expressive of the emergence of ‘actual’ matter from DeLanda’s ‘real’ matter of the poised realm, include a lipid’s formation of a bilipid membrane vesicle, the Fibonacci series of a pinecone’s phyllotaxis, the origin of life as phase transitions through collective autocatalytic processes of chemical reaction systems, patterns of ecosystem co-evolutions, and the evolutionary repurposing of fins as wings and temperature-moderating feathers for flight. “It is from these unlimited combinations that truly novel structures are generated” (DeLanda 1997, p. 16). DeLanda references, amongst others, Kauffman (1990, pp. 428-429), who calls these the ‘adjacent possible’ of biological functionalities. I think of these empty niches as the negative space of boundary conditions, a material gap where new relations

between parts may be ‘at-the-ready’ should and when conditions change, as if warehousing an indefinite array of creative, unpredictable-possibles of evolutionary and environmental processes for a possible future of becoming actual (the lungs of the lung fish become the swim bladder that yields neutral buoyancy in the water column for some fish, becomes the habitus of specialized endosymbiotic bacteria (Kauffman, 2013, Heraclitus). Unknowable by reason but made sense of by metaphor, the ‘emerging novel adjacent possible empty niches’, Kauffman suggests, follows a ‘quantum logic’ by which meanings cannot be ascribed to either true or false. The radical intervention here is Kauffman’s concept of order as a creative, playful, stunningly beautiful, and improvised<sup>24</sup> property of complex networks. “We seem to have been profoundly wrong. Order, vast and generative, arises naturally” (1995, p. 25).<sup>25</sup>

Evolution as a process of becoming over time ‘enables’ but does not cause. Like DeLanda, Kauffman erases classical notions of causality, and instead engages his concept of ‘enablement’, defined as making possible. Kauffman posits an explicit premise, that “no law entails the evolution of the biosphere” (2012, p. 1380) and that “the very phase space of evolution changes in unprestatable ways” (2012, p. 1386). In other words, nature is not an object obedient to limiting laws of prediction; the poised realm, or possibility space, of life’s vast and generative trajectory proceeds without limit or constraint, until subjected to the limiting effects of natural selection on the becoming of actual and historical matter; there exists (I even claim, materially) infinitely more possibilities and configurations than ever become actual. This ecological view of ‘enablement’ does not accommodate reductionism, instead, relationality in biotic and abiotic niches “enable what evolves,” and we do not begin to understand this co-constitution.

The scientific investigation into the mysteries of this co-constitution have also been modeled by Chilean biologists Humberto Maturana and Francisco Varela in their works on autopoiesis and enactive cognition, and by Lynn Margulis’ work in symbiogenesis and endosymbiosis<sup>26</sup>, by James Shapiro’s work in cellular genetics, and by Karen Barad’s work in entanglement and

quantum field theory. An analogous equivalent to possibility space and the poised realm (which I group under my umbrella term, the ‘gap’) appears as a component in all of their works, each contribution shores up the work of the others. Intra- and interactions between organisms, between cellular organelles and their information communication systems, biological niches, ecosystems, and electron spins and charges are “ever changing, intrinsically indeterminate”; we cannot anticipate the “niches” that constitute the boundary conditions and ecotones, we cannot anticipate what will have emerged. “We can only inhabit a micro-identity when it is already present, and not when it is in gestation” (1999, p. 52). For these scientists, despite their different disciplines and the particularities of their vernaculars, life —living matter— evolves as a creative and ordering emergence (or a bringing forth)<sup>27</sup> through processes that are sentient, embedded, and consciously ‘communicative’ on the interior of their enveloping membranes and with epi-entity / epi-component / epigenetic conditions. This position, despite the supporting advancements (using reductionist methods) already accepted by the larger scientific community, remains marginal and heretical to the culture of evolutionary biology, which relies on statistical formalisms to the exclusion of observation and physiology. Such intransigence gives testamentary evidence to the staying power of the neo-Darwinist genetic techno-imaginary of the selfish, capitalist gene/subject as a machined blueprint. I remind my reader of the definition of life by biochemist Craig Venter as “DNA software-driven machines” (as cited in Freeman, 2013). These precepts hold not only circles of science and industry but also the collective popular Western imagination in their narrative grasp of advanced capitalism; they model the content, practices, politics, and worldview of what alternative understandings of life-itself and the subject are up against, and thereby mark points for destabilizing interventions (Hemmings, 2011) in political strategies for change.

Views of possibility as material to the ‘responsible’ co-becomings of the world, such as put forth by DeLanda, Kauffman, Barad, Shapiro, and Varela, generate a different politics of life,



“there is in these new theories a positive, even joyful conception of reality. And while these views do indeed invoke the ‘death of man,’ it is only the death of the ‘man’ of the old ‘manifest destinies’” (DeLanda, 1997, p. 274).

The view of the material world that emerges from these considerations is not one of matter as inert...[nor] ... an obedient matter that follows general laws. It is rather an active matter endowed with its own tendencies and capacities, engaged in its own divergent, open-ended evolution, animated from within by immanent patterns of being and becoming. This other material world can certainly inspire awe in us but does not demand from us to be accepted with pious resignation. (DeLanda, p. 392).

Echoes of Deleuzian immanence and becoming figure prominently in DeLanda, and in Braidotti, as will be shown; these tracings, shown in Chapter 4, hail Vico and company. In the long history of inquiry into consciousness that extends far earlier than that of the Cartesian Enlightenment, individuality was not attributed to active processes of materiality; this ‘tortured vein’ of thought comes back to the surface in intersections of current science studies and philosophy, significantly contextualized, again, by the current social and political conditions that inspire and situate the inquiry.

Sounding like the radical and feminist philosophy that Kauffman is not schooled in, he states “radical emergent becoming...creates its own future possibilities of becoming” (2012, p. 17).<sup>28</sup>

Without selection acting to do so, the biosphere is persistently creating its own future possibilities! The biosphere, beyond selection, persistently creates what it may become!...[R]eductionism fails for the evolution of life and we are beyond Newton and Schrodinger. (2014, p. xiv)

Kauffman raises the same question that DeLanda raises in his statement that “no law entails the evolution of the biosphere” (Longo, Montevil, & Kauffman, 2012, 1380). “The question then,” as DeLanda puts forth, “is whether the very concept of ‘law’, a concept that, it may be argued, constitutes a kind of theological fossil embedded in modern science, is adequate to think about these immanent patterns” (2011, 386). Kauffman affirms that science can no longer be about prediction, it is a search for explanations in a paradoxical world; accordingly, he investigates life

as systems evolving spontaneously in conditions of complexity, “No vital force or extra substance is present in the emergent, self-reproducing whole” (1995, p. 24). In contrast to the Victorian canon of natural history that connected the political mindset of empire and progress in England to its legitimate powers to command and control nature, complexity evidences that “we do not know what we are doing...having invented the categories, we carve the world into them and find ourselves categorized as well .... global civilization would have to invent its own new sustaining myths” (1995, pp. 300-303). Causality, then, as defined by Kauffman and his scientist co-authors, is “difference that causes difference” (Longo et al., 2012, p. 1379) and is embedded in and embeds the “indefinite, un-orderable” (p. 1389) poised realm, spoken like a true feminist epistemologist. The material gap of intra-acting forces lies beyond mathematics and words, and may be imagined only as that which exceeds the imaginary, and enables radical collective emergence (the creative).

My discussion here on Kauffman and DeLanda focuses on a realm of meta-scientific inquiry that reveals possibility space, the poised realm, and the adjacent possible as active lacunas, the very materiality of which demands a transformation of scientific ideologies, if not of worldviews, and which, for now, are conceptually populated by the creative co-becomings of subject and world, both always-already in constant, dynamic motion, thus my phrase, the creative co-(m)otions of science and subjectivity (pun intended, the dynamics are definitionally in motion, appear chaotic, but in Vichian style, are simply complex). I now move to a parallel discussion of embodied creative possibility space on the scientific micro-level, in Varela’s neurocognitive sensorimotor patterns and in James Shapiro’s cellular genetics.

## Sentience

*“If my internal awareness were glued  
without gap to my fleeting experiences,  
the passage of time would rip my ego to shreds.”  
(Brough 1989, p. 288, as cited in Shear & Varela, 1999, p. 130).*

Varela’s work, too, undoes dualist frameworks of inquiry by which “logical antinomies” only lead to “conceptual knots,” indicative of wrongly posed questions that in neglecting first-person praxes (“the experiential and social dimension in—even the most consecrated forms of natural science—is often hidden, but never entirely absent” (Shear & Varela, 1999, 13)) neglect the neurodynamics of experience, thereby silencing the empirical evidence of the ecological intra-embeddedness of self, inter-subjectivities, and world. To study conscious experience<sup>29</sup> scientifically, defined as the lived *experience* associated with cognitive and mental events in which experience (and affect) are explicitly active components of consciousness (p. 1), Varela advocates first-person methodologies, linked to third-person accounts. Subjectivity is central to a science of the consciousness.

For Varela, “perception and action are embodied in self-organizing sensorimotor processes” (1999, p. 15). Cognition consists of embodied action. Actions/behaviors of immediate coping—‘know-how’—walking, reading aloud, dressing and undressing, eating, responding to the needs of others—are expert skills unfettered by intention or the application of rules or analysis, having taken the longest evolutionary time to develop; by training over time, these actions transformed into embodied behavior. It is on this level of cognition-as-expertise that Varela constructs his concept of ‘ethical know-how,’ one that can be learned through praxis. “The basic idea is that embodied (sensorimotor) structures are the substance of experience, and that experiential structures “motivate” conceptual understanding and rational thought” (p. 16), cognition brings forth embodied subjectivity. Varela suggests that cognition, as understood scientifically, has potential as a tool and practice for the development of the subject’s ethical engagement in the

world.<sup>30</sup>

To explain cognition as distributed processes of emergence by which “signals move back and forth, gradually becoming more coherent until a micro-world has been constituted” (1999, pp. 48-9), Varela cites Walter Freeman’s findings from a study of rabbits’ olfactory system, and I quote here at length:

Emergent patterns of activity are created out of a background of incoherent or chaotic activity by fast oscillations until the cortex settles into a global electrical pattern, which lasts until the end of the sniffing behavior and then dissolves back into the chaotic background. The oscillations then provide a means of *selectively binding* a set of neurons in a transient aggregate that constitutes the substrate for smell perception at that precise instant. Smell appears in this light, not as some kind of mapping of external features, but as a creative form of enacting significance on the basis of the animal’s embodied history. What is most pertinent here is that this enaction happens at the hinge between one behavioral moment and the next, via fast oscillations between neuronal populations that can give rise to coherent patterns. ...

It seems that between breakdowns these oscillations are the symptoms of very rapid reciprocal cooperation and competition between distinct agents activated by the current situation, vying with each other for differing modes of interpretation for a coherent cognitive framework and readiness-for-action. This dynamic engages all the sub-networks that give rise to the entire readiness-for-action in the next moment. It involves not just the sensory interpretation and motor action but the entire gamut of cognitive expectations and emotional tonality central to the shaping of a micro-world. On the basis of this dynamic one neuronal ensemble (one cognitive subnetwork) finally prevails (i.e. a bifurcation in a chaotic dynamic) to become *the behavioral mode for the next cognitive moment, a microworld*. ... In the breakdown before the next micro-world shows up, there are a myriad of possibilities available until, out of the constraints of the situation and the recurrence of history, a single one is selected. The fast dynamic is the neural correlate of the autonomous constitution of a cognitive agent at a given present moment of its life. ... *The cognitive self is its own implementation: its history and its action are of one piece*” (pp. 50-54, italics in original).

Systems of fast resonance to transiently bind neuronal ensembles pattern life-itself, being located, for example, in the visual cortex of mammals, the avian brain, and the ganglia of an invertebrate, *Hermisenda*. In objection to ‘causal modes of input-processing-output’ garnered

from computationalism to model the workings of the brain as “simply incorrect,” Varela describes the architecture of the brain as supporting the operation of signals to move “back and forth,” not in a seamless flow from one state to another, but “in a punctuated succession of behavioral patterns that arise and subside” in a “natural temporal parsing” (pp. 48-49). The oscillations and breakdowns of neurocognitive processes in Varela bear striking resemblance to Kauffman’s proposed “persistently poised quantum coherent-decoherent system”<sup>31</sup> of mind/consciousness, one difference being that Varela additionally explicitly addresses intersections of embodiment and affect as constitutive of the ‘virtual self’ and “at the same time contain[ing] a radical openness or unexpectedness with regards to its occurring” (Shear & Varela, p. 132). He explores the linkages between affection and the constitution of time as directly impacting what he calls ‘coping’, the readiness for action that marks an “expectation as to the way the world will show up,” for example habitus and learning a skill. Affect, for Varela, is “a dispositional trend proper to a coherent sequence of embodied actions.” Affection and learning enact a world by coping in temporal flows that are deeply rooted biologically.

In sum, Varela presents a ‘hard-science’ of the role of affect and experience in pre-conscious neurological processes in a co-(m)otion of becoming self and world, mapped by the co-(m)otions of science and subjectivity. He uses non-linear mathematics and dynamical systems methods to perform temporal measurements (msecs) of neuronal sensori-motor enactions that, in unceasing flow, configure items into ‘meaningful world’ (Shear & Varela, 1999, pp. 116-125). Lending evidence to cognition as embodied and dynamic, measurements of each of cellular rhythms, synaptic integration, central oscillations, memory, and excitability cycles show the emergence of self-organizing patterns of “endogenous configurations of [reciprocal cell assemblies] of neuronal activity” (p. 116). Taken together, these correspond as well to a view of temporality as an embodied, neurocognitive process. ‘Nowness’, present-time consciousness, emerges as a ‘pre-semantic descriptive-narrative assessment’ linked in humans to our linguistic

capacities. The integration of moments of ‘nowness’ gives rise to broader temporalities of memory and imagination (desire, anticipation) that constitute the flow of consciousness. “Inseparable from our history as living beings and minute events in brain physiology, ... emotional tonality [‘an awareness that is constitutive of the living present’], is, by its very [pre-conscious] action, a major boundary and initial condition for neuro-dynamics” (p. 132-133).

The neurodynamics of time as a dynamical system are based on non-linear coupled oscillators, for which the norms of perpetual self-propelled motion are instability and multi-stability. Accordingly, “any slight change in initial and boundary conditions makes the system move to a nearby stable/unstable region” (Shear & Varela, 1999, p. 128), and we are reminded of the butterfly effect.<sup>32</sup> Here Varela engages complexity theory to discuss consciousness in terms of fissures, breakdowns and loss in the fluidity of coping within the ‘phase space landscape and the specific trajectories that move in it,’ which condition the embodied coupling of affective-tonality and temporality. Varela acknowledges that this dynamic of breakdown and ‘re-membering desire’<sup>33</sup> is what Kauffman refers to as ‘operating at the edge of chaos’ and ‘self-organized criticality’ (1993) in the space that hovers, or oscillates, between chaos and order. I point out to my reader that this concept amounts to the quintessential scientific application of Vichian dynamics (Chapter 4) to the constitution of material possibility. In making scientific statements about ‘life’ as self-coordinating-systems, both Varela and Kauffman emphasize the creative function of embodied mind/cognition. The “continual redefinition of what to do is ... enormously dependent on contingency and improvisation, and is more flexible than any plan can be...in terms of the role such running redefinition plays in the coherence of the entire system” (Varela, 1999, p. 55). Varela’s uses ‘system’ in a specific sense that leads to another aspect of thinking that he and Kauffman share. The system in its entirety emerges out of the local chaos of interactions, there is no one central representation or command system, it is only the observer who imputes central control. “The creature itself has none” (p. 59).

Maturana's and Varela's system of autopoiesis, in setting out to define the phenomenology of biology, arrives at an epistemological stance by which living systems are describable only from the remove of an observer and, for social groups, only in a linguistic (social) domain, which for humans is language. I presume that in making this observation, Maturana and Varela are also commenting on scientific claims to objective truth of its knowledge. "No description of an absolute reality is possible" (1980, p. 121). Though we are embedded in it, 'nature' lies at a distance to our intelligibility of it, at best we might indirectly infer and debate its nature, which cannot be proven. The particular properties of an entity-in-itself cannot be directly apperceived, but autopoiesis generates observers, thus relations between entities can be described; hence, cognitive reality is unavoidably relative to the knower's interpretation, mediated by the behavior<sup>34</sup> of description. Humans, as autopoietic systems, interact with this world through their descriptions ... "this demands an entirely new cognitive outlook ... autopoiesis generates a phenomenological domain, this is cognition" (pp. 122-123), and it is cognition that generates time as a dimension of the descriptive domain, it is not a feature of the 'ambience'" (p. 133). Language, then, appears in the evolution of hominids as a biological phenomena of social groups dependent on communicative interactions for their survival, dependent on the biological-cognitive dynamic of love and acceptance of others. Emotions, (fear, anger, sadness, etc.) are part of the dynamic that defines an organism's structural pattern (TofK 247).

Language was never intended by anyone only to take in an outside world. Therefore, it cannot be used as a tool to reveal the world. Rather, it is by languaging that the act of knowing, in the behavioral coordination which is language, brings forth a world. We work out our lives in a mutual linguistic coupling, not because language permits us to reveal ourselves but because we are constituted in language in a continuous becoming that we bring forth with others. We find ourselves ... not as a pre-existing reference nor in reference to an origin, but as an ongoing transformation in the becoming of the linguistic world that we build with other human beings (1987, pp. 234-5).

In this way language directly links biology to social and cultural practices, Varela contextualizes the scientific phenomena of enactive cognition, not as concerned with objects but as self-reflexive *ricorsos*, by which, like a Klein bottle that has no inside or outside, no start and no finish, we bring forth ourselves. This knowledge, states Maturana and Varela,

“compels us to adopt an attitude of permanent vigilance against the temptation of certainty. It compels us to recognize that certainty is not a proof of truth. ... This is why we cannot evade ... an ethics that has its reference point in the awareness of the biological and social structure of human beings, an ethics that springs from human reflection and puts human reflection right at the core as a constitutive social phenomenon” (TofK 245). ... Every human act has an ethical meaning because it is an act of constitution of the human world. This linkage of human to human is, in the final analysis, the groundwork of all ethics as a reflection on the legitimacy of the presence of others” (1987, p. 247).

In a series of lectures printed in a volume *Ethical Know How* (1996), Varela presents the theoretical science of cognition and consciousness that drives his desires for a compassionate ethics and “the re-enchantment of wisdom, understood as non-intentional action” (p. 75).<sup>35</sup> He describes dense, chaotic, concurrent co-ordinations of multiple interacting cognitive sub-networks of the brain, which “ensure that every active neuron will operate as part of a large and distributed ensemble,” (p. 48) ultimately producing for the outside observer the illusion of a coherent pattern of behavior and representations as aspects of the world. Color, for example, emerges from the ‘dialogue’ between an organism’s active history and an environment by which a perturbation triggers “neural networks to constitute sensorimotor correlations and hence put into action their capacity for imagining and presenting” (p. 57), i.e. “we bring forth new worlds” (Barad, 2007, p. 170), “we construct the world we think we live in” (Kauffman, 2014, p. 18), “we have only the world that we bring forth with others” (Maturana & Varela, 1987, p. 248).

Varela brings the body back to a post-Cartesian science of mind driven by complexity, not dissimilarly from Kauffman’s science of mind, but with the significant distinction of his focus on the enactive body, which opens readily to feminist new materialisms. Varela’s enactive approach



is a neuroscience of embodied activity rather than a neuroscience of brain activity (Noë, 2004); the way neural activity is embedded, not in the brain but in sensorimotor patterns and structures of skillful activity (which I point out is a function of motion, or movement and of contingency) determines phenomenon. Experience is the enactive neuroscience of embodied activity, “realized in the active life of the skillful animal. ... Brain, body, and world work together to make consciousness happen” (Thompson & Varela, 2001, as cited in Noë, 2004, p. 227). Varela favors an ethical philosophy of the subject informed by phenomenology<sup>36</sup> and by *wisdom traditions* of the East, especially Buddhist mind-trainings, and he leaves behind rival Kantian and Hegelian moral philosophies of the West.

The effects of this move—used by Varela to connect empirical neurodynamics of temporal flow to self-motion (immanence), self, and affect— allow me to use Varela’s enactive cognition as a bridge from quantum complexity and neuroscience to feminist new materialist theories of ethical subjectivity. The dynamic functions of Varela’s enactive cognition serve to re-interpret borders, temporalities, and relationality outside of Western framings, and, instead, understand them as ensembles that operate without hierarchy, central control, or telos. By means of his autopoietic definition of life as closed operationally, yet systemically open to fluxes of matter and energy, Varela injects a conception of life-itself with fundamental paradox, a topological relation that also much enamors Braidotti, but before I delve into that realm, there are two more scientific threads to follow. One connects Varelan theory to Lynn Margulis’ theories of evolution grounded by her work, ecological in approach, in microbiology on symbiogenesis,<sup>37</sup> and the other, through Margulis, to James Shapiro’s presentation of cellular genetics, which absolutely undoes the Franklin / Dawkins ‘genetic imaginary’ presented in Chapter 3 and replaces it with a whole new narrative that prompts an altogether different ‘genetic imaginary’, one that is an autopoietic imaginary of the ‘responsible’ possible.

Consciousness, in the embodied enactive sense that Varela explores it, concurs with Margulis' interest in consciousness as the sentient, motile capacity of living entities to learn and evolve, the embodiment of all living entities being chimeras. (Omitted: explanation of SET of the eukaryotic cell.) The autopoietic characterization of 'life' frames Margulis' empirical work from microbiology to Gaia and, though she edited a volume on Chimeras and Consciousness, she was less familiar with Varela's neurological explorations of enactive cognition. Nonetheless, she holds to the same basic standard of consciousness as sentience that premises Varela's (and Alva Noë's) explorations of phenomenal consciousness; what Varela refers to as 'embodied sensorimotor systems' Margulis refers to as 'cellular motilities', each phrase necessarily describing phenomena immediate to triggered motion and movement. Margulis and Noë review these aspects of the development of life against an evolutionary setting that takes seriously sensorimotor skills as constitutive of a kind of knowledge, which extends from the simplest of bacterium to complex organisms with "greater degrees of freedom of movement, and so greater possible patterns of sensorimotor interaction" (ibid.). Phototactic (light), magnetotactic (electromagnetism), aerotactic (oxygen), thermotactic (temperature), gravitactic (gravity), phonotactic (sound), rheotactic (fluid), and chemotactic bacteria each embody particular evolutionary paths of environmental sentience and sensorimotor knowledge that stimulates their motor responses.

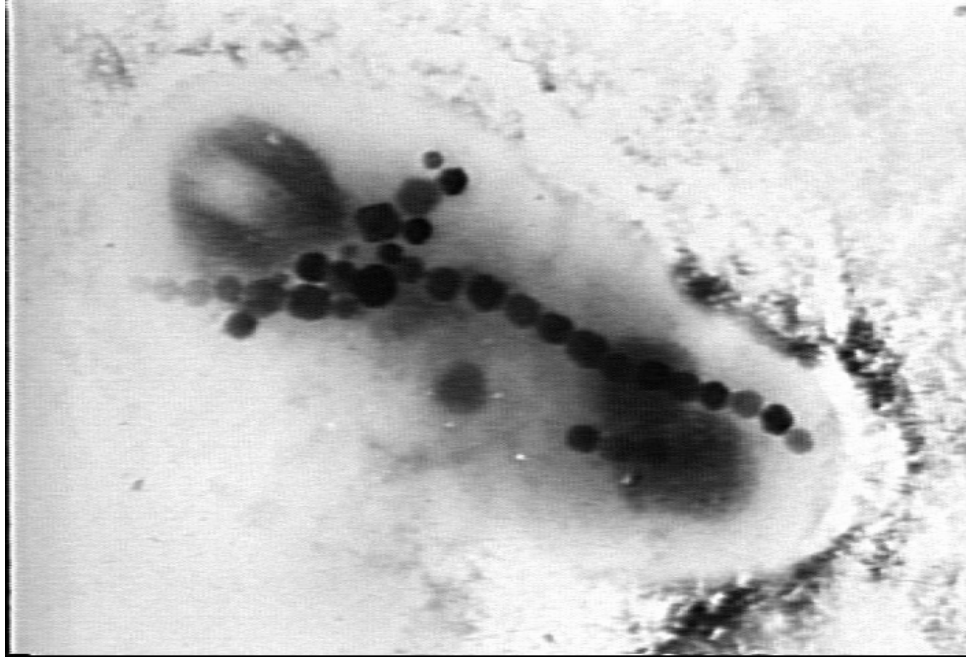


Figure 27. Magnetotactic bacterium. Image shows visible internal magnetite.

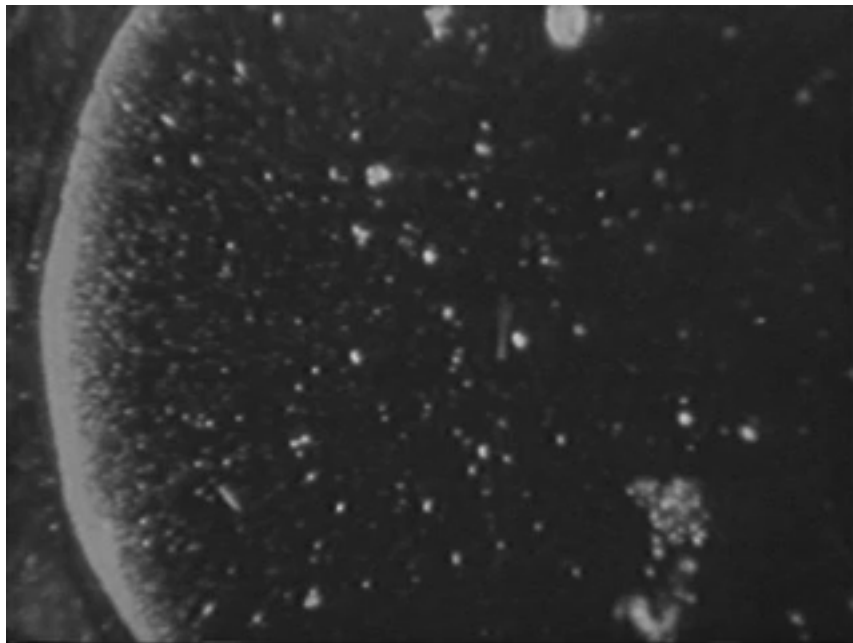


Figure 28. Magnetic polarity in bacterial motility.  
Double click on image to play video of Magnetotactic bacteria  
moving directionally in response to magnetic polarity.

These forms of sentience, the awareness of light, or magnetic polarization, or chemical conditions of the immediate environment amount to a form of consciousness in that the ‘knowledge’ provokes the action of their particular prokaryotic motility mechanisms.

Communication among millions of life forms (strains, varieties, and species) has been rampant nearly since the origins of life itself. Bacteria detect Earth’s magnetic field and gravity. Protoctist bodies evolved eyes, tentacles, and fishing rods to help catch prey. The biosphere is abuzz with more-than-human sensation and information flow. Chemical communication among trees, whale sonar systems, and, more recently, people who talk, read, and write electronically have augmented the nonstop tendency of this life to reach out to other life. Communication modes that began in crowded bacterial mats and scum have been in place, grown, declined, and changed for at least 3,000 million years. (Margulis 2011, p. 9)

Prokaryotic and eukaryotic cellular motilities differ by type, and within each category are scads of (co)-evolutionary innovations, convergences, and variations. The living entity not only “moves” in response to its environment, it is “moved” by its environment; in complex forms, entities embody a sensitivity to the way its own movements change the way the environment stimulates it (Noë, 2004), and has the capacity to change its environment (Margulis everywhere), as well. Speculatively, then, ‘life’ and ‘perceptual consciousness’ are integral to each other and to the environment and to (oft-neglected) motion/movement; operating in concert, these becoming cognitive skills, bring forth a ricorso (Chapter 4) becoming of self, other, and world.

In another micro-instance of ‘gap’ dynamics that model the bringing forth of life and world largely resonant with Varela’s and Margulis’ work, James Shapiro advances a science of sentient cellular genetic processes, the cell being the minimal autopoietic unit, that puts to final rest the neo-Darwinist-Dawkins concept of the selfish, autonomous, and immortal DNA-focused gene and its concomitant blinkered causal determinisms that devastate life and Earth. Shapiro’s evolution for the 21<sup>st</sup> century opens up, instead, to self-organizing genomic systems that leverage multiple paths of change to rewrite the non-species self (2011).

Accepting that these speculative sciences are adequately accurate (enactive cognition, the poised realm, the adjacent possible, and possibility space), and given the leaky processes of symbiosis, symbiogenesis, of coherence-decoherence in the quantum field, and of the genetic biology of the cell, then the physics and biology of uncertain, nonlinear processes of becoming are necessarily contingent, to some degree, on the social, ethical, and affective conditions that play an important role in the material constitution of possible realities and actuality. Explorations of consciousness and experience as natural phenomena belong not only to philosophy but appropriately also belong to problems in biology about the nature and origins of life (Noë, 2004), and perhaps, by extension to physics, as well; in both cases they belong as a matter not of the brain but of the active becoming of lives in motion. “Experience is what makes possible and constrains conceptual understandings” (Varela, 1999, p. 16), and is thus also integral to how subject and collective imaginaries function in the becoming of the world.

The multiple sciences of becoming inform of a sea-change underway in the sciences that speaks to a fundamental shift in their framing imaginaries, and that correlate to utterly different modes of thinking that have been subjugated and marginalized for centuries (Chapter 4). The qualitative character of the conditions that contextualize a subject’s and group’s experience and imaginary, and vice versa, are directly integral to what had traditionally been considered the exclusive domains of quantitative empirical research. Subjectivity, it has become evident, is in active co-(m)otion with the dynamic processes that are matters of science, they dance together inextricably in a structured and structuring improvisation. Perhaps now, as connected to the insights marked by these interventions in science, and in acknowledgment of current dire planetary conditions, new subjectivities might be hovering in a poised realm, oscillating between the possible and the actual, becoming skilled in ways that might enact a hopeful present. As Varela states, we are compelled to see that “the world will be different only if we live differently” (Maturana & Varela, 1987, p. 247). Subjectivity is in motion again.

### Co-(m)motions: From Memory to Desire

The sciences of becoming— quantum and complex, evolving and symbiogenic, hybrid and cognitive— teach that there is nothing fixed or static about nature or life, evolutionary processes open to limitless stories of what might be and what could be; should sundry conditions be favorable opens to understandings of life as flows of becoming alterities of matter-energy without limit, these constitute the conditions of proliferation on which natural selection acts. To clarify, natural selection is not creative, it edits, it cuts and limits. “Life is not what we thought and living it is beyond the ken of reason alone, for we cannot reason about that which we cannot know”(2012, p. 1)<sup>38</sup> nor can we reason about the body in pain, the sight of a loved child, the affection of music, or sun-setting light on white cows grazing in a golden field.

The sciences of desire move away from normative conventions of disciplinary science, and in so doing move subjectivity out of determinist contexts into new frames of thinking, new imaginaries, and new possibilities. The re-definition of boundary conditions as porous, sentient, and paradoxical, and finding creativity poised in gaps of possibility drive new attention to concepts of matter and materiality. Messy and emergent life as an object of scientific study cannot at once be both alive and dissected, the conduct of natural science by taxidermy and luxuriously framed dioramas of pinned specimens belongs to memories of imperial conquest and hyper-individuality, worlds of telos-structured entitlements. “What needs to be broken is the phantasy of unity, totality, and oneness [what I have called in this project the ‘irresistible charisma of monotheistic thinking’]. What gets pulled out from under the subject’s psychic landscape is the delusion of stability, the phantasy of omnipotence. To recognize this basic ego deflating principle is ground zero of subject formation” (Braidotti, 2012a, p. 174). Karen Barad, through her feminist work that applies the effects of developments in quantum physics, particularly entanglement and quantum field theory, to conceptualizations of matter, provides

Rosi's radical collapse of the delusion of classical certainty with quantum substance that shields Rosi's theory from charges of epistemological relativism. Barad provides the scholarship for moving from memory to desire, she engages her expertise in matter to interrogate cultural notions (whether in the social or science domain) of identity, agency, causality, and peculiar motions of temporality. Because I see Rosi Braidotti's work as building on and extending the sciences of desire (in which principles of becoming — of moving from possibility to actuality — entangle ethics) to a feminist critical theory of subjectivity, I use her work to observe how the new materialism project shifts feminist discourse from its focus on systems of power to discussions of matter, ethics, affect, and life. Through Rosi's work I am able to evaluate desire as a transformative strategy in a posthuman / threatened / techno-capitalist world, and as a feminist response to her question, *what may we hope now?*. In observing Rosi's vision, I also make note that she does not offer ideas as to praxes that might enact her vision of an ethical becoming of Earth and life. Memory, as narrated through the topics of Chapters 3 and 4, gets writ large on present bodies and becomes desires. *In becoming-desires, how do hopes for ethical desire get enacted now?*

The feminist voices of new materialism on matter are not univocal, but they share the same foundational desires for social transformation that find political and ethical function in “materiality” when dissolved of former and falsely imposed dichotomous contexts (material/discursive, nature/culture, matter/mind, human/nonhuman). Feminist new materialisms hold themselves and others to rigorous standards of scholarship that keep peeling back the layers to root out the instigating ways and means of oppression in order to resist them and foster change, even as planetary conditions rapidly change. The new materialist approaches claim to build on former feminisms, and in bringing the body back to feminism, bring back actionable ethical positions that evade former charges of cultural relativism.<sup>39</sup> All is aleatory and in motion, but not

detached from ‘substance’ or world or conditions for thriving. The aim on the grand scale, is a new paradigm of thinking.

My question, in light of my organizing exploration of new materialism’s effectiveness in advancing transformative feminist theories of ethical subjectivity for twenty-first century conditions, becomes: given their shared and divergent points of view within radical theoretical discourse, what patterns (technê) inform (en)activist strategies and practices to change paradigms of thinking? This political interest trumps the enticement to delve into an in-depth academic analysis and critique of their positions, which would be warranted, but for present purposes I restrain myself to doing so only to the extent that is useful to this larger question. This disclaimer now in place, I return to the matter of matter.

### **Rethinking Matter**

*“If we had a keen vision and feeling of all ordinary human life, it would be like hearing the grass grow and the squirrel’s heart beat, and we should die of that roar which lies on the other side of silence. As it is, the quickest of us walk about well wadded with stupidity.”*  
George Eliot, *Middlemarch*

In opposition to a long dominant notion of matter as inert and passive, and all that that genealogy confers and its practices configure, feminisms turn to a notion of matter as active, but there are different approaches taken, broadly speaking one largely associates a philosophical retrieval of ‘vitalism’ and ‘monism’ (e.g. Braidotti, Bennett, Connolly (?)), another complicates that (e.g. Claire Colebrook, Grosz), and another resists cultural, discursive modes by favoring feminist science studies of the agential material ‘non-human’ (e.g. Haraway, Barad, Alaimo, Wilson, Hird).<sup>40</sup> Jane Bennett’s descriptive term for matter is ‘vibrant’, and her (neo)vitalist notion finds support in many, mostly cultural and critical, theorists (Braidotti, Deleuze &



Guattari, Elisabeth Lloyd, Moira Gatens, John Protevi, Patricia Clough, Elizabeth Grosz, and Brian Massumi. These scholars back up their positions with a Spinozist monism, resurrected from 17<sup>th</sup> and 18<sup>th</sup> century philosophy for its rejection of mind/body dualism and for its ideas of interconnection and affectivity as defining features of the subject (Braidotti, 2006, p. 162), and for its concept of matter as one substance. A Spinozist vibrant matter, according to Bennett, locates potent ‘aliveness’ shared by all matter, living and otherwise, whether “edibles, commodities, storms, [or] metals” (2009, p. viii) by virtue of the agency of things with “non-personal, ahuman forces, flows, tendencies, and trajectories” (p. 61). All matter is intelligent, self-organizing, and densely interconnected through networks of relations. Bennett being a political theorist, I make sense of her, to me, obtuse concept of ‘vibrant matter’ as little more than a treatise on Brownian motion, engaged as a political methodology to redefine the relationship between humans and things (she calls her project a ‘political ecology of things’ with ‘thing-power’), in order to unseat the anthropocentricity of the subject-object binary and capitalist commodification. Whether successful or not, her ultimate aim is to enliven social justice; Bennett asks, *What difference would it make?* (p. viii), should all things be seen as interacting actants. Vibrant, monist matter is the core concept to Bennett’s ontology of ‘vital materialism’ that Spinozist-thinking descendants of Deleuze engage, and Rosi, echoing Deleuze, correlates to a political ontology of ‘radical immanence’ (2013, p. 115). This return<sup>41</sup> to ‘neovitalism’ (Rosi thus distinguishes it from classical vitalism to distance it from the tangential association to fascism and to incorporate a philosophy of flows and flux, which “benefits from the philosophical monism that is central to a materialist and nonunitary vision of subjectivity” (2011, p. 199). Monism is seen as the unity of matter from which self-organizing processes of difference, framed by internal and external forces (as opposed to a dialectic scheme), proliferates. Difference, then, paradoxically in Rosi’s description, is the effect of monism’s vitalist, non-essentialist principle of ‘not-One’<sup>42</sup> in a vital web of complex interrelations” (2013, p. 100). Politically it stands against

the necrophilia of an authoritarian dichotomous secular theology (“friend or enemy” / “with us or against us”) that structures modernity as necessarily violent, and, instead pursues a political reasoning with “the ability to account for the fluid workings of power in advanced capitalism by grounding them in immanent relations and hence resist them by the same means” (2011, p. 200). This brief synopsis of vitalism demonstrates that to theorize matter as inter- and intra-active necessarily bleeds into theorizations of subjectivity.

This holds true for each of my forthcoming foci in the triptych of Varela, Barad, and Braidotti. Rosi acknowledges an expressed element of “residual [nontheistic] spiritual values” in a neovitalist notion of immanence (2011, p. 200) that she defends against Žižek’s charges of neomysticism as a generative theory of desires (2011).<sup>43</sup> The point of critical theory for Braidotti is to “upset common opinion (doxa), not to confirm it” (2013, p. 87), and to pursue and create new ways of thinking and new frameworks “that help us think about change, transformation, and living transitions” (2011, p. 64).<sup>44</sup> Distinctively, Barad cannot be seen as subscribing to ‘vital materialism’, and though she, too, sees matter not as fixed substance but as active across organic-inert ‘boundaries’, she makes no claim to some mysterious vital ‘force’ (2007, p. 151). In terms of theoretical function, though, a similar relationship exists between Bennett’s vibrant matter and vital materialism as between Barad’s intra-action and agential realism, and to similar effect. The core concept (vibrant matter / intra-action) constitutes and enables the enactions of its larger theory (vital materialism / agential realism)— each being frames of thinking based on concepts of dynamically becoming matter that open to ethical accountabilities that the former construct of thinking, which characterizes Newtonian-Cartesian-Enlightenment attachments, silences.

matter is substance in its intra-active becoming—not a thing but a doing, a congealing of agency. ... ‘[M]atter’ refers to phenomena in their ongoing materialization (p. 151, ital. in original). Matter is a dynamic expression/articulation of the world in its intra-active becoming. ... The very nature of materiality is an entanglement. Matter itself is always already open to, or rather entangled with, the “Other”. The intra-actively emergent “parts” of phenomena are co-constituted. Not only subjects but also objects are

permeated through and through with their entangled kin; the other is not just in one's skin, but in one's bones, in one's belly, in one's heart, in one's nucleus, in one's past and future. This is true for electrons, as it is for brittlestars as it is for the differentially constituted human. (2007, pp. 392-3).

Intra-active matter forms the bedrock of Barad's "posthumanist performative theory of the nature of matter and discursive practices [which] provides a means for taking account of the productive nature of natural as well as cultural forces in the differential materialization of nonhuman as well as human bodies," (2007, p. 34) which she names 'agential realism', drawing on her particular meanings of both agency and realism.

Crucially, agency is a matter of intra-acting; it is an enactment, not something that someone or something has... It is the enactment of iterative changes to particular practices—iterative reconfigurings of topological manifolds of spacetime-matter relations—through the dynamics of intra-activity. Agency is about changing possibilities of change entailed in reconfiguring material-discursive apparatuses of bodily production, including the boundary articulations and exclusions that are marked by those practices in the enactment of a causal structure" (2007, p. 178, ital. in original).

Former modes of Newtonian determinist reasoning make no sense in this world that Barad builds. Her language is full of circular neologisms required to present new ideas based on new science using the preceding status quo of values-freighted lexicon. 'Realism' refers to a non-representationalist notion of "experimenting and theorizing dynamic practices that play a constitutive role in the production of objects and subjects and matter and meaning" (p. 56). Realism rejects the extreme oppositions between objectivism and relativism, each which deny the embodiment of knowledge claims.<sup>45</sup> Agential realism, then, is intra-active becoming of matter, movements and co-(m)motions in processes that navigate and negotiate possibilities within conditions for which dichotomous reasoning and binary divisions bear no relevance, even existence, beyond nonsense or syntactical convenience. The phenomena of agential realism, then, are entangled material agencies', 'intra-active' at their core. Again, terms need to be clarified.

Barad makes explicit that her use of the term ‘phenomena’ has nothing to do with philosophical associations either to phenomenology, the way things-in-themselves appear, or to Kant’s notion. Rather she bases her use on Bohr’s notion to refer to “that which is observed, what we take to be real” (2007, n.30, p. 412), and, as interpreted within the intra-actions of ‘agential realism’, phenomena are richly complex, and materially enactive. Agential realism understands “matter as a dynamic and shifting entanglement of relations, rather than a property of things” (p. 35).<sup>46</sup> Matter, Barad notes, is not classical, “it does not reside in space and move through time. Space and time are phenomenal, they do not exist outside of matter, rather they are matter’s agential performances” (2014). While I find her use of the term ‘performance’ misleading, by either conventional or post-structural terms, what begins to accrete, as Barad sees and shares it, is a multi-constituting world of dynamic relations and complex improvisations and becoming enactments that bear no resemblance to the world we thought we knew, but in fact had only wrongly imagined, this planet inhabited, perhaps infested, by neoliberalism.

Though Barad’s theory of intra-active matter derives from her familiarity with quantum physics, her concept of matter conforms, as well, to James Shapiro’s presentation of the many mechanisms active in cellular biology that process genetic information in response to both ‘internal’ and environmental and cultural factors, as well as to what Varela and Margulis refer to as the autopoietic functions of the cell that respond, signal, and inform how cells and matter ‘learn’.

Agential realism reflects Barad’s interest in scientific practices as “entangled material practices of knowing and becoming” (2007, p. 56), laying the foundation for her move from scientifically-framed discourse to matters of power, ethics, and subjectivity (“entanglements are relations of responsibility...not through the realization of some existing possibility, but through the iterative reworking of impossibility, an ongoing rupture, a cross-cutting of topological reconfiguring” (2014). While whether Barad succeeds at this transversal from the science to

ethics gets debated, and I return to this question later, but what is opened here is the direct relevance of discussions of the nature of matter and life to the feminist politics of new materialism and ethical subjectivity. Once the categories of exclusion have been dissolved by the science itself, the materiality of political and ethical responsibilities removes all innocence from systems that think and do in the purported purity of isolation.

Intra-action, spacetimematter, and agential realism are terms Barad introduced that have become integral to feminist new materialist literature, and which signify the inevitable awkward semantic wrangling that comes of thinking and communicating natural and social worlds together using the limiting lexicon of the status quo. Such neologisms continue the ‘tradition’ in science studies literature of ‘chimerical word forms’, Haraway’s ‘natureculture’ and ‘technoscience’, condensed without hyphen in a ‘kind of visual onomatopoeia’, exceed their composite distinctions (Haraway 1997, pp. 3-4, n. 21, as cited in Barad, 2007, p. 407) and “avoid cementing the nature-culture dichotomy into its foundations” (Barad, 2007, p. 32). Barad calls her framework an ‘ethico-ontoepistemology’ “to mark the inseparability of ontology, epistemology, and ethics” (p. 409, n.10). Such fusions evidence a thinking that utterly departs from the genealogical histories of Western philosophy that root the component parts of these neologisms in entirely separate disciplinary fields.

Barad shares this challenge of languaging a new framework of thinking with Francisco Varela. Interestingly, both concur, generally, that, using Barad’s words, “the world is intra-activity in its differential mattering...the universe is agential intra-activity in its becoming” (p. 141), though Varela (Margulis would concur, as well) references biology and calls the related explanation, autopoiesis (Kauffman, too, refers to a related ‘phenomenon’ as auto-catalytic processes). Where Varela explicitly tracks his empirical studies of cognition and theoretical explorations of consciousness and experience to Eastern meditative practices and to philosophical phenomenology through Husserl and Merleau-Ponty, Barad explicitly rejects any concept that our

“access to the world is mediated, whether by consciousness, experience, language, or any other alleged medium” (2007, p. 409, n.9). Most interesting, though, is that both Barad and Varela arrive at a core notion of *enaction* as the motile, dynamic (autopoietic / intra-active / Gaian) mode that is the paradoxical co-becoming of the world, and I would argue that Barad and Varela’s notions of enaction are synonymous, indicated as well by the fact that both theorists spill into considerations of ethics and subjectivity as an attention that, given their science, cannot be ignored. Their thought is not so very far apart. Varela’s notion of ‘consciousness’ and cognition is not what Barad gestures at in her rejection of a mediated access to the world. In contrast to Barad’s position that language functions as a ‘medium’, Varela considers language to be a material expression of autopoiesis, akin to what Barad encompasses within intra-active agential realism. This comparison and contrast could become a much more complex and nuanced study, but my interest and point here is that the gist of their thinking styles signals their shared subjectivity in terms of what belongs within science and how, as a practice, science and meaning-making relate. Perhaps another point of agreement gives evidence to this, that each warn against the export of their scientific theorizations to analogical models of politics or psychology in the macro-world. Ultimately, Barad and Varela are more concerned with the ethical and philosophical implications of their scientific explorations for natureculturesciencesociety (to extend the chimeric onomatopoeia) and notions of ethical subjectivity.

## Matter, Life, and Subjectivity

*“We are all linked by a fabric of unseen connections.  
The fabric is constantly changing and evolving.  
This field is directly structured and influenced  
by our behavior and by our understanding.”  
-David Bohm*

Barad’s erasure of delineation between subjects and objects is consistent with Margulis’ rejection of the notion of biological individuality. Where Barad’s work (2007) organizes around theories of matter, Margulis’ work (1995) focuses on characterizing life in terms of matter. “Life is matter gone wild... life is moving, thinking matter...it is awareness and responsiveness; it is consciousness and even self-consciousness ... life is the transmigrator of matter... life is a network of cross-kingdom alliances...life is the transmutation of energy and matter... life is memory—memory in action ... we carry our past with us ... life is not vitalistic” (Margulis, 1995, pp. 214-217). Margulis and Sagan agree with Samuel Butler that “life is matter that chooses...living matter can ‘memorize’, in support of which she, like Barad, references Niels Bohr. “Life, sensitive from the onset, is capable of thinking...thought, like life, is matter and energy in flux; the body is its ‘other side,’” (pp. 226-233), “Life is existence’s celebration.” Millions of years of endosymbiotic<sup>47</sup> intra-actions of living entities and cosmic elements have produced communities that co-enact— at every scale of systems, from cellular to Gaia, boundaries impute no isolation. Microbial symbionts, for example, are pervasive and essential contributors to animal metabolism, genetic variation, and the immune system. Epigenetics, noncoding RNA, and a myriad of complex functions within genomic processes evidence that autopoietic enactive cognition indeed becomes encoded in DNA (Shapiro, Evelyn Fox Keller). Biochemist, cell biologist and philosopher Alfred Tauber states, “Such an ecological understanding of organismal identity contextualizes the subject within a larger frame of reference

and thus breaks the self/non-self, subject-object dichotomy of Western language and thought” (Gilbert, Sapp, and Tauber, 2012, p. 326). Once deconstructed scientifically, the ‘individual’ of Margulis’ biological ‘subject’ is neither unitary nor autonomous. Functionally, and even anatomically, there is simply no such living thing as ‘self’ or individual. Informed by Varela’s autopoietic neurocognition, ‘a’ Margulisian subject is in fact a self-organizing, self-maintaining assemblage of conscious communities with permeable, shifting, and transitory membranes and borders.

It helps to hold Margulis’ argument against notions of individuated selves (which draws on Varela) in mind along the way to understanding Varela’s notion of the virtual ‘self’, but to get there first requires another explanatory tangent. Varela’s work precedes recent feminist debates on the ‘nature’ of ‘matter’, but, perhaps, because he and Barad explore questions of the becoming of the world from a shared positionality towards science and ethics (or is it just uncanny?), Varela’s autopoietic enactive cognition bears much resemblance to Barad’s intra-action. While Varela restricts his work to the study of living entities, Barad, acknowledges a “vitality to the liveliness of intra-activity” which she clarifies as unrelated to ‘vitalism’, but is meant in terms of the aliveness that makes possible the distinction between the animate from the inanimate (2007, p. 17 and p. 437, n. 81); this is the structuring principal behind autopoiesis. The two theorists put forth their respective concepts, enactive cognition and intra-action, as re-workings of the traditional notion of causality “in an ongoing reconfiguring of the real and the possible” (p. 177). We are back to ‘possibility space’, the ‘poised realm’ and the chaotic oscillations of Varela’s sniffing rabbit that, in context of a given environment, gives rise to coherent patterns of behavior based on the animal’s embodied history.





Figure 29. Peter Rabbit. (Beatrix Potter)

In another example of their convergences, the bioneurologist and physicist situate language (different discursive practices) as part and parcel to the dynamics of materiality that configure the world. Neither supports the idea that language serves a mediating function between dichotomous inner and outer realities so as to ascertain correspondence, which then constitutes ‘knowledge’. Rather, communication is an autopoietic function, materially immediate to the co-becomings of an indeterminate ‘self’ and world. “Matter is always already material-discursive, and discursivity is not to be understood as a human-based practice” (Barad, 1997, p. 445, n. 43). Thus, for both Barad and Varela, what matters, and what doesn’t, is directly bound up with issues of accountability and responsibility. Barad could be speaking for both of them when she writes, “matter emerges out of, and includes as part of its being, the ongoing reconfiguring of boundaries, just as discursive practices are always already material (i.e. they are ongoing material [re]configurings of the world). ... *the material and the discursive are mutually implicated in the dynamics of intra-activity*; ... matter and meaning are mutually articulated” (p. 152, italics in

original). With this context in place, it becomes possible to follow with explanations of Varela's notion of the 'virtual (selfless) self' and Barad's notion of the subject.

While they use very different styles of language and syntax, and reference very different domains, I suggest they share a similar conception of the subject without localized center; the apparent whole of complex, inter (intra-)acting functioning behaves in patterns *as though* coordinated. With no 'agential' center or 'self' to be found, Varela calls this the selfless (*virtual*) self. The reader is reminded that from the point of view of the Margulisian 'self' as a dynamic community of autopoietic communities, it could hardly be otherwise. But what Varela introduces here is the connection of the so-called-self to complexity, by which distributed network systems exhibit emergent, and in this case of living entities, cognitive properties. The selfless self, metaphorically, is emptiness,<sup>48</sup> a gap space that enables relationality with the environment, a gap that bridges the corporeal, neural body and emergent social properties.

Having referred to a 'gap space' throughout this chapter, I have now presented enough layers of meaning to clarify my concept, propped up by Barad's discussion of space in cultural geography (2007, pp. 223-4 and pp. 447-8, n. 2). Gap space in no way models a literal or static 'container' or 'locality' for intra-active, autopoietic dynamics of matter and energy in motion. Conceptually, then, gap space *is* what it exactly isn't, or *isn't* what it exactly is. It bears no relation to a 'Euclidean geometric imaginary' to use Barad's term. This would be impossible in the way that I apply it to Varela's absence of center, to the a priori that isn't of the non-locality of the subject. This conceptualization is non-Western to its core, gap space is the very inverse of a Western physical view of mappable space that sets the standard for so much of its noösphere of "objectivity, inevitability, and reification" (Soja, 1989, p. 79 as cited in Barad, 2007, p. 224), and that Haraway points out contributes to the fetishization of the neo-Darwinian gene (1997). Nor is the gap space, as I mean it, an "agent of change" as described by Henri Lefebvre and David Harvey. I do not mean to suggest in any way a notion of the gap space as absolute, such a view as

argued by Neil Smith and Cyndi Katz would position the gap space within capitalist patriarchy and racist imperialism (1993). My notion of the gap space can only be understood within a Baradian frame of spacetime-mattering, within Varela's autopoietic enactive cognition of the virtual 'self', within the contingencies and motile improvisations of how and what complexity brings forth. The gap space conforms to but is a more narrow focus of DeLanda's 'possibility space', and of Kauffman's 'poised realm'. Narrowing to this focus makes the concept useful for describing and applying what Varela does in tying the science to the subject, which in its sweep gathers in the ethical, and to what Barad does and the feminist new materialist project aims to do, namely also to gather within that sweep the political and issues of power, thereby affording new analytical approaches and enactive, embodied praxes of feminist intervention and transformation. These frames make sense of the direct connections between scientific materiality and the effects of power on the production of bodies and subjectivities. The gap space may be thought of as "the pause that precedes each breath before a moment comes into being and the world is remade again, because the becoming of the world is a deeply ethical matter" (Barad, 2007, p. 185). Like the quantum that exists neither in space nor time, which oscillates between continuity and discontinuity, and as the epitome of leaky spacetime-mattering, gap space torks and changes change. What the gap space makes clear that much of the posthuman and new materialist literature does not, is that the transformation envisioned requires training and praxis; the politics of the gap space requires embodied, strategic approaches that address imaginaries, understood as a constitutive, doing dynamic of spacetime-mattering, of enactive cognition and ethical know-how, all of which bring forth a Gaian, autopoietic world.

Varela's selfless, as-if-self (or virtual self, like a virtual interface) relates to the environment "in relation to the perspective established by the constantly emerging properties of the [system's continually contingent and improvisational redefinition of what to do] and in terms of the role such running redefinition plays in the coherence of the whole system" (1992, p. 55). This, for

Varela, is how ‘coupling events’ give rise to [embodied] intentions (desires) unique to living cognition; neural networks “put into action their capacity for imagining and presenting” (p. 57), and this precedes the bringing forth, or the enactment, of a compelling world.

Segueing from Varela’s ‘coupling events’ to Barad’s description of what intra-action iteratively performs, that these two concepts are analogous becomes apparent in terms of both enaction and their difference-configuring effects on boundaries, properties, bodies, and meanings.

Barad notes,

Intra-actions reconfigure the possibilities for change. In fact, intra-actions not only reconfigure spacetime-matter but reconfigure what is possible. Ethicality is part of the fabric of the world; the call to response and be responsible is part of what is. There is no spatial-temporal domain that is excluded from the ethicality of what matters. Questions of responsibility and accountability present themselves with every possibility; each moment is alive with different possibilities for the world’s becoming and different reconfigurings of what may yet be possible. (2007, p. 182).

Through Vicki Kirby, Barad, too, uses the language of non-locality to explicate the posthuman condition, to dispel Nature and human identity as containers or causal forces, and to dispel any whiffs of essentialism (184). As posthuman subjects, we are part of the world in its ongoing intra-active becoming, in which (sounding like Lyn Margulis and Varela) practices of knowing and learning afford humans no privilege. The subject in Barad’s thinking, by virtue of its entanglement with “Others” (living and not), is an embodiment that always already entails “an exposure to the Other; memory and remembering are not mind-based capacities but marked historicalities ingrained in the body’s becoming” (p. 393). Subjects (by now it should be clear that subjects are not only humans) are responsible to others through the entanglement that materiality entails, there is no such thing as individuation. “Ethics is therefore not about right response to a radically exterior/ized other, but about responsibility and accountability [to our part of the entangled webs we weave (p. 384)], for the lively relationalities of becoming of which we

are a part” (p. 393). Spacetime mattering entangles questions of justice (p. 236).

In summary, for Margulis, Varela, and Barad, the personal, self-constituted “I” is illusory, construed by virtue of ongoing, fragile micro-narratives. Exploration of the selfless self, the non-dual manifestation of subject and object, then, is “a matter of learning and sustained transformation (a praxis of “ethical know-how”) that resists deeply entrenched drives for identity construction (Varela, 1999, p. 63), instead to experience the groundlessness of becoming. Groundlessness, in this sense, is not a negative, but affectively positive. As emptiness and uncertainty, groundlessness paradoxically embodies the creative potentialities of the gap space. Groundless becoming is a mode of an embodiment of emptiness within the lived world (Varela, Rosch, & Thompson, 1992, p. 234). It is a stance of un-knowing, of possibility, of a becoming-in-community without category. It rests on a perspective on the evolution of Life and Earth as emergent, non-teleological, mutable, communal, and unpredictable. Groundlessness, the illusory selfless, virtual, intra-active “I”, is the space of the enactive imaginary, the transformation of which demands embodied training and praxis. In the Eastern wisdom traditions that Varela espouses, experience and praxis of groundless subjectivity cultivate ever-growing openness, compassion, and lack of fixation. Varela’s radical view merges metaphor, philosophy, and neurobiology in a counter-narrative of the ethical subject “for the troubled times we have at hand, and the even more troubled ones we are likely to have” (1999, p. 75).

This sentiment, too, frames Rosi’s motivation, “these are strange times and strange things are happening” (2012b, p. 22). Ultimately, Rosi’s self (and I will explain more below), like Varela’s, is virtual, “this self is in fact a movable assemblage within a common life space that the subject never masters or possesses” (p. 331), linked to temporalities that unfold virtually. She, like Varela, likens the ‘empty’ self to the heightened awareness of a meditative state. The hopes of her nomadic theory postulate the “materialist dissolution of the self, ... the “I” just inhabits [life] on a time-share basis” (p. 365).

Like Barad's, Rosi's is a material theory of desires for affirmative, in-depth change, shot through with memory and imagination. "Between the no longer and the not yet, desire traces the possible patterns of becoming" (2006, p. 197). Braidotti identifies her notion of desire as drawn from Spinozist passion and Deleuzian affirmative thought in service of the 'enfleshed' creative immanence that undoes the 'Hegelian trap' that associates desire with lack and negativity. Memory in this, her inherited frame, plays a crucial role in the formation of the politically active and ethically conscious subject; memory's nonlinear temporality is an always already of motion that connects to the subject's affective dimension to sustain, reworked by the imagination, the process of change and transformation. Affect, memory, and desire, then, are political tools of subjectivity, to be engaged with specific deliberation. Desire for Rosi belongs within a nonessentialist 'vitalistic pragmatism' that constitutes the nonunitary 'self' of complex political agency; for her, the subject is "an empirical transcendental site of becoming" (2012b, p. 284). In this last aspect, her attachment—to me unfortunate and unproductive—to the transcendental reflects a departure from Varela's and Barad's theory of the subject. However, Braidotti's following remark takes on new layers of meaning if read through the physics lenses of Kauffman and DeLanda's 'possibilities and actuals', through Varela's autopoietic neurobiology of the virtual, and through Barad's theory of 'memory' as an active spacetime-mattering of the becoming-present. "Memories need the imagination to empower the actualization of virtual possibilities in the subject" (Braidotti, 2013, p. 236). For Rosi, the imagination triggers the conceptual creativity that 'propels' the 'becomings' of the subject (p. 155), contextualized by the scientific sense of the virtual, the possible, and the actual; the imaginary belongs within that same conceptual frame, participating in the dynamic processes of sentience, gap space, the poised realm, and entanglement. While these are mysterious, they need not be therefore attributed transcendental qualities. Though Braidotti arrives at her remark through her philosophical gestations of "duration" from Bergson and Deleuze, and while I don't mean to discount that path,

her remark carries specific, meaningful, and material weight in terms of these scientific referential frames. Rosi's conception of the imagination, as the trigger of hopes rooted in ordinary, accountable micro-practices of everyday life, and critical to the project of developing new social imaginaries, supports this interpretation.

Varela, Barad, and Braidotti come together over the centrality of praxis in the becoming of matter and meaning, and to the enacting of ethical worlds.<sup>49</sup> Varela and Barad specifically emphasize training and skills as critical to the 'know-how' of praxis, and are conspicuously left out in Braidotti; but I would argue that visions and even a 'pragmatic vitalist' theory are insufficient to accomplish politically transformative goals in cultivating subjectivities. Through separate avenues of neurobiology and physics respectively, Varela and Barad arrive at the same accounting for the respons-(i)abilities of an ethical human 'knower', and at the same acknowledgment of ethics and science as inseparable, scientifically. For Barad, the 'knowing' subject has nothing to do with traditional philosophical models of the "self-contained rational human subject that stands outside the physical world the subject seeks to know" (2007, p. 342). Knowing is a physical, material (not ideational), ethical practice of differentially constituted subjects distributed across 'boundaries' through intra-actions. Knowing reflects the embeddedness of the subject in larger material configurations of the world and vice-versa. A knower embodies ethical enaction, regardless of any particular judgments as to what is and what is not 'ethical'. Ethicality is part of the fabric of subjectivity and of the world, subjectivity is part of the fabric of the world and ethicality, and the world is part of the fabric of the subject and ethicality. They co-matter in possibility and actuality. The politics of posthuman feminist new materialisms center on processes of collective well-being, which stands out in stark contrast to politics of capitalist growth and progress. "Each moment is alive with different possibilities for the world's becoming and different reconfigurings of what may yet be possible" (2007, p. 182). An ethical (or not) 'know-how' of intra-active worlding<sup>50</sup> hangs in the balance of praxes, training

and skills-acquisition. Thus, ‘knowing’, inclusive of its intra-active, enactive ethical dimension, is a proper object of scientific study.

### **Rosi**

-  
*If you want to change yourself, change your environment,  
if you want to change the world, change yourself.  
Francisco Varela (1992)*

Concurrent to feminism’s reassertion of the centrality of embodiment to subjectivity, a resurgence of physiology in genetics and evolution marked a return to the body as a complex community of sentient intra-acting communities, (Denis Noble 2008; Gilbert, Sapp, & Tauber 2012; Margulis and Sagan, 1995; Shapiro, 2011), as opposed to the former model of the body as a passive expression and carrier of deterministic DNA mechanics. Underscoring this synchronicity are shared understandings across these disciplines of matter as intra-active, that no creature is separable from the environment, that qualitative, affective and ethical topologies are part of the fabric of materiality, and that the preservation of academic apartheid prevents making sense of the complexities of our age. Rosi’s pursuit of an ethical re-grounding of hybrid social participations leads, she claims, to the formation of new social and political theory “worthy of the third millennium” (2012b, p. 20). I revisit the work of Rosi Braidotti in the remainder of this chapter, in light of the science of desire, to assess whether she lives up to these claims, and what this represents for the larger feminist new materialist project.

To link philosophy to the creation of new forms of subjectivity, Braidotti’s nomadic project functions on two intended planes, one inspirational and the other conceptual, in order to accomplish two aims, one that is cartographic in sourcing European critical theory (her primary inspirations are Spinozist monism and Deleuzian forces) and the other that is conceptual, to link “the act of thinking to the creation of new concepts and critique to creation” (2012b, p. 8). She



claims that her “reinstat[ement of] movement at the heart of thought” actualizes new, non-unitary visions of the subjectivity, and “collective experiments” with ways to actualize them (pp. 6-8).

Her stance is that a subjectivity constituted in an eco-philosophy of becoming will have produced<sup>51</sup> pragmatic analytical tools for dealing with our times ‘productively’ (p. 341), a nonunitary, complex politics will have disengaged from dialectical schemes of opposition and recognition, this politics will not have negated but, rather, resisted the present (and strains of memory) in constructing alternatives, echoes of Varela and Barad are heard. Braidotti calls for a social theory that integrates science, technological complexity, and its implications for political subjectivity, echoes of Varela are heard. Nomadic theory generates question of ethical values that reflect complex temporalities (this is also a Baradian theme); it makes space for conceptual creativity in confronting the dissolution of liberal individualism and moral universalism by the current historical condition. Nomadic theory desires disruption of the hegemonic subject.

I proffer that Rosi’s key theory of nomadic subjectivity is supported by the sciences of desire, and in this way she may be read as extending the transformations in scientific thinking about matter and materiality to a transformed feminist theory of the subject that produces a different politics.

The nomadic subject is ecologically bound, marked and mediated by its environmental (inclusive of technological) interdependencies. Reminiscent of the language of the subject used by Margulis and Varela, the nomadic subject is a non-unitary collective, and, in language reminiscent of the Baradian subject, the nomadic subject is an in-between entity immersed in and composed of multiple dynamic systems. Such synthetic analysis breaks down anthropocentrism and foregrounds the predicaments posed when multiple scales of systems —such as technological, ecological, transnational, organismic, scientific and militaristic—inter- and transect. Braidotti describes what I call the Scylla and Charybdis that the nomadic subject of her project must navigate between:

• “humanistic expectations of decency and dignity” on one side of the channel, and “the growing evidence of a posthuman universe of ruthless power relations mediated by technology” (2006, p. 4) on the other;

• between reductionist science and capitalocentric subjectivity;

• between metaphysical naturalism that literally maps cultural, social, and political theory according to science principles, and on the other side a naturalized techno-exceptionality (e.g. the technological rescue from the dire effects of climate change);

• between post-structuralism and transhumanism;

• between biogenetic capitalism and climate change;

• between domination and exclusion;

• between necropolitical ideologies of the state and bare survival (2006);

• between humanistic nostalgia and neo-liberal euphoria about bio-capitalism (2007).

The ethical posthuman subject is nomadic amongst multiple narratives, adumbrated by both restrictive and productive forces of power (material, cultural, political, technoscientific, discursive, affective, empathic). Consciousness synchronizes these multiple differences. Unlike consciousness in the humanistic subject, as conceptualized by Braidotti in a way that echoes Varela, Margulis, and Barad, consciousness is the sentient, embodied, autopoietic becoming process that constitutes the ethical core of nomadic subjectivity. Applied to a politics of the third millennium, ethical nomadic subjectivity is ultimately about living and leaving this Earth together gracefully (Jensen, 2015, quoting Jim Koplín).

At this early stage of its development, posthuman theory gropes toward protean unknowns, hoping to survive predatory monstrosities in getting to an ‘Other’ side that ‘thinks differently about ourselves’, that transposes the subject into a non-unitary, nomadic vision of collective community selves. Even Odysseus needed supernatural assistance to survive with only a few of his crew the dangers and inevitable shipwreck in crossing the Strait of Messina between

Scylla and Charybdis. Like that crossing, nomadic theory is a rescue mission, there is great anxiety, fear, and the stakes are high. Survival starts as a function of the imaginary, how which narratives transpose memory and danger, how to enact empathically. Embodied, embedded, and motile, the imaginary precedes, creates, infuses, and follows what *will have been*.

### **For the hell of it**

*What counts is what we are, and the way we deepen  
our relationship with the world and with others,  
a relationship that can be one both of love for all  
that exists and of desire for its transformation.  
Italo Calvino in interview,  
as cited in MacFarlane, 2013, p. 102*

The entry point of Braidotti's critical theoretical project begins with a feminist politics that advocates ethical change. From there her theory takes shape through her citations of European philosophers and feminist scholars who help drive forward a 'joyful' accountability to a future for which we now hope. Her project is politically pragmatic and theoretically visionary from the outset; she vests her hopes in a "non-rapacious ethics of sustainable becomings: for the hell of it and for love of the world" (2006, p. 278). This elucidation of her affective inspirations reflect a kind of outright abandon of determination that emerges from long mourning and which celebrates the challenges of fostering ethical subjectivities and political change in an era of global advanced technocapitalism.

Braidotti establishes nomadism as a thought-style built on former ontologies, and while she points out that the necropolitical machine (such as that produces drone warfare) demonstrates the potential of nomadic thinking for-profit, her work does not grapple with material praxes for a new posthuman sociality of her generative vitalist vision. . She identifies nomadic theory as

deeply materialist by virtue of its “neo-vitalist immanence of life” (2012b, p. 85) in dimensional, situated bodies. She argues for a transversal vision of subjectivity suited to biogenetic life’s hybridity of vitalism and machinism.

This is how I understand vitalism in the context of biogenetic sciences: the potency of multiple, self-organizing organisms, most of which are technologically mediated, from Dolly the sheep to multiple digital avatars, without forgetting genetically modified food, test tube babies and complex information and communication technology networks. Central to the posthuman turn as I see it is the impact of material vitalism, or vitalist new-materialism: zoe-driven practices of non-human life forms” (2013, p. 77).

Vital materialism is a transcendentalist accretion that merges 20<sup>th</sup> century desire with 17<sup>th</sup> century idealisms in reaction against Cartesian mechanistic viewpoints. Bergson in 1888 explains vitalism as an understanding of two distinct spiritual principles, the first dictates the organization of matter in cells, tissues, organs, and the “marvelous harmony among organs...which resists the forces of inorganic nature,” and the second is the domain of “thought, perception, decision-making, will...This would be the soul, properly speaking.” The distinction Bergson makes between these two principles identifies the former as acting without consciousness of itself and “blindly pursu[ing] an aim that the Creator has set” (2002, p. 31-32), while the latter principle is fully conscious of what it is doing. Generally, vitalism, as engaged by its many thinkers, “supports the notion that something exists in the living creature which cannot be understood by means of physicochemical analysis” (Kanamori, 2005, p. 13). Historically, vitalism has been largely dismissed by biological and medical science research that do not investigate philosophical conundrums of “wonder” and “conditions of possibility” that explain that something ‘life’ force of organismic development beyond genetic orders and gene expression that (Kanamoori, 2005, p. 22). The path of vitalism absorbs along its way from Bergson’s *élan vital*<sup>52</sup> to new materialism shades of Whiteheadian process and Deleuzian immanence, before arriving in Bennett’s vibrant matter and Braidotti’s posthuman materiality. Throughout this journey, vitalism retains

resonances of its dichotomous, transcendent roots of anthropocentric spirituality, posing problems for Braidotti's theoretical reasoning largely due to her uncritical over-reliance on Deleuzian metaphysics that recycle and resignify historical concepts. Braidotti's contribution to Deleuzian thought is to extend his brand of vitalism and monism to the body. Prior to Deleuze's mediations, Spinozist monism was situated by Europe of the 17<sup>th</sup> century and vitalism belonged with Bergson's France of the late 19<sup>th</sup>-early 20<sup>th</sup> century, each characterized by traits now viewed negatively by new materialist theory, e.g. theistic, universalizing, essentialist, and hierarchical.

To be sure, there are aspects of Spinozist thought that explain the perception of his relevance to new materialist thought, but the overwhelming problems show this engagement to be a marriage of convenience. For Spinoza, substance is not individualized, the individual is a mode of wholeness rather than an interplay of parts. Substance refers to the pervading trait of all existence, while not obliterating distinctions between the 'animate' sentient organism (unreasoning animals, exclusive of conscious and reasoning man) and the 'vegetative inanimate' (Hans Jonas, 51). Spinoza conceives of mind and matter (idealism and materialism) as belonging together and interrelated— and here's the catch overlooked by post-modernists— in 'finite brute animals', while the infinite of reason and intellect define the substance of man. Following are notes on Spinoza's philosophy that reveal too many points of conflict between his thought and founding views of feminist new materialisms to warrant his recent enamored status.

Spinoza's project was about knowing God as an indivisible totality, the infinite necessary existence of absolute being by which all things as they are, are necessary. "Spinoza's purpose is to get us to abandon the imagination. ... The Letter on the Infinite has the same pedagogical purpose as the *Ethics*: to teach us to think with the understanding alone, without help from the imagination" (Garvey, 2015). Spinoza defined his God as "an absolutely infinite being, that is, substance consisting of infinite attributes, each of which expresses eternal being and infinite substance" (Spinoza Ethics as cited by Garvey, 2015). Though Spinoza's God was not the

Abrahamic, his was a monist, i.e. monotheistic, God. The essence of monotheism in Spinoza's time was the rejection of idolatrous religions. Monism (and its associated quality, reason) was the binary opposite of imagination, or abstraction, which constituted the finite. To know Spinoza's God demanded non-representational understandings, and required men to abandon the imagination and imagery, for God could only be understood through reason. "The imagination is necessary for living and so all of us have good reason to resist its purging, as necessary as that might be for understanding God" (Garvey, 2015). Philosophers use only reason, for the imagination interfered with knowing God, or divine infinity, which could be known only through reason.<sup>53</sup> Everything that is real is necessary, there or no potentialities or possibilities, indeterminism does not exist. God determines absolutely, all substance is a mode of the monist God substance, which defines reason within the infinite and eternal of God, and from which all other substances are mere finite modes of that infinite substance. Only understanding, being of God, could conceive universality. Thus, in Spinoza, monotheism and knowledge of the infinite reject the imagination.

Spinoza reasons dichotomously, between substance and mind, between hierarchical dialectics of 'active' and 'passive' power that mark the fitness of an organism. The dialectic of individual life hinges on the ratio between the isolated autonomy of individuality "focused in a self, [and] the wider [...] periphery of communication with other things; the more isolated, the more related it is" (Jonas, 1965, p. 57). Even Bergson lectures on Spinoza as a Cartesianist and idealist who relegates the "phenomena of life to the ranks of purely physical phenomena, in order to establish a place apart for thought, the only spiritual being, the only free power" (Bergson 1887-1888, in Bergson and Vaughan, 2007, p. 27). This testament alone of Bergson's evidences the incompatibility of vitalism and monism that contemporary feminisms espousing vital materialism herald.

This is, of course, a coarse and simplistic summary of Spinoza's triangulation of monist substance, imagination, and reason that segregate the finite from the infinite. Garvey presents a nuanced questioning of Spinozist paradoxes in an attempt glean his position on the relation of the intellect to imagination, but for my purposes here, by presenting Spinozist monism in context exposes the concept as unsuited to feminist new materialisms.

As support of her political ecology of things, Bennett traces the absence of telos in Deleuze and Guattari's abstract machine<sup>54</sup> back to Spinoza, quoting, "There is no need to spend time in going on to show that Nature has no fixed goal and that all final causes are but figments of the human imagination" (Ethics, as cited in Bennett, 2009, p. 154, n.25). Bennett (and Deleuze and Guattari) take Spinoza romantically out of context, but if interpreted within the context of his denigration and rejection of imagination, Spinoza's remark is, in fact, an explicit rejection of the non-teleologies Bennett's and Deleuze and Guattari's metaphysics promote. The Spinozist move inadvertently actually draws a connecting line from Descartes through Spinoza to Kant and Bennett, the latter who explicitly supports the teleology of Kantian *Bildungstreib*,<sup>55</sup> causing Braidotti's alignment with Bennett's vital materialism to be a problematic one. Compare the above background with Braidotti's adoption of 'Spinozist monism':

The conceptual frame of reference I have adopted for the method of de-familiarization<sup>56</sup> is monism, It implies the open-ended, inter-relational, multi-sexed and trans-species flows of becoming through interaction with multiple flows. A posthuman subject thus constituted exceeds the boundaries of both anthropocentrism and of compensatory humanism, to acquire planetary dimension (2013, p. 89).

Indeed, Timothy Brennan calls the "resurrection" of Spinoza in cultural and literary theory, and in post colonialism a fad, and he critiques the invented use of Spinoza.

The very thinker who stood for an airtight and enclosed system of inflexible laws is invoked by the best philosophers as the champion of the open-ended productive force and positive potential of the human to develop outside of any social force (2010).

While that description does not perfectly match how vitalist new materialisms engage Spinoza, clearly, monism is hardly the path to de-familiarization. I concur with the Brennan's sentiment that finds radical philosophy's readings of Spinoza to be revisionist. Brennan, too, locates Spinoza within a Cartesianist genealogy, and offers, as I have in Chapter 4, Vico, Spinoza's contemporary, as an appropriate counter to the romance with Spinoza. Similar translation problems come up in Braidotti's adoption of autopoiesis as transfigured by Guattari.

While Maturana and Varela made a distinction between autopoietic and allopoietic systems, autopoietic being the biological domain self-organizing living entities, and allopoietic the domain of "machines that have as product of their functioning something different from themselves, as in a car" (Maturana & Varela, 1980, p. 135), Guattari extends the principle of autopoiesis to machines or technological others. Braidotti adopts Guattari's notion presumably because it supports the complexity of the posthuman subject and her monist conception of matter. It recognizes that the technological, as an attribute of Guattari's "transversalist conception of subjectivity" (2012b, p. 116), constitutes a site of post-anthropocentric becoming "which values non-human or a-personal Life" (2013, pp. 94-5). To think matter in terms of Guattari's autopoiesis, Braidotti somewhat fantastically claims, is an ethical intervention that frees matter from the commodifying imperative of advanced capitalism, demonstrating the effectiveness of the pragmatic and immanent aspects of nomadic vitalism (2013).

This corruption is no longer autopoiesis, it is poetic license taken to such an extreme that its inspiring concept (autopoiesis) loses its capacity to generate meaning, and thus, its metaphorical power for a new materialist philosophy. To extend autopoiesis to the machinic in order to recover the "'life' force of inorganic matter" (2006, p. 126) subverts Maturana's and Varela's initiating deliberate purpose in developing the theory,



which was to counter computational models in biology. Guattari's autopoiesis "takes the life out of biology" (Margulis, 1997) in the same way that neo-Darwinian formalistic evolutionary biology does. Braidotti and Guattari make the mistake of relying on a superficial understanding of autopoiesis. They are wrong in reading autopoiesis as "a dualistic scheme [that] opposes the inert to the living and is thus more oppositional than nomadic" (Braidotti, 2006, p. 125). Were Braidotti to have a deeper understanding of autopoiesis and enactive cognition, she would recognize these as, indeed, nomadic in every way she would wish— free of a re-naturalized evolution led by a deterministic master narrative of neo-liberalism, free of a paranoid techno-future that pitches Life and nature against the human. Autopoiesis is a systems-thinking that, paradoxically by definition, is not systematized, and it materially spatializes sentience, recognition, choice, and intra-action. Life hardly needs help from a machinic vitalism to achieve diversity and heterogeneity, and nomadism does not benefit from this artificial support. Machinic autopoiesis is an expensive tactic in a strategy to give primacy to "transversal connections among material and symbolic, concrete and discursive lines or forces...in the age of *bios/zoe*- power" (2006, p. 129, *italics in original*).

This problem casts attention on a slippage in new materialist thought between monist matter and making distinctions between living and inert entities. Barad is unclear as to how she resolves her concept of matter as entangled with her Levinas-grounded ethics. Vital materialists who refuse the distinction in order to be faithful to their dogma of monist matter (e.g. Bennett) find themselves awkwardly also trying to argue for a politics of life-itself. By grounding her theory in monism and vital materialism, Braidotti attaches her thinking to the essentialist, theistic philosophy of Spinoza and, through Deleuze and Bennett, to Bergson's transcendentalisms. Vitalism, reconfigured as a monist trait characteristic to all living and inert matter, competes against a zoe-politics

of life in an era of advanced techno-capitalism. It is not a 'legible' political strategy to embrace both monism and vitalism. Matter may be active and entangled, but monism fails to shield philosophical and political thought from the effects of binary attachments that extend androcentric lineages, even as the politics claim to reject individualistic and humanistic controls.

Despite her 'cartographic' method intended to subvert habits of linear thinking, Braidotti structures her argument as an a posteriori logic common in rationalist argumentation (e.g. Žižek). Biases drive the argument, which inevitably arrives at its pre-determined conclusion, and Braidotti's ideology contorts and drives methods. For example, autopoiesis does not support vital materialism. Though she declares a desire to break with divinely ordained telos, such as that of



Figure 30. The Still Point. (Betti Franceschi)

Teilhard de Chardin, her embrace of Spinoza and Bennett, ironically, also gathers in the divine and deterministic (2013). Consequently, zoe-nomadism wavers towards and away from whiffs of essentialism and transcendental empiricism, which Braidotti both hails, in her concepts of zoe and vitalism, and rejects, in her concept of nomadism. By skirting the edges of transcendental empiricism (Deleuze and Guattari) and Bergsonian/Spinozist theistic mysticisms, Braidotti's

claims to materiality are somewhat aspirational, and belie attachments that, in terms of struggles with her own subjectivity, suggest she has not broken free. “The process-oriented vision of the subject is capable of a universalistic reach, though it rejects moral and cognitive universalism” (2013, pp. 190-191). Her wrong reading of autopoiesis and Spinoza reveals the entrenchments in her own thinking habits. She acknowledges the privilege of nomadic theory in her case, made possible by the support of a steady job and partner. Nomadism requires a still point.

That said, the subject imaginary of the nomadic subject rejects classical ethics tied to Kantian moralistic normativity. For Braidotti, a ‘non-unitary’ and ‘non-essentialist’ zoe ethics is what emerges from the collision of bios and *zoe* in the contested and political space marked by the body. Nomadism requires agility and precision in its navigations. Given that the subject imaginary critically connects how global economic and planetary environmental challenges get addressed, becoming-nomad requires a praxis of the imaginary by the ethical subject. The imaginary of Rosi’s theorization gets set in motion by nomadic motilities premised on the dispersed ubiquity of ‘life-itself’<sup>57</sup> across shared spaces of ‘nonprofit micro-political practices.’<sup>58</sup> The imaginary Rosi describes reconnects to the past in a Hemmings return narrative that ‘knows better and can now move on’ from theoretical and political impasses (Hemmings, 2011, p. 5). But Rosi stops short of recognizing the imaginary as a political site of struggle, she misses the opportunity to repurpose cyclical time and memory as the imaginary’s capacity to disconnect from past undesired topologies in order to reinvent a present becoming-future. This is Rosi’s limit that I wish to extend, to mark a gap space for the subject imaginary as both embodied and transgressive of its boundaries, which, conversely, are also transgressed. Boundaries, like the bodies they entail, and embodiment are made paradoxical by the imaginary, revealing the subject imaginary as a nexus of enactions... a site, and even a target, of political contestation. Feminists must acknowledge the struggle over the subject imaginary as an out-and-out political conflict. For this battle, revised and new narratives, new myths, are needed; science, significantly, provides

one possible source of new texts for the nomadic subject's imaginary. New materialisms have been critiqued for claiming but not succeeding at connecting their ontological reorientations to an ethical vision (Materialism and New Materialism Across the Disciplines, Seminar, Rice University, 2014), and for re-inscribing the binaries and silos of disciplinarity it seeks to overturn (Willey, ), as well as for neglecting former feminist scholarship of science and the body (Ahmed, 2008) and for claiming what isn't to be 'new' (Sand, forthcoming). While there is credence to all these observations, none of these criticisms constitute grounds for overlooking or rejecting the sense-making energies and political animations of the project altogether. I critique the vitalist vein of new materialist thinking for inattentiveness to the residual traits that, lodged in its citations, inflect their discourse. As a result, the work fails to escape the conventions of the thinking they resist (Grosz, Braidotti, Hird, complete). These citational problems could have been avoided by Braidotti were she to have not felt an obligation to legitimize her philosophy with former deductive thinking traditions. Her methods cannot support an ethics that claims to produce an alternate ontology; Spinozist monism and vital materiality hail the very universalizing traditions that new material feminisms debunk. Inadequate historical vigilance sabotages the project. This intellectual strategy is unfortunate, because this, that undermines an otherwise persuasive project of ethical desires for contemporary conditions, is superfluous to the project anyway. Absent the methodological problems, Braidotti's qualitative cartographies would not invite the critical standards imposed by those who represent the thought-styles to which her work deliberately does not conform. In the end, held captive by her referential ontologies, Braidotti can't deliver on her claims.

That said, I am sympathetic to the problem of having to use old words to write new ideas, and so I read generously. Overlooking her citational choices allows me to see Braidotti's (and

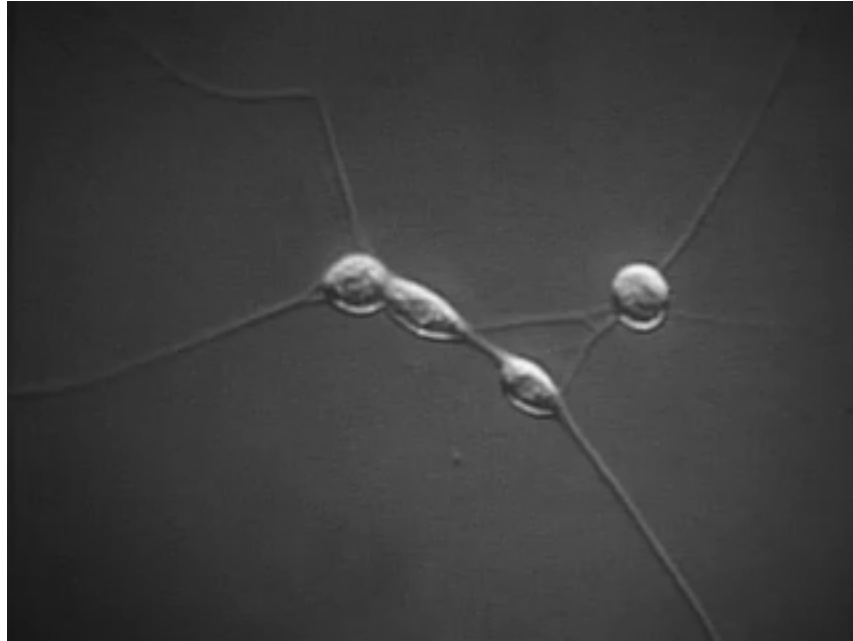


Figure 31. Labyrinthula. Double click to on image to play the video.

Varela's) concept of ethical subjectivity metaphorically, I imagine them as analogous to the microbe *labyrinthula*. This bacteria lays down new paths on the fly, never complete, a motile structuring sentience that, in a strange becoming of filamentous social networks, embodies the infrastructure of its entangled environment.

Braidotti's vision of ethical nomadic subjectivity works well as a cognitive, transcorporeal figuration, autopoietically situated by a matter-realist, onto-epistemological natureculture.<sup>59</sup> Her most compelling voice, though, comes through in her affirmative politics of hope that takes shape around her drive for an ethical accountability of the future perfect, for a future that *will have been*. Nomadic theory puts forth a compassionate ethics committed to a secular, nonunitary vision of the subject, ecophilosophically hopeful for living this Earth in a collective becoming of life beyond panic and mourning. Were her position argued from a more

scientific base, her arguments would support her transformative theory of subjectivity in a time of advanced techno-capitalism. Rosi's vision moves the subject imaginary a long way toward ethicality, and contrary to her claims, her work doesn't translate from theoretical inspiration to embodied praxis. Were there more clarity and attention given the political role of the imaginary than Rosi and new materialists offer (though gesture at), feminist analyses and theorization might broach this impasse creatively, and persuasively argue the dynamic immediacies of materiality, subjectivity, ethicality, and enactive politics.

## Notes

1 J.K. Gibson-Graham focus on community practices of specifically *economic* subjectivity, and Alaimo focuses on *environmental* practices.

2 A common nomenclature of our current time is the ‘Anthropocene’, but remaining faithful to official international chronostratigraphic standards, the Holocene is still, officially, our epoch. There is currently no ‘golden spike’ for the Anthropocene, nor a determination whether the Anthropocene constitutes an epoch or an age in stratigraphical terms. For more information, see: <http://quaternary.stratigraphy.org/workinggroups/anthropocene/>

3 Others, of many, include J.K. Gibson-Graham and Elizabeth Grosz.

4 For the parameters I use, I include Chilean Francisco Varela in this group, and though Lynn Margulis rejected feminism, she had little understanding of it and was much more feminist than she knew or would have wanted to admit. It could also include John Protevi, William Connolly, and Brian Massumi.

5 And artists, but I am not getting to them in this iteration of my project.

6 Secular, here, refers to a thinking style and ethical practice that respects difference and is free of the qualitative traits of monotheistic origins as discussed in Chapter 3. I do not mean it as that which is not religion, nor in the sense that Joan Scott (2010) argued it as a tool of gendered power systems that has played a role in the oppression of women. A secularity that does not reify binary divisions, etc. becomes a tactical tool for a skilled political activism in a time of a global resurgence of fundamentalism. As explained in Chapter 3, I do not consider the leaders of Enlightenment thinking as secular, inclusive of Kant and Spinoza, I do consider Bruno, Vico, and Darwin as secular thinkers, as explained in Chapter 4.

7 Some of whom this includes are: Donna Haraway, Karen Barad, Jane Bennet, Stacy Alaimo, Claire Colebrook, Elisabeth Lloyd, Moira Gatens, Vicki Kirby, John Protevi, Rosi Braidotti.

8 In this paper, I have associated this list of properties being disrupted with what I call the ‘irresistible charismatic of monotheistic thinking’ in Chapter 3.

9 Here is another alignment of Braidotti’s theory of nomadic subjectivity with J.K. Gibson-Graham’s politics of the post-capitalist economic subject.

10 my insertion

11 Analyzed in literatures by Hubbard, Haraway, Sandra Harding, Ruth Bleier

12 Autonomy for Varela is meant scientifically as the operational closure of an autopoietic entity that sustains that entity as itself. It does not suggest either cognitive or informational closure. Autonomy in feminist discourse may apply disparagingly to systems of power or to conceits of biological purity that entitle anthropocentrism.

13 This is a tenant of autopoiesis, it is also applied philosophically by Hans Jonas in the *Phenomenon of Life*, 1966, p. 98.

14 “Zoe stands for the mindless vitality of Life carrying on independently of and regardless of rational control. This is the dubious privilege attributed to the non-humans and to all the ‘others’ of Man, whereas bios refers to the specific social nexus of humans. That these two competing notions of ‘life’ coincide on the human body turns the issue of embodiment into a contested space and a political arena” (2006, p. 37). Braidotti’s concept of zoe becomes less binary by 2013, when she describes it as an affirmative, posthuman life-force with vital and self-organizing powers that undoes clear-cut distinctions between living and dying and extinction. It is a vital materialism that ‘engenders a transversal relational ethics to counteract the inhuman(e) aspects of the posthuman predicament” (2013, p. 115). Zoe allows a transversal redefinition of science and humanistic study as to what counts as the subject [and/or object] of posthuman scientific practice” (2013, p. 159).

15 nostalgia, paranoia, euphoria, exaltation, manic-depressive, fear, insecurity, frustration

16 for example, Margulis’ work on symbiogenesis, endosymbiosis, and Gaia; Humberto Maturana and Francisco Varela’s early work on autopoiesis, and Varela’s later work on cognition; ecology. I do not invoke the term posthuman as a specific critique of Humanism, though that would not be unrelated.

17 Trade winds characterize wind currents and lava flows drive plate tectonics. In topological terms, they explain but do not cause, the distinction is critical. A topological object is a dynamic object that is emergent in one sense of the term - it is more than the sum of its parts - and in another, the effect of its actualization is novel or heterogeneous. Heterogeneity becomes quite interesting to philosophical musings on materiality. Chemically, heterogeneity denotes a process involving substances in different phases, such as gaseous, liquid, or solid. Mathematically, it means incommensurable, through being of different kinds, degrees, or dimensions.

18 Nonlinearity is the norm in topological explorations.

19 The poised realm hovers unpredictably between classical and quantum worlds, in the intersection of continuums between order and chaos, and between quantum coherence and classicality.

20 By ‘responsible,’ Kauffman means the capacity to make decisions, stemming from his suggestion that on the quantum level, electrons possibly have the capacity to measure and make choices. The quantum level exhibits non-independence of electrons, which exhibit *preferences*, therefor *responsibility*.

21 Language gets awkward when it attempts to avoid value-laden terms. Margulis often used *co-operative*, but James Shapiro, to avoid the value-systems, prefers *coordinates*. Kauffman uses *jointly functions*.

22 I would prefer the term spontaneous, but that’s a different matter for the next iteration that connects such concepts to artists’ engagement of structured improvisation as a creative method.

23 Does he mean all of matter or just living matter? I’ll have to ask him.



24 *Improvised* is my term that I substitute for ‘unpredictably emergent’ in order to hone the concept into something with broader application and accessibility, such as the process familiar to the construction of performance work by artists. But that is Chapter 6, forthcoming when I get that book contract.

25 Hold this concept in mind while reading the below, by which Kauffman’s adjacent possible of future becomings is enriched by Varela’s notions of how temporality and affect materially play an integral role in the dynamics and processes by which the world, inclusive and indivisible of selves and others, becomes.

26 Margulis brings to Western light this concept that was first proposed in the 1920s by Russian biologist Koza-Polyansky.

27 Francisco Varela mentions that a new word is needed here, he finds *emergence* dissatisfying because of its lack of clarity vis a vis parts and wholes. He prefers *bringing forth* to suggest that the emergent *whole* is really an expression of the relations of the self-organizing, self-maintaining component networks. The emergent entity leaves no parts behind, nor is there hierarchical privilege given to any level. Varela would not be a Kantian. He preferred the cross-currents of his work with Merleau-Ponty’s phenomenology, but especially with Buddhism. Margulis would agree with Varela, but her philosophical allegiance came through Whitehead. What starts to emerge here are the sympathetic overtones between these scientists and the feminist new materialists inspired by Deleuze (inspired by Whitehead (inspired by Vico) and inspiring Braidotti) and Bergson (who inspires Bennett and Grosz and Whitehead). The web keeps expanding and yet it has a focus and a function. Becoming entraps determinism.

28 Kauffman identifies this stance as positivist science. Kauffman’s subjectivity is caught in a liminal zone of biology, a poised realm, stretched thin between two worlds, one being that of the Kantian Enlightenment of his training and the other being that of his research, complexity. Like Kant and Darwin, he struggles for reconciliation, working in a conflicted place that at once privileges Rationalist human exceptionalism (‘we the expected’); he stays loyal to neoDarwinian genetic selection at the level of the individual (1995), while challenging its dogma as the ‘central directing agency,’ stating that cooperation carries a competitive advantage. Kauffman later skeptically acknowledges growing arguments for group selection (2009, p. 261), and also argues for creative emergence, the materiality of possibility, and self-organization. Kauffman’s reconciliation comes in the form of his call for a reinvention of the sacred, which serves the ends of both, retaining the traits discussed in Chapter 3 concerning the irresistible charisma of monotheism that gets relocated in science, while also bringing forth heretical ideas of the creative becoming of the biosphere.

29 aka ‘qualia’ in Kauffman

30 Specifically, Varela promotes Buddhist meditation.

31 I have not explained here the concepts of quantum coherence and decoherence, a nice, simple instructional video can be found at: Wikipedia, [http://en.wikipedia.org/wiki/Quantum\\_decoherence](http://en.wikipedia.org/wiki/Quantum_decoherence). An interesting point to bear in mind in the context of Varela’s work that emphasizes the epistemological limits of an observer, is that decoherence relates only to the “observation of wave function collapse, as the quantum nature of the system “leaks” into the environment. That is, components of the wave function are decoupled

from a coherent system, and acquire phases from their immediate surroundings.” An independent mathematician tells me that the formula that collapses the wave function into Euclidian form =  $A + 1/A$ . Coherence still exists, but is subject to its interpretation by an observer’s perception. (Wikipedia decoherence). Note to self: this decoupling and the decoupling is discussed by Noë of Humphrey’s work).

32 The butterfly effect is also cited by Kauffman and Gibson-Graham. Very small changes in initial conditions can lead to profound changes. Kauffman cites this as evidence that the empirical unknown obviates prediction, Gibson-Graham cite this as a political vision of possibility for world change. Kauffman explains emergence as a radical principle of science, Gibson-Graham hopes for it as a radical politics of economic possibility.

33 My term, building off of Barad’s use of ‘re-membering’ drawn from entanglement, and referring to how history marks the future present, is used here as an adjective of desire to describe the material-actual temporal/affective inclination, or tendency, that guides expectation and possibility.

34 “By *behavior* we mean the changes of a living being’s position or attitude, which an observer describes as movements or actions in relation to a certain environment” (Maturana & Varela, 1987, p. 136).

35 We see in Varela another instantiation of wonder, also engaged by Kauffman, Stengers, and Braidotti.

36 “A phenomenon, in the most original sense of the word, is an appearance, and therefore something relational. It is what something is for something else; it is a being for, by opposition to a being in itself, independently of its apprehension by another entity” (Shear & Varela, 1999, p. 3). Varela makes neural correlates to phenomenological concepts of temporality and language in explaining consciousness and cognition as a science that bridges mind, experience, and the co-becoming materiality of subject(s) and world.

37 Symbiogenesis is defined as “an evolutionary change by the inheritance of acquired gene sets” (Margulis, 1998, p. 9).

38 This echoes Varela’s epistemological stance of the subject.

39 Perhaps it is the fear of the latter that inspires across the board all too many references to and claims of *ontology*.

40 For example, two edited volumes on feminist new materialisms stake out different grounds, *Material Feminisms* (2008) edited by Stacy Alaimo and Susan Hekman, stakes out its ground on explicitly corporeal themes, especially of the human body, while *New Materialisms: Ontology, Agency, and Politics* (2010) edited by Diane Coole and Samantha Frost favors theorists who lean more towards vital materialism. At stake seems to be the relationship to the linguistic turn which is no longer adequate for making sense of the world’s advancements, is it outright rejected or does it become incorporated, modified, appended in theoretical shifts? Arguments to one direction or another seem to hinge on various readings of Deleuze. This project does not take on the particularities of that philosophical topic.

41 Yes, Clare Hemmings' critical sense of the feminist return narrative is appropriately hailed.

42 as opposed to the unitary 'ruthless' neoliberal self, experienced by the subject who is, in fact, non-unitary, by virtue of the embodied and embedded "ties that bind us to the multiple 'others', most of which are not anthropomorphic (Braidotti, 2006, p. 4)

43 I will return to questions of secularity and 'postsecularity' later (that might be a note to self – might not get to it in this draft).

44 I would counter that neither Žižek nor Braidotti can escape charges of theism in their work, albeit for different reasons and different intents.

45 Though embodiment of knowledge claims are central to Barad, she does not explore this deeply in her book, *Meeting the Universe Halfway*. She is well complemented by Rosi's thorough attention to embodiment.

46 I do not actually see this in opposition to the topological (properties-based) method I engage. In this method, properties are significant insofar as they effect and are affected by and in relations; that is, relations manifest properties and vice versa. In this light, this could be a minor critique of Barad's contrast.

47 Endosymbiosis: a relationship in which a member of one species lives not just near or even permanently on a member of another species, but inside it. Together they (the bionts) form the symbiont in a holarchy.

48 This is not meant in any way Lacanian, as a negativity, to the contrary, Varela's sense of emptiness is affirmative, in Rosi's sense.

49 Gibson-Graham, too, emphasize diverse non-capitalist praxes that cultivate new economic subjectivities. The differentiation is interesting, JKG are concerned with economic praxis, which in the context of my inquiry, could be positioned as a form expressive of a more fundamental level of the role of praxis in the becoming of matter itself. Ethics, as theorized by all these thinkers, are operational at every level.

50 Turns out Haraway and Barad use this term, too.

51 Braidotti deliberately engages use of the future perfect tense to reflect the temporality of this transformation.

52 *Élan vital* is the "informing spirit which, through man, evolves into consciousness and therefore gives man his favored position as the goal and the apex of creation" (Chiari, *Vitalism and Contemporary Thought*, p. 254, as cited in Bennett, 2009, p. 143, n.40).

53 Spinoza's 17<sup>th</sup> century, imagination referred to representational, iconographic picture-thinking and diagrams—inclusive of measurement, time, and motion. The imagination concerned how ideas affect us, while reason was about 'reality out there'.

54 The abstract machine is Deleuze and Guattari's metaphor for the generativity of Nature whose pieces and assemblages enter into an infinity of interconnected relations.

55 *Bildungstreib* "names a nonmaterial, teleological drive that imparts to matter its functional coherence, its "organic" quality (wherein each part of the whole is both cause and effect of the others)" (Bennett, 2009, p. 65).

56 De-familiarization refers to strategies of estrangement from hierarchical relations that had privileged 'Man' and from dominant visions of the subject and habits of thought and representation.

57 Rosi shares this affinity with post-neoDarwinist evolutionists, geneticists, and complexity theorists; she acknowledges Margulis and Varela but not scholars working in other fields outside of feminist science.

58 Ubiquitous dispersal of collective non-capitalist micro-political practices is also a theme of Gibson-Graham's postcapitalist subjectivity.

59 Consider that sentence a really bad joke when I am up too late to test my reader and to let me know that I need to take a break. Cognitive=Varela, transcorporeal=Alaimo, matter-realist=Haraway, ontoepistemological=Barad, natureculture=Haraway.

## IN CONCLUSION

*For years I labored with the idea of reforming the existing institutions of society,  
a little change here, a little change there. Now I feel quite differently.  
I think you've got to have a reconstruction of the entire society,  
a revolution of values. ... We are treading in difficult water,  
because it [economic and social justice] really means that  
we are saying that something is wrong with capitalism.  
(Told to journalist David Halberstam in early 1968  
by Dr. Martin Luther King)*

The biosphere-geosphere-noösphere that takes shape as planet Earth of the third millennium, when seen through the lenses shared by new science, posthumanism and feminist new materialism, is an altogether different natureculture than that celebrated by teleological Western tales of technocapitalism, progress, and consumption. Material determinism has morphed into the monster in our midst. After centuries of determinism, mechanistic telos, individualism, human exceptionalism and dialectical transcendence, – and in spite of these identitarian logics having been countered scientifically, such patriarchal ‘truths’ and ‘realities’ continue to dominate subject and social imaginaries, having come to represent what is ‘natural’ and ‘normal’. To critique them constitutes an attack on freedoms and capitalism. To challenge these ‘givens,’ so embedded are they in the fabric of social, economic, and political institutions as to be invisible, requires a radical act of the imaginary.

This radical act provokes strong, even violent response (Occupy!). Overturning that applecart, the new materialist political project is not for the feint of heart, nor can it succeed if its enactments remain safely sequestered within intellectual discourse, or if it remains grounded by roots that it also wants to cut. That project demands putting at risk what modernity has

normalized as the self, acknowledging the not-necessarily-human subject instead as community, hybrid, dispersed and virtual, diffracted across becomings and temporalities, and moving through uncertainties. This subject fosters conditions for desired becomings, and recognizes that free will is not a dictator, but, rather, a collaborator, there is no autonomous center of controls. This challenge at the baseline of subjectivity necessarily confronts the well-educated Western radical subject--a self-confrontation acknowledged by Gibson-Graham, Braidotti, Darwin, Varela, myself, and remaining unacknowledged by Kant and Žižek, with problematic critical consequences.

In the natureculture world as represented by my triptych, Francisco Varela, Karen Barad, and Rosi Braidotti, the topological qualities and establishing principles of humanism and Cartesianism simply have no bearing. The paradigms of that thinking are revealed as illusory by light of the changes to the former science with which they ostensibly identify. Alternate paradigms, by which the world and lived experience are narrated anew, emerge collectively from new perspectives in microbiology, evolution, cellular genetics, ecology, and physics. The scientists from these fields I have considered all bring to their inquiries a systems-thinking approach, one that reckons with feedback loops, mergers and tangents, uncertainty and complexity. Consistently, they find a world of becoming materiality, always already in entangled dynamic process, moving from possibility to the actual and back again, sentient, cognitive, affective, contingent, indeterminate, and selective in the complex intra-actions taking place at every level, from the cell to Gaia. The exuberance<sup>1</sup> of life performs a radical dance of bodies and environment moving, as in a structured improvisation, between possibility and actuality. The creation is a *pre factum* emergence,<sup>2</sup> neither producible nor deducible, neither aleatory nor a posteriori calculation (1991, p. 70), and with no outside, there is no inside. This is Barad's halfway of the universe. In making this sense of the world, disciplinary divides implode, binaries dissolve, and language strains. What's required of the imaginary is a mode of understanding utterly incommensurate at its

foundations with what it confronts, the Cartesian-Newtonian-capitalist mindset of the world-that-is.

This new science enacts an academic revolution, liberating ethicality from the narrow confines of ‘philosophy’ and locating it within the purview of science, as well. In this, the new science represents a fundamental challenge to the dominant and powerful modes of knowing. Indeed, science has done this for centuries, as explanations displace the divine and transcendental. Of course, power is never happy to have its territory challenged. Bruno burns at the stake. Galileo goes under house-arrest. Edward Snowden seeks asylum in Russia. When the authority of western Cartesian-style thinking to impose its own patriarchal terms of morality begins to erode, those whose subjectivity has been constructed on such thinking feel their institutions of power threatened (and, for example, the National Guard dons riot gear to take to the streets to silence a Baltimore community). In this context, the fantasy that science is in its nature inoculated against politics becomes strained: becomings are accountable to their effects, and materiality has no hidden zones in the actual. My exploration of this shift thus reveals [r]evolutionary patterns of movement away from telos and toward ethical possibility—toward, as Varela describes it, “thinking the living being” (Castoriadis, 2011, p. 61).

Challenging disciplinarity in general, this new thinking challenges the disciplinary practices of science in particular. The quantum subverts the linear and causal, undermining notions of teleology—structures of thought embedded in the scientific method itself. To make scientific sense of this different world, then, requires methods that accommodate the unknown and unknowable, not as realms science has yet to reveal, but as part and parcel to possibility in the materiality of the universe. To accommodate this fundamentally different perspective, the practice of science must expand from reductive obsession with proper objects to the primacy of relations, and hold open the ‘actual’ space of the vague, elusive, and ephemeral enactive gap. This, then, begs a shift in the languaging of science, for studies of relationality cannot extract

from their focus spatial and temporal contexts, or the researcher's positionality from its narratives. The language would not silence or 'other' the unknown. The bounds of scientific knowledge would be made porous and expandable, in acknowledgment that scientific knowledge constitutes just one narrative of many using metaphor to make shared sense.

Working in a Continental philosophy and critical theory tradition, Braidotti engages the same themes of creative becomings based on which Varela, Barad, and other scientists and critical science scholars re-inscribe the bounds and accountabilities of science and its necessary implication in the world it interrogates. These themes convene in Braidotti's theory of subjectivity (nomadism) to inform a politics that might interrupt current trajectories of neoliberalism. Though the manner of her engagement of Continental philosophy is somewhat problematic to the tenets of posthuman feminist new materialisms that she identifies with, Braidotti also cites the founding principles of Varela's autopoiesis, Margulis' endosymbiosis, and Barad's agential-realism (2013, pp. 93-4, 158-159 and 2012b, pp. 135-6). The dynamics constituting her politics for these times, intended to inspire and activate, match those of the sciences of desire, and she thus brings to the fore of the subject an affirmative affectivity as a strategy of political resistance. Braidotti understands subjectivity itself as a political imaginary brought forth by and bringing forth the momentums of all that it connects and processes—the concatenation of autopoietically material, ethical, ecological, transcorporeal, economic, involutinary, sociable, and companioned becomings. Such expressions of ethical nomadic posthuman subjectivity become apparent in, for example, the praxes of Gibson-Graham's community economies, in Stacy Alaimo's ecologies of transcorporeality, in Myra Hird's bacterial sociable life, in the ecological intimacies of Natasha Myers' affective involutions, and in Haraway's companion species. Together, the sciences of desire and feminist new materialism establish a scientifically grounded, non-Kantian political perspective on subjectivity, the world, and Earth as an entangled, intra-active, ethical natureculture "worthy of the present" (Braidotti,



2012, p. 189).

Transforming the political imaginary demands embodied training and practice of new skills appropriate to that vision. Subjects need to train for wrestling multiple, protean monsters. Accompanying a deeply informed strategy, vigilance against inherited thinking habits is needed, and a deliberative engagement of history is requisite. But while Varela refers to meditative practices, and Gibson-Graham refers to diverse economic practices--and while the military, a variety of fundamentalisms, and perhaps FOX News, model effective modes of training that cultivate particular subjects--there has been little attention to the significance of skills training and practices for thinking and doing a 'radical' politics, such as occurred in the civil rights movement of the 1960s and has been being conducted by Mondragon cooperatives for decades. If, as the new materialisms and sciences of desire tell us, life is a protean energetic force and subjectivity a delicate matter, then ethical becomings of a different world require the learning and praxis of new skills and relationalities.

Gabriel Rockhill describes Cornelius Castoriadis' repudiation of the dominant imaginary of contemporary unlimited expansion, a dominance leading to "an overall atrophy of the imagination and a retreat in creativity in all fields (philosophy, art, science, etc.), [as a] ... revolutionary praxis and the struggle to demonstrate that history is not a fatality because a "break" is always possible"(2011, xvii-xviii).<sup>3</sup> For Castoriadis, the "creative capacity of the anonymous collective" (Castoriadis, 1997b, p. 131 as cited in Castoriadis, 2011, p. xiv) fueling radical social imagination pushes back against the groundlessness that in his philosophy looms as a dark threat. He sees the purpose of art, philosophy, and science as to give form to chaos, and by so doing remind society that it operates at the edge of the abyss. That concept of the edge of chaos carries less apocalyptic meanings as offered by Vico, by complexity theory, and by Varela's theory of groundlessness. In these contexts, the social imaginary<sup>4</sup> inhabits the material gap, and home is the poised realm of possibilities, which is the domain of autopoietic creative

production—a vision aligning with Castoriadis’ view of the social imaginary as self-instituting and with his stance on history as creation, and therefore undetermined (though not unconditioned). Politics for Castoriadis thus belongs within the domain of creative production, being a “collective activity whose object is the institution of society as such” (Castoriadis, 1997a, p. 272, in 2011, p. xvi). In sum, Castoriadis presents a view of the social imaginary as inherently creative such that history (“a past that has never been present, and which never will be, whose future to come will never be a production or reproduction in the form of presence...” (Derrida, as quoted by Barad in lecture) preconditions possibilities for revolution against what editor Gabriel Rockhill describes the “determined world of blind narcissism and hedonism orchestrated by the Eliatic fatalities of neoliberalism” (Castoriadis, 2011, p. xvii).

In a late 1990s dialogue on the topic of “Life and Creation,” Castoriadis and Varela explore the relationship between their positions, in light of Varela’s expertise in the biological phenomena of the origin of life and Castoriadis’ in theorizing the psychological and social domain.<sup>5</sup> They come to this dialogue each having been influenced by the other, Varela by Castoriadis’ theory that there is an excess of the imaginary sourced in the autopoietic origin of life, and Castoriadis by Varela’s theory of autopoiesis and autonomy.<sup>6</sup> Winding down their discussion of how autopoietic biological innovation and the creative social imaginary relate, they fall into questioning whether “one can deduce a politics from a philosophy or from a knowledge” (2011, p. 71)— the same question that, as I recounted in the Introduction, was posed to Stacy Alaimo by the scholar of 19<sup>th</sup> century German naturphilosophie. Though Castoriadis’ objects to reductionist theories of life (for him as for Varela, “being is creation, the propriety of being is to make surface new forms” (2011, p. 72)), his style of philosophizing is classical in terms of its linear determinisms and anthropocentric premises. On the other hand, Varela, rooted in the hard sciences, is an unconventional process-and-systems thinker. It comes as no surprise, then, that Castoriadis, whose thought style remains framed by a Newtonian-Enlightenment logic, denies

that a politics may be deduced, though it may be surmised, from a philosophy or knowledge, while Varela finds nuance and connection.

Castoriadis asserts that a philosophy of creative becoming “liberates us to think politics. It liberates us from social determinisms, from the idea that one could never do otherwise...” (2011, p. 72). He thus contravenes the disciplinary, academic mandate to ‘deduce’ certainty, and instead recognizes in philosophy and politics a “certain complementarity” (p. 72). Certainly, complementarity is more than the philosopher of German naturphilosophie would concede to the feminist new materialism project whose discourse he called “catty and indecorous,” but Castoriadis’ response does illustrate the difficulty that a thinking cemented in conventional patterns of rationalist logic has no opening to an altogether other paradigm of thinking. The former defines ‘right’ thinking as the product of deductive reasoning, the latter supports observation as the process that yields co-(m)otions of relationality—an impasse that must be contended with in conceiving strategies for achieving intellectual legitimacy or, of course, for shaping political and social change.

Varela, outspoken in his political engagements, responds to the question about philosophy and politics not in terms of what is proper and improper according to deductive logics, but in terms of his own subjectivity as scientist and as citizen, a non-unitary nomadic subjectivity in Braidotti’s sense. With only vague reference to his own published work, Varela affirms that philosophy, science, and politics are multiply and mutually implicated, but that his very active political engagements arise not from his knowledge as a scientist, but from his intuitions as a citizen. The pitfall of succumbing to pressures for deductive reasoning, he implies, is that it signals finality, and thus risks proposing either some sort of utopia (one charge levied against Spinozist new materialists), or in Žižek’s model, dystopia.

While Varela’s cautions are crucial, I suggest that feminist scholars working in the posthuman and new materialist vein would meet with better success beyond their own community

by remaining more vigilant about how the discourse gets constituted. We should avidly resist, that is, speaking in the language and resorting to the methods of reasoning and thinking, that conform to monotheistic / humanistic topologies. This does not mean we should ignore history—quite to the contrary. But it does mean we should err on the side of extreme caution in the resources we hail and how we engage them, so as to avoid those that conjure the very modes of thought we seek to indict. No Spinoza. No monism. No Lacan. No transcendent empiricism. No manipulations of concepts with already established meanings.<sup>7</sup> No deduction. Inspiration must be appended with informed, enactionable strategies. We must work with methods of uncertainty and unknowing, such as diffraction, (Haraway and Barad), cartography (Braidotti), tactical recitation (Cummings), topologies and technê (Sand). As we embrace uncertainty, the limits of self-knowledge and of knowledge of the other, emerge as the starting point of political engagement, enabling “a present and a future with some unpredictability in them” (Hemmings, 2011, p. 226).

*What may we hope now?* The theories of life and subjectivity presented in this project continue to be marginalized by an academic establishment whose defensiveness, in the face of the evidence proffered by scientists and science studies scholars, suggests that feminisms must be onto something big. Even if we can’t quite know exactly what, something important is happening. The material and metaphorical powers of the quantum and new biology foster new imaginaries and political possibility for subject and social transformation. A sea-change in thinking practices is underway. Yes, there is plenty of hope for our future, in theory, as demonstrated by the theoretical work of many scholars, but the actualization of these hopes depends on transposing memory and desire into skilled, collective praxis. This hope keeps optimism in reserve. But another, deeper strata of hope provide the baseline for all others, and as Margulis and Sagan remind us, “Nature has not ended, nor does the planet require saving,” (1995, p. 242). From the perspective of geologic time, Gaian Earth and Life know only ghosts, but no true monsters.

## Notes

1 'Exuberance' is a common descriptor used by Margulis.

2 Varela acknowledges that new words are needed for what he means by emergence, non-linearity, and he clarifies his meaning of enaction as bringing together the gestures and tasks that accompany 'making-something-emerge', inclusive of its conception and its history that gets set in motion. Varela's meaning of emergence is particular, a non-separability between created phenomenon and the specificity of its locality.

3 An affective vector (passion), and a desire to know and experience, accompany the imaginary's self-representation of the world.

4 For Castoriadis, the human subject is by definition social, there is no individual human subject, so the social imaginary parallels the radical creative imaginary of the individual subject, and functions collectively to institute society.

5 They are in full agreement on the rootedness of the imaginary in corporeality. They depart on the exceptionality of the human, which Castoriadis supports and Varela rejects. This divide maps their ensuing disagreement, Varela objects to the anthropocentricity of Castoriadis' deterministic 'indentitarian logics' that reject non-linear dynamics.

6 Varela objects to Castoriadis' application of his sense of autonomy beyond biology.

7 e.g. Deleuze's reworking of autopoiesis and machinic symbiosis; I wish scholars would not mess with the science but get it right— e.g. Grosz gets Darwin wrong, Hird is shaky on autopoiesis.

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