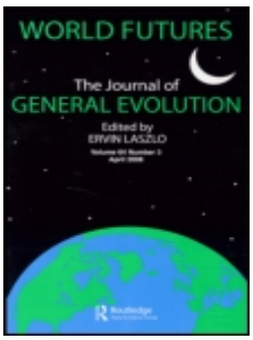

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LOGOS OF A LIVING EARTH: TOWARD A NEW MARRIAGE OF SCIENCE AND MYTH FOR OUR PLANETARY FUTURE

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The social and ecological crises of the twenty-first century represent a failure of the techno-industrial way of living and knowing. It has become apparent that we need both a new mythos and a new science. In this essay, I draw attention to the important epistemological and cosmological implications of enactivism, a still emerging paradigm within the life sciences. Guided by the insights of the enactive paradigm, I offer a new story of human origins and destiny in an attempt to contribute to a more livable future for our species and the rest of the community of life on Earth.

KEYWORDS: Autopoiesis, ecology, enactivism, Gaia, logos, mythos.

> There is no way to rationality—to actually existing worlds—outside stories, not for our species, anyway. —Donna Haraway (1997, 44)

INTRODUCTION

There is no need to hype the extent of our planetary crisis. Climate change and ecosystem collapse are forcing our species to re-imagine the very foundations of industrial civilization. The natural sciences are of their own accord beginning the necessary epistemological and cosmological reassessments that any adequate response to this crisis will require. In the essay to follow, I highlight the still emerging paradigm of enactivism, a philosophically informed and scientifically rigorous approach to the life sciences that I believe offers crucial critiques of and constructive amendments to the still predominant modes of discourse within biology today. I then attempt to weave the evolutionary insights provided by the enactive perspective into a new story of human origins and destiny, differentially inspired by Donna Haraway's situated knowledges, James Lovelock's Gaia theory, and William Irwin Thompson's, Thomas Berry's, and Richard Tarnas's integral cosmologies. I aim only to briefly outline the promiscuous ties between the normally unrelated categories of science and story, or logos and mythos. It is my hope

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that the combination of concepts and images to follow contributes in some small way to the collective effort to bring forth a more livable future for our species and the rest of the community of life on Earth. This is what Berry called the Great Work.

AUTOPOIETIC BIOLOGY AND ENACTIVE COGNITION

The particular discourse of biology is one that I, like Haraway, "value, want to participate in and make better . . . and believe to be culturally, politically, and epistemologically important" (1997, 218). The biology of the late Francisco Varela, more recently carried forward by Evan Thompson, strikes me as especially important because it arises out of an awareness of the "unbroken coincidence of our being, our doing, and our knowing" (Maturana and Varela 1988, 25). Deep inquiry into biology can reveal that our ontology, praxis, and epistemology are knotted together in such a way that " . . . every act of knowing brings forth a world" (26).

Varela's central conceptual contribution (alongside Humberto Maturana) to the study of life is the theory of autopoiesis.[1] The theory is part of a larger move away from current orthodoxy in biology that understands organisms as "heteronomous units operating by a logic of correspondence"; instead, Varela offers a new biology that sees organisms as "autonomous units operating by a logic of coherence" (W. I. Thompson 1987, 50). The standard, gene-centric perspective of neo-Darwinist biology maintains that individual organisms are the puppets of their DNA, selfishly struggling to achieve reproductive fitness by way of natural selection into pre-given niches.[2] They are "other-determined" (heteronomous) because the shape of their bodies and behaviors are imposed extrasomatically by a supposedly objective world and endosomatically by supposedly objective genetic algorithms. Evolutionary success is explained retroactively as the result of a correspondence between an organism's body, instincts, and thoughts (all reducible to genetic coding) and the pressures of a fixed, external world. Varela's autopoietic view, in contrast, allows us to see organisms as autonomous and purposeful beings whose success is explained not by correct representation of a pre-given, objective reality, but by adequate structural coupling[3] with other organisms and an environment in such a way as to bring forth enduring because coherent material-semiotic worlds.

Further, an autopoietic biology makes clear that self-production is at least logically (if not also temporally) prior to reproduction (E. Thompson 2007, 131). Life cannot be explained based on the ability of a DNA molecule to reproduce[4] if living organization is defined primarily by self-production. The essence of living organization is not the ability to genetically replicate, but rather the capacity to produce a membrane-bound, self-organizing identity. The identity of a living system acts both to distinguish it from and to structurally couple it with a particular environment. From the perspective of an autopoietic biology, the ecopoiesis[5] of Gaia grants her living status, contrary to gene-centric, neo-Darwinian criticisms of Lovelock's theory. Gaia theory presents the scientific imagination with an opportunity to see that life does not adapt to fit the stagnant physical parameters

of a lifeless rock, but instead acts to transform its would be material host into a semiotic ecosystem of self-regulating feedback loops.

Varela's penchant for transdisciplinarity lead him to link his autopoietic biology to cognitive science, and his enactive theory of cognition to sociology. Varela has described enaction by borrowing the words of the poet Antonio Machado: "Wanderer the road is your footsteps, nothing else; you lay down a path in walking" (Thompson, 1987, 63).

The scientific principles underlying this poetic insight have been highlighted by Evan Thompson, who offers five features central to the theory of enactive cognition (2007, 13):

1. . . . living beings are autonomous agents that actively generate and maintain themselves, and thereby also enact or bring forth their own cognitive domains.
2. . . . the nervous system is an autonomous dynamic system [that] actively generates and maintains its own coherent and meaningful patterns of activity according to its operation as a circular and reentrant network of interacting neurons.
3. . . . cognition is the exercise of skillful know-how in situated and embodied action.
4. . . . a cognitive being's world is not a prespecified, external realm, represented internally by its brain, but a relational domain enacted or brought forth by that being's autonomous agency and mode of coupling with the environment.
5. . . . experience is not an epiphenomenal side issue, but central to any understanding of the mind, and needs to be investigated in a careful phenomenological manner.

One consequence of the enactive approach is that the Cartesian quest for epistemological certainty becomes but the expression of a particular "cognitive domain" (see # 1) made possible by the abstract languages of mathematics, precise measurements of machine technologies, and controlled laboratory environments. If the nervous system is a reentrant network (see # 2), its function cannot be to passively mirror an external, objective reality, even if the modest witnesses are highly trained scientists allied with powerful instruments that extend their sensory reach. The operational closure of the nervous system forestalls a representational account of its activity, as its role is maintaining coherence, rather than correspondence, between an organism and its environment. New techniques may open up previously hidden worlds, as when Galileo first turned a telescope to the sky and revealed the moons of Jupiter in 1610, or Hooke first recognized cells through a microscope in 1665, but one cannot speak of finally discovering the real as if it existed independently of our bodily and inter-bodily experience of meaning (see # 4).

As Haraway has suggested, ". . . objectivity is less about realism than about intersubjectivity" (1997, 199). She yearns for us to come to see objectivity as a way of "forming ties across wide distances" (199), instead of as the privileged perspective of self-invisible European men who remain somehow unpolluted by

their ambiguously situated bodies (23–32). If science can claim relative epistemological purity, it is not the result of transcending culture, but of the ever-growing mobility and combinability of the traces scientists and their cyborg[6] surrogates have constructed within their networks. Outside of these special networks of labs, machines, shared languages, and centrally controlled policy initiatives, scientific facts have little relevance.[7]

Referring to technoscience, as opposed to just science, emphasizes the extent to which knowledge, even when objective, emerges out of skillful action in embodied situations (see #s 3 and 4). Science has always been dependent upon technological sensorimotor extensions to deepen its understanding of that commonplace called by its peculiar culture "Nature." Artifacts and their effects, including alphabetic technologies, play a constitutive role in shaping the sorts of worlds scientists can inhabit. Even mathematics is a figurative language (11), allowing for the construction of analogies between otherwise unrelated domains of experience.[8]

Varela's biology has implications not only for scientific epistemology, but also for society and the cosmology that informs our relationship with the Earth. Echoing the sentiments of Haraway, Varela implores us to recognize the importance of the discourse surrounding the life sciences, since, he says, they are the main source of the metaphors structuring our postmodern common sense. "Ours is but one of many possible worlds," and if "what we do is what we know," then changing the way we talk about the Earth is intimately bound up with changing the way we think and the way we live.[9]

It is the shared biological lineage of our physiological organization that secures the basic structure of the worlds human beings can bring forth together via semiotic and empathic structural coupling. But culture is not bound by nature, which is to say that human nature is sufficiently malleable that diverse cultural expressions can emerge within isolated social groups and amongst individuals within a group. It is often only through inter-cultural confrontation and misunderstanding that members of one society come to recognize the unthought background of their own enacted worlds. The essential message of Varela's biology of cognition is that "... as human beings, we have only the world which we create with others" (1988, 246). Unless I can encounter the differences between my (or my culture's) cognitive domain and another's with the willingness to make room for their meanings beside my own, I undermine the biological process of structural coupling that produces livable worlds. Meaning emerges out of difference (Hornborg 2001, 167), and as W. I. Thompson suggests, "the recognition of differences [is] the consciousness of the unique that contributes to the understanding of the universal" (1985, 167). Bringing forth worlds with others requires first and foremost tapping into a universally accessible substratum of compassion by way of empathic structural coupling, not in order to erase difference, but to approach it with care instead of fear.

Varela calls this willingness to forego self-certainty for the sake of enacting inclusive worlds with others *love*. Love, says Varela (and Maturana), "is the biological foundation of social phenomena: without love, without acceptance of others living beside us, there is no social process and, therefore, no humanness" (1988, 264). Most scientists would dismiss these ethical claims because they

overshoot the objective scope of the scientific enterprise. But Varela's biology is an attempt to break down the Cartesian divide between rationality and emotion, between what is and what ought to be. Biology is the study of life, but in the context of the recursive logic of enactivism, it becomes the self-study of our own living. And because of the close relationship between knowing and doing, the stories we tell about how life came to be and what it is doing here will determine what sorts of future worlds we bring forth together. "Whatever we do," says Varela," in every domain, whether concrete (walking) or abstract (philosophical reflection) . . . is a structural dance in the choreography of coexistence" (248).

Varela's autopoietic biology is a critical response to mechanistic tendencies in mainstream studies of living organization. He emphasizes the autonomy of individual organisms while also situating them within the ecological and social environments that sustain them materially and semiotically. Varela also engages the philosophical implications of biology in a more penetrating way than most other scientists when he recognizes the dynamic unity of mind and body. Thought, perception, and action are knotted together in the process of living, and life is by its very nature a co-creative, world-making affair.

DISCURSIVE EARTH

Language is the primary instrument of human knowing, the tool of tools that opens up worlds of meaning more flexible (and reflexive) than the biosemiotic endowments granted to most other organisms. But the great virtue of human language is also its tragic flaw, as the creative power of words enable the imagination to almost entirely detach from the actuality of the body and Earth. One result of such disengagement is what A. N. Whitehead has called the fallacy of "misplaced concreteness" (1925, 51): abstract worlds of words and images restructure not only thought, but perception and action, such that the concrete lived experience of the uniqueness of individual persons, to take one example, becomes obscured by pre-conceived notions of culture, race, and class (etc.), leading to an objectification of others that short-circuits the process of linguistic and empathic structural coupling.

Varela suggests that human language evolved as a result of increased socialization and loving cooperation between our hominid ancestors (1988, 220). The female shift from estral cycles to year-round sexuality and the frontal coitus resulting from upright posture are offered as possible reasons for the development of such a complex and expressive behavior as speech (219).[10]

Evan Thompson points also to "... the evolution of a new stage of development, namely, childhood," which provides developing human beings with an incredible plasticity, so much in fact that

> . . . individual subjectivity is from the outset intersubjectivity, a result of the communally handed down norms, conventions, symbolic artifacts, and cultural traditions in which the individual is always already embedded. (2007, 409–411)

Writing may have arisen later (around the fourth millennium BCE) for economic reasons (Jean 1987, 13), but the spoken word appears to have emerged originally as a result of the desire for increased interpersonal intimacy.

This is a radical account of the origins of human culture, focusing more on the evolution of consciousness than the development of tools. In his study of the origins of culture, W. I. Thompson offers evidence contrary to the standard technophilic and androcentric explanations. He cites the work of prehistorian Alexander Marshack, who, like E. Thompson and Varela, argues language arose as a result of neoteny and increased social cohesion:

> If, at any point in the evolutionary process 'language' or proto-language was to be learned, it would not have been in the context of the hunt. It would have been learned young, before the individual was economically productive . . . in the context of the child's widening, increasingly complex relational competence. (1981, 91)

Enactivism provides a novel way of relating to language as primarily communicative, rather than representational. The meaning of our words comes not from a correspondence between them, a neural pattern in our brains, and pre-existing objects or events in the world, but from the consensual coordination of our lived bodies and their linguistic intentions.[11] Social coherence, rather than representational correspondence, produces meaningful linguistic domains.

The communicative origins of language should make it clear that claims to establish a pure observer language free of cultural idiosyncrasy (and so capable of objective description of phenomena) are more political than scientific. Human beings speak with one another in order to share emotion and direct attention, and so any notion of descriptive or explanatory truth must include at least the potential for agreement between structurally coupled agents. In most cases, if one culture's emically verified description contradicts another's, there has not been a factual conflict but a failure to communicate. Such conflicts of description are especially insidious when political power is used to enforce "true" accounts of reality despite the resistance of marginalized cultural enactments of meaning.

The move away from representational accounts of language is the first step toward ". . . [placing] the human within the dynamics of the planet rather than [placing] the planet within the dynamics of the human" (T. Berry 1999, 160). By recognizing human language as a poetic product of the Earth's own semioticity—in short, its own desire for autobiography—perhaps the psychological alienation and spiritual disenchantment so characteristic of our historical moment can be overcome.[12] According to Berry, "this awakening is our human participation in the dream of the Earth" (165). As suggested above, our language and the imaginative capacities it facilitates could not have evolved without humanity's enhanced capacity for empathic structural coupling. As the cultural and symbolic systems that emerged from this consensual coordination became more complex, some grew isolated and began to reify the differences between themselves and "others." At least in the European West, one particularly hazardous reification dissociated humanity from nature. In effect, Western consciousness has detached from the dream

of the Earth and fallen into the nightmare of endless economic growth fueled by evermore-efficient technological methods of resource extraction.

A flourishing Gaian-polity will require rooting human imagination and language back in the body of Earth, putting consciousness in its proper place so as to reveal our evolutionary journey from protozoa to speaking primates to be an expression of the planet's own *joie de vivre.*

Psychologist and philosopher Richard Tarnas has written persuasively in a similar vein about the need for a worldview that does not separate mind from matter, or nature from spirit:

> The human spirit does not merely prescribe nature's phenomenal order; rather, the spirit of nature brings forth its *own* order through the human mind when that mind is employing its full complement of faculties—intellectual, volitional, emotional, sensory, imaginative, aesthetic, epiphanic ... human language itself can be recognized as rooted in a deeper reality, as reflecting the universe's unfolding meaning. ... Human thought does not and cannot mirror a ready-made objective truth in the world; rather, the world's truth achieves its existence when it comes to birth in the human mind. (1991, 435)

A participatory approach like Tarnas's is a consequence of the way the enactive paradigm re-organizes our standard notion of the relationship between culture and nature. Humanity, rather than the alienated dominator of Earth, can become Gaia's most articulate storyteller and most potent dream weaver. Logos did not suddenly arrive in human form from a transcendent eternity far beyond the universe at some point in history; rather, its creative intelligence has been an integral part of cosmogenesis from the beginning.[13] Humanity has cosmic origins, and re-imagining our techno-industrial presence on Earth means entering into a renewed participation in the story of the universe. Language and culture need not be viewed as opposed to or other than nature, but as nature's way of rising to the level of articulation and self-consciousness.

GAIAN MYTHOS

Humanity is unique, in the double sense of being both one with (Latin: *unus*) Earth/Cosmos *and* undeniably alone. What it is that makes our species so special is a matter of contention. The risk one takes in attempting to define the difference between human and nonhuman is that some group be marginalized by not being included in the favored category. History makes it quite apparent that societies become more willing to commit atrocities when they adopt antagonistic linguistic classifications (race, class, gender, species, etc.). But even to deny the difference is already to have marked the topic as a forbidden fruit. I cannot avoid this risk if I wish to tell my story (cross-cultural communication depends, at least etymologically, on munitions—on firing an opening shot). I can only provisionally offer that what makes us human is our being always already embedded participants in evolving worlds of meaning, *and knowing so*. Knowledge is what

distinguishes humanity, but all knowing is situated within the promiscuous meanings and romantic-comedic-tragic narratives of embodied life among others, both human and non-.

Our human capacity for knowledge also clues us into our ignorance, the fact that we lack, perhaps indefinitely, a total understanding of how we came to be and how best to live. Nonetheless, we must act; we must participate in the everyday tasks of making the world's meaning even without being ultimately certain what that meaning is. Our cultures must provide us with a flexible way to navigate the unmappable complexities of the terrain of life within this evolving planetary organism. A renewed engagement with the mythopoeic dimensions of consciousness is one way to keep our balance while walking upon such uncertain ground.

Myth, according to W. I. Thompson, "is a state of being, analogous to music [and so] not simply a description, but a performance of the very reality it seeks to describe" (1996, 6). Any knowledge we pretend to have regarding the world simultaneously participates in the bringing forth of exactly such a world. Even modern techno-sciences of life have deep mythological roots, and so to properly contextualize matters of fact it is necessary to invoke the poetic images of the ancient past (of at least the Western, alphabetic tradition).

Hesiod, Ovid, Homer and other Greek orators have given poetic, divinatory, or dramatic tribute to Gaia, the "Mother of All [and] Most Ancient" (Edgar, 1891, 119). She is imagined to have emerged at the beginning of the world from the undifferentiated, lifeless mass of Chaos. Once her earthly foundation was in place, she birthed the sky, the mountains, and the sea, along with countless other beings, mortal and immortal. She was, for ancient humanity (on all continents, though by other names), personified as Grandmother, revered for her creative generativity and life-sustaining soils.[14]

For us, despite living thousands of years later in an age of "Reason," it remains wise to remember with W. I. Thompson that a Gaian way of life "requires not simply training and data collection, but imagination" (1991, 252).

Imagination, for Thompson, is what integrates sensorimotor perception into coherent worlds of situated meaning:

> What brings forth a world is the human body as a field of metaphoric extension of the known into the unknown. . . . [Imagination's] ability to stabilize a world derives from . . . preverbal geometries of behavior we have come to cognize as the way things happen. (253)

These preverbal geometries of behavior archetypally structure our unconscious experience of Earth. In those "mythic times called the 'Scientific Revolution'" (Haraway 1997, 1), the Cartesian coordinate plane emerged to refigure the human body–mind, constructing a flattened background on which the Western imagination could perform its world-making magic at relative distance from the local complexities and particular faces of Earth's many cultural and biological ecologies.

The re-imagining of the world in light of enactivism that is here suggested calls into question the supposedly universal truths of scientific materialism responsible for disenchanting Earth and Cosmos. "[The scientific tribe]," says Latour, "like

earlier ones, projects its own special categories onto Nature; what is new is that it pretends it has not done so" (1993, 102).

Ours is a living planet made up of eco-semiotic webs of community. Upon this planet a special primate has evolved who can know the difference between sign and thing (and who surfs the mystery in between with myth). This differential knowing raises the specter of minds separate from bodies, of a noosphere over and above the biosphere using it as a means for its own elevated ends. But we need not reproduce the Sacred Image of the Same by reifying the human difference; instead, through a self-critical and diffractive consciousness, it is possible to bring forth histories of entangled meaning where reality and idea, science and story, nature and culture mutually constitute one another (Haraway 1997). The cosmogenesis of Earth is as much mental, cultural, and transcendent as it is physical, natural, and immanent. There is no one true and ideal copy of the world that might be reproduced culturally or technologically. The truth about reality is not a reflected image in the human mind, but an emergent interference pattern co-generated by the varied material-semiotic activities of countless earthlings, most of whom are not human (Haraway 1992, 299). Earth is a more-than-human event whose value and purpose are not solely determined by the prices of the human marketplace. This ethically radical inter-species realization must be made explicit in our public discourses and our economic choices.

Imagine a world where Lovelock's scientific narratives about the "Ages of Gaia" are tied together in a distributed and layered way with the ancient myths and mysterious organic origins of the entire family of human and nonhuman naturescultures (Haraway 1997, 121). Building a future Gaian civilization will require not hegemonic universalism in the form of globalization, but a shared discourse of common origins always open to further interpellation (49–50). Humanity does not yet share a sacred story of creation, but our global techno-industrial activities have already inextricably linked our biological destinies. A more livable future for planet Earth depends in part upon humanity's renewed cultivation of the imaginal consciousness that is capable of perceiving the reciprocal ties between our being, doing, and knowing, because as J. G. Frazer warned in *The Golden Bough*, "... imagination acts upon man as really as does gravitation, and may kill him as certainly as a dose of prussic acid" (1915, ch. 22).

NOTES

1. The details of the technical definition of "autopoiesis" (self-production) need not concern us in this essay, but in short, a system is generally defined as autopoietic if it is composed of a network of dynamic chemical transformations that produces its own components and the membrane that spatially defines it as a system (Maturana and Varela 1988, 46). The paradigmatic example of autopoiesis is the cell.
2. See Dawkins (1989) and Dennett (1995).
3. "We speak of structural coupling whenever there is a history of recurrent interactions leading to the structural congruence between two (or more) systems" (Maturana and Varela 1988, 74).
4. Nor can life be explained by a sensorimotor system's ability to represent an external world, as will be argued below in connection with the enactive paradigm of cognitive science.

5. "In one of his articles Lovelock uses the term *ecopoiesis* to describe Gaia (Lovelock 1987). This term seems just right for conveying both the resemblance and difference between Gaia and the autopoietic cell. The resemblance is due to the ecosphere and the cell being autonomous systems, the difference to the scale and manner in which their autonomy takes form" (E. Thompson 2007, 122).
6. As Haraway describes them, cyborgs are "the offspring of . . . technoscientific wombs—imploded germinal entities, densely packed condensations of worlds, shocked into being from the force of the implosion of the natural and the artificial, nature and culture, subject and object, machine and organic body, money and lives, narrative and reality" (Haraway 1997, 14). In the information age, we have all become cybernetic organisms, as much technological as biological.
7. ". . . we might compare scientific facts to frozen fish: the cold chain that keeps them fresh must not be interrupted, however briefly" (Latour 1993, 119).
8. For example, Thomas Edison wove a chain of associations together to relate Joule's and Ohm's equations with economic principles. The result was the electric light bulb (Latour 1987, 239–240).
9. See W. I. Thompson (1987, 62).
10. W. I. Thompson (1981, 21–26) similarly links the evolution of language and sexuality, pointing to, among other things, Alfred Kinsey's studies in the 1950s showing the intelligentsia (those who have mastered language), unlike the working classes, tended to revel in oral sexuality.
11. See Maturana's "Biology of Language: The Epistemology of Reality" (1978), where he points to structural coupling as the origin of language. This is in contrast to denotative or representational theories of language, where words stand for things independent of consensual coordination between human organisms.
12. "The governing dream of the twentieth century appears as a kind of ultimate manifestation of that deep inner rage of Western society against its earthly condition as a vital member of the life community" (T. Berry 1999, 165).
13. "In the beginning was the Word, and the Word was God. The same was in the beginning with God. All things were made through [the Word] and without [the Word] was not anything made that hath been made" (John 1:1–1:4).
14. See James George Frazer's *Golden Bough* (1915). Frazer points to the common origin of all modern religions in the ancient goddess worshipping traditions of the world.

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