



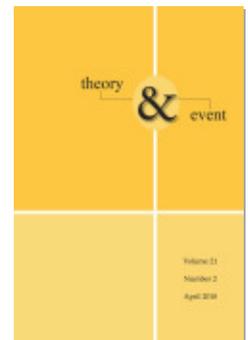
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Biocultural Polymorphic Fields, Receptive Agency and Symbiotic Evolution beyond the Anthropocentric Wave

Romand Coles

Abstract I sketch aspects of Samantha Frost's writing that I find most intriguing and discuss directions in my work that resonate with them, elaborating possible connections between her reflections on subatomic through intercellular fields, and mine on the intercorporeal sensual relations among organisms—particularly those between humans and nonhumans. I read the human sensual field, or clearing, as trafficking and teaming with the affective energies and perceptual fields of myriad other beings and suggest a theory of symbiotic selection that accounts for the emergence of extravagant receptivity. This pulls toward political ecological practices and institutions that foster receptive agency with nonhumans.

There is a vast and powerful wave in the brutal ocean of Western thinking about the human as exceptional in relation to the nonhuman. Somewhat like a wave of sports fans in a stadium, the movement is not primarily due to traveling bodies or paradigms of knowledge (though, of course, these can and do circulate). Rather, it is a *charge*—an insistent transmission of a peculiar energy—that moves through the bodies, animating (standing) and de-animating (sitting) each in ways that incarnate the flow of energy and make it visible as a rippling pattern in the history of those crowded around the human exception. In modern times, one capacity after another has been raised up to define the exceptionally human, only soon to be discovered significantly present in other beings, and thus compelled to sit back down. Yet this evanescence has not diminished the energy of our insistence so much as it has (for some) made the character of human exceptionalism more visible *as a wave* of insistent animation, rather than a set of substantive qualities or powers we alone actually possess. Giorgio Agamben had something similar in mind when he wrote of “the anthropological machine” that compulsively differentiates humans from all the rest in order to repeatedly produce the surplus value of *the gap itself*—a value that far exceeds the specific values of the shifting characteristics through which the gap is made to appear.¹ Like every such machine, a significant part of the work it does is to create cuts and hierarchical

gaps *within* the exception—here in the form of racialized, gendered, and classed others who resemble “lower” forms of life.

In *Biocultural Creatures: Toward a New Theory of the Human*, Samantha Frost seeks to contribute to the animating energies, artful navigation, and emergent aspirational horizons of a very different sort of waviness. If we were to depict these energies and activities in terms of an alternative rippling in a crowd, it might look like several swirling, trafficking and interacting vortices—making visible how patterns of distinction arise and are sustained precisely through processes of inter-animation, relational modulation, and mutually entangled responses. One senses that Frost’s effort to theorize humans and all living beings as biocultural creatures constituted through and through by relationships of influx and efflux of energies and elements with their environs, is *itself* significantly animated by this different field of distributed charges and flows. Frost casts her lot with this world of interactive energies not only by theorizing them but by allowing them to infiltrate *how* she theorizes, in ways that animate her readers (at least this one) to join her in efforts to creatively transmit new wave patterns of biocultural theory and practice in the face of ecological catastrophe. She marks her surprises, disappointments, and shifts provoked by her encounter with research in the sciences, including having to acknowledge unexpected flaws in her “new materialist” investments. She offers her work “not as a sealed theory,” but as a terrain “for other thinkers to do creative and politically generative work.”²

Frost’s important text is creative, profoundly suggestive, and painstakingly argued. It contributes to wave-patterns of experimentation that form amplificatory resonances with some of my own efforts. I begin by sketching aspects of her writing that I find most intriguing and then discuss some directions in my own work that are enlivened and informed by it, elaborating possible connections between her reflections on subatomic through intercellular fields, and mine on the intercorporeal sensual relations among organisms—particularly but not only those between humans and nonhumans. My aim here is to read the human sensual field, or the human “clearing,” as trafficking and teaming with the affective energies and perceptual fields of myriad other beings. Insofar as the world-disclosive possibilities of humans are thus co-constituted in these inter- and trans-species biocultural fields, the characteristics, modes and limits of political life to which we find ourselves called may shift quite significantly. We may tend toward possibilities beyond those insistently centered around human freedom as a form of exceptional mastery, or as singularly human individual or collective autonomy, or even as exclusively constituted by human-to-human communicative relationships. We might cast our efforts toward exploring political visions, quotidian practices, and legal-institutional arrangements that foster *receptive agency* with and amongst nonhuman

beings as integral to our freedom, ecological care and co-flourishing in a time of catastrophe—integral to any forms of human distinctiveness worthy of our affirmation.

* * *

Central to Frost's argument in *Biocultural Creatures* is that what we take to be matter-in-general is better conceived of as energy that enters myriad patterns of constraint and interrelationship that generate substances with very different qualities and capacities. In relationship with positively charged protons in the nucleus of an atom, shifting flows of negatively charged energy we call electrons form multiple and mutually repellant orbits. These form distinctive atomic resonances and configurations with differential capacities to hold together and pull apart, varying degrees of stability, and diverse potentials for shifting and sharing electrons with other negatively charged flows to generate combinatory bonds and molecular configurations with their own distinctive resonances and qualities. Vibrant energy generates the vibrancy of matter.

In this context, carbon atoms are particularly well-suited for the materiality of living beings because their small nuclei are stable in ways that make repetitious chemical reactions possible, while the atom is simultaneously flexible in relation to which elements it bonds with and how. This combination of constraint and potential allows carbon to proliferate manifold molecular formations and transformations that, along with the "gappiness" within and among atoms and molecules, are indispensable both to the porosity of cellular membranes and "developmental plasticity" of living beings.

Cellular membranes are sometimes misconstrued as primarily protective borders that seal off the distinct substance inside the cell. Frost shows that they are better conceived of as highly (if selectively) permeable layers, both because of the energetic character of their molecular composition and because they form "innumerable channels, gates, and pores that facilitate and force continual traffic of molecules in and out of cells."³ Membranes enable specific processes in cells by continually generating and harnessing chemical and energetic imbalances that "create the conditions for the movement, flow, or dispersion of molecules and their transformation from one kind into another." This porosity and activity, in turn, not only allows cells to "persist in their activities but also to respond to and to perceive their environments."⁴ In short, subatomic flows and relationships of energy enable and are used by living forms in ways that generate emergent energetic relationships, characteristics, and capacities such as bewilderingly complex forms of perception and modulating capacities for responsiveness and active engagement.

This is particularly striking in Frost's account of chains of nerve cells, where we witness interactive cellular processes responding dynamically to shifting concentrations of sodium and potassium ions generated by nearby cells. As a nerve cell senses and absorbs these shifting concentrations, the associated electrical gradients interact with opening and closing sodium-potassium gates, moving along the cell membrane until the gradient and associated ions provoke the perception, response, and engagement of the next cell in the chain in a "cascade of depolarization and repolarization" that flows like the energy in the wave of fans crowded around the game in a stadium—or the human exception. These intra- and inter-cellular transmissions generate emergent patterns of relationship that "enable a multicellular organism to absorb and respond to the world *as an organism*," as light, sound waves, chemicals, external surfaces and shifts within trigger these cascades and myriad associated processes of organism-scale perception, response, and engagement—including unconscious and conscious processes of bodily modulation through which life-forms survive and thrive in response to their habitats.⁵

All of this, along with the structure, function, and character of organisms, has long been understood to be unilaterally determined by DNA. Within this frame, these "Uberbiological" germ cells are sealed off by protective membranes from biocultural impacts and undergo lasting significant changes only when random mutations happen to generate comparatively favorable outcomes in a given environment. Yet, informed by recent research, Frost shows how genes are biocultural processes in multiple senses: The permeable membranes that surround genes facilitate massive molecular influx and efflux in processes that are responsive to changes in habitat and alter chemical concentrations, mixes and reactions in ways that make particular replications, developments and uses of genes more or less likely. Significantly, these processes are altered by chemicals that the body produces in relation to an organism's perceptual, affective, socially anticipatory, and physically stressful responses to the world, as well as by those chemicals that are absorbed from outside the body. All of this impacts how the 98% of DNA that was previously thought to be useless "junk" actually regulates and can markedly alter DNA sequencing and therefore how the vital codes of the 2% are used in ways that change the genetic "recipe." This may even include implanting spliced DNA from other organisms. Remarkably, methyl groups associated with some epigenetic molecules have chemical characteristics that may fundamentally alter the basic genetic "recipe" in DNA molecules when they are persistently attached to DNA across multiple generations. All of this suggests a picture in which significant changes may occur within species—and new species may even emerge—through responsive biocultural processes

in which organisms alter their offspring in ways that make them better prepared to respond to and survive in a given environment.

Frost argues, that as “responses-in-progress,” each organism “carries response-traces of the many habitats its progenitors have engaged.”⁶ In this sense, “biocultural creatures are anticipatory forms whose creative responses to the provocations of habitat draw on a rich and deep histories-of-responses.”⁷ With this gestalt shift toward bodies continuously embedded in energetic gradients and molecular flows with their environments, Frost hopes to contribute to an imaginary that erodes the energies that propel the wave of human separateness and exceptionalism. Energetic “gappiness” supplants the exceptionalist gap. Human beings manifest their own distinctions, but these must be reinterpreted as activities-sustained-in-relationship-and-exchange-all-the-way-through.

Presumably, we will have to rethink our agency, flourishing, ethics, and politics in ways that register the profundity of this co-constitutive relationality, so that we might better take account of how the habitats we construct and destroy simultaneously compose, decompose, and recompose the limits and capacities, responsiveness and insensibilities, suffering and thriving of our bodies—and those of others.

* * *

In *The Faraway Nearby*, Rebecca Solnit writes: “Where does a story begin? The fiction is that they do, and end, rather than that the stuff of story is just a cup of water scooped from the sea and poured back into it . . .”⁸ Frost’s story is one of myriad emergent and layered processes of scooping up and pouring back in relation to a biocultural sea swirling with relational energies and resonant wave patterns. Animated by these as I scoop from *Biocultural Creatures*, I am interested in exploring further possibilities of emergent responsive resonance—especially those among the bodies of different species—in an effort to pour another cup into this sea.

Frost’s understands the “it-ness” of an organism—that which is irreducible to the effects of its environment—to be rooted in the historically sedimented noncontemporaneity of its response capacities. Yet I think that this understanding of organismic distinctiveness must to be supplemented with one that has a more potent futural index. We might begin to think in that direction by considering systems theorist, John Holland’s observations that as new capacities for responsiveness emerge, “the possibilities for emergence [themselves] increase rapidly, as the flexibility of the interactions increases” (my emphasis).⁹ I suggest below, that this amplification of powers for responsive emergence is integral to the irreducibility of organisms and is perhaps drawn forth

by an evolutionary curvature we might call “symbiotic selection.” Integral to enriched capacities for receptive agency are immanent (if always partial) experiences of the receptivity of other bodies, including those of other species. I think this is one of the pivotal insights to be gleaned from biocultural theories of inter-organism responsive novelty and it harbors important ethical-political implications that are consonant with Frost’s work, yet undeveloped there.

Mirror neurons are one vital way that intercorporeal receptivity has been explored in recent neuroscience research, and they were discovered in relation to inter-species resonance between a macaque monkey and a human in the laboratory of Vittorio Gallese, a neuroscientist deeply influenced by Maurice Merleau-Ponty.¹⁰ One day, as Gallese reached for something during a break in his research on a brain-wired monkey, he perceived his computer unexpectedly register monkey-brain grasping activity even though the monkey was entirely still. In a seemingly impossible transbeing neurological event, the monkey’s neurological activity triggered an expansive field of research devoted to mirror neurons, which activate in small fractions of a second in relation to the movements of those we watch. It turns out that these intercorporeal modes of receptivity co-constitute our perception, in ways that have led Gallese to theorize our elemental sensual fields as a “shared manifold” – rather than a manifold stemming from a single body.¹¹ Moreover, this manifold is profoundly biocultural insofar as our experiential capacities are cultivated, or not, through the practices we experience or engage. Because I never watched or played baseball as a kid, I not only don’t understand it, I actually don’t *see* much of what is happening in front of me, in comparison to those whose lives are more entangled with the game. My neurological patterns are quiescent, as the light waves pass into a brain lacking the mirror neurological developments that would have likely occurred had I either played or watched the game regularly. This means that our neurological systems develop in the resonant assemblages of acting, sensing, moving, aspiring bodies with which we are associated. The research on precisely how this happens is not very far along. Yet Frost’s account is suggestive of how it might unfold. In a manner analogous to how an organism’s perceptions, affects, and anticipations impact intra-cellular chemical compositions and activities that, in turn, impact the whole organism and its offspring, one might investigate how resonances, energy gradients and elemental flows at atomic, molecular, cellular, and intercellular levels are dynamically entangled with intercorporeal processes that are both made possible by them and manifest strikingly new patterns and powers that act back upon them.

Though these intercorporeal neurological processes were first discovered in *inter-species* resonances constituting a partially shared manifold between a macaque monkey and a human, the anthropocen-

tric wave remains pervasive and most of the work on mirror neurons has focused on humans. Yet it is highly probable that there are similar or analogous intra- and inter-species processes at play—however different or asymmetrical they may be across diverse species, modes of activity, and registers of receptivity. Leading animal biologist Marc Beckoff and critical science scholar Donna Haraway, for example, have presented highly suggestive evidence of the shared affective-perceptual manifold in the playful interactions amongst members of canine species, resonant disclosive relationships between (especially domesticated) canines and humans, as well as what appear to be powerful perceptual-interpretive fields between some predators and some prey.¹² Stretching our curiosity about intercorporeal perceptual-energetic-fields and communications dramatically further—toward inter-species relationships that cross kingdoms and do not involve central nervous systems—are the chemical flows and one-third of an inch per second electrical impulses that have recently been found to move from tree roots through fungal networks to the roots of other trees—and facilitate bewildering forms of cooperation and (re)distribution in forests.¹³ Life seems everywhere to be teeming with myriad modes of bio-cultural receptivity, responsiveness and engagement.

While many indigenous peoples have rich traditions of knowledge in relation to these immanent inter-species receptive entanglements, the biological sciences are largely new to such inquiry. One who arrived early to the scene was Swiss zoologist and theoretical biologist Adolf Portmann. Portmann's work on the receptive-expressive relationships that are integral to highly sentient animal life forms significantly informed the philosophical reflections of Maurice Merleau-Ponty and Hannah Arendt, and is illuminating for our present inquiry.

Focusing primarily on the visual register, Portmann investigated a remarkable array of animals whose living bodies he thought of as spectacular "optical devices" that integrate elements of shape, pattern, nervous system, and behavior to generate profoundly expressive "organic forms" immanently oriented toward the perceptual fields of other living beings who sense them (think, for example of a frog or birds, whose fleshy or feathery patterns only appear when the animals sit or flutter in particular ways). Depending upon animal and context, such expressiveness may be oriented directly outward toward other beings (to allure, disguise, dazzle, delight), or it may pass through inward conditions to manifest changes of sense, affect, vitality, mood, intention with the beings who perceive it.

These immanent relationships hinge upon dense intertwinements of expressive and receptive capacities among beings within a species or of different species. Portmann was particularly interested in how these sometimes undergo reciprocally amplifying dynamics. In the present context, among the most fascinating are those morphological

developments that both draw others' perception toward—and heighten—the expressivity of the areas around the sense organs and focal points of intentionality, such as the head. These developments, he argued, increased circuits of receptivity, interest, and desire amongst animals, at the same time they intensified expressive capacities. These “amplified structures” of expressive appearance necessarily involved new modes of integrating the complexity of the whole body and “must be incorporated by means of nervous connections into the chemical mechanism resulting from the action of the glands of nervous secretion.”¹⁴ In turn, these bodily “transmitters” must be newly “tuned-in to a very special receiving set” (or several) because “above all a system must be built up in the inner psychological world of the animal... which is ready to ‘read’, and therefore to understand immediately any manifestations.”¹⁵

Such reciprocally heightened capacities for expressivity and receptivity enable “mutual expression of moods so that the being together is raised to a richer relationship, to a true meeting of independent creatures.”¹⁶ Portmann is careful, however, to resist interpretations that would reduce this intensifying vitality of social life to the biological nervous and sensory systems that are integral to its possibilities, for social relationships are immanent in and constituent parts of this biological evolution.

As the dynamics between expressivity and receptivity intensify, the richness of intercorporeal social relationships (both within and, differently, across species) grows to the point that “the most outstanding organic forms” are “endowed with the ability to break the ban of isolation so as to possess that common life which rests on a rich inwardness and on preformed organs of mutual recognition.”¹⁷ This enables beings “to find each other” in deeper and deeper registers; not simply to know and coordinate their spatial and temporal locations, but to experience qualities and intensities of affect and experience in myriad others. In this way, beings are awash not merely with the manifestations of others but elements of their depth, as their affective and experiential fields participate in the very emergence and character of the sensual fields we humans, for example, call our own. In these ways, many beings that are, in Frost’s terms, “rich and deep histories-of-responses,” are further enriched through modes of immanent receptivity (however partial) and co-constitutive disclosive relations with other organisms’ “rich and deep histories-of-responses.”

In the last several years of his life, Merleau-Ponty’s was profoundly influenced by Portmann’s work. For Merleau-Ponty, “the body as the power of *Einfühlung*” [empathy, sensitivity, perceptive understanding] “is already desire, libido, projection-introjection, identification” — in a mimetic rather than logical sense.¹⁸ In this way, “the world and others become our flesh” and we theirs, in varying degrees of co-affective and

co-experiential “lateral union of animality and humanity” that is our “Ineinander [in each other] with Sensible Being and with other corporeities”.¹⁹ For Merleau-Ponty, this suggests that as we open onto the world through what we might call a *distributed and dispersed clearing* that is opened *as* sensed through irreducibly different locations and life-modes. We enter into a “fantastic polymorphism” of and amongst sensual-desiring-behavioral beings, each enveloping, penetrating, resonating, and washing through the others (in different ways and to different degrees) with the receptive novelty of their *Umwelten*.²⁰ Merleau-Ponty theorizes the ineliminable depths, ambiguities, and play of concealments that are continually at work in human-human relations of intercorporeality, and he is well-aware of the extent to which inter-species intercorporeality poses even more difficult challenges and lacks some of the resources, such as shared language, that may help us address human challenges. Nevertheless, he argued that we share a “strange kinship” with other life forms insofar as resonances of affect, vivacious intensities, motility and partial affinities of sense slip into our affective and experiential fields to generate a kind of “co-perception.”²¹

What sense might we make of this polymorphous intertwining? All present responses will be infused with high levels of speculation—wagers that guide how we scoop and pour. This is so especially because much scientific research has been animated not only by the anthropocentric wave, but by related atomistic and reductionist speculative tendencies. Research oriented toward biocultural horizons has a lot of catching up to do. As Lynn Margulis was among the most provocative scientists exploring profoundly relational understandings of life, biocultural research today stands to learn much from her work.

Margulis focuses upon the sublime creativity of microbial cellular evolution—particularly the genesis of eukaryotes (cells with nuclei), as well as non-nuclei membrane-based organelles—during the many hundreds of millions of years prior to the emergence of fungi, plants, and animals. On her reading, the overwhelming majority of the most pivotal evolutionary leaps have not happened (and likely will not happen) as a result of genetic variation based on sexual difference and natural selection. Though these are significant, Margulis and other evolutionary biologists have questioned whether the still-typically-modest variations associated with sexual reproduction are sufficient to generate the evolutionary leaps that are now widely thought to have occurred in light of the “punctuated equilibrium” evolutionary paradigm that Stephen Jay Gould developed after his encounter with a fossil record indicating long periods of relatively stable life forms, interrupted by comparatively short periods in which tremendous evolution appears to have happened across myriad life forms.²² The epigenetic line of enquiry that Frost recounts may provide one potentially fruitful

response to this problem. Margulis's work on symbiogenesis moves in a different direction than Frost's epigenetic line of inquiry, but there may be synergies between the two.

Symbiogenesis is the emergence of long-term or effectively permanent (in some cases, billions of years) joining of different beings into a new organism—or organ, tissue, etc.—that is typically radically different than either of its constituents in isolation. Consider Margulis' account of the emergence of eukaryotic cells from the far simpler bacteria that were once the only form of life on earth. Because bacteria have “neither immune systems nor rigid exterior barriers,” when stressed and hungry (and sometimes when not), they seek through various modes of assimilation and infiltration to eat each other.²³ Yet in innumerable cases these efforts failed: Some bacteria “engulfed, ingested, but failed to digest” the others, in a kind of “abortive cannibalism,” an “indigestion” in which different bacteria established an “uneasy alliance of distinct life-forms” through which long-term symbiotic relationships originated.²⁴ This “coming together... merging of cells of different histories and abilities” formed new organisms—cells with nuclei and organelles, cells with mobile tails, and mixings of genetic materials in addition to these structural-functional developments.²⁵ From these evolutionary developments, Margulis argues, new symbiotic relations were likely primarily responsible for the emergence not only of protozoa, but also fungi, plants, and animals, as well as all sorts of endosymbiotic (and exosymbiotic) relationships between each of these groupings that produced photosynthetic worms, lichen, terraforming mycorrhizae that enabled “animated water” to emerge from the sea, and countless other formations.²⁶

These examples and more suggest to Margulis that symbiogenesis is “crucial to an understanding of evolutionary novelty and the origin of species”, and “a far more splendid generator of evolutionary novelty” than sexual fusion.²⁷ Like all life, she writes, we humans are not in largest part the result of mere natural and sexual selection, but rather of “*thousands of millions of years of interaction among highly responsive microbes*” (my emphasis) that learned how to flourish through new modes of co-existence and merging instead of reducing each other to food and excrement.²⁸ Such symbiotic responsiveness has developed macro formations of a planetary scale through the relationships among countless species and things that generate self-regulating system dynamics with significant resilience.

If the receptivity of such “highly responsive microbes” is indeed vital to processes of creative symbiosis that are, in turn, the most (or at least *a*) salient mode of evolutionary novelty, then I suggest that it may not be a wild leap to theorize something like “*symbiotic selection*” (my concept, not Margulis') in relation to such receptivity. By symbiotic selection I refer to a process that favors the emergence, articulation

and amplification of receptive capacities of two different kinds. One would be very specific forms of responsiveness in relation to those entities, energies, beings, relationships and patterns that enable *extant* processes of symbiosis conducive to survival and flourishing in the context of a given habitat. The other type of receptive capacities that would be favored would be those with more dynamic, plastic and open-ended powers for responsively perceiving and engaging the world in new ways that tend to contribute to *emergent* symbiotic possibilities. Organisms (or organs, cells, proteins, etc.) that manifest such apparently extravagant receptive capacities would, over time, have greater probabilities of co-generating symbiotic novelties that, in turn, tend to enhance longer-term survival and flourishing. Such receptivity and responsiveness would be extravagant in relation to extant symbiotic processes, but not in relation to a species' long-term prospects for generating emergent symbiotic relationships, which would be highly beneficial in terms of evolutionary potential— if the broad contours of Margulis' evolutionary theory are correct.

If we bring this idea of extravagant receptivity together with Frost's discussion of responsive epigenetics, a multi-layered dynamic picture of intensified symbiotic potentials is imaginable in which responsive epigenetic processes work in relation with organism-level responsiveness. Micro-responsive processes that favor the emergence and resilience of macro-responsive processes would be evolutionarily favored by the enhanced likelihood of survival and flourishing of the organisms whose responsiveness is both indebted to them and forms emergent relationships that, in turn, newly impact them. These multi-layered symbiotic relationships might themselves, on this scenario, enhance extravagant receptivity and potentials for symbiotic novelty—potentials that begin and are intertwined, as Frost shows, with the "gappiness" and traffic of atoms, molecules and cell membranes.

* * *

I am aware of the highly speculative character of what I have just written, especially because I am drawing on the work of a controversial evolutionary biologist, and I am not trained as one. These thoughts are "not '[quite] what I think', but... what I wonder whether one couldn't think."²⁹ Nevertheless, I would like to suggest a couple of broad ethical-political implications that seem to emerge from this set of biocultural reflections.

As a descriptive or diagnostic term, the Anthropocene is a poor choice for many reasons that are becoming commonplace among critical theorists. Yet as a *prophetic* term that calls the *anthropos* toward newness (*cene*, from *kainos*) it may be resonant in the face of looming

ecological collapse. Beyond the automatic gestures of the “anthropological machine,” these reflections tend toward a conception of the birth of the new through receptive agency and symbiotic becoming. By this I mean that our capacity to resist wholesale destruction and do a new thing hinges upon cultivating a responsive freedom that springs from and cares for the inter-species character of the experiential fields through which the world is primordially disclosed — even as this is easily eclipsed. This means more than just caring for the ecological conditions of life. It is a somewhat paradoxical call to *care for the “fantastic polymorphism” of entangled receptivities as the very condition of cultivating any sense at all of what it might mean to care well for beings and the planet* — learning *with* the others, engendering our difficult freedoms *with* them, though the associated ambiguities and dangers are inextinguishable. The discussion above suggests that this is a biocultural endeavor through which we may over time amplify our corporeal capacities to receptively engage in symbiotic emergence in ways that are epigenetic, intra- and inter-cellular, at the same time as they are cultural. In such decentered processes of overcoming we might, against the odds, midwife beings energized by higher possibilities than those repeatedly tossed up by the anthropocentric wave.

Relatedly, receptive agency in relation to the nonhuman world pulls us away from an understanding of the political as an exclusively human activity, even though our political engagement and responsibilities as animals with highly refined linguistic capacities remains distinctive. We are called to cultivate political practices and institutions that seek to include, engage and be transformed by other beings on this planet, who are integral partners in discerning and co-creating the commons. This in turn requires that we listen to and learn with those among us who have been living more carefully with the land — many of whom have been subject to the unending horrors of the Anthropocentric machine. Biocultural political movements toward receptive ecological symbiosis are thus entangled with biocultures of radical democracy.³⁰

Notes

1. Giorgio Agamben, *The Open: Man and Animal*, trans., K. Attell (Stanford: Stanford University Press, 2003) and Samantha Frost, *Biocultural Creatures: Toward a New Theory of the Human* (Durham: Duke University Press, 2016), 7–8.
2. Frost, *Biocultural Creatures*, 147 and 29.
3. *Ibid.*, 54.
4. *Ibid.*, 55.
5. *Ibid.*, 70.
6. *Ibid.*, 135.
7. *Ibid.*, 150.
8. Rebecca Solnit, *The Faraway Nearby* (New York: Penguin Books, 2014), 27.

9. John H. Holland, *Emergence: From Chaos to Order* (Boston: Addison-Wesley, 1998), 5.
10. The brief overview of mirror neuron research here draws on my extensive engagement with the neuroscience research in *Visionary Pragmatism: Radical and Ecological Democracy in Neoliberal Times* (Durham: Duke University Press, 2016): 31–71.
11. Vittorio Gallese, “The ‘Shared Manifold’ Hypothesis: From Mirror Neurons to Empathy,” *Journal of Consciousness Studies* 8, no. 5–7 (May 2001): 33–50.
12. See, for example, Marc Beckoff, *The Emotional Lives of Animals: A Leading Scientist Explores Animal Joy, Sorrow and Empathy – and Why They Matter* (Novato: New World Library, 2007) and Donna Haraway, *When Species Meet* (Minneapolis: University of Minnesota Press, 2007).
13. Peter Wohlleben, *The Hidden Life of Trees: What they Feel, How they Communicate, Discoveries from a Secret World*, trans. J. Billinghamurst (Berkeley: Greystone Books, 2016).
14. Adolf Portmann, *Animal Forms and Patterns: A Study of the Appearances of Animals*, trans. H Czech (New York: Schocken Books, 1967), 185.
15. *Ibid.*, 185 and 112.
16. *Ibid.*, 183.
17. *Ibid.*, 196.
18. *Nature: Course Notes from the College de France*, trans. R. Vallier (Evanston: Northwestern University Press, 2003), 210.
19. *Ibid.*, 282 and 271.
20. *Ibid.*, 282.
21. *Ibid.*, 225.
22. *Wonderful Life: The Burgess Shale and the Nature of History* (New York, NY: W.W. Norton and Company, 1990).
23. Lynn Margulis, *Symbiotic Planet: A New Look at Evolution* (Amherst: Basic Books, 1990), 64.
24. *Ibid.*, 37, 89, and 20.
25. *Ibid.*, 32.
26. Lynn Margulis and Dorian Sagan write: “The creative force of symbiosis produced eukaryotic cells from bacteria. Hence all larger organisms – prokaryotes, fungi, animals, and plants – originated symbiotically. But creation of novelty by symbiosis did not end with the evolution of the earliest nucleated cells. Symbiosis still is everywhere.” In, *Acquiring Genomes: A Theory of the Origins of Species* (New York: Basic Books, 2002): 55–56.
27. Margulis, *Symbiotic Planet*, 6 and 89.
28. *Ibid.*, 4.
29. Michel Foucault, 1980, “Power and Strategies” in *Power-Knowledge* (New York: Pantheon, 1980), 145.
30. I explore these themes in relation to mirror neurons, sustainable materialist circulations, complex systems dynamics, and political energetics in *Visionary Pragmatism*.