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Heather I. Sullivan

Trinity University, [hsulliva@trinity.edu](mailto:hsulliva@trinity.edu)

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## Agency in the Anthropocene: Goethe, Radical Reality, and the New Materialisms

*Heather I. Sullivan*

Abstract: Our current era has been termed the Age of the “Anthropocene,” or the human-inflected geological era. This essay addresses the implications of human impact on the Earth as a form of “radical reality” by addressing the broad spectrum of human and non-human agency. The analysis follows a three-step process: it begins with an introduction to the new materialisms and distributed agency in contrast to Howard Tuttle’s notion of “radical reality” based on human consciousness. It then explores the agency of nature’s “vibrancy” in the debate occurring early in the Anthropocene (during Goethe’s lifetime) between “vitalism” and “mechanism.” Finally, I use this context to explore Goethe’s optics as a view that, like the new materialisms, is grounded in the interactivity of human and non-human energies. I juxtapose Tuttle’s notion of radical reality with the new materialisms via Goethe in order to explore the broader implications of human and non-human agency in the age of the Anthropocene. Goethe offers convenient access into the Anthropocene with surprisingly prescient insights into what we now see as ecological enmeshments within nature’s systems.

We are in the Age of the Anthropocene, or the human-inflected geological era, as the Nobel Laureate in atmospheric chemistry, Paul Crutzen, announced in 2000.<sup>1</sup> Since then, many scholars have adopted the term to describe the scientifically traceable impact of human activity across the entire planet since the Industrial Revolution. With such wide-spread traces and changes attributable to human beings, our actions loom ever larger and our agency to guide our future seems ever more profound. Debates rage concerning whether we should engineer the globe intentionally to counter the damage, or to try to work within the parameters in which we have evolved along with our co-species and thus limit our impact. The sway of human activity on reality seems ever more radical. Yet, at the same time, thinking “globally” means that our actual individual agency appears diminished, particularly when compared to traditionally humanist assumptions of a self-determining rational individual. Hence we face the complex dilemma of navigating between the vast collective impact of human beings as a species on the surface of the earth and climate and an acknowledgement of our limited individual agency in the scale of these circumstances.

In addressing this striking disparity of scale in the context of our ecological enmeshment, I consider our agency as a “distributed” force; that is, it

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<sup>1</sup> Cf. Rob Nixon, *Slow Violence and the Environmentalism of the Poor* (Cambridge: Harvard UP, 2011).

not so much driven by singular individuals making well-considered choices, but rather by a plurality of interactions and impulses from very large groups and a multitude of discourses, other beings of all kinds and on many scales, and, also, by our physical and cultural environments. Indeed, “matter” itself has an “agentic capacity” that influences our daily choices. We exist within the movements and meshes of living and non-living energies, from viruses and bacteria to weather and economics, even while our talents for technology and cultural constructions have shifted the planet’s flows and climate. Agency in the age of the Anthropocene is complex and kaleidoscopic, distributed and global. This understanding of agency is one of the framing theses of the “new materialisms” for which reality emerges from the combined energies of vibrant matter (from quantum level to the cosmic), bodies, things, and cultural discourses.

To carry out this study, I examine the works of an author writing at the Anthropocene’s dawn, one who expresses the shifting views on the body-mind-environment interface at the time when the radical planetary changes that we are now experiencing broadly were beginning to gain velocity: Johann Wolfgang von Goethe (1749-1832). Goethe, in fact, spoke of modernity’s increasing speed as “veloziferisch,” or devilishly fast. He is also acclaimed as the exemplary author of the modern, self-determining subject who creates his own destiny. From *Werther* to *Faust*, his literary figures stride through history and their eponymous texts creating worlds and their futures. Or at least that is the standard account of Goethe as major German author and shaper of cosmopolitan European modernity. In contrast to that view, I suggest that Goethe’s vision – as we note when viewing both his science and literature together – documents figures who may *believe* that they choose their own fates yet actually *engage in reciprocally determining exchanges* with their companions and their physical surroundings in a manner best described as distributed agency. In other words, Goethe presents human reality as an enmeshment within historical culture, local communities, global interactions, and, not to be forgotten, multiple scales of natural forces. Discussing how these entanglements among culture, physical nature, and intellectual world-building interact as part of human “reality” presents a challenge for studies of the environment and the human being alike.

In this essay, I address the question of the “physically” radical reality of the age of the Anthropocene as documented in the new materialisms, and compare it to the “mentally” radical reality of human consciousness proposed by Howard Tuttle and explored in this volume.<sup>2</sup> Tuttle writes that the composition of reality is inevitably altered by the presence of our conscious-

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<sup>2</sup> Howard Tuttle, *Human Life is Radical Reality: An Idea Developed from the Conceptions of Dilthey, Heidegger, and Ortega y Gasset* (New York: Lang, 2005).

ness perceiving and shaping itself and its surroundings. I juxtapose these types of radical reality through the lens of agency: who and what has it, how or if it can be directed, and what agency in the age of the Anthropocene means for humanity's "radical reality." In his *Human Life is Radical Reality*, Tuttle explores how reality and the very matrix of our existence is impacted by human consciousness. As human subjects, we are always (only) within the range of our consciousness, though we extend our "reality" outwards, and so shape ever more of our environment accordingly. Tuttle declares radical reality to be the idea that in order for something to be real for human beings,

it must somehow appear with and be kept in view of at least one human life. Ortega's claim that it is the destiny of human beings to 'humanize the world' is neither an anti-environmental notion nor an anthropocentric one. Human beings cannot avoid understanding circumstances in terms of the nature and understanding they actually possess. Even the idea of a non-anthropomorphic environmentalism is in fact a humanization of circumstances by human life itself. We cannot avoid imparting meanings and values that are not human meanings and values. (Tuttle, p.178)

Tuttle labels our perspective as inevitably human, in that we can see the world only through our own eyes and cultural systems. It is not just our frame that is altered in the contact, but reality itself is shaped in both directions by our "humanizing."

Tuttle's concrete assessment of human reality as being human shares with mechanistic views a belief that we human beings can escape our frame – bodily, material, ecological – and "transcend." Tuttle's radical reality is the human ability to have a "voluntary, transcending construction" that is different from our "biological nature" (Tuttle, p.141). Tuttle thus maintains the difference between human reality and the rest of physical reality:

The issue here is the distinction between our life as a voluntary, transcending construction, as radical reality, and our life as our biological nature. Our historical and fabricated being and our biological being are not identical. Our self-transcending and historical being is a denaturalized existence which cannot be discerned by exclusive reference to our anatomy, sensations, or physiology [...]. While our biological existence, of course, is a necessary condition of our life as embodied, it is not a sufficient condition to explain our life as radical reality, and it is not anything radically real. Our human being is both natural and extra-natural; we are thus 'ontological centaurs.' Our body, of a given and fixed nature, does its work automatically, through biological laws of growth and decay, but our extra-natural life as radical reality is not given ready-made or realized according to laws; it is achieved in historical time, an existence which accumulates and fabricates itself toward its own future. (Tuttle, p.141)

Tuttle maintains a line between our “biological existence” and our “self-transcending being,” something I question through both Goethe and the new materialists. Certainly, our reality is “achieved in historical time, an existence which accumulates and fabricates itself toward its own future,” yet unlike Tuttle, I follow the new materialist’s assertion that this type of existence is pervasive in matter’s widespread creative forces in many forms (Tuttle, p.141). In fact, there is increasing evidence that “reality” is more a cacophonous and creative symphony of co-emergence including the tones from both mind and matter. As John McCarthy writes in his 2006 discussion of Goethe and complexity theory in *Remapping Reality: Chaos and Creativity in Science and Literature (Goethe-Nietzsche-Grass)*: “Perhaps the creative act alone is real. Perhaps all principles of reality are ultimately derivative of the one principle of creative convergence and divergence of inner and outer spaces, of matter and mind.”<sup>3</sup>

It is significant, therefore, that Tuttle prevaricates most promisingly, despite generally maintaining the problematic dichotomy of “human biology” versus “transcendent ability,” when he emphasizes the requirement of “relations” that allow the existence of the two things related: significantly, there is therefore no “I,” or human subject, *without its world*. We may see the world through human eyes and exist in a “human reality” which is like no other reality, yet this does not happen in a vacuum; the two are fully interdependent. Tuttle claims:

Human life remains inseparable from its confrontation with a world which exists as something serviceable for the mediation of what hinders or advances it. Neither the ‘I’ nor its circumstances can be authentically understood as independent ‘things in themselves’ which are each independent of the others. [...] *(I)be ‘I’ and its circumstances are always bonded together in a dialectical bipolar relation*. This polarity is neither the pure ‘outside world’ of realism nor the pure ‘inside world’ of idealism. (Tuttle, pp.47-48, emphasis mine)

For Tuttle, experience is always a polarity of things and viewers. His polarized view is, however, one based on a contrast between “human life” and the world “as something serviceable” for it. This tension remains. He nevertheless emphasizes a bipolar relationship between the individual and its “circumstances” that each depends on the other. With the emphasis on the bipolar tension, Tuttle provides fertile ground for our study of the new materialisms and questions of agency and the environment in the Anthropocene.

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<sup>3</sup> John A. McCarthy, *Remapping Reality: Chaos and Creativity in Science and Literature (Goethe-Nietzsche-Grass)* (Amsterdam: Rodopi, 2006), p.70.

In addressing agency and our physical and mental enmeshment the scopes of “reality,” this paper follows a three-step process: it begins with an introduction to the new materialisms and distributed agency. I then briefly explore the agency of nature’s “vibrancy” in the debate occurring early in the Anthropocene (the age of Goethe is the dawn of this era) between “vitalism” and “mechanism” in terms of Tuttle’s notion of radical reality. Finally, I use this context to explore Goethe’s optics as a view that, like the new materialisms, is grounded in the interactivity of human and non-human energies. In sum, I juxtapose the notion of radical reality with the new materialisms via Goethe in order to explore the broader implications of human and non-human agency in the age of the Anthropocene.

The “new materialisms” emerge from a wide range of scientific work, the social sciences, and the humanities. Unlike traditional Marxist materialism that emphasizes economic production as part of a (seemingly inevitable) teleological development into rather utopian social systems, the new materialisms concentrate on the interrelationships of human beings, bodies, and cultures in terms of patterns of matter and energy, autopoiesis, and complex systems including weather, the dissipative structures described by Ilya Prigogine, and all living beings (and economics, too). This view emphasizes above all the agentic capacities of matter in many forms and not just the human will. Agency in this context thus indicates the ability to impact and alter the surroundings, broadly speaking. Obviously, there is a wide spectrum of agentic capacity. The flows of matter and energy with such agentic capacity include the powerful weather patterns such as tornadoes and hurricanes, the bodily processes of all living things, and the long-term alterations to inorganic forms as well, including geological forces, the impact action of solar energy, and such effects as the fluctuations of electricity in the power grid. These all take on a “life of their own,” so to speak, that is outside our control. Major works in the new materialisms include Stacy Alaimo’s 2010 *Bodily Natures* and her 2008 jointly edited volume with Susan Hekman, *Material Feminisms*; Karen Barad’s 2010 *Meeting the Universe Halfway*; Jane Bennett’s 2010 *Vibrant Matter: A Political Ecology of Things*; Diana Coole’s and Samantha Frost’s 2010 volume, *New Materialisms: Ontology, Agency, and Politics*; Andrew Pickering’s 1995 *The Mangle of Practice: Time, Agency, & Science*; and Serenella Iovino’s and Serpil Oppermann’s literary studies in “material ecocriticism.”<sup>4</sup>

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<sup>4</sup> Stacy Alaimo, *Bodily Natures: Science, Environment, and the Material Self*. (Bloomington: Indiana UP, 2010), *Material Feminisms*, ed. by S. Alaimo and Susan Hekman (Bloomington: Indiana UP, 2008); Karen Barad, *Meeting the Universe Halfway: Quantum Physics and the Entanglement of Matter and Meaning* (Durham: Duke UP, 2007); Jane Bennett, *Vibrant Matter: A Political Ecology of Things* (Durham: Duke UP, 2010); *New Materialisms: Ontology, Agency, and Politics*, ed. by Diana Coole and Samantha Frost (Durham:

These works bridge the power of discourses and physical matter, thereby contextualizing human activity within broader cultural and natural forces.

The performative aspects of emerging reality are not limited to human linguistic capacity and our consciousness, since our bodily immersion and co-entanglements with light and the machinations of our intestinal bacteria, for example, are constant. It is not just discourses shaping our bodies and behaviors: the type of music playing in the background at the mall apparently impacts our shopping choices, the amount of daily sunlight can influence our moods, and, more ominously, the hormones introduced into our bodies from factory farming practices may be altering the early onset of puberty. The list of significant factors altering – literally – our bodies and minds grows ever larger in the Anthropocene’s industrial coating of anthropogenic matter across the globe. The impact of such medicinal and toxic elements is explored at great length in Alaimo’s *Bodily Natures*; in this essay I look primarily at the question of light as a part of our bodily environment. One cannot argue, after all, that we exist independently from light. We are products of solar energy, and it is an ecologically relevant exercise to consider the implications for our agency.

I cannot do full justice to the range of ideas from the new materialisms here; in brief, I concentrate on the questions of agency with an eye towards our participation in broader flows of energy and matter (the downgrading of human agency into contextualized interactions) juxtaposed with the immense impact of humanity during the age of the Anthropocene (upgrading our agency as a species). Barad gives us solid ground for thinking about matter’s agency: her research in quantum mechanics demonstrates concretely how matter is “agentive” and how the “linguistic turn” in scholarship has tended to neglect matter itself.<sup>5</sup> Building on the physics of Niels Bohr, Barad presents a “posthumanist performative” approach to “understanding technoscientific and other naturalcultural practices that specifically acknowledges and takes account of matter’s dynamism” (Barad, p.135). She works with optics – like Goethe, but in her case also with electrons and quantum particles. This leads her to see matter not as “reflective” (of a subject) but rather as “refractive” (dispersed with specific patterns) and agentic in its

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Duke UP, 2010); Andrew Pickering, *The Mangle of Practice: Time, Agency, & Science* (Chicago: U of Chicago P, 1995). See especially the literary application of the new materialisms as “material ecocriticism” by Serenella Iovino and Serpil Oppermann in their essay “Material Ecocriticism: Materiality, Agency, and Models of Narrativity,” in *Ecozon@*, 3.1 (2012), 75-91, and their volume on *Material Ecocriticism* (Bloomington: Indiana UP, 2014).

<sup>5</sup> Cf. especially her chapter on “Agential Realism: How Material-Discursive Practices Matter,” pp.132-185.

movements: “Matter is neither fixed and given nor the mere end result of different processes. Matter is produced and productive, generated and generative. Matter is agentive, not a fixed essence or property of things” (Barad, p.37). In fact, she writes that:

Matter’s dynamism is generative not merely in the sense of bringing new things into the world but in the sense of bringing forth new worlds, of engaging in an ongoing reconfiguring of the world. Bodies do not simply take their places in the world. They are not simply situated in, or located in, particular environments. Rather, “environments” and “bodies” are intra-actively co-constituted. (Barad, p.170)

In short, Barad presents what I consider an “ecological” view from quantum mechanics, one that puts human beings into matter’s mix of bodies and environments constantly reconfiguring each other at varying levels. According to Barad: “[T]he phenomena produced are not the consequences of human will or intentionality or the effects of the operations of Culture, Language, or Power. Humans do not merely assemble different apparatuses for satisfying particular knowledge projects; they themselves are part of the ongoing reconfiguring of the world” (Barad, p.171). This is one aspect of what the new materialisms, even the seemingly abstract studies in quantum mechanics, offer current ecocritical explorations of the human-environment interfaces: reconfigurations and diffraction are the patterns in which we exist and in which we shape our surroundings. In this context, the toxic wastes and disasters ensuing in the wake of our “reconfigurations” take on a life of their own. Radioactivity, for example, lives on past any master narratives we may tell (as Rob Nixon notes in *Slow Violence and the Environmentalism of the Poor*, depleted uranium used in many recent American munitions has a half-life of 4.51 billion years, thus at a scale that one might only label cosmic).<sup>6</sup>

Barad contextualizes our agency within scales such as the quantum that we are not typically used to seeing in environmental contexts. Bennett, on the other hand, works with more familiar scales of bodies and humanly visible objects, yet she similarly declares that agency is distributed. “Agency is,” she writes, “distributed across a mosaic” (Bennett, p.38). She also notes, however, that human agency is like a bicyclist “riding a bicycle on a gravel road. One can throw one’s weight this way or that, inflect the bike in one direction or toward one trajectory of motion. But the rider is but one actant operative in the moving whole” (Bennett, p.38).

Energies and vitalities are a “swarm,” or an assemblage, and not part of a binary of active subject working with passive matter. Bodies are therefore

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<sup>6</sup> Nixon, *Slow Violence* (2011), p.201.



imbricated in other systems of bodies and matter where they act alongside and with others: “bodies enhance their power *in or as a heterogeneous assemblage*” (Bennett, 23, original emphasis). One may perceive each bodily motion as an autonomous decision but that is more a willful overlooking of context than an accurate perception. Hence, even our most conscious actions are actually, in Bennett’s terms that are typical of the new materialisms, “distributed.” “What this suggests for the concept of *agency* is that the efficacy or effectivity to which that term has traditionally referred becomes distributed across an ontologically heterogeneous field, rather than being a capacity localized in a human body or in a collective produced (only) by human efforts” (Bennett, p.23). For Bennett, distributed agency is at a bodily level, such as the ingestion and digestion of food that our bodies actively consume thereby engaging the eaten and the eater in an “eating encounter” in which bodies are shown to be but temporary congealments of a materiality that is a process of becoming” (Bennett, p.49).

All living things from human beings to birds, animals, plants, and microbes are enmeshed within manifold processes and at multiples scales. Additionally relevant are the food substances inherent to life, solar energy, and the ever more omnipresent particles of industrial debris covering the planet since the explosion of the Anthropocene. These scales do not eradicate human agency but rather contextualize it within our own species and discourses as well as our relation to other species with whom we co-exist. In this sense, we are not quite ourselves but rather scales of collectivity coagulated into fleshy bodies. This materiality sounds alienating, but it elucidates a vision of “shared reality.” As Bennett writes:

Vital materiality better captures an “alien” quality of our own flesh, and in so doing reminds humans of the very *radical* character of the (fractious) kinship between the human and the nonhuman. My “own” body is material, and yet this vital materiality is not fully or exclusively human. My flesh is populated and constituted by different swarms of foreigners. The crook of my elbow, for example, is a “special ecosystem, a bountiful home to no fewer than six tribes of bacteria [...]” (Bennett, p.112, original emphasis)

“Radical reality” in Bennett’s terms is based on the “kinship between the human and nonhuman”; and indeed, it is that ecological context to which I compare Tuttle’s “radical reality” focusing instead on human consciousness. In short, thinking of the environment in terms of the new materialisms means finding new grounds on many different scales of our human-matter interface. These do not begin and end with the bodily boundaries, but rather our bodies are part of the co-emerging flows.

Such ideas about flow and distributed agency are not entirely new, of course, and one finds these concepts throughout Western culture and in many cultures across the globe. For this particular discussion of human and non-human, relevant background can be found the eighteenth- and nineteenth-century *Lebenskraft*-related debate between “vitalism,” as expounded upon by Paracelsus in the sixteenth century in which the four elements are themselves active agents, and the “mechanistic” explanations describing all non-human life as a machine as per Descartes and Newton. In terms of agency, this dichotomy was fierce: the vitalistic explanations suggested that a life force akin to a kind of wide-spread agency animated the world, whereas the mechanistic views described nature as “mere matter,” a machine moving unceasingly according to the laws of physics utterly devoid of agentic capacity.<sup>7</sup> In the mechanistic view, only human beings and the divine have agency, since our “soul” separates us from matter and links us to the divine. Interestingly, the scientific view drew an ultimate line between passive matter and the immaterial (human) soul and so maintained an ultimate distinction between human beings and the rest of the world, whereas vitalism more scientifically, at least in terms of contemporary quantum physics and ecology, included humanity in the mix of the vibrant material world.

In vitalism, our minds and bodies are more than simple vessels for our souls, though the explanations for matter’s energy were often fanciful or spiritually based. During the Age of Goethe, romantic “Naturphilosophie” sought various unifying principles for the life force, mind, soul, and even body, thereby bridging the two sides and revealing the faulty structure of the dichotomy.<sup>8</sup> Many of these discussions circled around the problem of agency; that is, the issue of how life shapes itself and acts on its own terms (or as mechanistic enactments of divine directive), and how this relates to human activities. As Andrew Cunningham and Nicholas Jardine write in the introduction to *Romanticism and the Sciences*, this “age of reflection” sought a self-understanding based on the “unity of spiritual process in nature and ourselves.”<sup>9</sup> The more scientific and mechanistic perspectives rejected vitalism’s holistic and spirit-based harmonies while also fueling a dualistic and seemingly paradoxical tendency to assert that our bodies are determined by mate-

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<sup>7</sup> Cf. Hartmut Böhme, *Natur und Subjekt* (Frankfurt am Main: Suhrkamp, 1988); Val Plumwood, *Environmental Culture: The Ecological Crisis of Reason*, (London: Routledge, 2006); and Carolyn Merchant, *The Death of Nature: Women, Ecology and the Scientific Revolution*, (New York: Harper Collins, 1989), esp. pp.117-126 and 235.

<sup>8</sup> Cf. Kate Rigby, *Topographies of the Sacred: The Poetics of Place in European Romanticism*, (Charlottesville: U of Virginia P, 2004).

<sup>9</sup> “Introduction: The Age of Reflection,” in *Romanticism and the Sciences*, ed. by Andrew Cunningham and Nicholas Jardine (Cambridge: Cambridge UP, 1990), pp.1-9 (p.3).

rial laws yet our souls are free. Thus, mechanistic thinkers claimed that there is an absolute difference between the human being as a soul-carrier or a rational mind, and all other materiality and living beings. In other words, the hard-edged scientific knowledge cemented an ultimate (and non-scientific) distinction between humanity and the rest of the organic world.

This mechanistic view is part of the traditional materialism that understood human beings in isolation from both our environment and our “companion species,” as Donna Haraway describes the species with which human beings co-evolved including our fellow animals, but also bacteria and plants, etc.<sup>10</sup> As we now realize with greater ecological knowledge, there are very troubling implications associated with the belief that human beings are radically separate from rest of the biosphere; indeed, the mechanistic model neglecting the ecological context of the human species is radically insufficient. Both Nixon in *Slow Violence and the Environmentalism of the Poor* and Thomas Heberlein in *Navigating Environmental Attitudes* have written poignantly about the disastrous social and environmental impact of practices that pretend humanity and ecology are two entirely separate categories.<sup>11</sup> Although the vitalist-mechanistic debates continue in various forms today, the blind spots of both views render the dichotomy ineffective for explaining human participation in Earth’s realities, particularly in terms of what we now know from such fields as ecological science, quantum mechanics, non-equilibrium thermodynamics, complexity theory, animal studies, and all of these in relationship to artistic creativity. One might more productively think non-dualistically about creativity, mind, matter and reality. As McCarthy writes:

Once we begin to distance ourselves from the binary mode and think complementarily – even holistically – we begin to notice linkages previously unsuspected. We also come to appreciate the fact that nonlinearity is actually the rule in the real world, whether in cloud formations, gypsy moth populations, particle physics, our heart rhythms and brain waves – or in enduring works of art. (McCarthy, p.271)

In other words, creativity appears to be a shared capacity of bodies, clouds, and our minds. In the rest of the essay, I work through the implications of interwoven agencies for the radical reality of our consciousness in conjunction with the autopoietic creativity and vibrant “becoming” of the physical, ecological, reality of planet Earth through Goethe’s optical lens.

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<sup>10</sup> Cf. Donna Haraway, *The Companion Species Manifesto: Dogs, People, and Significant Otherness* (Chicago: Prickly Paradigm, 2003).

<sup>11</sup> Thomas Heberlein, *Navigating Environmental Attitudes* (New York: Oxford UP, 2012).

This philosophical strand emphasizing emergence from relations *preceding the things related* resonates with Barad's views on quantum mechanics. From the bridging work of the romantics and Goethe continuing through contemporary ideas in complexity, chaos theory, quantum mechanics, non-equilibrium systems, networks, environmental thinking, postmodern literature and the arts, etc., we find models of "relationality" that overcome such dichotomies.<sup>12</sup> McCarthy echoes and updates Goethe in terms of chaos theory with the assertion that: "At the center of rumination is the creative act in both nature and the arts. The chief hypothesis is the belief that science and the arts are *interrelated via deep structures*" (McCarthy, p.14, emphasis mine). These deep structures in both the natural world and in the arts are shared energies and, according to the new materialisms, they express agentic capacities beyond the human. This is not revived vitalism based on spirituality or a "vital force," but rather a contextualization of human abilities within a living, growing environment constantly shaped by complex flows of energy and matter. In this sense, reality is an ongoing emergence of relations amongst creative patterns. The radical reality of humanity is not dissolved into these motions but rather a supplemental extension infused with, and related to, other earthly processes.

Goethe's work reflects similar ideas regarding human activities. He was never entirely bound to a dichotomy of realism versus idealism, and, indeed, his science and literature bridge such artificial divides. Particularly in his optical works but also throughout his science, as Ingrid Dzialas writes, Goethe sees human beings engaging with "elementary natural phenomena," like colors, in terms of *interactive* processes, rather than as an "active" mind processing "passive" nature.<sup>13</sup> Taming the mind to avoid hasty assumptions and

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<sup>12</sup> I explore these in terms of non-equilibrium thermodynamics elsewhere; see Heather I. Sullivan, "Affinity Studies and Open Systems: A Nonequilibrium, Ecocritical Reading of Goethe's *Faust*." In: *Ecocritical Theory: New European Approaches*, eds. Axel Goodbody and Kate Rigby (Charlottesville: U of Virginia Press, 2011), pp.243-255.

<sup>13</sup> In Ingrid Dzialas's *Auffassung und Darstellung der Elemente bei Goethe*, (Berlin: Ebering, 1939), she describes Goethe's sense of relationship to the elements as an "Einheitsgefühl." Of air, she writes that Goethe "weiß genau, daß er von der Atmosphäre abhängig ist – und er will es auch nicht anders. Wie ein mystisches Erlebnis durchschauert ihn diese Erkenntnis. Er hat das Gefühl, als ob die ganze ihn umgebende Welt in ihn eindringe und mit ihrem Sein sein eigenes Sein erfülle. Bei keinem Element hat Goethe das tatsächliche Ineinandergehen, die Einheit zwischen Mensch und Außenwelt so stark empfunden wie bei der Luft. Eine engere Verbindung kann es nicht geben. In der Luft und von der Luft leben wir und reagieren im höchsten Grade auf sie" (p.43). (Goethe 'knows precisely that he is dependent on the atmosphere – and he does not wish it to be otherwise. Like a mystical experience, this knowledge thrills him. He feels as if the entire surrounding world infiltrates him and fills his own essence with its essence. With no other element did Goethe perceive so

to allow the natural phenomena to emerge on their own terms, to renounce the false belief in mastery, is one of Goethe's primary goals in all of his science and one that permeates his literary work as well. Dennis Sepper's book-length comparison of Goethe's work to Newtonian systems clearly outlines the Goethean methodology in which one "ought to let things speak for themselves."<sup>14</sup> Those who are aware and sensitive enough to allow themselves to see and flow with nature's patterns will most readily be able to explain them, since nature's patterns and our own being and vision are deeply related, as McCarthy and Astrida Tantillo also explain.<sup>15</sup> Goethe's work from early in the Anthropocene offers a view exploring our shared material participation in physical reality like all living things, even as he struggles simultaneously to maintain the sense that we human beings are also absolutely unique, as is typical to humanism. In other words, Goethe provides an excellent example of work that connects the traditional, subject-centered humanism, and ideas similar to those of the contemporary work in the "new materialisms," that emphasize non-human forms of agency or agentic capacity as the context for our own bodily and intellectual environments and actions.

Goethe's figures in *Werther* engage with, and are shaped by, cultural and natural forces outside their control, including class expectations, thunder storms, and flooding rivers; in *Faust* with literary traditions, cosmic pacts between the Lord and Mephistopheles, witches' brew, sexual desires, water nymphs, and the elements of fire, water, air, and the earth; and in *die Novelle* and *Das Märchen* with lions and tigers, gold, unruly giants, uncontrolled shadows, mysterious vegetable debts, and the antics of will o' wisps, to mention a few. We human beings are in the mix of elements, in other words. Gernot Böhme describes how Goethe inscribes the human being from *within nature*, so that we, too, are "Naturwesen":

Der Erkennende, der Mensch, ist Naturwesen, und er kennt deshalb die Natur von innen heraus, wir würden heute sagen: aus der Teilnehmerperspektive. Die-

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strongly the concrete infusion, the unity of human and outer world, as he did with air. There cannot be a closer connection. In the air and from the air we live and react to the greatest extent.")

<sup>14</sup> Dennis Sepper, *Goethe contra Newton: Polemics and the Project for a New Science of Color*, (Cambridge: Cambridge UP, 1988), p.3.

<sup>15</sup> Cf. McCarthy, esp. his chapter 5 on *Faust*; and Astrida O. Tantillo, *The Will to Create: Goethe's Philosophy of Nature* (Pittsburgh: U of Pittsburgh P, 2002).

ser Gedanke ist allerdings bis heute nicht ausgedacht und in seinen Erkenntnis-möglichkeiten nicht im entferntesten ausgeschöpft.<sup>16</sup>

(The perceiver/knower, the human being, is a natural being, and s/he thus knows nature from the inside out. Today, we would call this seeing from the participant's perspective. This thought has not, through today, been fully thought through and has not been by any means exhausted in its full potential for perceptual/knowledge possibilities" [translation mine].)

Furthermore, in Goethe's many scientific writings, he details a very clear emphasis on the interactive processes of the human "subject" and the observed world or object. The observer must temper her impulses and let "nature" or, in the case of Goethe's optical treatise, *Zur Farbenlehre*, the colors and light, emerge on their own terms. The elements of color and light, as well as water, fire, earth, and air and other non-human factors have significant influence in Goethe's works, so much so that they appear to have "agentic" capacities. One might say, for example, that water determines much of Faust's fate as he battles against the sea with his dike, uses the water nymphs to accomplish victory against the "other Kaiser," and when he faces the putrid swamp in his final moments. Even his final "ascent" into the heavens looks a lot like the flow of water rising with warm air, as I discuss elsewhere.<sup>17</sup> With this kind of distributed agency among humans and non-humans, Goethe's works are similar to the new materialisms and their emphasis on the active impact, or "vibrancy" and creativity of matter, as Jane Bennett describes it, in which we partake rather than lead from "outside."

For Goethe, our sensory connection to the material world, "nature," most strongly arises from our visual perception, from sight. In his optical works, *Zur Farbenlehre* and *Beiträge zur Optik*, Goethe's description of vision is representative of the interface of mind and matter. Goethe criticizes Newton's famous optics for numerous reasons including Newton's (correct) theory that white light contains all the spectrum of colors, which Goethe believes was based on "faulty logic." That is, Goethe (with, in this case, significant insight) insists that colors emerge only when light interacts with objects and eyes; whereas Newton sees the colors in terms of light itself (it is a matter of light's pure essence). Goethe's colors are specifically *interactive*:

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<sup>16</sup> Gernot Böhme, "Natur hat weder Kern noch Schale. Goethes Methode der Naturbe-trachtung," in *Goethe: Ungewöhnliche Ansichten*, ed. by Karl Richter and Gerhard Sauder (St. Ingbert, Germany: Röhrig UP, 2001), pp.9-21 (p.15).

<sup>17</sup> Heather I. Sullivan, "Ecocriticism, the Elements, and the Ascent/Descent into Weather in Goethe's *Faust*," *Goethe Yearbook*, 17 (2010), 55-72.

Newton begeht hierbei den Fehler, den wir schon früher gerügt haben, und den er durch sein ganzes Werk begeht, daß er nämlich das prismatische Bild als ein fertiges unveränderliches ansieht, das es doch eigentlich immer nur ein werden-des und immer abänderliches bleibt.<sup>18</sup>

(Newton makes hereby the mistake that we earlier rebuked, and that he makes throughout his entire work; namely that he sees the prismatic image as final and unchanging. It, however, only ever occurs as something always becoming and always changing [translation mine].)

Colors and all of nature – including human beings – are always “becoming” and changing according to Goethe. Science must work within this framework of emergence rather than in an ultimate divide with an objective, outside observer and solid, fixed object. Things in Goethean terms have a more agentic capacity than Newton’s view of light as an object of physics with specific and straightforward characteristics. Goethe rejects specifically the mechanistic model here, as Walter Heitler asserts in his discussion of the *Farbenlehre*.<sup>19</sup>

Additionally, Goethe tends to describe nature, eyes, and colors as interactive, intertwined relations rather than isolated objects. Tuttle’s “relations” between the “I” and the world are similar, but his stress of the humanly inflected “radical reality” leans more heavily towards our consciousness than to the broader scope of physical interactivity. Goethe describes such interactivity at many levels and in many forms, including the polarity of dark and light, and the co-shaping of eyes and colors, all of which are always experienced in conjunction with objects. He sees nature and eyes as fully interrelated, and the form of human perception as emerging from the fundamental polarity of dark and light. Newton thinks of light itself, as something in isolation, rather than in terms of its relations to the rest of the world as Goethe preferred: “Newton scheint vom Einfacheren auszugehen, indem er sich bloß an’s Licht halten will; allein er setzt ihm auch Bedingungen entgegen so gut wie wir, nur daß er denselben ihren integrierenden Anteil an dem Hervorgebrachten ableugnet” (FL, p.304). (Newton appears to proceed from the simpler [starting point] in that he wants to address only light. However, he also subjects it to conditions just as we do, only that he denies their assimilative impact on the result” [translation mine]).

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<sup>18</sup> Johann Wolfgang von Goethe, *Zur Farbenlehre*, ed. Manfred Wenzel (Frankfurt am Main: Klassiker, 1991), p.337. Future references to this work are made parenthetically, labelled “FL.”

<sup>19</sup> Walter Heitler, “Goethean Science,” in *Goethe’s Way of Science: A Phenomenology of Nature*, eds. David Seamon and Arthur Zajonc (New York: State U of New York P, 1998), pp.55-69.

Note that Goethe insists we include our own impact on the process and results in the scientific understanding. In this, he speaks with contemporary quantum physics and the new materialists who see an emergent reality shaped by material and human interactions. Frank Schweitzer speaks in this regard of Goethe's "aktives Mitwirken des Erkennenden"<sup>20</sup> ["active participation of the perceiver/knower"]:

Der Erkenntnisprozeß ist also durchaus auf das aktive Mitwirken des Erkennenden angewiesen. Erkenntnis hier ist kein Akt bloßer Konstruktion, sondern schließt auch einen nicht-konstruierbaren, *nur erlebbaren* Teil mit ein, der sich auf Genuß und Empfindung bezieht." (Schweitzer, p.390)

(The perceptual/knowning process is related fully to the active participation of the perceiver/knower. Perception/knowledge is here no act of simple construction, but rather includes also a piece that is not able to be constructed, only able *to be experienced*, and that relates to enjoyment and sensation" [translation mine]).

To ignore the act of perception and observation in science is, in Goethe's phrase, an example of Newton's "Gewalt des Selbstbetruges" and "Unredlichkeit" (violence of self-deception and unspeakableness) (FL, p.315).

Goethe condemns Newton's refusal to acknowledge the role of the observer and the broader context. In McCarthy's terms, his "main objection to Newtonian optics, for example, was Newton's failure to include the observing subject in his calculations and the conditions of the experiment itself. Above all, Goethe criticizes a perceived tendency toward microreduction which leads to the loss of the broader context of the isolated part studied."<sup>21</sup> Michael Böhler similarly stresses Goethe's rejection of the Newtonian division between "Mensch und Natur," describing how Goethe believed that Newtonian methods are destructive and cannot lead "zur Wahrheit" (to truth).<sup>22</sup> Goethe critiques the isolated and static quality of a Newtonian uni-

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<sup>20</sup> Frank Schweitzer, "Naturwissenschaft und Selbsterkenntnis," in *Goethe und die Verzeitlichung der Natur*, ed. Peter Matussek (Munich: Beck, 1998), pp.383-398 (p.390).

<sup>21</sup> John A. McCarthy, "The Pregnant Point: Goethe on Complexity, Interdisciplinarity, and Emergence," in Herbert Rowland, ed., *Goethe, Chaos, and Complexity* (Amsterdam: Rodopi, 2001), pp.17-31 (p.26).

<sup>22</sup> Michael Böhler writes: "Es ist nun diese der wissenschaftlichen Methodik eigene Trennung von Mensch und Natur sowie der Isolation des Subjekts und des Intellekts von ihrem ursprünglichen Zusammenhang, es ist diese abstrahierende ‚Scheidkunst‘, welche Goethe für höchst verderblich hält. Denn auch wenn sie nur instrumentellen Charakter haben sollte, auch wenn sie nur Mittel zum Zweck der Wissensvermehrung wäre--: für Goethe bedeutet das Verfahren einen verhängnisvollen künstlichen Bruch



verse, devoid of becoming and without human impact on the process of observation.

If Newton sees the process of perception as final and complete, it is, in contrast, only so for a brief moment in Goethe's vision. In fact, Goethe sees eyes as themselves creative. The ability to become, develop, and create is distributed among colors, eyes, colored things, lights, and human beings. This is not to assign agency randomly among objects and organs, nor to assert that we determine the full scope of creativity. Instead Goethe asserts a co-creativity of humans and nature. The eyes and the thing perceived participate in exchanges based on fundamental relatedness as interactive processes. Goethe writes of the eyes' creativity: "Dieses Organ [das Auge] ist immer in der Disposition, selbst Farben hervorzubringen, und genießt einer angenehmen Empfindung, wenn etwas der eignen Natur Gemäßes ihm von außen gebracht wird" (This organ (the eye) is always capable of bringing forth colors itself, and it enjoys a pleasant sensation when something compatible with its own nature is presented to itself.) (FL, pp.247-248; translation mine). The eyes and the colors, in other words, are fully interrelated; we do not come to nature as an outsider but rather as part of the natural systems, or as Böhme states, with a "Teilnehmerperspektive" (participatory perspective). Sepper comments on the interactive process of perception typical to Goethe's science, and notes that it is fully based on this sense of relationships and coordination with the phenomena emerging as part of the visual process itself. Hence the Goethean process is predominantly experiential (that is, empirical), not theoretical. Goethe, he notes, understands truth as residing "less in propositions than in experience, less in statements about nature than in the adequacy of one's approach to it" (Sepper, p.184). Goethe strives for an "adherence to a way (method) that corresponds to and amplifies the encounter of human beings with nature" (Sepper, p.184).

In that we are now working within an acknowledgement of the Anthropocene, and the highly "amplified" encounter of human beings and the rest of the world, this attention to how human beings correspond to nature – that is, how we resonate with and against our vibrant surroundings –

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im Zusammenhang zwischen Mensch und Natur." (It is this separation typical to the scientific methodology that divides human from nature and that isolates the subject and the intellect from its original context, it is this abstracting 'art of division,' which Goethe considers highly destructive. In that even when it supposedly has only an instrumental characteristic, or only serves as means to an end for the goal of increasing knowledge, this process means for Goethe a fateful, artificial break of the connection between humans and nature.) "Naturwissenschaft und Dichtung bei Goethe," in *Goethe im Kontext: Kunst und Humanität, Naturwissenschaft und Politik von der Aufklärung bis zur Restauration*, ed. Wolfgang Wittkowski, (Tübingen: Niemeyer, 1984), pp.313-339 (p.333).

is all the more relevant. Indeed, Sepper's phrase of "amplifying the encounter" takes on a new, more disturbing meaning in this context. The more we achieve "correspondence" and so understand our enmeshment in the world, the more, it seems, that we also attempt to "amplify" energy flows and gradients in ways that benefit us in the short term. Our very success is an amplification that cannot continue without limits, ecologically, and without exponential impact on the biosphere. Goethe's insights are that we "amplify" from within instead of "mastering from without." This may not change our behavior but it certainly helps us understand it.

The human agent can attain a high level of accuracy in perception and assessment of the colors and natural world by acknowledging the creativity and interactivity of the things around her. This "accuracy" pertains to perception for Goethe, but not only there. It is, in fact, his formula for great art: to see the world as it develops and "becomes" and to seek to replicate and converge one's own genius with respect to "nature's" creative acts. This strategy holds both for the individual education and for the artist. Self-restraint is not so much a monastic exercise of deprivation as it is an ability to merge creative energies with the surrounding forces and patterns, and to benefit from their wisdom rather than only to impose ourselves onto the world: whether our surroundings be composed of fellow thinkers, nature's creativity, or matter's basic forms in plant growth, the shimmering colors, or the flows of water and the movements of the earth. As Frederick Amrine notes, this process of creative perception/interaction is as much about the metamorphosis of things as it is the "metamorphosis of the scientist."<sup>23</sup> Above all, one must attempt to line up one's vision with the "natural order," which agentially emerges if one only will allow it to do so instead of imposing oneself blindly onto the world (as Newton does, according to Goethe's vituperative critiques). Goethe stresses repeatedly that one must carry out scientific and poetic studies in a natural order. Newton fails, because he carries out "seine Versuche nicht in einer natürlichen Ordnung, sondern auf eine künstlich verschränkte Weise" (his experiments not in a natural order, but rather an artificially limited manner) (FL, p.422; translation mine). This natural order is a key to his work: the sequence of descriptions and development of ideas is central.

Because of Goethe's typical emphasis on "natural order," the structural sequence of the *Farbenlehre* is itself of great significance. Goethe divides his treatise into three parts: the explanation of colors themselves; the critique of Newton's optics; and the historical development of optics and color studies.

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<sup>23</sup> Frederick Amrine, "The Metamorphosis of the Scientist," in *Goethe's Way of Science: A Phenomenology of Nature*, ed. by David Seamon and Arthur Zajonc (New York: State U of New York P, 1998), pp.33-54.

Each section contextualizes the other. In the first section on the colors, he also has three parts: the physiological, or colors belonging to the “eye”: the physical colors relating to the interaction of light on the surface of an object such as shimmering mother of pearl; and the chemical colors deriving from the color-absorbing matter of the objects seen. Goethe begins therefore with the eye (or human brain, as we now realize) engaging with light, then moves to interaction of light with surfaces and objects, and closes with unchanging colors of objects as they appear when light shines on them. Each step is part of our engagement among eyes, light, and/or objects rather than of things themselves in isolation.

Above all, Goethean optics are based on relations and interactions: “In der ganzen sinnlichen Welt kommt alles überhaupt auf das Verhältnis der Gegenstände untereinander an, vorzüglich aber auf das Verhältnis des bedeutendsten irdischen Gegenstandes, des Menschen, zu den übrigen” (In the entire sensory world, everything depends entirely on the relationship of the objects among each other, particularly however on the relationship of the most meaningful of earthly objects, the human being, to the others.) (FL, p.83; translation mine.). Repeatedly, he stresses the interactions and “relations,” or the “Beziehungen”: “Immer bleibt es aber auch hier die Hauptsache, daß die *Beziehungen* wahrhaft *eingesehen* werden” (The main issue here is always that the *relations* are *truthfully* seen) (FL, p.182). Here is where he draws the major distinction between his own optics and those of Newton who sees only colors and not light acting in space with objects, not to mention the actual process of visual perception.

I am not arguing that Newton was wrong, but rather that his view, as part of the mechanistic divide between human beings and the environment, is itself in need of context, at least in terms of the new materialisms and ecological thinking. In this sense, Goethe’s somewhat (in)accurate yet revolutionarily contextualizing optical studies are worth recalling. For Goethe, Newton’s inward focus eliminates the equally significant interactions and relations that place humanity – the observers – in the polarity of light and dark. Similarly, light is always contextualized in relation to the surroundings and not a stand-alone entity. Goethean science, in sum, posits exchanges and polarities as the basis of the physical world, and we as perceiving beings in the realm of light are fully within these processes. There is some continuation of traditional humanism in the sense that Goethe understands human beings as the “most meaningful earthly object” (“der bedeutendste irdische Gegenstand”), and yet Goethe maintains an emphasis on our perception and awareness of reality in terms of light, colors, and the other aspects of the physical world. Our agency is not isolated from the workings of solar energy, in other words. Goethe’s entire optical opus rests upon the assertion that

only in a relational understanding of interactions does reality emerge. His polarity is not passive objects manipulated and seen by active subjects but rather active matter across the spectrum. In terms of radical reality, this shifts the emphasis from the human consciousness to the interactive exchanges of many forces cohering into forms – diffraction patterns, waves, and spirals – of distributed agency.

Goethe thus provides us with an access point for understanding both the changing ideas of modernity at the beginning of the Anthropocene in terms of the human-material interfaces, and a bridge to the contemporary discussions in the new materialisms. Not just vitalistic or animistic musings, Goethe's science (re)animates the world with both human and non-human agencies. His interdisciplinary views based on life-long scientific interests and towering literary accomplishments provide a bridge to the new materialisms and their similarly cross-disciplinary notion of vibrant nature. I utilize the study of "radical reality" to help us rethink what exactly we mean with "environment" and reality broadly. In particular, the study of the era 1770-1830 is a study of the early Anthropocene: the very era when science disassociates human beings from the material world while simultaneously enabling the much more rapid impact on the Earth's ecological systems with the industrial revolution and the emerging age of fossil fuels. For this reason, my focus on ecocriticism and Goethe does not favor scenic landscapes and charismatic mega-fauna (or their devastation, or even environmental justice) but rather emphasizes the effort to disturb what we take to be our "human" and separate foundation from the rest of the planet. The task is to study how our bodies, minds, and cultures are imbricated into material systems and vice versa. Perhaps paradoxically, the more knowledge we gain about our utter dependency on ecological functioning, the more we assert that we can technologically transcend in our capacity as "master" who functions outside the system. Tuttle's assertion that we can "transcend" our biological body is troubling in this context. It is therefore an important exercise to imagine and explore both narratives and scientific studies that document just how fully we are enmeshed *within* the solar-powered biosphere and part of the light-life-energy-matter cycles therein. That optics and color studies – especially the role of light – can thus be "ecological" is particularly relevant in the age of fossil fuels now known as the Anthropocene.

In conclusion, it must be said that Goethe is not – *avante la letter* – a strictly "green" or environmental writer *per se*. Many of his texts, like *The Sorrows of Young Werther*, do include what we now term nature writing that express clear enthusiasm for nature's wonders. But nature writing itself does not necessarily prompt a re-thinking of humanity's relation to ecological systems. Indeed, Goethe's position at the brink of the Anthropocene meant

that he could only partly see the extent of coming changes. Nevertheless, his *Farbenlehre* clearly takes a stance immersing us materially and physically in our world of light in a way that resonates with the new materialists' efforts to reshape our understanding of agency as a joint event of both the human and non-human. This Goethe does from "within" the world, as Böhme's term "Teilnehmerperspektive" suggests. Analogous to the new materialisms, Goethe's optical studies prompt us to look beyond the sublime scenery, interesting animal species, and water-air-soil nexus apparent in contemporary ecology studies. Thus he offers convenient access to understanding the early Anthropocene. With the goal of making visible a broad spectrum of the diffracted and distributed agencies actually in play, this essays offers an alternative to a concept of radical reality based solely on human consciousness. The radical reality of the Anthropocene consists of the many proliferating human and non-human agentic capacities – caused, in part, by the release of fossil fuels into the atmosphere – that radiate around the planet. We are inextricably bound up with that radically creative reality.