



PROJECT MUSE®

Not So New Materialism: Homeostasis Revisited

Benjamin J. Murphy

Configurations, Volume 27, Number 1, Winter 2019, pp. 1-36 (Article)

Published by Johns Hopkins University Press

DOI: <https://doi.org/10.1353/con.2019.0000>



➔ *For additional information about this article*

<https://muse.jhu.edu/article/714470>

Not So New Materialism:
Homeostasis Revisited

Benjamin J. Murphy
University of North Carolina,
Chapel Hill

ABSTRACT: The term “homeostasis” is routinely discarded within contemporary eco-discourse. But this paper revisits a largely overlooked moment of homeostatic theorization, a moment that is both consonant with, as well as instructive for, current trends in ecocritical new materialism. Challenging the purported newness of “new materialism,” then, this paper goes on to consider the benefits of revisiting Walter B. Cannon’s writings on “social homeostasis.” Mediated by Georges Canguilhem’s criticisms of this work, on the one hand, and by work in feminist science studies on the other, Cannon’s thinking promotes a political vision currently attenuated in contemporary new materialist eco-discourse.

Within ecologically and environmentally inclined work in the humanities, the term “homeostasis” has largely fallen out of favor. Along with a trio of other suspect terms—“balance,” “harmony,” and “equilibrium”—homeostasis has been consigned to a debunked model of ecology. Critics usually bring it up only to put it down. A number of historical threads account for this association between homeostasis and a largely dismissed set of ecological ideas. But these threads often obscure the originary moment of homeostatic theorization, a moment revisited in this essay in order to argue for the continued relevance and usefulness of homeostasis. The American physiologist and Harvard research professor Walter Bradford Cannon coined the term “homeostasis” in print in 1926 to provide a specific designation for the complex physiological reactions and processes

that “indicate” and “maintain” the “stability of the organism.”¹ This moment of coinage and Cannon’s subsequent writings in the 1930s and 1940s constitute the primary focus of this essay. Even at this origin of Cannon’s neologism, however, the term “homeostasis” reached backward in time to adopt longstanding tenets in physiology, and also radiated outward in disciplinary application, since Cannon himself discussed homeostasis with respect to socio-economic regulation, not just physiology. Revisiting Cannon’s conception of homeostasis thus entails a foray into his predecessors as well as successors, discipline-specific usage as well as metaphorical adaptation. Approached in this seesawing fashion, homeostasis can set itself apart in the present as a useful heuristic with more to offer eco-discourse than its regular dismissals by the field suggest. Indeed, homeostasis comes to look strikingly contemporary, especially with respect to how we consider the political dimensions of new materialism. Where critics in this emergent field often succeed in depicting a world more ecologically interconnected than we conventionally expect, Cannon’s homeostasis asserts a similarly relational view while nonetheless retaining a focus on structural conditions and certain norms. This retention makes his work an important complement, since it keeps in view the political repercussions of interconnection that are frequently obscured within new materialism. Before we can revisit homeostasis, however, we need to understand the current standing of the term.

Homeostasis and Its Discontents: Or, It’s Not Easy Being Green

Eco-discourse has morphed and splintered into a prodigious number of subfields and terms (hence the vagueness of the term “eco-discourse” itself and the cumbersome nature of the opening lines of this essay: “ecologically and environmentally inclined work in the humanities”). According to Lawrence Buell, terminological proliferation and disciplinary drift characterized the field from its beginnings.²

1. Walter B. Cannon, “Physiological Regulation of Normal States: Some Tentative Postulates Concerning Biological Homeostasis” (1926), reprinted in *Homeostasis: Origins of the Concept* (Stroudsburg, PA: Dowden, Hutchinson & Ross, Inc., 1973), pp. 246–249, at p. 246.

2. Buell discusses why “the environmental turn in literary studies is best understood . . . less as a monolith than a concourse of discrepant practices” (Lawrence Buell, *The Future of Environmental Criticism* [Malden, MA: Blackwell Publishing, 2005], p. 11). For a similar discussion, see what is arguably the touchstone for ecocriticism as a field, *The Ecocriticism Reader*, where Cheryll Glotfelty describes similar reasons for a “disunity” at the core of ecological approaches to literature. Cheryll Glotfelty, “Introduction: Liter-

Still, whatever the offshoots and their important distinctions—from ecocriticism to environmental humanities to new materialist ecocriticism, and so forth—the rejection of an older model of ecology (and the terms that accompany it, including “homeostasis,” “balance,” “equilibrium,” and “harmony”) stands as a defining feature across the board. For all that divides it, eco-discourse finds common ground in leaving these terms behind. Recent ecocriticism, for instance, narrates its own history by identifying a break precisely along these lines: in the 2012 revision to his (2004) book-length introduction to the field, Greg Garrard employs the term “postequilibrium” to differentiate between an “outmoded” ecology of “harmony and balance” and a newer view that understands nature and culture as intersecting, dynamic domains.³ Likewise, Lawrence Buell joins fellow giants of eco-discourse Ursula K. Heise and Karen L. Thornber to explain that the now-debunked “first wave” of ecocriticism understood ecology “to provide an account of the natural function of ecosystems as stable, harmonious, and homeostatic if not disrupted by humans.”⁴ As understood by both of these arguments, this shift in eco-discourse relies to some extent on theorist Bruno Latour, on the ecologist Daniel Botkin, and—often more explicitly—on the literary critic Dana Phillips, who first brought Latour and Botkin together. Phillips’s *The Truth of Ecology* argued that early ecocriticism relied disproportionately on romanticized naturalism, and that ecology as practiced from the mid-to-late twentieth century comprises a far more variegated texture of sometimes-contradictory practices than literary critics appreciate.⁵ Four years later, Timothy Morton argued similarly that we actually leave the term “ecocriticism” behind altogether for Timothy

ary Studies in the Age of Environmental Crisis,” in *The Ecocriticism Reader*, ed. Cheryll Glotfelty and Richard Fromm (Athens: The University of Georgia Press, 1996), pp. xv–xxxvii, at p. xvii.

3. Greg Garrard, *Ecocriticism*, 2nd ed. (London: Routledge, 2012), pp. 64–65.

4. Lawrence Buell, Ursula K. Heise, and Karen L. Thornber, “Literature and Environment,” *Annual Review of Environment and Resources* 36 (2011): 417–440, at p. 422.

5. Thus, Phillips’s index entry for “homeostasis” reads only “see balance,” a redirection to passages where he scorns the “utopian” and “more or less unscientific” values that ecologists dedicated themselves to “early on” (Dana Phillips, *Truth of Ecology: Nature, Culture, and Literature in America* [New York: Oxford University Press, 2003], p. 42 [emphasis in original]). Heather Houser compounds this particular dismissal of homeostasis by returning to Phillips. The index entry for “homeostasis” in her excellent *Ecosickness in Contemporary U.S. Fiction: Environment and Affect* (New York: Columbia University Press, 2014) also reads “see Balance” as it indicates one page in her third chapter where she cites Phillips’s admonition of “environmentally oriented cultural critics” who have “ignored debates within and outside of ecological study over the veracity of contested concepts such as harmony and homeostasis” (p. 106).

Luke's practice of "ecocritique," since the former is "too enmeshed in the ideology that churns out stereotypical ideas of nature," key among which are notions of "Nature" as unchanging and static.⁶

Even more recently—and likewise disinterested in "ecocriticism" per se—we see a commitment to something like the "postequilibrium" view throughout new materialism.⁷ Consider Samantha Frost and Diana Coole's introduction to their important, early edited collection dedicated to this still-emerging field. Here the editors note a shift in contemporary science away from "equilibrium" and toward "dynamic processes": "In the life sciences as well as physics," they explain, "material phenomenon are increasingly being conceptualized not as discrete entities or closed systems but rather as open, complex systems with porous boundaries."⁸ While the essays that follow in Frost and Coole's volume ultimately delve less into the life sciences than into physics and Marxist political theory (one of the "old" materialisms), a later, more explicitly ecologically focused volume of new materialist essays articulates the eco-discourse break with particular verve. *Prismatic Ecology: Ecotheory beyond Green* sees over twenty prominent critics (Morton included) explore "ecothetical" options that go—as the subtitle suggests—"beyond green." Editor Jeffrey Jerome Cohen's introduction explains that the collected essays reject the "bucolic expanses of green readings, or at least . . . those that possess utopian emphasis on homeostasis, order, and the implicit benevolence of an unexamined force labeled

6. Timothy Morton, *Ecology without Nature: Rethinking Environmental Aesthetics* (Cambridge, MA: Harvard University Press, 2009), p. 13. Buell, Heise, and Thornber maintain that "a similar questioning of ecology as the science of natural harmony had already taken place earlier in environmental history" (Buell, Heise, and Thornber, "Literature and Environment" [above, n. 4], p. 432). They point to Donald Worster, *Nature's Economy: A History of Ecological Ideas*, 2nd ed. (Cambridge: Cambridge University Press, 1994). Predating even this work, however, is Frank Egerton's landmark 1973 article in the history of ecology, which describes "changing concepts of the balance of nature" from antiquity up to the time of his writing; again, we find homeostasis at the fulcrum. Egerton describes the term as being "part of the most authoritative modern defense of a supraorganismic balance of nature concept" (Frank Egerton, "Changing Concepts of the Balance of Nature," *The Quarterly Review of Biology* 48:2 [1973]: 322–350, at p. 344).

7. "New Materialism" might better be called "new materialisms" given the range of conversations that are themselves related to a family tree of overlapping—but not synonymous—theoretical positions, including feminist science studies, actor network theory, object oriented ontology, speculative realism, thing theory, and animal studies. I take "new materialism" to be the most explicitly ecological mode within the so-called ontological turn.

8. Diana Coole and Samantha Frost, "Introducing the New Materialism," in *New Materialisms: Ontology, Agency, and Politics* (Durham, NC: Duke University Press, 2010), pp. 1–43, at pp. 13, 15.

Nature.”⁹ “[O]ther colors may be necessary,” he says, to escape a greenness, which assumes “anthropocentric and detached concepts like stewardship and preservation, and prescriptive models of environmental management.”¹⁰ Thus, each essay in *Prismatic Ecology* turns to a different color—or at least some range of the electromagnetic spectrum—to explore the ways in which culture and nature blur in an “untidy and dispersive entanglement.”¹¹ And if there’s any doubt about whether the likes of Phillips and new materialism meet in shared disinterest with homeostasis, it is worth noting that Phillips’s largely dismissive book review of *Prismatic* (Phillips calls the volume “almost unreadable”) singles out Levi R. Bryant’s essay—the “strongest essay” of the bunch—for showing how homeostasis in particular belongs to the “scholastic” (i.e., green) view of nature.¹² Homeostasis, it seems, is just another noxious green obfuscation in need of a good critical weeding.

This essay is not concerned with rehabilitating the “outmoded” model of ecology as such—the green model, as *Prismatic* has it. Leaving this basic split in eco-discourse intact and to the side, however, we need to pry homeostasis away from the discarded model in order to explore what the term, understood in its full and messy context, can contribute to the field. To that end, the first and longest section below shows how Cannon’s homeostasis diverges from what came before it even as it anticipates what came after. Recognizing in particular the influence of the preeminent nineteenth-century father of physiology, French scientist Claude Bernard, I explore how Cannon’s thinking departs from his predecessor’s to describe an open, mutable, and dynamic body much like the organismic body valorized in new materialist eco-discourse. Literary and cultural critic Stacy Alaimo’s notion of “trans-corporeality” (which has rapidly become eco-discourse canon) and Dana Phillips’s own commitment to “material ecocriticism” are just two formulations that will emerge

9. Jeffrey Jerome Cohen, “Introduction: Ecology’s Rainbow,” in *Prismatic Ecology: Eco-theory beyond Green*, ed. Jeffrey Jerome Cohen (Minneapolis: University of Minnesota Press, 2013), pp. xv–xxxv, at p. xxii.

10. *Ibid.*, p. xx. So whereas Jane Bennett’s *Vibrant Matter: A Political Ecology of Things* (Durham, NC: Duke University Press, 2010) helped to establish the broader umbrella of new materialist thought while nonetheless relying on the term “green” as an unproblematic, “sustainable” good, *Prismatic Ecology* endeavors to expand the spectrum (literally) of insight. See *ibid.*, pp. x, xiv.

11. *Ibid.*, pp. xxv.

12. Dana Phillips, review of *Prismatic Ecology* (above, n. 9), *Interdisciplinary Studies in Literature and Environment* 22:2 (2015): 419–420, at p. 420.

in critical retrospect as strikingly homeostatic.¹³ In this sense, homeostasis as established by Cannon is remarkably contemporary, less green than evergreen.

But if, as I will argue in the second section, Cannon's homeostasis and new materialism rely on consonant models of organismic enmeshments, the two approaches articulate the political stakes of this ontology in quite different ways. For Cannon, understanding "the body physiologic" indicates the best way to construct and support the "body politic." As I explore below, this formula prompts Cannon to call for a political system that values stability over economy, a structure built to ensure the material well-being of the individuals who comprise it. Though compelling in ways that I consider, this approach to the social resonates with dated, discredited accounts in sociology and—more problematically—with reactionary political programs.¹⁴ It is telling in this regard that Cannon's tongue-in-cheek word of choice to describe his ideal of physiological social regulation—"biocracy"—is now, in a different context, associated most readily with Nazi eugenics.¹⁵ This ominous connotation suggests one reason to push back against "social homeostasis," and the historian and philosopher of science Georges Canguilhem articu-

13. Stacy Alaimo explores "trans-corporeal" bodies extensively in *Bodily Natures: Science, Environment, and the Material Self* (Bloomington: Indiana University Press, 2010). And Dana Phillips and Heather I. Sullivan elaborate on "material ecocriticism" in a special issue journal introduction, "Material Ecocriticism: Dirt, Waste, Bodies, Food, and Other Matter," *Interdisciplinary Studies in Literature and the Environment* 19:3 (2012): 445–447.

14. The literature on organismic sociology and political theory is extensive, but D. C. Phillips provides a helpful, relatively early account of the period under study here, the late nineteenth century and early twentieth century. D. C. Phillips, "Organicism in the Late Nineteenth and Early Twentieth Centuries," *Journal of the History of Ideas* 31:3 (1970): 413–432.

15. Cannon's biographers explain that Cannon was having a bit of fun while using the term "biocracy" in a lecture at MIT. See Elin L. A. Wolfe, Clifford Barger, and Saul Benson, *Walter B. Cannon, Science and Society* (Cambridge, MA: Harvard University Press, 2000), p. 263. The tone of Cannon's "Biocracy" article certainly bears out this light touch. As such, it is not surprising that there is no connection between Cannon's use of the term "biocracy" and Robert Jay Lifton's well-known use of the same term in *Nazi Doctors: Medical Killing and the Psychology of Genocide* (New York: Basic Books, 1986). Nevertheless, I highlight the shared use of the same term to emphasize even at the onset of this paper that any consideration of organismic political analogies like those invoked by Cannon must keep in mind the ongoing critical work of examining the biopolitical—or thanatopolitical—logics of state-sponsored eugenics and genocide (see, for instance, the discussion of Lifton's term throughout the first two chapters of Roberto Esposito, *Bios: Biopolitics and Philosophy*, trans. Timothy Campbell [Minneapolis: University of Minnesota Press, 2008]).

lates even more basic limitations to Cannon's approach. Still, as I discuss below, even Canguilhem's important criticisms fall short of apprehending the full scope of Cannon's ideas. "Biocracy" is not the miracle fix that Cannon envisioned, but neither is it the naive naturalism that Canguilhem pillories. With Canguilhem as an important interlocutor, we must think carefully about what remains tenable from "social homeostasis."

Where Cannon moves perhaps too hastily and smoothly from the body physiological to the body politic, new materialist ecocritics are allergic to such brazen attempts to yoke ontology with specific imperatives. Instead, these critics commit to the difficult work of tracing the dizzying world of agency that both undermines and transcends any account of human exceptionalism. For all the salutary and exciting possibilities thereby generated, this approach risks privileging an aesthetic project of description at the expense of political values. Thus, while there is much work in the field of eco-discourse writ large that forcefully interrogates issues of social, racial, and global justice and reparative action, these concerns are less clearly addressed—if just as ardently supported in spirit—when new materialism attends to ontology. This is a problematic pattern that at least some critics—new materialist and otherwise—appreciate. And as I show in the third section, it is a pattern that actually reiterates, in surprising ways, just the sort of naturalism that Canguilhem critiques: new materialist critics suppose that a better or more accurate model of biological life will produce a better ethical and political paradigm. Yet where Cannon is explicit about how he believes this paradigm should be realized and built, new materialism stops short by prioritizing exploration over intervention. Though less overtly prescriptive, then, new materialism depends on its own version of "biocracy."

As I argue in my concluding sections, realizing this similarity allows us to appreciate a version of Cannon's homeostasis for the sake of what it offers to eco-discourse, and to new materialism in particular. While new materialism too often submerges questions of value and differentiation within a vast field of intractable ecological interrelation, Cannon builds from his understanding of the singular organism to identity values that a group of organisms—society—should collectively work to realize. In this constructivist approach, Cannon's project of applying the lessons of the "body physiologic" to the "body politic" actually draws on what Canguilhem calls a mechanistic, or machinic, view of society. Cannon's work thus approaches the political as a function of the biological without collapsing the two domains. His homeostasis hews to the ecological insights

of new materialism while simultaneously amplifying political and ethical questions that are muted in contemporary conversations. Of course, where Cannon prioritizes human well-being, eco-discourse in general reaches for a more inclusive, expansive rubric of care. This is an important and irreconcilable discrepancy. And yet, Cannon's focus on the human provides a much-needed reminder that politics is fundamentally a human affair. Without simply embracing Cannon's human exceptionalism, we nonetheless have much to gain from revisiting homeostasis.

Cannon's Homeostasis

The term "homeostasis" has exerted tremendous influence across a number of fields and disciplines, including community ecology, cybernetics, ecosystem ecology, and Gaia Theory. As Joel B. Hagen points out, this widespread adoption by such diverse traditions makes "tracing lines of influence" extremely difficult.¹⁶ But despite the complexity of these overlapping "lines"—or perhaps as a compensatory response to this very complexity—critical discussions of homeostasis typically rely on a now-familiar formula. In 1974, historian and philosopher of science Georges Canguilhem boiled down this familiar history of organismic regulation to a single sentence. The "well known" line of descent, he says, runs thusly: "Claude Bernard *qui genuit* Cannon *qui genuit* Rosenbleuth *apud* Wiener."¹⁷ Canguilhem's view characterizes much of the work on this term insofar as Cannon is often understood as a neutral conduit: homeostasis moves through him to get from Bernard, on the one hand, to cybernetics, on the other (and from there, we might add, to ecosystem science and Gaia Theory).¹⁸ But Cannon's thought entails some crucial

16. Joel B. Hagen, *An Entangled Bank: The Origins of Ecosystem Ecology* (New Brunswick, NJ: Rutgers University Press, 1992), p. 129.

17. Georges Canguilhem, *Ideology and Rationality in the Life Sciences*, trans. Arthur Goldhammer (Cambridge, MA: The MIT Press, 1988), p. 82. This remark can be found in "The Formation of the Biological Concept of Regulation in the Eighteenth and Nineteenth Centuries," which was originally a 1974 lecture and was subsequently included as chapter 4 in *Ideology and Rationality in the Life Sciences*, as cited here. See the introduction to the collection of Canguilhem essays, *Writings on Medicine*, for bibliographic notes and an overview of where this lecture/essay sits within Canguilhem's larger thesis on the conceptual history of regulation. Stefanos Geroulanos and Todd Meyers, ed., *Writings on Medicine* (New York: Fordham University Press, 2012), pp. 1–24.

18. On the one hand, homeostasis is treated as Bernard redux. As Mathieu Arminjon explains, "With few rare exceptions, the concept of the constancy of [Bernard's] *milieu interieur* and of homeostasis are generally held to be synonymous" (Mathieu Arminjon, "Birth of the Allostatic Model: From Cannon's Biocracy to Critical Physiology," *Journal of the History of Biology* 49:2 [2016]: 397–423, at p. 399). On the other hand, homeo-

specificities that distinguish it from the work of both Bernard and from his cybernetic and ecosystemic descendants. To recognize this discrepancy is to demonstrate that homeostasis has more in common with new materialism than it does with terms such as “equilibrium,” “balance,” and “harmony”—the unholy trinity that eco-discourse at large wants to leave behind.

The prevailing idea that Cannon adopted from Claude Bernard’s understanding of bodily regulation was the notion of the “internal environment,” or *milieu intérieur*. Bernard developed this idea at length in his late lectures on “The Phenomenon of Life Common to Animals and Plants” (delivered in 1878).¹⁹ Here Bernard explains that “[l]ife does not run its course within the external environment, atmospheric air for the air breathing creatures, [or] fresh or salt water for the aquatic animals, but within the *fluid internal environment* formed by the circulating organic liquid that surrounds and bathes all of the anatomical elements” of the organism.²⁰ For Bernard, the organism produces an “invariable medium” that “acts as an atmosphere of its own in the constantly changing cosmic environment”; this “invariable medium” was, for Bernard, markedly inert—or *not* living—and it provided a buffer between, on the one hand, life, and, on the other hand, disturbances that threaten life. The organism enfolds an environment—a word etymologically related to “surrounding” and “encircling”: that which surrounds comes to reside within.²¹

This nesting of environments, or milieus, around the central kernel of “life” signals Bernard’s involvement in vexed debates regarding vitalism. Bernard attempted to avoid both vitalist and reductionist positions. He wanted to identify processes essential to, necessary for, and exceptional with respect to life that, in contradistinction to an ineffable vital force, could nevertheless be approximated and manipulated through physical processes, especially those processes enacted

stasis is just as frequently projected forward as a synonymous term for cybernetics. As Joel Hagen puts it, for influential mid-century ecologists, “Homeostasis and cybernetics were simply two different ways of discussing the same thing” (Hagen, *An Entangled Bank* [above, n. 16], p. 130).

19. Though Bernard had not yet formalized the language of *milieu intérieur*, these ideas were present in his earlier and more widely read *An Introduction to the Study of Experimental Medicine* (New York: Dover Publications, 1957).

20. Claude Bernard, *Lectures on the Phenomena of Life Common to Animals and Plants*, trans. Hebbel E. Hoff, Roger Guillemin, and Lucienne Guillemin (Springfield: Charles C. Thomas, 1974), pp. 83–84 (emphasis in original).

21. *Ibid.*, p. 23. See Leo Spitzer on the etymology of “milieu” and on Bernard’s use of *milieu intérieur* in particular. Leo Spitzer, “Milieu and Ambience: An Essay in Historical Semantics,” *Philosophy and Phenomenological Research* 3:2 (1942): 169–218, at p. 182.

in a controlled laboratory space. While accepting life's uniqueness (and thus securing the status of biology and physiology as discrete sciences), he nonetheless maintained that life could be studied and affected—if perhaps not fully understood—through a pragmatic approach to the processes that modified and encircled it.²²

The metaphor Bernard used to describe the internal environment encodes his concern with life being guarded at the center of operationally navigable surroundings. According to him, the “organism has placed itself in a hothouse. Thus the perpetual changes in the cosmic environment do not touch it; it is not chained to them, it is free and independent.”²³ “The organism” (as metonym for the *life* of the organism) places itself in a “hothouse” that still resides ultimately within its bodily operations; outside these bodily operations lies the “cosmic environment,” the external milieu.²⁴ At best, Bernard says, one can come to know and manipulate the conditions of the hothouse. Able to jiggle thermostat dials, control for humidity, and adjust the atmospheric makeup—to push the metaphor further—the scientist-technician of the hothouse is kept at a relative remove from the living organism itself.

Whereas Bernard relies on the institutional, control-oriented metaphor of “the hothouse,” Cannon is consistently attuned to a different register of language and set of analogies. Considering Cannon's language and presentation of homeostasis allows us to see how the term splits away from Bernard to appear remarkably contemporary. For instance, Cannon frequently begins discussions of homeostasis by stressing the profound unlikeliness of life. The first line of his book-length popularization of “homeostasis,” *The Wisdom of the Body*, reads, “Our bodies are made of extraordinarily unstable material.”²⁵ Here and elsewhere, Cannon expresses a “wonder” and “amazement” at the “remarkable” way in which human bodies have

22. I am relying here on several invaluable discussions of Bernard and Cannon with respect to the former's “internal environment” and navigation vis-à-vis vitalism. See William Coleman, *Biology in the Nineteenth Century: Problems of Form, Function, and Transformation* (Cambridge: Cambridge University Press, 1977); Donald Fleming, “Walter B. Cannon and Homeostasis,” *Social Research* 51:3 (1984): 609–640; Frederic L. Holmes, “Claude Bernard, the Milieu Interieur, and Regulatory Physiology,” *History and Philosophy of the Life Sciences* 8:1 (1986): 3–25; Alan G. Wasserstein, “Death and the Internal Milieu: Claude Bernard and the Origins of Experimental Medicine,” *Perspectives in Biology and Medicine* 39:4 (1996): 313–326.

23. Bernard, *Lectures on the Phenomena of Life* (above, n. 20), p. 83.

24. *Ibid.*

25. Walter B. Cannon, *The Wisdom of the Body* (New York: W. W. Norton & Company, 1932), p. 19.

“learned” what he calls “the trick of maintaining stability.”²⁶ And the introduction to *The Wisdom of the Body* goes on to explain that this “trick” is all the more incredible given the conditions that the body finds itself in. He writes,

When we consider the extreme instability of our bodily structure, its readiness for disturbance by the slightest application of external forces and the rapid onset of its decomposition as soon as favoring circumstances are withdrawn, its persistence through many decades seems almost miraculous. The wonder increases when we realize that the system is open, engaging in free exchange with the outer world, and that the structure itself is not permanent but is being continuously broken down by the wear and tear of action, and is continuously built up again by processes of repair.²⁷

Cannon insists that the stability of life is not a hermetic state but rather a precarious persistence that is continually depleted and repaired. The organism is not merely accessible by means of an external environment (a hothouse) but always vulnerable *to*, as well as dependent *on*, this mediating outside. But if this passage describes the body’s relation to mediating factors—whether external “threats” or the necessary “free exchange” from an “outer world”—in terms referencing an outside, Cannon elsewhere insists that disturbances to bodily stability also arise from within. His most consistent example of internal disturbance is the acid secreted as a result of muscular exertion: just as a disturbance from the outside may upset “favoring circumstances,” so too can the body upset itself from the *inside*.²⁸ The name that Cannon gives to the process—or “trick”—of “maintaining stability” in an “open system” despite all internal and external disturbances is, of course, homeostasis.²⁹

Though Cannon’s use of the term “stability” may seem to evoke terms like equilibrium, harmony, and balance, Cannon defended his neologism precisely *against* such a conflation. The very term “homeostasis” was necessary, Cannon thought, to differentiate between organic self-regulation and inorganic equilibrium.³⁰ Indeed, Cannon

26. *Ibid.*, pp. 20–23.

27. *Ibid.*, p. 20.

28. *Ibid.* Also see Walter B. Cannon, “Stresses and Strains of Homeostasis,” *The American Journal of the Medical Sciences* 189:1 (1935): 1–14, at pp. 4–5.

29. Cannon, *The Wisdom of the Body* (above, n. 25), pp. 20–23.

30. This is certainly how Cynthia Eagle Russett understood the import of the term “homeostasis” several years later in her masterful intellectual history of “equilibrium” in American social theory. Cynthia Eagle Russett, *The Concept of Equilibrium in American Social Thought* (New Haven, CT: Yale University Press, 1966), pp. 20–21.

actually rejects the term “equilibrium” because, he says, the word has “come to have exact meaning as applied to relatively simple physico-chemical states in closed systems where known forces are balanced.”³¹ Precisely in order to describe a contrasting, more “complex” “steady state” “peculiar to the living organism,” Cannon introduces “homeostasis” with careful etymological parsing:

Objection might be offered to the use of the term *stasis*, as implying something set and immobile, a stagnation. *Stasis* means, however, not only that, but also a condition; it is in this sense that the term is employed. *Homeo*, [the abbreviated form of *homoio*] is prefixed instead of *homo*, because the former indicates “like” or “similar” and admits some variation, whereas the latter, meaning the “same,” indicates a fixed and rigid constancy.³²

Despite first appearances of diction, homeostasis names a condition of open, variable similarity, not a static, rigid, closed sameness.

The etymology and import of Cannon’s coinage are important not only because they track away from the technocratic precision of Bernard’s “hothouse,” but also because the “lines of influence” that incorporated homeostasis from the mid-twentieth century onward seem in many cases to have neglected the term’s origins. Indeed, if we want to understand why homeostasis has become associated with (and discarded alongside) equilibrium, balance, and harmony, we might return to Canguilhem’s genealogical quip to reconsider the players involved. For instance, Norbert Wiener’s early writings on cybernetics made prominent use of the term “homeostasis,” but in several important publications, the term is cut off from reference to Cannon.³³ Later, N. Katherine Hayles’s seminal account of Wie-

31. Walter B. Cannon, “Organization for Physiological Homeostasis,” *Physiological Reviews* 9:3 (1929): 399–431, at p. 400.

32. *Ibid.*, pp. 400–401 (emphasis in original).

33. Homeostasis appears at key points in Wiener’s important popularization of cybernetics, *The Human Use of Human Beings: Cybernetics and Society*, 2nd ed. (Boston: Houghton Mifflin, 1954), reprinted with introduction by Steve J. Heims (London: Free Association Books, 1989), at pp. 95–96, but there is no mention of Cannon. Similarly, Wiener’s paper “The Concept of Homeostasis in Medicine” discusses the titular term without reference to Cannon. In fact, this article states that, despite the many scientists and writers who have contributed to the idea of “organization,” “it seems fairest to attribute a true recognition of its importance to Claude Bernard. The word in which Claude Bernard’s notions are crystalized is *homeostasis*” (Norbert Wiener, “The Concept of Homeostasis in Medicine,” *Transactions and Studies of the College of Physicians of Philadelphia* 20:3 [1953]: 87–93, at p. 89 [emphasis in original]). That Wiener should rely so heavily on homeostasis but downplay the significance of Cannon is intriguing because, for one thing, Wiener and Cannon had been personal acquaintances before Cannon’s death in 1945. A generation removed and friend to the father, Leo Wiener, Can-

ner and of the Macy Conferences helped sediment homeostasis as the “key concept” for early (or first wave) cybernetics with a similar inattention to the prior circulation of the term. “At the center of Wiener’s early cybernetics,” Hayles writes, “was the concept of homeostasis, defined as the ability of an organism to maintain itself in a stable state. The other [later] constellation led away from the closed circle of corrective feedback, privileging change over constancy, evolution over equilibrium, complexity over predictability.”³⁴ While Hayles’s understanding of how cybernetics came to operationalize reflexivity and, later, virtuality, surely do mark departures from the first “homeostatic” articulation of cybernetics, her description of this shift conflates homeostasis with equilibrium and with a “stable state” understood in the sense of constant and predictable stasis.³⁵ The founder of ecosystem science, Eugene Odum, incorporated homeostasis in much the same way.³⁶ First published in 1953 without

non was actually something of a mentor and role model for young Norbert. This personal connection is signaled in Wiener’s more technical book-length introduction to cybernetics, *Cybernetics; or, Control and Communication in the Animal and Machine* (Cambridge, MA: MIT Press, 1948). Here Cannon’s name appears in the first, dedicatory paragraph. Still, even with this acknowledgment, the book proceeds with very little to say about Cannon’s writings. Norbert Wiener, *Cybernetics* (Cambridge, MA: MIT Press, 1948), p. 7.

34. N. Katherine Hayles, “Boundary Disputes: Homeostasis, Reflexivity, and the Foundation of Cybernetics,” *Configurations* 2:3 (1994): 441–467, at p. 446.

35. Hayles premiered her three-wave understanding of cybernetics in “Boundary Disputes: Homeostasis, Reflexivity, and the Foundations of Cybernetics” (above, n. 34), an article that—surprisingly, given the title—makes no mention of Cannon. Only in her *How We Became Posthuman: Virtual Bodies in Cybernetics, Literature, and Informatics* (Chicago: University of Chicago Press, 1999) does Hayles cite the originator of homeostasis, and here only briefly in a footnote before also naming Bernard, who she says “originated the concept in the nineteenth century” (p. 294).

36. The uptake of homeostasis into ecosystem science is important for understanding the way in which the term has been taken up in cybernetics and later discourses; however, as a number of critics have shown, homeostasis actually entered ecology earlier, through community ecology. See Alfred E. Emerson’s classic essay on “dynamic homeostasis,” which—unlike Odum and later users of the term—actually pays careful attention to Cannon. For instance, Emerson describes homeostasis as “relative equilibrium within narrow ranges of variation, and balanced compromise, among multitudinous activities” (Alfred E. Emerson, “Dynamic Homeostasis: A Unifying Principle in Organic, Social, and Ethical Evolution,” *The Scientific Monthly* 78:2 [1954]: 67–85, at p. 73). For more on homeostasis and the historical and institutional arc of community ecology, see Gregg Mitman, *The State of Nature: Ecology, Community, and American Social Thought, 1900–1950* (Chicago: University of Chicago Press, 1992), pp. 146–168; and Egerton, “Changing Concepts” (above, n. 6), p. 344. For accounts that compliment Hagen on ecosystems ecology, see Peter Taylor, “Technocratic Optimism, H. T. Odum, and the Partial Transformation of Ecological Metaphor after World War

mention of “homeostasis,” later editions of Odum’s field-defining textbook, *Fundamentals of Ecology*, proffer a definition of homeostasis that Cannon would not have countenanced.³⁷ Explaining that Cannon’s word combines “homeo = same” with “stasis = standing,” Odum contrasts “homeostasis” with what he sees to be a more “fluid,” self-correcting regulation in the term “homeorhesis.”³⁸ This new term is Greek, Odum says, for “maintaining the [same] flow.”³⁹ Homeostasis, according to Odum, is wedded to a paradigm of balance and equilibrium—specifically, to the “set-point” control of a thermostat; but homeorhesis, Odum says, names a more flexible, mutable, and negotiable stability.⁴⁰

The term “homeorhesis” was coined by developmental biologist C. H. Waddington, who introduced it as a compliment to, not a replacement for, homeostasis. Homeorhesis *does* emphasize “flow,” as Odum suggests, but not in the sense of a more flexible version of physiological functioning than is implied by homeostasis. Instead, the “flow” of homeorhesis refers to what Waddington calls developmental canalization, the embryological “attainment of some particular end-state in spite of temporary deviations on the way there,” rather than to the physiological “maintenance of a steady state.”⁴¹ Despite this difference, however, Odum’s understanding of homeostasis as the rigid, inflexible counterpart to homeorhesis, a sleeker, more dynamic version of regulation, recurs across a number of contexts. For instance, in early discussions of the Gaia Hypothesis—now

II,” *Journal of the History of Biology* 21:2 (1988): 213–244; Sharon Kingsland, *The Evolution of American Ecology, 1890–2000* (Baltimore: Johns Hopkins University Press, 2008), pp. 179–205; and Donald Worster, *Nature’s Economy* (above, n. 6), pp. 302–360.

37. For Odum’s own account of the importance of the textbook, see Eugene P. Odum, “The Emergence of Ecology as a New Integrative Discipline,” *Science* 195:4284 (1977): 1289–1293. For an account of the textbook as it changed over the course of Odum’s career and through multiple editions, see Joel B. Hagen, “Teaching Ecology during the Environmental Age, 1965–1980,” *Environmental History* 13:4 (2008): 704–723.

38. Eugene P. Odum and Gary W. Barret, *Fundamentals of Ecology*, 5th ed. (Belmont, CA: Thomson Brooks/Cole, 2005), p. 68. This exact definition of homeostasis as “same standing” is the one repeated—with reference to Odum—in a recent encyclopedia article on the term. See S. K. M. Ernest, “Homeostasis,” *Encyclopedia of Ecology*, ed. Sven Erik Jørgensen and Brian D. Fath (Oxford: Elsevier, 2008), pp. 1879–1884, at p. 1879.

39. Odum and Barret, *Fundamentals of Ecology* (above, n. 38), p. 68.

40. Odum’s reference to “set points” and thermostats seems to return homeostasis, contra Cannon, to Bernard’s “hothouse.”

41. C. H. Waddington, *The Strategy of the Gene: A Discussion of Some Aspects of Theoretical Biology* (London: Ruskin House, 1957; republished by New York: Routledge, 2014), pp. 32–42.

rebranded as the “leaner and more scientifically acceptable” Gaia Theory—James Lovelock and Lynn Margulis argued that earth systems relied on homeostasis to maintain an “active adaptive control system” in support of life.⁴² Homeostasis was so important to this early articulation that it recurred in technical and popular presentations alike, even appearing in the title of several landmark articles.⁴³ According to P. J. Boston, however, Margulis was dissatisfied with the term “homeostasis”; she preferred to think in terms of homeorhesis, since for her, Earth’s atmosphere, lithosphere, and hydrosphere were “regulated around set points that can change in time as the whole system evolves essentially through a life cycle.”⁴⁴ Homeostasis, Boston suggests, was simply too “narrow” for the type of regulation that Margulis deemed important.⁴⁵ Similarly, but with reference to biological organisms rather than of atmospheric systems, philosopher of science Michel Serres argues that “homeorrhesis” [*sic*] is a better term than homeostasis for describing the “open system” of the relatively stable organism.⁴⁶ The editors explain in a footnote that

42. James Lovelock, *Gaia: A New Look at Life on Earth* (Oxford: Oxford University Press, 1995), p. xv; James Lovelock and Lynn Margulis, “Atmospheric Homeostasis by and for the Biosphere: The Gaia Hypothesis,” *Tellus* 26:1–2 (1974): 2–10, at p. 3.

43. For technical papers, see Lovelock and Margulis, “Atmospheric Homeostasis” (above, n. 42); James Lovelock and Lynn Margulis, “Homeostatic Tendencies of the Earth’s Atmosphere,” *Origins of Life* 5:1–2 (1974): 93–103. The first more broadly pitched discussion of the Gaia hypothesis also relied heavily on the idea of homeostasis. See Lynn Margulis and James Lovelock, “The Atmosphere as Circulatory System of the Biosphere—The Gaia Hypothesis,” *The CoEvolution Quarterly* 6 (Summer 1975): 31–40, at p. 32.

44. P. J. Boston, “Gaia Hypothesis,” in *Encyclopedia of Ecology* (above, n. 38), pp. 1727–1731, at p. 1728.

45. A full consideration of homeostasis with respect to Gaia Theory is beyond the scope of this paper, and several critics have already explored the issue in more detail. See Bruce Clarke, “Autopoiesis and the Planet,” in *Impasses of the Post-Global: Theory in the Era of Climate Change, Volume 2*, ed. Henry Sussman (Ann Arbor, MI: Open Humanities Press, 2012), pp. 58–75; Bruce Clarke, “‘Gaia Is Not an Organism’: Scenes from the Early Scientific Collaboration between Lynn Margulis and James Lovelock,” in *Lynn Margulis: The Life and Legacy of a Scientific Rebel*, ed. Dorion Sagan (White River Junction, VT: Chelsea Green Publishing, 2012), pp. 32–43; David M. Wilkinson, “Homeostatic Gaia: An Ecologist’s Perspective on the Possibility of Regulation,” in *Scientists Debate Gaia: The Next Century*, ed. Stephen H. Schneider, James R. Miller, Eileen Crist, and Penelope J. Boston (Cambridge, MA: The MIT Press, 2004), pp. 71–78; J. Scott Turner, “Gaia, Extended Organisms, and Emergent Homeostasis,” in *Scientists Debate Gaia: The Next Century*, ed. Stephen H. Schneider, James R. Miller, Eileen Crist, and Penelope J. Boston (Cambridge, MA: The MIT Press, 2004), pp. 57–70.

46. Michel Serres, “The Origins of Language: Biology, Information Theory, and Thermodynamics,” in *Hermes: Science, Literature, and Philosophy*, ed. José V. Harari and David F. Bell (Baltimore: Johns Hopkins University Press, 1982), pp. 71–83, at p. 74.

“homeorrhesis” [*sic*] emphasizes the “idea of continual movement and exchange as opposed to the less dynamic idea of stasis” implied in homeostasis.⁴⁷ The same opposition of terms structures Jianguo Wu and Orié L. Loucks’s important paper on ecological “paradigm shifts” and “patchiness.” Central to Phillips’s *The Truth of Ecology*, this summative article glosses homeostasis as “stable stability” before the authors go on to explore homeorhesis as—in contrast—a “more flexible framework for open systems.”⁴⁸ And most recently, ecocritic Greg Garrard’s consideration of the “health” trope in eco-life writing rehashes the same distinction: “Homeostatic conceptions of both environmental and human health have proven less defensible than the idea of oscillations within certain parameters, which allows for dynamism and continual change—what one might call a ‘homeorhetic’ approach.”⁴⁹ Whatever legitimate purchase the term “homeorhesis” undoubtedly has for the likes of Gaia Theory, Serres, Wu and Loucks, and Garrard, their respective invocations of the term consistently work to back-project an undue rigidity onto homeostasis. In other words, while “homeorhesis” does describe regulation and self-organization in different ways—ways perhaps better suited to their various projects—the pattern of term substitution identified above paves over the nuances of Cannon’s account. Rhetorically, homeorhesis acts to stabilize homeostasis as “same standing,” static “stable stability,” and equilibrium even though Cannon tried (unsuccessfully, it seems) to head off this rendering from the start.

Cannon’s etymological gloss was just one of the ways in which he tried to emphasize the non-equilibrium meaning of homeostasis. Elsewhere he drew on the work of S. J. Meltzer, a physiologist who had compared the “margin[s] of safety” within which organisms could remain alive to the ways in which engineers design bridges to withstand many times the weight that they are likely to bear.⁵⁰ Homeostasis for Cannon figures a range within forgiving limits. As Cannon puts things in a later and more popularly pitched paper, “it is obvious that our bodies are not built on a niggardly and skimpy plan, but have abundant margins of security.”⁵¹ This quality of abundance

47. Ibid.

48. Jianguo Wu and Orié L. Loucks, “From Balance of Nature to Hierarchical Patch Dynamics: A Paradigm Shift in Ecology,” *The Quarterly Review of Biology* 70:4 (1995): 439–466, at p. 444.

49. Greg Garrard, “Nature Cures?: Or, How to Police Analogies of Personal and Ecological Health,” *Interdisciplinary Studies in Literature and Environment* 19:3 (2012): 494–514, at p. 496.

50. Cannon, *The Wisdom of the Body* (above, n. 25), p. 231.

51. Walter B. Cannon, “Biocracy: Does the Human Body Contain the Secret of Eco-

further fueled Cannon's amazement at the body's relative stability: it is not just that homeostasis regulates life within an "open system" but that this regulation is itself adjustable, is itself able to account for vicissitudes.⁵² Indeed, homeostatic stability was achievable largely *because* the body was in some ways fundamentally unstable. As Cannon put it, the living being is "stable because it is modifiable—the slight instability is the necessary condition for the true stability of the organism."⁵³ Despite the language of "steady states," then, Cannon insists the "homeostasis" requires relative and flexible stability dependent on an ongoing negotiation between inside and outside.

The most telling language that both sets Cannon's thinking apart from Bernard and likens homeostasis to new materialism follows through on Bernard's own language of fluidity and the sense of a "flow" (language usually reserved by later critics—as we have seen—for homeorhesis). Indeed, Cannon's choice of analogy reveals what is specially emphasized in homeostasis, and it is here that we can appreciate the way in which Cannon's theorization of homeostasis resonates with contemporary ecotheory. Cannon describes the organism's "fluid matrix" through the metaphor of the womb. He writes,

Though the world outside us may be distressingly cold, though the heat and acid which arise from our own strenuous exertions may tend to become an overwhelming menace, we are not greatly disturbed for our living parts touch only the body fluids which are maintained in an even and steady state. So long as this personal, individual sack of salty water, in which each one of us lives and moves and has his being, is protected from change, we are freed from serious peril.⁵⁴

After again citing threats from without and from within, Cannon here describes homeostasis as if it is the prolongation of fetal protection, a sort of amniotic insulation retained long after birth.⁵⁵

onomic Stabilization?," *The Technology Review* 35:6 (1993): 203–206 and 227, at p. 206.

52. Here we might consider Lynda Birke's argument that "'homeostasis' can be turned around, decentering the 'constancy' theme and focusing instead on fine changes involved in keeping within gross limits" (Lynda Birke, "Bodies and Biology," in *Feminist Theory and the Body: A Reader*, ed. Margrit Shildrick and Janet Price [New York: Routledge, 1999], pp. 42–49, at p. 45).

53. Cannon, *The Wisdom of the Body* (above, n. 25), p. 21. Arminjon recognizes the importance of this idea with a helpful gloss: "For Cannon, the dynamic variability of the milieu interieur is the condition that permits the adaptive stability of the organism" (Arminjon, "Birth of the Allostatic Model" [above, n. 18], p. 403).

54. Cannon, "Stresses and Strains" (above, n. 28), p. 2.

55. Cannon extends this womb analogy elsewhere by way of recalling the so-called biogenetic law. Cannon suggests that the newborn child's relative inability to maintain

We might surmise that Cannon could employ the metaphor of the womb because he had the benefit of relative distance from the debates about vitalism that so dictated Bernard's terms and thinking. After all, recourse to reproductive imagery would surely have landed Bernard in the vitalist camp that he worked so hard to avoid. In contrast, Cannon delivers his description of homeostasis-as-womb with biblical reverence.⁵⁶

More crucial for our consideration here, however, is the fact that this difference between hothouse and womb actually indexes the key distinction between Bernard and Cannon. Continuous with Bernard's view, "life" in Cannon's account is still removed from direct intervention. But where the "hothouse" retains control for the scientist who manipulates life from without, Cannon's language of the womb intuits relation through unpredictable exchange.⁵⁷ Science studies critic Ed Cohen's magisterial treatment of the immune system, *A Body Worth Defending*, clarifies this distinction. Cohen enthrones Bernard as the culminating figure in his history of the modern immunological body. It was Bernard who most influentially inaugurated physiology and medicine as a laboratory procedure wherein the organism is cut off from its surroundings.⁵⁸ Cohen argues that it was only late in Bernard's career that he came to understand that isolation was an "illusion."⁵⁹ Bernard realized that "free and independent" life only *seemed* free and independent because regulatory agencies were constantly working to make it appear so.

homeostasis after departing the womb replays on the level of the individual what has occurred on the evolutionary scale of the species. That is, if we, as "higher" creatures, have achieved homeostasis after the trial and error of generations, the homeostatic-weak infant returns to—recapitulates—a time before we perfected the art (see Cannon, *The Wisdom of the Body* [above, n. 25], p. 301).

56. In direct reference to God, Acts 17:28 of the American Standard Version of the Bible reads, "for in him we live, and move, and have our being; as certain even of your own poets have said, for we are also his offspring." Biographers Wolfe, Barger, and Benison explain that Cannon traded in the reformed Christianity of his upbringing for a religious devotion to science as such; this swap in commitments certainly comes across in this striking passage. See Elin L. A. Wolfe, Clifford Barger, and Saul Benison, *Walter B. Cannon: The Life and Times of a Young Scientist* (Cambridge, MA: Belknap Press, 1987), p. 104.

57. As Arminjon puts it, Cannon's homeostasis differs from Bernard's thinking not so much as a fundamental transformation but rather through "a better appreciation of the interactions that [the milieu interieur] entertains with the external milieu" (Arminjon, "Birth of the Allostatic Model" [above, n. 18], p. 405).

58. Ed Cohen, *A Body Worth Defending: Immunity, Biopolitics, and the Apotheosis of the Modern Body* (Durham, NC: Duke University Press, 2009), p. 94.

59. *Ibid.*, p. 204.

The problem, for Cohen, is not that Bernard made this eventual realization that the organism is always in contact with an outside but that Bernard's response to such a realization was to envision and install a defensive apparatus. In other words, for Cohen, Bernard's "concept of life establishes a theoretical basis not just for affirming the organism's singularity—however fragile and precarious—but also for conceiving defense as one of its vital functions."⁶⁰ At least late in his career if not earlier, then, Bernard did understand regulation in terms of relation. But this relation was always coded, Cohen says, as a threat in need of neutralization.⁶¹

If Bernard's understanding of bodily self-regulation recognizes relation only via a defense that negates this relation, Cannon's womb metaphor understands the body/environment distinction in a markedly different sense. Reiterating his insistence on ever-exchanging "open systems" kept within "abundant margins," the womb emphasizes that homeostasis is always provisional and flexible. Like Bernard, Cannon still emphasizes protection—for example, by explaining that the homeostatic organism (or fetus) within the "salty sack" must be "protected from change."⁶² But the militant fortification of Bernard's hothouse gives way to protection in terms of a nurturing and ongoing mediation. Life does not mobilize to combat its outside, as in Bernard; rather, life—"[s]o long as this personal, individual sack of salty water . . . is protected from change"—is "freed," at least provisionally, for the time being, "from serious peril." Homeostasis is a process that maintains relative constancy by always putting life in umbilical touch with what is not-life, a process of rendering the putative boundaries of what must be regulated—life itself—in the porous and permeable terms of "fluid" exchange.⁶³

60. *Ibid.*, p. 205.

61. Frederic L. Holmes argues that while Bernard is best remembered for his account as laid down in the deathbed edition of the lectures that Cohen cites, ideas about the centrality of the relation between organism and environment were present throughout Bernard's research arc. See Holmes, "Claude Bernard" (above, n. 22).

62. Indeed, chapter 14 of *The Wisdom of the Body* enumerates the "natural defenses of the organism" and describes homeostasis as belonging to the "general category of protective functions" (Cannon, *The Wisdom of the Body* [above, n. 25], p. 216).

63. Among the few critics to note such a distinction between Bernard and Cannon, Steven J. Cooper provides an invaluable (though brief) account of the "emergence of the term homeostasis." He argues that Cannon hewed closely to Bernard's work even as his new term emphasized important distinctions. For Cooper, "Cannon sharpened up Bernard's terminology, and moved from a sense of 'fixed values' to the more realistic notion of 'keeping within narrow limits.'" This difference explains why Bernard was interested in the "state of the internal environment" while Cannon was interested in the "control factors," or processes, in my terms, "which intervene to ensure the mainte-

For Cohen, Bernard marks the “apotheosis” of the modern body of immunity-as-defense. Cannon’s homeostasis, on the other hand, corresponds with the type of alternative that Cohen and others before and after him are interested in exploring. Cohen joins so-called immunophosophers such as Emily Martin, Donna J. Haraway, and Roberto Esposito in imagining a version of the immune system that replaces defense with interaction, separation with integration. Given Cannon’s womb metaphor, Martin’s approach is particularly germane. Her work calls for a shift from traditional understandings of immunity as the protection of a (white/male) bounded machine or nation-state to new metaphors derived from feminist environmentalism and chaos theory. These new metaphors, Martin says in a 1998 essay, describe a “fluid” body “attuned to its environment,” a body that “reach[es] out with the sticky fingers of its mucosal surfaces, flexibly and nimbly changing to meet a continuous stream of challenges from without and within.”⁶⁴ Mucosal and mixed, the feminist version of the immune system (or *commune* system, in Cohen’s terms) sounds remarkably like Cannon’s “homeostasis.”⁶⁵ For Cannon as for Martin, each of us is connected to and animated by relations that bring the outside world into contact with an “I” that is never wholly separate, singular, or at a static equilibrium.⁶⁶

nance of the steady conditions of the body” (Steven J. Cooper, “From Claude Bernard to Walter Cannon: Emergence of the Concept of Homeostasis,” *Appetite* 51:3 [2008]: 419–427, at p. 424 [emphasis in original]).

64. Emily Martin, “Fluid Bodies, Managed Nature,” in *Remaking Reality: Nature at the Millennium*, ed. Bruce Braun and Noel Castree (London: Routledge, 1998), pp. 64–83, at pp. 73, 75.

65. First delivered as a lecture in 1988, Haraway’s discussion of “postmodern” immunity is very much in line with Martin. Donna Haraway, “The Biopolitics of Postmodern Bodies: Constitutions of Self in Immune System Discourse,” in *Simians, Cyborgs, and Women: The Reinvention of Women* (New York: Routledge, 1991), pp. 203–230. For a more recent approach that upends the defensive immune system model from within the sciences, see Scott F. Gilbert, Jan Sapp, and Alfred I. Tauber, “A Symbiotic View of Life: We Have Never Been Individuals,” *The Quarterly Review of Biology* 87:4 (2012): 325–341.

66. I have used the more general term “womb,” but Cannon’s similarity to Martin’s work on immunity—and their shared vocabulary of fluidity and “mucosal surfaces”—might also be thought of in the more specific language of the placenta, as Marjolein Oele’s recent essay makes clear. Indeed, Oele’s compelling “placentology” of an “original hospitality” resonates with Cannon’s metaphorical descriptions of the “salty sack” of homeostasis. Thus, Oele may be too quick to argue that the *generative* work of the placenta must go beyond the fundamentally conservative work of homeostasis—at least, too quick if homeostasis is understood in the terms I am offering throughout this essay. See Marjolein Oele, “Openness and Protection: A Philosophical Analysis of the Placenta’s Mediatory Role in Co-Constituting Emergent, Intertwined Identities,” *Configurations* 25:1 (2017): 343–371, at pp. 370, 335.

As these connections with Martin's work suggests, Cannon's homeostasis anticipates not only the integrated immune system but also what Stacy Alaimo has more recently termed "trans-corporeality," the notion that "the human is always intermeshed with the more-than-human world."⁶⁷ Alaimo develops this idea at length in *Bodily Natures* and elsewhere, and she uses her neologism to explore the often "unpredictable and unwanted" connections that prove, again and again, how the human cannot be separated from its environment. This project of course departs from Cannon's physiological focus, but the two nevertheless share an undergirding commitment to understanding the organismic body as just one permeable environment nested within others. Indeed, Cannon's womb analogy answers in advance Alaimo's call for an understanding that "'the environment' is not located somewhere out there, but is always the very substance of ourselves."⁶⁸ Similarly, homeostasis anticipates Dana Phillips and Heather I. Sullivan's desire for a form of "story-telling and tool-making" that "serves to *extend* our material bodies and the material processes in which they are enmeshed, not to *sever* us from them."⁶⁹ Lastly, we might also recall the distinct view of "material phenomenon" introduced in Frost and Coole's primer on "new materialism," where insistence on "discrete entities or closed systems" is traded in for an appreciation of "open, complex systems with porous boundaries."⁷⁰ Thus, rather than finding itself always on the outs of new materialist eco-discourse—always already pitched to the scrap heap of green—Cannon's homeostasis seems a prescient, kindred endeavor.

The Body Physiologic, the Body Politic

Of course, even in light of the foregoing, Cannon's preeminent interest in bodily "regulation" suggests that homeostasis may be in tension with the "commune system" body, the trans-corporeal body, and new materialism generally insofar as Cannon retains a focus on norms. Homeostasis is, after all, a process that maintains *health*, a term perennially problematized not only in feminist science studies like that of Martin but also in recent environmental and ecological thinking.⁷¹ Still, as we have seen, Cannon's understanding of life as

67. Alaimo, *Bodily Natures* (above, n. 13), p. 2.

68. *Ibid.*, p. 4.

69. Phillips and Sullivan, "Material Ecocriticism" (above, n. 13), p. 447 (emphasis in original).

70. Coole and Frost, "Introducing" (above, n. 8), p. 15.

71. For recent accounts that stress the oppressive function of health and normativity in ecological and environmental discourse, see Lawrence Buell, *Writing for an Engen-*

a relatively “steady state” within “margins” is more flexible than the exact, inviolable set point that is often incorrectly associated with homeostasis. Rather than regarding health as a universal, normative standard, Cannon’s homeostatic womb accords with health as understood by Canguilhem, who discusses “normativity,” the ability to establish new norms in the face of change. Indeed, though Canguilhem draws on a number of thinkers in the history of physiology and medicine to develop his view, he seems to have Cannon specifically in mind when he writes, “Health is a margin of tolerance for the inconsistencies of the environment.”⁷² This version of health-as-normativity is not reliant on returning to a set point of equilibrium, nor on the need to defend the immunological fortress. Instead it is a matter of the organism’s competency to live and adapt to any given moment.⁷³ As Steven J. Cooper explains of homeostasis, “The ‘normal’ was not a ‘resting’ state” since, as he puts it earlier in his article on Bernard and Cannon, “constancy and equilibrium are not default conditions but have to be achieved and maintained for as long as the animal continues its free and independent life.”⁷⁴ Taken in this sense, Cannon’s homeostasis encodes notions of health and norms far different from the more typically prescriptive and limiting version.⁷⁵

But whatever conceptual convergences link homeostasis to the ambit of contemporary new materialism, Cannon’s thinking includes a more encompassing sociopolitical vision than one is likely

dered World: Literature, Culture, and Environment in the U.S. and Beyond (Cambridge: Harvard University Press, 2001); Eli Clare, “Meditations on Natural Worlds, Disabled Bodies, and a Politics of Cure,” in *Material Ecocriticism*, ed. Serenella Iovino and Serpil Oppermann (Bloomington: Indiana University Press, 2014), pp. 204–218; Alison Kafer, *Feminist, Queer, Crip* (Bloomington: Indiana University Press, 2013); Sarah Jaquette Ray, *The Ecological Other: Environmental Exclusion in American Culture* (Bloomington: Indiana University Press, 2013). More generally on this topic, see the essays in Jonathon M. Metz and Ana Kirkland, eds., *Against Health: How Health Became the New Morality* (New York: New York University Press, 2010).

72. Georges Canguilhem, *The Normal and the Pathological*, trans. Carolyn R. Fawcett in collaboration with Robert S. Cohen (New York: Zone Books, 1991), p. 197.

73. For a concise summary of Canguilhem’s understanding of health, see “What Is Health? The Ability to Adapt,” *The Lancet* 373:9666 (2009): 781.

74. Cooper, “From Claude Bernard” (above, n. 63), pp. 426, 422.

75. Situating homeostasis vis-à-vis health and Canguilhem’s normativity joins Kevin Gotkin’s recent call to find in Canguilhem a “provocation” for the field of disability studies, where Canguilhem’s “propulsive atavism” allows one to continually return to and reconsider the metastable “constants” necessary for life. See Kevin Gotkin, “The Norm__ and the Pathological,” *Disabilities Studies Quarterly* 36:1 (2016): doi: <http://dsq-sds.org/article/view/4281>.

to encounter there. Writing in the midst of the Great Depression—when the United States was, according to him, in a “hell of a mess”—Cannon decided to pitch homeostasis into the national conversation regarding social organization.⁷⁶ This application of the “body physiological” to the “body politic” amounted to a call for what Cannon called “biocracy,” or, elsewhere, “social homeostasis.” What his biomedical research on homeostasis suggested, Cannon said, was that certain “general principles of organization might be quite as true of the body politic as they are of the body biologic.”⁷⁷ In particular, Cannon says, we should consider developing and strengthening the “system of distribution,” which is the social “analogue” to the body’s homeostasis fluid matrix. This system includes infrastructure (canals, rivers, roads, and railroads) and should work to “deliver continuously the necessities of existence.” “Food, clothing, shelter, the means of warmth, and assistance in case of injury or disease, are,” Cannon insists, “among these necessities.”⁷⁸ Stephen J. Cross and William R. Albury explain that Cannon’s application of the natural sciences (physiology, in this case) to social theory joined a number of other interwar attempts to apply scientific expertise to looming national anxieties;⁷⁹ elaborated throughout the early 1930s and into the ‘40s, Cannon’s remarks in particular called for a “New Deal before the New Deal,” as Donald Fleming puts it.⁸⁰

Apart from its structural or functional recommendations, homeostasis also supplies several summative “suggestions.” “First,” Cannon says, homeostasis suggests that “*stability is of prime importance*. It is more important than economy.”⁸¹ For Cannon, this is clear insofar as the organism regularly throws off “not only water and salts but also sugar, when they are present in excess”;⁸² thus, the organism suggests that economy is less critical than a preparedness “to meet unusual demands which would disturb the fluid matrix of the body if they were not met.”⁸³ Next, the organism also suggests that there are “early signs of disturbance of stable states which, if sought, can

76. Cannon, “Biocracy” (above, n. 51), p. 203.

77. *Ibid.*, p. 206.

78. *Ibid.*

79. Stephen J. Cross and William R. Albury, “Walter B. Cannon, L. J. Henderson, and the Organic Analogy,” *Osiris*, 2nd ser., 3 (1987): 165–192.

80. Fleming, “Walter B. Cannon” (above, n. 22), p. 637.

81. Cannon, *The Wisdom of the Body* (above, n. 25), p. 299 (emphasis in original).

82. *Ibid.*

83. *Ibid.*

be found. Such warning signals are known in the body biologic. It is hard to believe that there are not similar warning signals in the body politic."⁸⁴ Thinking in organismic terms encourages us to locate, study, and attend to those small signals that portend larger-scale effects, such as signals of "perilous economic tendencies" that may begin with falling stock prices only to lead to "panic."⁸⁵ If followed, the result of these suggestions and recommendations, Cannon says, is that the social body will effectively support the individual (organismic) bodies of which it is comprised. As he reiterates in the closing lines of *The Wisdom of the Body*, "steady states in society as a whole and steady states in its members are closely linked."⁸⁶ Thus, "the main service of social stabilization," as he puts it elsewhere, is to "support bodily stabilization by assuring the supply of fundamental needs. In that way social stabilization would help to release the highest activities of the brain for adventure and achievement."⁸⁷ Released for these "highest activities," we are "free," free in the classically liberal sense to "enter into agreeable relations with our fellows."⁸⁸ Bodily homeostasis is thus the model, Cannon says, for a social order that secures both "security and freedom."⁸⁹

Cannon was far from the first to suggest that society could or should be thought of as an organism. As Cannon himself realized, treating the "body politic" in organismic or biological terms is a theoretical move as old as political thought itself. In fact, Donald Fleming suggests that Cannon's "explicit analogies" between organism and society were already "anathema" to intellectual trends at the time of their appearance, since by the 1930s such a one-to-one juxtaposition "smacked of an outworn nineteenth century tradition in sociology."⁹⁰ Among the best critical authorities conversant with just

84. Cannon, "Biocracy" (above, n. 51), p. 206.

85. Walter B. Cannon, "The Body Physiologic and the Body Politic," *Science* 93:2401 (1941): 1-10, at p. 6

86. Cannon, *The Wisdom of the Body* (above, n. 25), p. 306.

87. Cannon, "Biocracy" (above, n. 51), p. 227.

88. *Ibid.*

89. Cannon, "The Body Physiologic" (above, n. 85), p. 2.

90. Fleming, "Walter B. Cannon" (above, n. 22), p. 638. Cannon seems to have recognized that his ideas struck some as old-fashioned, since his later writing on social homeostasis qualified his understanding of analogies. In his 1941 article, for instance, he explains that the analogies offered to sociology from biologists falter when stressed to an "absurd degree": "We are not illuminated," he says, "by a likening of manual laborers to muscle cells, manufacturers to gland cells, bankers to fat cells and policeman to white blood corpuscles." "On the other hand," he goes on, "analogies may be instruc-

this “outworn nineteenth century tradition” is Canguilhem himself, whose discussion of Cannon’s physiological findings regularly dilated to consider “social homeostasis,” as well. Canguilhem was thoroughly unimpressed with Cannon’s social theories. Cannon’s mistake, Canguilhem says, is the classic mistake of all organismic sociology. Cannon failed to see the essential difference between biological organization and social organization. Whereas the norms of the organism are immanent, the norms of society are always external and applied. Nobody instructs the organism how to live—how to regulate and persist—but someone *must* and always *does* instruct a society’s formation. The fact that a society is organized, Canguilhem says, does not mean that it is organic or that it is an organism.⁹¹ Or, to be more precise: society undergoes organization through a “mechanistic” process of receiving regulation imposed from without, whereas the organism—if it is to live—cannot help but be regulated from within.⁹²

That Cannon did not understand this crucial difference is evidenced, according to Canguilhem, in remarks made near the beginning of the epilogue of *The Wisdom of the Body*. Here Cannon writes, “At the outset it is noteworthy that the body politic itself exhibits some indications of crude automatic stabilizing processes.”⁹³ Cannon then provides an example: “A display of conservatism excited a radical revolt and that in turn is followed by a return to conservatism. Loose government and its consequences bring the reforms into power, but their tight reins soon provoke restiveness and the desire for release.”⁹⁴ For Canguilhem, this example is absurd and even quaint. Cannon, he says, conflates the contingent workings of one particular nation and form of government (the parliamentary United States) with the workings of sociopolitical organization unto itself. “As if this alteration” between conservatism and radicalism, Canguilhem scolds,

far from being the effect of an apparatus which is inherent, even in the rudimentary state, to every social structure, were not in fact the expression of the relative efficiency of a regime invented to channel and smother social antago-

tive if, instead of a comparison of structural details, there is inquiry into relative functional accomplishments in the physiological and social realms” (Cannon, “Biocracy” [above, n. 51], p. 5).

91. See Canguilhem, *Writings on Medicine* (above, n. 17), p. 76.

92. See Canguilhem, *The Normal* (above, n. 72), pp. 251–252.

93. Cannon, *The Wisdom of the Body* (above, n. 25), p. 293.

94. *Ibid.*

nism, of a political machine acquired by modern societies in order to delay, without finally being able to prevent, the transformations of their consistencies into crisis.⁹⁵

Cannon conflates what has been “invented” (a political machine meant to smother) with what is immanent (a biological norm such as homeostasis). According to Canguilhem, such a conflation renders Cannon’s overreaching take naïve and meaningless at best.⁹⁶ And at times Canguilhem even hinted—however obliquely—at the fascist consequences that, by mid-century, were seen to depend on similarly organismic sociologies, although he never suggested that Cannon himself was sympathetic to such views. If trite and simplistic at the time of Cannon’s writings, the organismic analogy should now put us on guard.⁹⁷

Canguilhem’s critique precludes unproblematic sociopolitical application of homeostasis. His critique demonstrates why we cannot join Cannon in rejoicing in the notion that the body “contain[s]” and has revealed the “secret” of social organization.⁹⁸ Indeed, paradoxically, if this celebration is rendered unavailable by Canguilhem’s *distinction* between immanent bodily norms and imposed social norms, it is made equally untenable by the *collapse* of such a distinction. This is the point made by Canguilhem in his later writings on vital and social norms. In partial response to the work of his student, Michel Foucault, on the history of medicine, Canguilhem argues that vital and social norms are in fact reciprocating nodes in contingent fields. While the organism may indeed make and remake its norms, these norms are always situated within power dynamics that traverse the social *and* the biological alike. “The form and functions of the human body,” Canguilhem explains, “are the expression not only of conditions imposed on life by the environment but also of socially accepted modes of living in the environment.”⁹⁹ And

95. *Ibid.*, p. 260.

96. Cannon himself feared that his foray into “social homeostasis” was overreaching. According to his biographers, his reluctance to add the epilogue to *The Wisdom of the Body* was worn down by the insistence of his publisher. See Wolfe, Barger, and Benison, *Walter B. Cannon, Science and Society* (above, n. 15), pp. 260–261.

97. For example, Canguilhem concludes a 1955 essay (originally a lecture) with a rather circuitous plea that his listeners be “vigilant towards all these comparisons” between organisms and society, comparisons “whose consequences you can guess” (Canguilhem, *Writings on Medicine* [above, n. 17], p. 78).

98. Cannon, “Biocracy” (above, n. 51), p. 203.

99. Canguilhem, *The Normal* (above, n. 72), p. 269. On Canguilhem’s discussion of vital and social norms, see Pierre Macherey, “From Canguilhem to Canguilhem by Way

this recognition of the fundamentally social dimension of norms is made all the more complicated, Canguilhem realized, by the work of eugenicists who strove to generate and shape biological norms in the name of specific social and political “calculations.”¹⁰⁰ If Cannon was misguided because he conflated the (organic) natural with the (machinic) social, his account is also inadequate, then, insofar as he established an enduring distinction between the naturalism of the organismic body and society as a supra- or nonnatural set of conditions. Cannon erred in rendering the social as too organismic, on the one hand, and in failing to see the myriad ways in which society shaped the organism, on the other.

But if Cannon’s “social homeostasis” is indefensible and inadequate in the important ways that Canguilhem identifies, it is worth noting that Cannon’s thinking actually has more in common with Canguilhem than the latter’s critique would seem to allow. Canguilhem was right to criticize Cannon’s too easy application of biology to social organization, and Cannon’s chosen example of revolt and reform operating as twin, self-regulating forces is open to censure in just the way that Canguilhem elaborates. On the other hand, Cannon recognized the essentially “machinic” nature of social organization in much the same way that Canguilhem describes. For Cannon, the clearest distinction between the organism and the body politic is that the former must die, whereas the latter can, at least in the theory, live “indefinitely.”¹⁰¹ In his 1941 article, Cannon glosses this particular discrepancy by discussing the way in which—to borrow Canguilhem’s phrase—society is “composed mechanically.”¹⁰² “Death” in the organism, Cannon says here, “is due, therefore, to dependence on irreplaceable parts. By substitution of new parts a machine may continue operating without limit of time. Likewise in social organization there can be unending continuity of efficient existence so long as there are arrangements for continual renewal

of Foucault,” in *Essays in a Materialist Way: Selected Essays*, ed. Warren Montag, trans. Ted Stolze (London: Verso, 1998), pp. 108–116; Maria Muhle, “From the Vital to the Social: Canguilhem and Foucault—Reflections on Vital and Social Norms,” *Republics of Letters: A Journal for the Study of Knowledge, Politics, and the Arts* 3:2 (2014): <https://archive.stanford.edu/rofl/vital-social>; Catherine Mills, “Biopolitics and the Concept of Life,” in *Biopower: Foucault and Beyond*, ed. Nicolae Morar and Vernon Cisney (New York: New York University Press, 2016), pp. 82–101.

100. Canguilhem, *The Normal* (above, n. 72), p. 259.

101. Cannon, “The Body Physiologic” (above, n. 85), p. 9.

102. Canguilhem, *The Normal* (above, n. 72), p. 225.

of the functional groups."¹⁰³ The language here is cumbersome, but the core idea affirms Canguilhem's insistence that social organization requires imposed (i.e., machinic) regulations. Precisely because social organization relies on these replaceable, interchangeable parts, Cannon could look to intercede in the introduction and coordination of these parts. And again, Cannon's inquiries into whether and how bodily homeostasis might offer recommendations to social organization anticipates Canguilhem, who, in *The Normal and Pathological*, describes the "phenomena of social organization" in terms of a "mimicry" of vital functions. To imitate, Canguilhem explains, "does not mean to copy but to tend to rediscover the sense of a production. Social organization is, above all, the invention of organs—organs to look for and receive information, organs to calculate and even make decisions."¹⁰⁴ It is exactly this interest in inventing social "organs" that motivated Cannon's musings on biocracy. If Cannon selected inopportune, simplistic examples, and if he did rely on a fundamental naturalism that we should join Canguilhem in disavowing, he also saw it as his goal to construct social regulations ("organs") that would, he hoped, contribute to organismic well-being. In other words, if social homeostasis suggested, on its face, that the social was inherently organismic, the motivation for Cannon's project came from his belief that social regulation was at its best when it promoted the health of the individual organisms distributed throughout. "The main service of social stabilization," Cannon repeatedly stated, "would be to support [individual] bodily homeostasis";¹⁰⁵ or, as he put it in the 1941 article, "steadiness in society as a whole and steadiness in its members are closely aligned."¹⁰⁶ The organism and the social are linked not merely as analogical systems, then, but also in a material continuum, since organisms comprise the social. This material continuum demands that we invent and introduce the regulating organs that are otherwise lacking in the machinic (because augmentable) social organism. As I show in the next section, this is important insofar as Cannon—as seen through the layers of Canguilhem's critique—proves an instructive complement to new materialism.

Biocracy 2.0

If Cannon was bold and—in Canguilhem's view—misguided to prescribe social homeostasis, new materialist eco-discourse is decidedly

103. Cannon, "The Body Physiologic" (above, n. 85), p. 9.

104. Canguilhem, *The Normal* (above, n. 72), p. 253.

105. Cannon, *The Wisdom of the Body* (above, n. 25), p. 305.

106. Cannon, "The Body Physiologic" (above, n. 85), p. 10.

less sure of how to articulate sociopolitical intervention. We might return first to *Prismatic Ecology*, which is exemplary but not alone in this tendency. As a collection of essays, *Prismatic Ecology* hears from many of the most important critics in the field, which makes it important as a varied cross-section and meeting place. Perhaps more importantly, this varied nature means that certain essays seem acutely aware of the problem I am identifying, while others perpetuate it. For example, in the opening pages we find expressed a rather remarkable anxiety about the volume's general omission of prescription. Lawrence Buell's preface to the volume remarks on the "common gravitational field" shared between the essays before asking: "Can this revisionist ontology deliver a better ethics—not to mention politics—for the Anthropocene?"¹⁰⁷ No, he suggests, or at least *not yet*, not in a way that we can understand at this moment. Buell defers the question to the future, saying, "whatever its eventual payoff direct or indirect as an intervention in the public sphere more generally," this volume can claim to "mov[e] towards a more auspicious conception of ontology and aesthetics than [ecocriticism] has achieved thus far."¹⁰⁸ Attention paid to just this "auspicious conception" turns up in the other bookend, too, when the concluding essay retrospectively characterizes the collection in largely promissory terms. Titled an "Onward"—as opposed to the conventional *afterword*—Serenella Iovino and Serpil Opperman's essay closes *Prismatic* by reminding us that "prismatic ecologies can theorize a pluralist vision interpreting the world as the result of endless mediations and combinations"; or again, "prismatic ecologies can theorize," we are told, "the way our human gaze participates in a world of alterity and likeness."¹⁰⁹ This "theorizing," it would seem, should surely be self-evident by this point: what, after all, is each preceding essay but just such a color-coded "theorization"? But in light of all these theorizations—these truly intriguing new modes of seeing, apprehending, appreciating, tracing, tracking, uncovering, and so forth—what does "participat[ion]" look like? Whither (the) "onward"?

While I do not want to present *Prismatic Ecology* as monolithic, the promissory tone registered above generally holds throughout the collection. Many contributors explore their respective colors only to suggest that, one way or another, such hue-bound exploration will somehow beget a new and better way of acting in the world.¹¹⁰ Stacy

107. Lawrence Buell, "Foreword," in *Prismatic Ecology* (above, n. 9), pp. ix–xii, at p. xi.

108. *Ibid.*, p. xii.

109. Serenella Iovino and Serpil Oppermann, "Onward: After Green Ecologies," in *Prismatic Ecology* (above, n. 9), pp. 328–336, at pp. 335, 336.

110. Two chapters in particular stand out as exceptions to this pattern: Tobias Menely

Alaimo's compelling contribution, for instance, concludes by calling for a non-self-centered ethics of the Other, a hope that "prismatic ecologies" will "lure us into less anthropocentric, less 'grounded' modes of knowledge, politics, and ethics."¹¹¹ Similarly, Jeffrey Jerome Cohen argues that apprehending distributed agency is itself a form of intervention: "Agency is distributed among multifarious relations and not necessarily knowable in advance. . . . This agentism is a form of activism: only in admitting that the inhuman is not ours to control, possesses desires and even will, can we apprehend the environment disanthropocentrically, in a teetering mode that renders human centrality a problem rather than a starting point."¹¹² This eloquent statement accords with the introduction to *Material Ecocriticism*, another collection of ecologically focused new materialist essays published one year after *Prismatic*. Here, Iovino and Opperman provide a helpfully synoptic sense of how ecocriticism and new materialism join together; but the overwhelming sense is that simply describing and tracing material agencies is enough:

Even though no preordered plot can rigorously distinguish these stories of matter, what characterizes them is a narrative performance, a dynamic process of material expressions seen in bodies, things, and phenomena coemerging from these networks of intra-acting forces and entities. Seen in this light, every living creature, from humans to fungi, tells evolutionary stories of coexistence, interdependence, adaptation, and hybridization, extinctions and survivals. Whether perceived or interpreted by the human mind or not, these stories shape trajectories that have a formative, enactive power.¹¹³

New materialist eco-discourse is promissory, then, not only in pushing imperatives to an as yet to be enacted future (as in Buell's rather

and Margaret Ronda's coauthored "Red" and Levi R. Bryant's "Black." I discuss "Black" in more detail below, but "Red" is worth touching on briefly. Menely and Ronda consider how the color red both makes visible and—paradoxically—contains the usually hidden violence of modernity; their essay draws on a rich archive that spans animal studies, Marxist materialism, and political critique. The result is an argument about how contradiction perpetuates rather than obviates business as usual. Still, even here, the essay concludes by wondering aloud about how, whether, and if awareness of the "new ontological order" precipitated by global capitalism and the Anthropocene will bring about a "transformation of political order" (Tobias Menely and Margaret Ronda, "Red," in *Prismatic Ecology* [above, n. 9], pp. 22–41, at p. 38).

111. Stacy Alaimo, "Violet-Black," in *Prismatic Ecology* (above, n. 9), pp. 233–251, at p. 249.

112. Cohen, "Introduction" (above, n. 9), p. xxiv.

113. Serenella Iovino and Serpil Oppermann, "Introduction: Stories Come to Matter," in *Material Ecocriticism* (above, n. 71), pp. 1–17, at p. 7.

nervous blessing on *Prismatic*) but also in suggesting that a better conception of ecological relations—that “auspicious conception of ontology and aesthetics”—will, as if by necessity, produce a better praxis.

In a strange sense, this promissory approach reiterates the logic of Cannon’s organismic sociology, albeit with a very different sense of the organism in mind. Where Cannon wanted to find in the homeostatic organism “general principles” of regulation to improve social organization, new materialists similarly wish to siphon from nature—whether via trans-corporeal posthuman ecology or quantum physics—some socially applicable “general principles.” Canguilhem’s critique thus still holds: where Cannon seems naïve in his stated certainty that regulation would function the same in the case of society and in the organism, new materialism is less certain regarding—but no less dependent *on*—an isomorphism between sociopolitical issues and ecological entanglements. Indeed, the very lack of certainty is built into the isomorphism, since nebulosity and unpredictability are inherent and valorized qualities of the entanglement that new materialism wishes to focalize in its “prismatic” capture. In other words, society for new materialism is still an organism, but the organism has changed; this, it seems, is what Buell has in mind when he says that *Prismatic Ecology* “entertain[s] a new kind of ecological holism, a post-humanist one.”¹¹⁴ Where Cannon gleaned “secrets” from the homeostatic organism, new materialism transcribes and projects an unruly ecology into the hazily stated terms of its “onwards.” This new biocracy, of sorts, is especially apparent in Steve Mentz’s new materialist essay in *PMLA*, “After Sustainability.” Mentz dispatches outworn “green” terms like the “pastoral,” “balance,” and “equilibrium” in the typical fashion before going on to describe the world as we now know it: dynamic and far from equilibrium.¹¹⁵ Apprehending this turbulent, swirling world, Mentz believes, should cause us to see ourselves as so many swimmers, swimmers whose skill and buoyancy keep us afloat in an inhospitable environment, but only for a time. “An ecocriticism that treats dynamic change as a fundamental feature of natural systems,” he explains, “may help us recognize that change is the ‘natural’ value, the condition and structure-breaking structure of all systems.”¹¹⁶ Only by according

114. Buell, “Foreword” (above, n. 107), p. xi.

115. Steve Mentz, “After Sustainability,” *PMLA* 127:3 (2012): 586–592, at p. 587.

116. *Ibid.*, p. 591. Mentz is also a contributor to *Prismatic Ecology*, and his chapter on “Brown” similarly stresses the liquid flux of the world. He concludes by claiming that “[a]ll things connect and cannot escape into separation, and in the face of soupy,

with this ecology of flux, Mentz believes, do we stand a chance of a “postsustainable” survival.

There is undoubtedly much to be gained from new materialism. Nevertheless, the nature of the discourse as explored above points to problems that are best understood in relation to a critique made years ago and pitched in a slightly different register. Indeed, we can understand the reason for Buell’s anxiety—for instance—by returning, once again, to Emily Martin. Dedicated, as we saw above, to debunking the body of “defended borders” in favor of viewing “bodies as complex systems,” Martin’s “Fluid Bodies, Managed Natures” (1998) and her earlier book, *Flexible Bodies* (1994), each close by injecting a warning about relying too totally on a type of messy, unruly, and endlessly relational thinking similar to that championed by new materialism. The last section of Martin’s essay, entitled “Cautions,” notes the problematic consonance between the discourse of “flexible bodies” and the power of cultural trends untethered to accountability, trends including economic demands on an ever-increasingly “flexible” and adaptive workforce.¹¹⁷ In other words, Martin recognizes the consonance between the so-called postmodern body and the socioeconomic and cultural logics of neoliberalism.

In 1999, Martin reiterated and expanded on these concerns about the political connotations of natural metaphors in an interview. Here she suggests that her “cautions” apply to eco-discourse as well as to her primary interests in immunological discourse. When asked to elaborate on the “no-so-great consequences” that might follow from a cultural commitment to a world understood in terms of “integration with everything,” Martin replies,

Well, one of them that I would continue to think is very, very worrisome is the one way in which beginning to see everything related to health has a way of placing more and more responsibility on the individual to manage all these multitudinous links to everything in the world. And it wouldn’t necessarily have to do this, but in practice it tends to remove a sense of the social effects that matter. When people become captivated by a complex systems model, where everything seems to play a role in the outcome of the weather or your health or whatever, the model itself seems to rob you of an ability to differentiate what matters most, to differentiate which structural forces really are crucial versus ones that are much less important. And the reason this is worrisome is that it seems to make political action impossible. Everything’s

smelly, brown existence human intelligences struggle to grasp fleeting separations and imperfect categorizations” (Steve Mentz, “Brown,” in *Prismatic Ecology* [above, n. 9], pp. 193–212, at p. 209).

117. Martin, “Fluid Bodies” (above, n. 64), pp. 76–79.

integrated but it's integrated in kind of an indiscriminate way. . . . And people seem to revel in the fact that they can spell out all these cross-linking connections. It's almost an aesthetic product, and I think that makes it very hard to hang onto what matters. And the reason that matters is because, for the sake of ever getting anything to change, surely some things matter more than others.¹¹⁸

Martin is here referring specifically to the way an "integration" outlook—or a "complex systems model"—can, "in practice," forestall action. Relation to everything means that the "aesthetic product" of interconnection takes precedence over singling out and affecting any one *thing* that might matter most. Paradoxically, then, when health is a matter of being related to everything in a seemingly "indiscriminate" way, the result is an isolation that puts the onus on the individual to navigate a ceaseless flux seemingly unconnected to social or structural conditions. In this sense, if the "integration" model of health spells death for the "possessive individualism" of the (white/male) bounded individual, it smuggles this privileged body back in under the guise of the emergent entrepreneur of the self.¹¹⁹

Though Martin engages specifically with health discourse and immunology, her "caution[s]" underscore the potential pitfalls in new materialism's impetus to approach social and ethical questions in terms only of unruly entanglement. With Martin we might worry over the way in which "integration" is made an "aesthetic product" at the expense of "political action." *Prismatic Ecology* seems at points the apotheosis of just the "revel[ry]" in "indiscriminate" relations that Martin fears. Cohen models this revelry (at the expense of "differentiation") from the start. "Yet nonhuman things," Cohen writes in the introduction, "do not thereby vanish into a swirl of primordial possibility, as if nothing possessed integrity. Instead the human and the nonhuman are granted the ability to forge multiple connections, to sustain (or break) transformative relations, to bring about the new thing, to create, to vanish, and to surprise."¹²⁰ This list of verbs does *not* amount, Cohen says, to a "swirl of primordial possibility." Even accepting this dubious statement, such a dizzying prefatory remark

118. Suzanne R. Kirchner and Emily Martin, "From Flexible Bodies to Fluid Minds: An Interview with Emily Martin," *Ethos* 27:3 (1999): 247–282, at p. 259.

119. Martin's remarks anticipate more recently expressed concerns about how neoliberalism is affecting discourses of health and healthcare. See, for instance, Anna Kirkland's remarks on the "untenable presumption of personal control that is deeply at odds with the realities of our lives." See Anna Kirkland, "Conclusion: What Next?," in *Against Health* (above, n. 71), pp. 195–203, at pp. 198, 203.

120. Cohen, "Introduction" (above, n. 9), p. xxv.

indicates that new materialism is more engaged in “cross-linking connections,” in Martin’s words, than in hanging on to what matters most, whatever that might be. Returning to Iovino and Opperman’s introduction to their own edited volume, *Material Ecocriticism*, we might interrogate the seeming equivalence suggested by their list of possibilities: “[E]very living creature,” recall, “from humans to fungi, tells evolutionary stories of coexistence, interdependence, adaptation and hybridization, extinctions, and survivals.”¹²¹ Surely we do in fact find all of these “stories” in ecology, but Martin would point out that listing them as if equivalents and ascribing their telling to the objects in question ignores all the ways in which storytelling is often out of the hands of those who are most affected by it, whether human or fungal. When everything matters, and when, in new materialism, matter itself comes to matter, nothing seems to matter. It is thus unsurprising that a dominant idiom of the neoliberal now fits just as well into Mentz’s postsustainability paradigm: sink or swim.

This emphasis on needing to find what matters within the “swirl” of matter is one of the key points made by Levi K. Bryant in his contribution to *Prismatic Ecology*. Like Martin before him, Bryant insists that focusing exclusively on interconnected relations—where everything is related to everything else—makes ecology both “incoherent” and impotent.¹²² As he explains, “[If] we begin with the premise that everything is interrelated, we risk not doing the hard work to determine how things are linked and related, with disturbing political and practical consequences. We forgot that many of our central political problems arise from the fact that people and other living beings are *not* related. People suffer because they are unrelated to jobs, food, water, opportunity, and political representation.”¹²³ It is striking that Bryant emphasizes a list of “necessities” concurrent with the list repeatedly enumerated by Cannon in his call for social homeostasis: “food, clothing, shelter, the means of warmth, and assistance in case of injury or disease, are, of course, among these necessities.”¹²⁴ Bryant, it seems, believes in the need to invent and impose organs—to forge and preserve relations—in much the same way as Cannon, and this despite the fact that—as mentioned at the beginning of this essay—homeostasis is for Bryant a distinctly nefarious term in need of disposal. But if sheared away from the reifications of balance, harmony, and equilibrium, the term homeosta-

121. Iovino and Oppermann, “Introduction: Stories” (above, n. 113), p. 7.

122. Levi R. Bryant, “Black,” in *Prismatic Ecology* (above, n. 9), pp. 290–310, at p. 303.

123. *Ibid.*, p. 304.

124. Cannon, “Biocracy” (above, n. 51), p. 226.

sis—as developed in this essay—comes to look surprisingly like the “black” ecology described by Bryant.

Conclusion

Cannon’s homeostasis anticipates the relational frameworks so important to new materialist critics and to feminist science studies scholars like Martin before them. The term makes the health of an organism its own ecology of relations that is itself suspended in material and performative assemblages. But if new materialism is lacking in exactly the ways that Martin foresaw, Cannon’s social homeostasis works to assuage her prescient concerns. Cannon, after all, does insist that one thing matters more than others. As we have seen, he insists that “biocracy” is a project enacted in the name of supporting and maintaining the bodily homeostasis of the humans who comprise the social. If we can glean from Cannon’s writings a strikingly new materialist understanding of the trans-corporeal nature of organismic welfare, we can take from social homeostasis the commitment to building systems that aim fundamentally to sustain a nuanced and ecological notion of health. The homeostatic organism is not abandoned to the flux of relations but rather identified as a node within a larger supporting network that must be maintained.

Of course, these claims immediately run up against related problem terms for eco-discourse: the human and sustainability. Cannon’s account is strictly attendant to human needs, and for this reason we depend on the continued work of critics who point us beyond species myopia. But if we wish to wrest a politics from such a new materialist approach, we would do well to remember that, as Stephanie Clare has recently argued, “it is to this ‘human’ that politics remains turned toward.”¹²⁵ We can “critique” the limits of the human and of who counts as human, as Clare explains, but attention to “more than human worlds” should not forestall attention to the “power relations between humans, for it is humans whom we address in our writing and it is, arguably, human lives, enmeshed in more-than-human worlds, that we care most about.”¹²⁶ Indeed, we might push further than Clare’s point to suggest that human-centered politics as carried out by Cannon’s vision actually promotes nonhuman flourishing precisely *through* anthropocentrism. Understanding the human as enmeshed in Cannon’s organic/machinic system of social

125. Stephanie Clare, “On the Politics of ‘New Feminist Materialisms,’” in *Mattering: Feminism, Science, and Materialism*, ed. Victoria Pitts-Taylor (New York: New York University Press, 2016), pp. 58–72, at p. 68.

126. *Ibid.*

homeostasis demands that we attend to the nonhuman and intra-human environments that precariously sustain and surround us. Social homeostasis thus resonates with what Alaimo calls a “posthumanist, new materialist sustainability,” a model that cannot retreat into “separation and denial” and which—with Cannon’s valuation of stability over economy—does not capitulate to the status quo of capitalist instrumentalism.¹²⁷ Cannon’s biocracy is not sufficient unto itself. But if considered alongside contemporary eco-discourse, whether new materialist or more traditionally ecocritical, social homeostasis takes shape as both spur and supplement. Social homeostasis reminds us that we must work to invent and impose organs rather than simply reflect—or refract, as through a prism—the world we find.

Acknowledgments

A number of individuals provided encouragement and indispensable feedback on various versions of this essay, and I want to thank in particular Travis Alexander, Nicole Berland, Benjamin Mangrum, Robert Mitchell, Matthew M. Taylor, and Jacob T. Watson. I am also grateful for the careful and invaluable commentary provided by the anonymous reviewers and the editors at *Configurations*.

127. Stacy Alaimo, “Sustainable This, Sustainable That: New Materialism, Posthumanisms, and Unknown Futures,” *PMLA* 127:3 (2012): 558–564, at p. 563.