

Entropic Exchanges: An Interview with Clayton Crockett on Entropy, Energy, Life, and Politics

Interviewed by Joshua S. Hanan

Introduction

In recent years, the concept of entropy has become increasingly central to academic thought. While emerging out of nineteenth- and early twentieth-century physics as a way to measure heat dissipation and later the uncertainty related to a quantity of information, the concept expanded during the twentieth and twenty-first centuries to become a general way of explaining “the nature of the transformation and operation of energy in and between its various forms.”¹ Through this broader conceptualization, entropy came to be taken up across scientific fields, from quantum physics and the life sciences to economics and anthropology. The humanities have also recently expressed growing interest in entropy, treating it as a concept for thinking through material processes that are relational, improvisational, and constantly in flux rather than predictable, linear, or deterministic. Subfields such as the energy humanities have begun to touch on entropy,² and scholars have used the concept to develop an entropic philosophy, a theory of life’s purpose, and even a framework for recasting the Anthropocene as the “Entropocene.”³

Building upon this momentum, *Technophany* recently devoted a special issue to the topic. Titled “Entropies” (Vol. 2, No. 2, 2024), the special issue highlights entropy as “a multivalent concept in scientific, philosophical, and literary registers.”⁴ It turns to entropy in a wide range of contexts, from the thermodynamic and biological to the informational

1 Drew M. Dalton, “The Unbecoming of Being: Thermodynamics and the Metaphysics and Ethics of Entropic Decay,” *Technophany* 2, no. 2 (2023): 6.

2 See, for example, Cara New Daggett, *The Birth of Energy: Fossil Fuels, Thermodynamics and the Politics of Work* (Durham: Duke University Press, 2019); Michael Marder, *Energy Dreams: Of Actuality* (New York: Columbia University Press, 2017); Thomas Nail, *Theory of the Earth* (Stanford: Stanford University Press, 2021); Allan Stoekl, *The Three Sustainabilities: Energy, Economy, Time* (Minneapolis: University of Minnesota Press, 2021)..

3 Shannon M. Mussett, *Entropic Philosophy: Chaos, Breakdown, and Creation* (London: Rowman & Littlefield, 2022); Dorion Sagan, *The Purpose of Life* (in progress); Bernard Stiegler, *The Neganthropocene* (London: Open Humanities Press, 2018).

4 Shannon Mussett, “Human Aging and Entropy,” *Technophany* 2, no. 2 (2024): 3.

and psychosocial, showing how entropy requires rethinking nothing less than “being, moral value, and practical action.”⁵ Through its centering of the primacy of entropy as an engine of change and material transformation, the issue encourages readers to rethink notions of progress, economic growth, and biological development in a cosmos and world where all stable referents tend toward “entropic decay, disintegration, and dissolution.”⁶

The “Entropies” special issue sought to gather the leading voices on entropy across the critical humanities and largely succeeded. However, the conversation remains incomplete without bringing in the work of Clayton Crockett. A professor and director of the religious studies program at the University of Central Arkansas, Crockett has been writing about entropy for quite some time and develops a particularly robust account of the concept in his 2022 book *Energy and Change*.⁷ Drawing on Deleuze, non-equilibrium thermodynamics, quantum theory, and Sagan and Schneider’s influential book, *Into the Cool*,⁸ Crockett frames entropy in physical and energetic terms as a relational logic that produces chaos and order simultaneously. He also extends entropy beyond physics, considering its ontological function as a process of (ex)change that underpins various modes of social organization, from gift societies to contemporary capitalism. His work further draws implicit and explicit connections between entropy and religious worldviews, especially non-Western ones such as Amerindian cosmology, Vodou, and neo-Confucianism, that embrace change, flux, and continual transformation as the ground of existence. In the dialogue below, Clayton and I explore these facets of his work, in conversation with the *Technophany* special issue on “Entropies.”

Josh: Thanks so much for agreeing to be interviewed by me, Clayton. As you know, I have a deep appreciation for your work and the way it ties together many threads in the humanities that I have also been interested in exploring for a long time!

Let’s start at the most general level with your interest in entropy prior to the book *Energy and Change*. I’ve read a number of your pieces now, including your book *Deleuze Beyond Badiou*, and your essay “Energy and Subjectivity: Psychoanalysis Between Zizek and Deleuze,” and from my engagement with these projects it’s clear that you’ve been thinking about entropy for a long time.⁹ Can you say a little bit about how you’ve explored entropy in previous scholarship leading up to the book *Energy and Change*? I’m particularly

5 Dalton, “The Unbecoming of Being,” 1.

6 Dalton, “The Unbecoming of Being,” 14.

7 Clayton Crockett, *Energy and Change: A New Materialist Cosmotheology* (New York: Columbia University Press, 2022).

8 Eric D. Schneider and Dorion Sagan, *Into the Cool: Energy Flow, Thermodynamics, and Life* (Chicago: University of Chicago Press, 2006).

9 Clayton Crockett, *Deleuze Beyond Badiou: Ontology, Multiplicity, and Event* (New York: Columbia University Press, 2013); Clayton Crockett, “Energy and Subjectivity: Psychoanalysis Between Zizek and Deleuze,” *Critical Theory* 6, no. 1 (2022): 5–25.

interested in how you've thought about entropy in relation to Deleuzian concepts such as the intensive and extensive, the asymmetrical synthesis, and hysteresis.

Clayton: I so appreciate the opportunity for this conversation, and I'm also really excited to see such a powerful and comprehensive engagement with entropy from all the various perspectives that are included in the "Entropies" special issue. I first started thinking seriously about energy about twenty years ago, in the context of peak oil, and more generally the depletion of energy resources on a finite planet. As I explored energy in broadly theoretical terms in connection with human technological civilization, I had to wrestle with thermodynamics and how energy is connected to entropy. The genesis of *Energy and Change* is from an encounter with Sagan and Schneider's book *Into the Cool*, and how I was able to connect their restatement of entropy as the reduction of gradients in nonequilibrium thermodynamics with Deleuze's discussion of intensity and extensity, and what he calls the "transcendental illusion" of entropy in chapter five of *Difference and Repetition*.¹⁰

Deleuze says that it appears as if all differences cancel themselves out in extensity, and that's an illusion based on our classical understanding of thermal dynamics, where every system tends towards static equilibrium. But actually, there's always this remainder of difference that leads to new repetitions in a dynamic way. I think that Deleuze is theorizing something like chaotic complexity in nonlinear nonequilibrium systems here, which had not really been appreciated or understood. In Chapter 4, Deleuze posits a more symmetrical synthesis of virtual ideas, based on his understanding of differential calculus, but Chapter 5 is an "Asymmetrical Synthesis of the Sensible," and that asymmetrical synthesis involves both the reduction of gradients that cancels out differences in extensity and a remainder of difference—a kind of physical memory or hysteresis—that is not cancelled out that leads to new interactions and syntheses in actuality. My rereading of *Difference and Repetition* is at the core of my book *Deleuze Beyond Badiou*, because I felt that Badiou's critique of Deleuze really didn't do justice to the complexity of Deleuze's philosophy. Both Deleuze and Sagan & Schneider point to a more productive and creative power of entropy.

Josh: Now let's move to some of the key claims about entropy in your more recent book *Energy and Change*. One of the things I love about your book is the history of thermodynamics that you provide. In my opinion you offer a clear and accurate account of the development of thermodynamics in the 19th and 20th centuries, and trace how entropy moves from a concept primarily centered on the dissipation of heat to one centered on information. In the process of providing this account, you also lay out the different thermodynamic laws

10 Gilles Deleuze, *Difference and Repetition*, trans. Paul Patton (New York: Columbia University Press, 1994): 229.

and offer ways to think about them in a new light. One argument I see you making is that the tendency to read thermodynamics in terms of closed (rather than open) systems stems largely from the zeroth and third laws of thermodynamics. The zeroth law, as you argue, “establishes the relationship of equilibrium across systems,”¹¹ and the third law, as you also argue, establishes temperature “as a fundamental category with an absolute limit at zero.”¹² Can you speak more about these two laws and the barriers they pose to thinking about entropy in a more radical and open sense?

Clayton: Right. The problem with classical thermodynamics is that it’s obsessed with heat, because the invention of the steam engine and other modern engines are trying to perform the most work in the most efficient way possible by limiting the dissipation of energy in the form of heat. This inevitable loss of useful energy is then named entropy, and when the laws of thermodynamics are elaborated, energy and entropy are both situated within a context defined by temperature as an objective measure of motion and heat. The zeroth law is about comparing relatively closed systems to each other, and the third law establishes an objective scale of temperature to measure both energy and entropy.

Josh: Another innovative move I see you making is the way you engage the first law of thermodynamics, the law of the conservation of energy. Your book acknowledges that this law is a crucial feature of all thermodynamic processes and entails that energy is neither created nor destroyed. At the same time, your book emphasizes change as ontologically primary and in this sense your project would not want to approach the conservation law in a traditional way, which, as I understand it, points toward something that doesn’t change (via its emphasis on a fundamental symmetry and reversibility to physical reality). Can you discuss how you’re approaching the law of the conservation of energy in your book so that you demonstrate fidelity to the science but also allow for an ontology where indeterminacy and change are primary? How does the law of conservation work in relation to your argument that all change occurs through asymmetrical (ex)change if the conservation law implies that something is initially conserved in a way that creates symmetry across asymmetry (and allows for time reversibility)? I’d also welcome any discussion here of how you see the law of conservation as related to the problem of origin discussed throughout your text. A running theme of the book is that being arises out of a generative void or (in Deleuze’s language) a “rhizomatic multiplicity.”¹³ Are these religious and ontological accounts of being’s origin essentially analogous to the law of conservation of energy in your view?

Clayton: I agree that there is this tension in the book between the first law which asserts the conservation of energy and the second, which is more directly connected to

11 Crockett, *Energy and Change*, 42.

12 Crockett, *Energy and Change*, 41.

13 Crockett, *Energy and Change*, 256.

transformation and change. I didn't make this clear enough, but I think that because energy is a way to measure change, we need to *posit* the conservation of energy so that we can balance the two sides of an equation. Otherwise, it doesn't make sense. It's akin to Newton's third law of motion where every action has an equal and opposite reaction. Scientists require that balancing for the equations to work, but at the same time it's also in some sense an abstraction. It's not that there is this substance called energy that doesn't change; it's that we have to posit the conservation of energy if we want to make sense of any transformation. Conservation as a law is more of a symbolic phenomenon compared to the Real of entropy, to use Lacan's terms. The conservation of energy—that energy is neither created nor destroyed becomes more of a retroactive projection onto the reality that is energy transformation, which is entropic.

The problem of origin here is an ontological and, in some ways, theological problem because we don't know the first cause that is the origin. That's what we refer to at least implicitly with our conservation laws, the idea that there has to be something that sets everything in motion and explains why the world operates the way it does. We have to take account of the fact that things are happening, and we don't completely know why or where they came from. It appears as if something comes from nothing, but this nothing is not a void that's an absence; rather, it's a dynamic multiplicity of possibility. The creation of something from what appears to be nothing is a kind of subtraction from the teeming void. As Žižek says, something is *less than nothing*.

Josh: Toward the end of your first chapter, you discuss how in the 20th century the main concern of thermodynamics shifted from heat to information. You rightfully recognize that, because of this shift, entropy becomes a more complex and murkier concept. It is no longer used primarily as a concept to describe the dissipation of heat but rather as a term to describe both information and the absence of information. You get at this in your "Energy and Subjectivity" essay as well, where you write that "information is entropy, not negentropy, because information is uncertainty and surprise."¹⁴ This line strikes me as particularly profound as it gets at the fact that entropy is both information and the destruction of information. Can you say more about what it means to think entropy as surprise in the context of information theory? Does the view of entropy as surprise have implications for all scales of material reality? If so, what might some of those implications be?

Clayton: There is a strange transition from energy and thermodynamics to information theory, where entropy is an important concept for each, but in slightly different ways. The mathematical formulation for entropy is similar in both thermodynamic entropy and information entropy, but the context is different. Information theory is about formalizing

14 Crockett, "Energy and Subjectivity," 11.

communication no matter what physical medium is being used. For Shannon, information is entropy, because both communicate something unexpected and surprising. However, due to the negative implications of entropy in thermodynamics, many people have understood entropy as the loss of information.

The problem with defining entropy as the loss of information and as disorder is that then you get this word negentropy, or negative entropy, which is a way to talk about something positive, a phenomenon that can generate structures or patterns, something that constitutes information despite the dissipation of heat to which entropy generally refers. And that's wrong, because there is no such thing as negative entropy. There's only entropy, which is change and transformation, and the entropic transformation of a system spontaneously reduces gradients. Often this gradient reduction leads to what we view as dissipation or disorder, but in other circumstances it actually generates order, as Sagan and Schneider demonstrate in their book. In *Into the Cool*, they revise the second law of thermodynamics as "nature abhors a gradient," arguing that nature works to reduce gradients as efficiently as possible.¹⁵ In many cases, this gradient reduction dissipates structured patterns and leads to what we perceive as disorder. However, in certain circumstances gradient reduction generates and sustains order, like in a liter bottle filled with a liquid that is twisted to form a vortex. The vortex is created and remains until the water is emptied from the bottle because that's the most efficient way to reduce the gradient between the water and the opening through which it flows.

Josh: Information is one way you connect entropy to a discussion of quantum mechanics. Can you say more about your thinking related to entropy and the quantum world? It seems that an ontological theory of entropy would have to account for entropy's emergence out of quantum processes, and specifically quantum indeterminacy. Do you have thoughts related to this?

Clayton: Yes, I think that both Deleuze's notion of intensity in *Difference and Repetition* and nonlinear thermodynamics as theorized by Sagan and Schneider are broadly compatible with how Karen Barad understands quantum mechanics. Specifically, difference relates to difference in the form of a diffraction pattern, and this is something that Deleuze theorizes about differentiation in chapter 2 of *Difference and Repetition* when he says that things are always constituted in series that then interact, and it is their differences that end up producing a pattern, a new thing.

Barad discusses quantum field theory in *Meeting the Universe Halfway* and in other works, and here the quantum void is teeming with energetic fluctuations.¹⁶ Barad doesn't

15 Schneider and Sagan, *Into the Cool*, 6.

16 Karen Barad, *Meeting the Universe Halfway: Quantum Physics and the Entanglement of Matter and Meaning* (Durham, NC: Duke University Press, 2007)

use the term entropy here, but I think that their analysis of quantum phenomena and the entanglement of matter and meaning is entropic in the sense that I understand it in my book, and it's compatible with many of the contributions to the special issue of *Technophany*. For Barad, the key term is indeterminacy, and entropic transformations as well as the repetition of differences in Deleuze are fundamentally indeterminate processes. Indeterminacy is what allows for and leads to novelty in Deleuzian terms, the creation of something new out of what appears to be chaotic randomness.

Josh: Another central concept related to your discussion of information and quantum mechanics is the time-image, which you get from Deleuze, especially his work on Cinema.¹⁷ You use the time image in chapter one to discuss the way "the image is what physicists call a bit of 'spacetime,' and the time-image refers to the process of delinking and relinking these bits."¹⁸ It also seems like the time-image offers an interesting way to think about entropy and its connection to the arrow of time. If I understand your conception of the time-image correctly, you are challenging the idea that there could ever be a universal arrow of time. Rather time is always constructed relationally and heterogeneously through a diffraction of different temporalities. If this is the case what are the implications of the time-image for entropy? Is the time-image another way of saying that connection and relationality is fundamentally entropic?

Clayton: In his Cinema books, the time-image is related to the movement-image in cinema. Historically, cinema was seen as filming movement, but at a certain point in New Wave Cinema, cinema turns to the construction of a time-image, which means that the director selects the next image in a sequence not according to any pre-determined plan, but intentionally so as to generate new thoughts and new ideas about what can be presented in film. For me, the time-image ranges far beyond cinema in a narrow sense. That means that we can actually think about something like the pure order or empty form of time as he puts it in the third synthesis of time in *Difference and Repetition* as prefiguring the time-image in his later book. Reading Deleuze in this way suggests that something like spacetime is not continuous, but discrete or granular, and it acquires this consistency as it comes together under the conditions of matter and energy in an entropic process. Here it's less about the director who selects the next image in constructing a time-image in an intentional or voluntarist way, but it is, echoing Barad, an agential process that produces a new form of (space)time.

Neither Deleuze nor I think that time is linear, but that doesn't mean that time doesn't exist, or that nothing changes. Some physicists reduce time to the geometry of a configuration space, and I'm skeptical of that conclusion. On the other hand, what we

17 Gilles Deleuze, *Cinema 2: The Time-Image*, trans. Hugh Tomlinson and Robert Galeta (Minneapolis: University of Minnesota Press, 1989).

18 Crockett, *Energy and Change*, 66.

experience as the “movement” or the flow of entropy that goes from the hot into the cool gives us this arrow of time, or what we picture as an arrow or a directional process. But just as the association of entropy with disorder is an overinterpretation, so too is the notion that entropy gives us a straight temporal arrow. Instead, as you put it so well, “time is always constructed relationally and heterogeneously through a diffraction of different temporalities.” Entropic energy transformation supplies the intensity or push whereby we can’t say that time is circular or an illusion, but time is never straightforward or linear either. Ultimately, we cannot know for certain what is outside of time, if anything, but everything we experience is in some way entropic, due to the spreading out of energy and the change that process implies. So, both our experience of entropy and the physical phenomenon of entropy produce an experience of temporality, but there’s never just one ordered time that proceeds in a linear fashion.

Josh: As a way of closing out this discussion of the physical aspects of entropy, can you share any other thoughts you have about the relationship between energy and entropy? Your book is called *Energy and Change*, so how would you frame entropy as central to that narrative? Is entropy in a certain sense the way energy and change get expressed phenomenologically as appearance? I ask this in part thinking of Ashley Woodward’s contribution to the *Technophany* special issue. In his contribution he argues for a Nietzschean affirmation of entropy as “becoming itself, life itself,”¹⁹ moving away from the demonization of entropy found in someone like Stiegler. Do you view this “affirmation of entropy”²⁰ as synonymous with your “New Materialist Cosmotheology,” or are there distinct theological stakes in calling this process “God” versus calling it “becoming”?

Clayton: I like the connection to Nietzsche as Woodward expresses it, because it’s the affirmation of energetic/entropic change that constitutes a kind of love, something akin to Nietzsche’s *amor fati*. I saw energy and entropy as two sides of the same coin in *Energy and Change*, but I have shifted towards seeing entropy as the heart of change and transformation in any energetic process. To talk about energy separate from entropy appears too abstract. Entropy is energy-in-transformation. Energy is the entropic transformation that changes everything with which it interacts (and intra-acts), and it also changes itself. That’s the closest to something like “God” that I can get to in any metaphysical sense.

Josh: Let’s now move from the physics discussion to the claims in your book about life and bioenergetics. One of the things I really like about your book is that you engage with the subject of life in a robust way without coming off as a vitalist. I agree with your argument, channeling Katherine Hayles, that too often new materialist thinkers flatten

19 Ashley Woodward, “Affirming Entropy,” *Technophany: A Journal for Philosophy and Technology* 2, no. 2 (2024): 27.

20 Woodward, “Affirming Entropy,” 16.

different levels of reality and don't engage enough with processes of emergence.²¹ At the same time, I appreciate how you keep the entropy thread throughout the life chapter by drawing upon Sagan and Schneider's argument from *Into the Cool* (a text I have also read and really appreciate). Can you please speak to how you're theorizing life in relationship to entropy? You highlight a paradox (similar to Sagan and Schneider) that life both slows down its own internal entropic decay (as an open and living biological system) while at the same time increasing overall entropy. You also say at one point that "Life is something less than nonlife, because it amplifies its own constraints to pause the dissolution that brings it into existence,"²² implying, in a certain sense, that the death drive (i.e., entropic dissolution and becoming inorganic) brings living entities closer to existence as pure potentiality and pure indeterminacy. Can you speak to this tension between entropy as a driver of life and entropy as something that life resists?

Clayton: Yes, I would express that tension similarly, but we have to be careful not to separate and oppose the driving and the resisting processes. It's tricky because it's generated so much discussion and speculation, but life is in no way an exception to or a working against entropy overall. In many ways, we are conditioned to see entropy as a form of dissolution or disorder, which loses the organization that life has, but that's also a value judgment that's imposed onto the process. And it is a kind of death drive, but one that's in the service of the prolongation and the reproduction of life, and we can see that in both Freud and Lacan. For Freud, the death drive attempts to reinstate an earlier order of things, but in its very effort it also prolongs life. For Lacan it's the death drive in the symbolic order that propels the "I" to posit and consolidate itself through speech, even though it never completely succeeds in producing a consistent "I." Life is one way to organize gradient reduction more efficiently by containing and channeling it in certain ways. Slowing down dissolution and postponing the death of an organism isn't slowing entropy, but it can seem like it due to how it maintains the gradients and uses them to more efficiently break down and use energy to do things like self-organize, self-repair, and self-reproduce. Instead of adding something like what Bergson calls an *élan vital* to physical materiality, I think that life instead *subtracts* from nonliving physical processes in a way that channels it into a certain configuration that it can sustain given sufficient energy flow. Something gets locked in in such a way that that form becomes the preferred direction of entropy production and gradient reduction. I think that a living being is an extraordinary system that comes about through evolution, which occurs largely by chance, trial and error and then something "works" and thereby persists over time. But it's also an expression of the same physical processes of energy and entropy transformation.

Josh: Another way that you characterize life in your book is through Catherine Malabou's

21 Crockett, *Energy and Change*, 122.

22 Crockett, *Energy and Change*, 128.

concept of the transcendental, which you distinguish from the Kantian transcendental. Can you discuss what it means to think about life in terms of the transcendental, and can you discuss the relationship between the transcendental and entropy? You don't really discuss this specific connection in your book from what I recall, but is there a way to think the transcendental as something that emerges out of entropy? In the *Technophany* special issue, Joel White defines entropy as "the dissipative condition of possibility and impossibility of any metastable energetic system."²³ Do you see this Kantian framing of entropy as relevant to your own thinking around entropy and the transcendental?

Clayton: Malabou helps me think about how what we call the transcendental and the historical can be brought together in a consistent and rigorous philosophical way, and she tends to preference life and form due to her work on the brain, neuroplasticity, biology, and epigenetics. For Malabou, plasticity shows up in three ways: the active shaping of form, the capacity to receive form, and the auto-annihilation of form. The third kind of plasticity is called destructive plasticity, and she says that destructive plasticity is the energetic explosion of form. I think that my understanding is broadly compatible with hers, although I prioritize energy and then want to comprehend the emergence of form, which is always implicit in the word transformation. I agree that Joel White's formulation is helpful so long as we are careful to acknowledge that the transcendental is both the quasi-universal or generalizable framing of what we think of as conditions of possibility *and* the specific singular situation to which we are applying it and from which we draw our provisional definition of the transcendental. That means that the transcendental is not just an anthropocentric human phenomenon, something that conditions how we think; it actually exists as a constraint (condition of possibility and impossibility) in reality. And at the same time, there is something akin to how we conceive subjectivity as an experience of radical discontinuity already in so-called nature. This is clearest at the quantum level, as theorized by Barad with her agential realism, but Žižek also argues in *Quantum History* that something like subjectivity can be seen in quantum mechanics, because both institute a parallax where we have these two apparently contradictory perspectives that cannot be simply reconciled or eliminated.²⁴ In quantum mechanics, this is one way to think about wave/particle duality, for example. And phenomenologically, we can neither dispense with nor reconcile the viewpoints of the third person and the third person.

Josh: Let's now discuss how entropy is operating as an economic concept in your book. In chapter 3 of your book, you connect the concept of entropy to economy and argue, building upon thinkers such as Georgescu-Roegen, that entropy is central to

23 Thomas Nail and Joel White, "A Moving and Exhausting Cosmos: A Discussion on Entropy," *Technophany: A Journal for Philosophy and Technology* 2, no. 2 (2025): 2.

24 Barad, *Meeting the Universe Halfway*; Slavoj Žižek, *Quantum History: A New Materialist Philosophy* (London: Bloomsbury Academic, 2025).

understanding our current economic predicament which, borrowing from Stiegler in his book the *Neganthropocene*, we might call the “Entropocene.”²⁵ How does Stiegler’s concept of the Entropocene align with or differ from your diagnosis of “neoliberal capitalism” as a system that “cannot avoid plunging forward in its mad race?”²⁶ Do you share Stiegler’s view in the *Technophany* special issue that the solution lies in a “new industrial economy” of “anti-anthropic” (anti-entropic) knowledge?²⁷ If negentropic knowledge isn’t the solution to grappling with our current predicament, what is?

Clayton: I appreciate Stiegler’s work very much, and I sympathize broadly with what he’s trying to do. However, from my perspective there’s a conflation of the anthropic and the entropic here. The Anthropocene is a description of a planet whose fundamental geological and climatological processes have been altered by human behavior. This is really dire for creatures like us, because we are pushing the Earth into a new unstable climate regime, which has negative consequences for human flourishing compared to most of our history. We can argue about the causes as well as the faults of this situation, and one that is often singled out is anthropocentrism. I also understand why some scholars prefer to use different words for our contemporary era, including “Capitalocene” or “Chthulucene.”²⁸

I think that Stiegler is saying that the negative elements of the Anthropocene are connected to a proliferation of entropy in a destructive sense. But that’s the more stereotypical notion of entropy that I’m opposing, as does Sagan. And the idea of negentropy is a mistake, because there’s no such thing as negative entropy in physical terms. At most, there’s the delaying of dissolution of certain forms through certain processes that still increase entropy overall.

When Steigler says that we need an anti-Anthropocene or a Neganthropocene I understand him as saying we need to be less anthropocentric in our thinking and in our practice. But when he says we need to be anti-entropic that doesn’t make sense in terms of my understanding of physical entropy. Rather, the problem is that many of our physical planetary gradients have been increased to enormous extremes so that we can perpetuate a destructive neoliberal capitalism. We are extracting fossil fuels and minerals from the earth and processing them for profit in a way that emits carbon dioxide and other gases

25 Crockett, *Energy and Change*; Bernard Stiegler, *The Neganthropocene*, ed. and trans. Daniel Ross (London: Open Humanities Press, 2018), 139–51.

26 Crockett, *Energy and Change*, 147.

27 Bernard Stiegler, Maël Montévil, Victor Chaix, and Marie Chollat-Namy, “Towards a New Industrial Revolution? Entropy and Its Challenges,” trans. Joel White, *Technophany: A Journal for Philosophy and Technology* 2, no. 2 (2025): 7.

28 See Jason W. Moore, ed., *Anthropocene or Capitalocene? Nature, History, and the Crisis of Capitalism* (Oakland, CA: PM Press, 2016); Donna J. Haraway, *Staying with the Trouble: Making Kin in the Chthulucene* (Durham, NC: Duke University Press, 2016).

into the atmosphere, leading to global warming. Our anthropogenic efforts have opened up enormous metabolic rifts (to use Marx's term) in nature, and our efforts to perpetuate them ultimately makes the collapse of these gradients worse.

One way to define modern industrial capitalism is that it's fundamentally based on the extraction of resources from the planet and from non-European peoples and traditions so that they can be commodified for profit. We desperately need to slow down this process even if we cannot stop it, and that's what Stiegler is getting at. Our industrial emissions increase entropy, which like all entropy is a form of entropy as gradient reduction, but doing something different does not decrease entropy, it increases it in a way that's less immediately destructive for us. By working to perpetuate and even increase the physical gradients to maintain our technical civilization we will end up with a much more catastrophic collapse. However, contrary to Stiegler's arguments, any response that more gently reduces these gradients would also be entropic in a positive sense, not negentropic. Slowing down our industrial production and emissions does not decrease entropy; it increases entropy in a way that's less destructive to humans and other animals that have evolved to live in a climate like the one we have had over the last 12,000 years or so.

Josh: Staying on the topic of economy, can you discuss how you're theorizing entropy in relation to the work of Georges Bataille? As you note Bataille didn't really use the term entropy in his writing but there's a sense in which this concept is exactly what he's getting at when he emphasizes the limits of all growth and the excess that drives all expenditure. How does your project take up Bataille in relation to entropy and how might Bataille help rethink economics with its traditional focus on growth, utility, and productivity? Is there a sense in which Bataille's project might respond to Shannon Mussett's article in the *Technophany* special issue, where she critiques the capitalist tendency to treat aging human bodies as machines that wear down and decay overtime.²⁹ How might your reading of Bataille's "general economy" offer a theological or ethical framework for valuing the "entropic" aging body that Mussett defends?

Clayton: I think that Bataille helps us better comprehend Stiegler's project, because according to Bataille, we have produced so much that we need to consume it or it will consume us. We need to learn how to waste or squander the products of our industrial civilization more intentionally or they end us wasting us. The word consumption is probably not the best term, but that's the word Bataille uses, and I wanted to think about his general economy more in terms of exchange. What Bataille gives us in *The Accursed Share* is a way to think about economics in terms of energy, which for Bataille is solar energy. He doesn't use the term entropy either, but it's implied in his global economy, and Georgescu-Roegen helps articulate entropy in economic terms more explicitly.

29 Mussett, "Human Aging and Entropy," 2.

I definitely think that Sagan's concept of entropy and Bataille's notion of general economy are relevant for us to think about aging. It's not just about resisting or delaying death as an entropic process. It's about accepting and affirming the changes that change us as we grow and age in mental and physical terms. Just as we need to avoid the opposition between entropy as disorder and life as order, we can also draw from scholarly work on aging along with disability studies in a way that affirms that we are all in the process of becoming senescent and/or disabled, and that disability is not the opposite of ability. Part of the problem of how we misunderstand entropy is due to how it was developed in relation to the mechanics of heat engines in the 19th century, so I agree with Mussett's argument—both that life is not anti-entropy, and that we need to find ways to affirm the lived experience of senescence in ways that contest contemporary capitalism. Organic bodies are not machines, and in her article, she uses the work of de Beauvoir to offer ways to value these aging bodies.

Josh: Can you discuss the concept of (ex)change in your book, which you get from Malabou's discussion of Heidegger? As I read the argument, (ex)change is always an asymmetrical process and implies a certain way of talking about entropy as ontological. Is this a proper reading of how you're developing the concept and do all beings in the cosmos participate in (ex)change? Is ex(change) another way to think about Bataille's general economy and maybe even Deleuze's concept of the time image?

Clayton: Certainly. In her book on *The Heidegger Change*, Malabou reads Heidegger's *Beiträge zur Philosophie* as a work concerning change, exchange, and metamorphosis.³⁰ Malabou herself is a profound thinker of change, and I relay on her philosophy a great deal in *Energy and Change*. What she says is that we have to think about the ontological difference between Being and beings in terms of exchange, where Being itself can exchange or transform itself into being and vice versa. This interpretation, which is one of the most original readings of Heidegger's philosophy, then has important implications for an economy of exchange, including that of the gift, which is related to Bataille's general economy. I read Bataille from the perspective of the Japanese Marxist philosopher Kojin Karatani, who argues that we need to shift from a focus on systems of production to systems of exchange, and both Karatani and Bataille focus a good deal on the asymmetrical gift exchange of indigenous societies. In my third chapter, I tried to reflect on energy and entropy from the standpoint of economics, but an economics that is situated within an ecological framework, and Bataille is crucial to that. Every exchange is relational and asymmetrical, whether it is a physical/ecological exchange or a political/economic exchange—these are all material exchanges that take place within what Bataille calls a

30 Catherine Malabou, *The Heidegger Change: On the Fantastic in Philosophy*, trans. Peter Skafish, SUNY Series in Contemporary French Thought (New York: SUNY Press, 2011).

general economy of energy transformation. Every change is exchange, and every exchange increases entropy by transforming a system.

Josh: Later in your book, you imply that “Vodou economics” operates as “an economics of scarcity” and that the “Meso-American view of the world as an ‘eating landscape’” likewise works through logics of (ex)change that diffractively resonate with an entropy framework.³¹ All of the practices share a view that creation is generated through destruction and vice versa. How do we distinguish entropy as a physical concept in science and as a broader notion that speaks to the idea of being as ex(change), the pharmakon (as discussed in Derrida, Stiegler, and others) and the notion of shape shifting, plastic materiality (a term you use borrowing from Malabou? How can we connect theories of entropy to indigenous and non-western world views without imposing our own scientific frame on them?

Clayton: I think that entropy is the heart of energy because change is what’s truly real about existence. That is a result of a lot of work that I’ve done trying to grapple with theoretical ideas of physics and thermodynamics. At the same time, I’m not a scientist, and I’m not trying to impose a scientific frame onto indigenous and non-western worldviews. I’m trying to read them from the perspective of a general economics of exchange that understands beings, processes, rules and spirits as fundamentally agential and relational. I guess for me that’s more philosophical, in accordance with my understanding of New Materialism, than strictly scientific. When I set up chapter 4, I say that I wanted to read these non-Euromodern traditions diffractively, rather than intrinsically, because I’m not an expert in any of them, but they all offer important resources and insights into how I’m trying to understand the world.

In a similar way, even though the book proceeds from physics to biology to economics to spirit to theology, I don’t want that to be seen as laying a ground with thermodynamics that then the other chapters rest on top of. At the same time, I want to resist any reading that is teleological, where we proceed from a simpler to more complex situation that increases the meaning and value of the elements of these complex systems. We could view each of these—physics, biology, economics, spirit and theology—as themselves diffractive, because ultimately what’s important are the interstices between them, how they interact, and in Barad’s terms, intra-act. Another way to think about these is along the lines of plateaus, in the way that Deleuze and Guattari define them in *A Thousand Plateaus*. A plateau is not defined in terms of hierarchy, but more in terms of a series. These Deleuzian logics of differentiation and diffraction along and across plateaus, are more central to how I am thinking about energy and entropy than the scientific concepts themselves. I don’t think we can avoid understanding phenomena from a particular perspective, but these perspectives are themselves multiple rather than unitary. Finally,

31 Crockett, *Energy and Change*, 209.

the indigenous perspectives I am thinking about necessarily interact with the scientific and philosophical ideas that I am bringing to bear and they cause them to change as well. It's not just one way.

Josh: While your reading of certain religions and indigenous cultures seems to emphasize their compatibility with an entropic world view, Felipe Alves Leão's contribution to the *Technophany* special issue uses Viveiros de Castro's work to think about negentropy (a logic he calls "syntropic agriculture").³² Do you see "syntropic agriculture" as a practical application of the "Political Theology of the Earth"³³ you advocate for, or does the centering of human planning and the framing of intervention in terms of "negentropy" go against the position you'd advocate for?

Clayton: I like how Leão advocates for the practice of what Ernst Götsch calls syntropic agriculture—drawing on ancestral techniques of agroforestry—in his contribution. I also appreciate how he connects it to Amazonian Amerindians, who are the focus of Vivieros de Castro's fieldwork. At the same time, I would contest the term negentropy for reasons I stated above in reference to Stiegler, and I would also argue that syntropy is not the opposite of entropy. We need better ways to conceive and manage the generation of entropy, to channel our efforts more responsibly, and to work to ease some of the enormous rifts that humans have opened up in nature. The techniques developed by indigenous peoples are an important resource for such efforts. This is not negentropy or negative entropy, but a different way of working with the entropic processes we express.

Josh: Related to the last several questions, do you have any other thoughts about the politics (both good and bad) that might surface if we accept that entropy is an ontological condition of existence? If entropy entails that reality is always already a pharmakon, always already ambivalent, and always requiring destruction for creation, what sort of ethics and politics emerges if we accept this way of looking at the world? How might we think about this subject in relationship to bio/necro politics as the management of precarity and vulnerability? Your book is one that is characterized by concern about the present but also hope.

Clayton: In terms of politics, part of the problem with modern capitalism and neoclassical economics is they are predicated on indefinite growth and do not acknowledge limits. There are always limits, and that's part of the lesson of entropy and energy as a finite resource stored in fossil fuels and other minerals. Energy is much more abundant in general terms as solar energy, but there's only so much we can harness for production without pushing up against real limits to growth and human flourishing. Entropy and

32 Felipe Alves Leão, "Contributions to the Neganthropology: Agroforestry and Syntropic Agriculture," *Technophany: A Journal for Philosophy and Technology* 2, no. 2 (2025): 2.

33 Crockett, *Energy and Change*, 250.

energy, thought in terms of nature and spirit, draw us back to more viable traditions and practices, even if it is in some sense too late for our late modern civilization. We are going to die, but we can be reactive and deny this death or we can orient ourselves to death in more healthy ways.

Unfortunately, our modern and postmodern societies are predicated on hierarchies between people and nations and they define growth in ways that consolidate wealth among fewer and fewer people. As climate change intensifies, the most vulnerable and marginalized people suffer primarily, whereas the people who are white, male, wealthy, European, and/or American can ward off these destructive effects, at least for a while. Part of what's so horrific about this situation is that many people who look like me are comfortable sacrificing others to try to hold onto our own status and possessions a little bit longer. At the same time, climate change and the ongoing planetary transformations will eventually come for all of us, no matter who or where we are. Necropolitics deals in death, but as long as we are still living and breathing there is always hope, because there is always change. Death, too, or the dissolution of our bounded bodies and minds, is also an entropic transformation. I also want to resist any form of cheap optimism about what we are facing in terms of climate change, but that doesn't destroy hope. In the words of Catherine Keller, a contemporary theologian, we hold onto hope for meaningful exchanges and valuable entropic transformations *no matter what*.

Josh: In the *Technophany* special issue, Drew M. Dalton argues that if we take the second law of thermodynamics seriously as a metaphysical absolute, we must accept a pessimistic ethics that states "existence is evil."³⁴ This stands in stark contrast to your suggestion that "Energy is also another name for divinity... We could describe the affirmation of this energy we are as a kind of love."³⁵ However, Dorion Sagan's contribution to the issue, "Entropy, Said the Devil," seems to challenge the pessimistic reading. Sagan suggests that life's dissipation of energy is not merely decay, asking: "In reducing the sun/space gradient, are we all actually working toward Tikkun Olam?"³⁶ This aligns with the Kabbalistic imagery you invoke in your final chapter regarding the "sparks or shells of the Shechinah" scattered across the Earth.³⁷ How do you respond to Dalton's Schopenhauerian reading of entropy as "radical evil" versus your own reading of energy and change as an affirmative, amatory spirit, especially in light of Sagan's suggestion that entropic dissipation might actually be a holy act of repair?³⁸

34 Dalton, "The Unbecoming of Being," 20.

35 Crockett, *Energy and Change*, 253.

36 Dorion Sagan, "Entropy, Said the Devil: Entropy & Its Discontents: From Heat Death to the Eternal Return," *Technophany: A Journal for Philosophy and Technology* 2, no. 2 (2024): 23.

37 Crockett, *Energy and Change*, 252.

38 Dalton, "The Unbecoming of Being," 20.

Clayton: I side more with Sagan than with Dalton here, and I certainly don't view entropy as evil. Dalton's metaphysics of decay seems based on the more stereotypical understanding of entropy as disorder and heat death, which is complicated and enlarged from the perspectives of Sagan and Deleuze that I'm drawing upon. Under certain circumstances, the entropic flow of energy generates and sustains systems, structures, and patterns. I like the idea of Tikkun Olam both intrinsically and as Sagan invokes it, although we also need to recognize that some particular phenomena are beyond repair, even as there is nothing that is irreparably evil about existence in general terms. Entropy is beyond good and evil, in Nietzschean terms, but we can make use of it more for good than for bad, largely by working carefully to more gently reduce some of the planetary gradients of wealth, technology, and climate that have been set up by contemporary capitalism that are enormously destructive.

Thank you so much for this Josh, and thanks also to Joel White, to *Technophany*, and to the contributors to the special issue on entropy!

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