THE BIRTH OF ENERGY FROM THE SPIRIT OF REVENGE: ON THE GENEALOGY OF THE CONCEPT OF 'ENERGY' AND ITS RELATION TO TIME

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I develop a genealogy of the concept of 'energy' in western philosophy and science, focusing on how energy concepts (e.g., energeia, vis viva, kinetic/potential energy) have been theorized in relation to time. Looking especially to the ideas of Gilles Deleuze, Henri Bergson, Friedrich Nietzsche, and Martin Heidegger, I argue that the thread that connects energy concepts through time is the epistemological tendency to derive conceptual accounts of change from a prior ontological sameness or essence. I then attempt to lay the groundwork for a process metaphysics that harmonizes with contemporary findings in the physical sciences, while also extending the concept of energy to account for the presence of subjectivity in nature.

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CHAPTER 1

INTRODUCTION

Motivation and Purpose of the Study

This project is the culmination of my rebellion against the nihilism of the materialistic worldview that I inherited from my physics education. Beset by a crippling spell of anxiety and depression that lasted over a year, I turned to philosophy at the end of my undergraduate education in search of any sort of meaning or intellectually honest basis for values in nature to redeem a seemingly absurd and indifferent existence. In retrospect, it is very clear to me that the impetus for all my graduate work has been to redeem the dignity of human life from the reductive clutches of modern science, which has repeatedly attempted to treat living beings like non-living matter, thereby placing an abyss between consciousness and the material world. In this dissertation, I attempt to bridge that abyss.

Reading the work of Friedrich Nietzsche was the cold shower that, one could say, awoke me from my dogmatic slumber. By focusing on the psychological motivations of philosophers and the historical contingency of concepts, Nietzsche broke the chains that kept me fettered to the reductive materialism of physics. In demonstrating the psychological motivations for the scientific project and the limitations of our human-all-too-human perspective, Nietzsche allowed me to step out of my dogmatic materialism and glimpse the anything-but-objective value claims of modern science. Perhaps it is no surprise then that the initial spark for this dissertation was my desire to understand what Nietzsche meant when he said that modern science is the most recent and noblest form of what he called the 'ascetic ideal.'

In my pursuit of the answer to that question, I was led to Nietzsche's rich but convoluted concept of *ressentiment*—'the spirit of revenge'— which he used to refer in various places to a

subterranean nihilism and hostility towards existence that he saw as driving forces in the development of western philosophy and science. Although much has been written about *ressentiment* in European culture and history, much less has been written about the relation of *ressentiment* to modern science. Following this lead to the end, in the second chapter, I eventually make the argument that *ressentiment* arises from hostility towards and denial of the fleeting nature of time on both an epistemic and ontological level of experience. I thus argue that western philosophers' and scientists' almost ubiquitous epistemic privileging of the eternal over the ephemeral in metaphysical accounts of change is symptomatic of this underlying *ressentiment*.

The objective of this dissertation, then, is to show how this onto-epistemological tendency is present throughout western intellectual history by showing how the concept of 'energy,' often referred to as the crown jewel of all the concepts in physics, has been theorized in relation to time. In conceptually dismantling the concept of energy by looking at its genealogy, it becomes possible to see the contingency of this concept and, therefore, of the scientific worldview. By accepting the idea introduced by physics that being is energetic flux, this conceptual deconstruction promises the possibility of a *gestalt* shift, that is, a complete transformation of our perception of time and the cosmos.

The first chapter is thus dedicated to developing a genealogy of the concept of energy, beginning with Ancient Greek philosophy and ending with the birth of the modern concept of energy in classical thermodynamics. Chapter 2, as I stated above, focuses on interpreting Nietzsche's claim that modern science is the newest and noblest form of the ascetic ideal, ending with an analysis of Richard Ira Sugarman's phenomenological description of *ressentiment* and Martin Heidegger's criticism of the metaphysics of presence and how it builds on Nietzsche's

claim that *ressentiment* betrays a 'rancor against time.' The key takeaway from this chapter is that, in order to theorize change without deriving it from a prior sameness or immobility, it is necessary to ground the concept of energy in an ecstatic account of time, where the past and the future are interpreted as ontologically positive forms of absence that are different in kind from the present, rather than developing a static account of time where the past and future are really nothing but snapshots of the moving image of an eternal present.

Although the initial impetus for this project came from the ideas of Nietzsche and Heidegger, I take up the project of conceptualizing energy beyond the tendency to ground change in the change-less by turning to the works of Henri Bergson and Gilles Deleuze in the final two chapters. I argue that both these thinkers develop a similar critique of temporality and science as Nietzsche and Heidegger, but that their more positive engagement with the sciences makes their philosophies more adequate for the project of reconceptualizing energy in light of criticisms of static accounts of time, i.e., philosophies of time where change is derivative from the ontologically immobile; the tendency to derive becoming from being. In doing so, I try to pave the way for thinking of phenomena such as memory and thought as energetic processes in their own right, not by a reductive materialism, but, inspired by Bergson's *Creative Evolution* and *Matter and Memory*, through the idea that the difference between minds and bodies is not one of dually opposed metaphysical substances, but as dual temporal tendencies of a single reality understood as pure temporality—Bergson's concept of 'duration.' I hope to show that looking at the world in terms of time rather than space helps bridge the Cartesian dualism that has plagued western philosophy and science for nearly four centuries, thereby demanding a fundamental reconceptualization of the concept of energy to account for the different temporal levels of existence that determine the difference between matter and consciousness. In this way,

if we can grasp the fundamental interrelatedness of objective and subjective processes via the concept of energy, we will have gone a long way towards overcoming the nihilistic solipsism of reductive materialism wrought by modern science from which myself and many others have suffered.

Preliminary Thoughts Concerning the Genealogical Method

I want to begin by calling attention to some of the initial considerations that went into compiling the genealogy of energy in the first chapter and my subsequent conceptual analysis of this concept in the chapters that follow. First, I would like to note that, like a river, the genealogy of a concept has no precise point-like origin or source. Rather, one should remember that, rather than a single point of eminence, rivers have many tributaries—above and below ground. Furthermore, the life of a river does not progress linearly through space and time but, rather, is cyclical, since the river itself exists through a hydrologic cycle of which it is an integral and inseparable part. Thus, if one could be a god and trace the flows of rivers, one would trace many circles, corresponding here to the hermeneutic circle of concepts that determine and are determined by those who think/embody them; energy and its history precede me, thus I receive them and am shaped by them, but, in receiving, I diffract them, returning the concept to the circle slightly different than I found it; I become a condition of the concept's existence and therefore a part of its history. That said, much like a river, it would be futile to account for every single tributary or stream that feeds into it. However, one cannot deny that not all tributaries are made equal, some clearly contribute "more water" than others. My genealogy of energy, written within the context of the space-time-constraints of a dissertation project, attempts to explore some of the most significant contributions in the history of energy within western philosophy and physics, with an eye towards energy's relation to time and *ressentiment*, which I explore in later chapters.

Furthermore, considering the idea of cyclicality above, this genealogy should not be interpreted as tracking the "progress" of the concept of energy, as though the march of history has continuously "improved" our idea of what energy *is*; as if ancient knowledge were far more impoverished than modern knowledge simply by virtue of being in the past. What is important here is not whether the concept of energy corresponds to what energy *really is* (I argue later on that energy is not a substance that we can objectively hold a mirror to or something we could ever come to full conceptual awareness of). Rather, much like how Nietzsche undertakes his critique of traditional moral values in the *Genealogy of Morals*, a critique of the concept of energy requires "knowledge of the conditions and circumstances in which [it] grew, under which [it] evolved and changed."[1] Nietzsche was not concerned with good and evil as such, but within the general context (or "field of forces," as Nietzsche might have said) within which, and through which, these concepts were conceived. This, not coincidentally, resonates with methods of conceptual analysis in affect theory. Rowe notes that "affect theorists focus on the intersection of bodies and discourses/systems/institutions of power, viewing the body as a particular locus where systemic and intimate power converge."[2] Furthermore, "[a]ccounting for the enchantments of energy requires closer attention to the imbrications of affects, concepts, ideals, and desires."[3] I believe one could say that, in the *Genealogy of Morals*, Nietzsche reaches the conclusion that the affective context (which, as indicated above, includes bodies, discourses, systems, and institutions of power) within which western morality has evolved is that of *ressentiment*, and I argue for a similar conclusion later on regarding energy. My point is that the reader should not approach this genealogy with the intention of tracking the "progress" of the

[1] Friedrich Nietzsche, *On the Genealogy of Morals*, trans. Walter Kaufmann (New York: Vintage Books, 1989), 20.

[2] Rowe, 16.

[3] Ibid.

concept of energy, as if it were possible to achieve a full and comprehensive account of what energy is over time. Rather, although I do develop a genealogy of the concept in the first chapter, this genealogy is a means for foregrounding the underlying philosophical and psychological motivations that sparked the need to theorize energy in the first place.

Lastly, one of the challenges of writing a genealogy of energy is that, right off the bat, it seems there are two routes one can take. These two paths would be 1) the etymological path that follows the evolution of the concept from *energeia* in Aristotle to "energy" in contemporary physics, or 2) the shorter path that begins in the 19th century, when energy as we know it was conceived. This bifurcation is due to the fact that what we mean by "energy" is basically the opposite of what Aristotle meant in his original coining of the term,[4] which would make it seem that energy and *energeia* are only connected superficially by their homography. However, although it is true that *energeia* and energy are far from meaning the same thing, I hope to show that there is still much that resonates between *energeia* and other proto-concepts of energy than meets the eye—particularly how these concepts have been theorized in relation to time. With this in mind, I carve out a third path, closely related to the first, but exceeding it, in that I identify affective tributaries of *energeia* in Pre-Socratic philosophy, which is where my genealogy of energy begins. Before diving into the first chapter, I provide a brief review of the genealogies in the literature that have inspired the one developed for this project.

Literature Review: Other Genealogies

Within the budding field of energy humanities, there has been much new scholarship in exploring genealogies of energy that highlight the cultural contexts and assumptions that have

[4] Michael Marder, *Energy Dreams: Of Actuality* (New York: Columbia University Press, 2017).

molded the concept and our current understanding of it. Cara Daggett's *The Birth of Energy* is especially salient for this project, considering that, while the genealogical thematic of energy is implied in the literature I discuss below, Daggett's is the only one that explicitly claims to be a genealogy of energy *per se*. Acknowledging that the etymological roots of energy go all the way back to the ancients, nevertheless, Daggett focuses her attention on the modern concept of energy as formulated by the science of thermodynamics, which has been decisive for western energy discourse. To this end, Daggett's genealogy is grounded in energy's connection to work, broadly construed as both scientific concept and as a political-economic concept of labor and its exploitation for westward imperialistic expansion—hence the subtitle of Daggett's book: *Fossil Fuels, Thermodynamics, & the Politics of Work*. Daggett, remarking on the industrial/imperial interests tied up with the founding assumptions and motivations for the development of the concept of energy, stresses that, in its original articulation, energy was not simply an objective/value-neutral concept, but a political object serving European industrial interests.

One of the key arguments of Daggett's book is that "our commitment to growth and productivity has been reinforced by a geo-theology of energy that combines the prestige of physics with the appeal of Protestantism in order to support the interests of an industrial, imperial West."[5] Daggett's genealogical approach to the study of energy exemplifies the purpose of such a method: to foreground the cultural, political, and theological assumptions and histories that form the background for the evolution of the concept of energy. Accordingly, a genealogical approach does not create any artificial schisms between the foreground and the background of the concept, since it is precisely the permeability and interplay of the two that constitute the life

[5] Cara Daggett, *The Birth of Energy: Fossil Fuels, Thermodynamics, and the Politics of Work* (Durham: Duke University Press, 2019), 190.

of the concept. In other words, “energy cannot be reduced to an artifact of Victorian culture, nor merely to a set of fuels. It is a hybrid assemblage where these things are entangled, what Donna Haraway (and others) has called a natureculture, a term that points to the inseparability of nature and culture.”[6] Daggett focuses on highlighting how, 1) British imperial interests concerning the production of evermore efficient engines and methods of industrial production for imperial expansion and 2) the fateful synthesis of Scottish Presbyterianism with thermodynamics, were decisive for the birth of energy.

A political scientist, Daggett considers the central role of energy and work in the development of western politics. The questions that she is interested in include: “how did energy come to signify fuel as an object in need of governance? Why does energy politics refer to the acquisition and security of fuel, rather than to the politics of ensuring public vitality?”[7] She wants to understand energy as a “ruling idea,” which means to “appreciate how energy arises in the context of the power relations of fossil-fueled industrialization, with “an aim” that is oriented toward the extension of Western trade and industry.”[8] She contests the universality of energy in that she refuses to take the concept and reify it into a sort of transcendental substance or signifier that would account for the underlying substratum of nature. Rather, Daggett and I are in accord with each other in seeing energy not as a ubiquitous substance, but as something novel that partitions nature according to a particular logic that is decisive for how people see, think, feel, and know reality and their place in it. This is what Daggett means when she says that energy is a figuration. Figurations are neither true nor false, “they do not (mis)represent the world, for to do so implies the world as a signified preexists them. Rather, figurations… condense diffuse

[6] Daggett, 5.

[7] Ibid., 3.

[8] Ibid., 7.

imaginaries about the world into specific forms or images that bring specific worlds into being."[9] Thus, she wants to show how energy and work have helped bring the world of Western industrial society into being.

In calling the objectivity of the relation of energy to work into question, Daggett attempts to imagine life beyond the confines imposed by the consumptive and exploitative status quo of a neoliberal society that depends on the perpetual consumption of massive amounts of fossil fuels and the global exploitation of labor for its existence. Quoting Daggett,

> the early logic of energy, with its energetic emphasis on thermodynamics and its drive to maximize productivism and efficiency, continues to haunt the politics of energy, and limits our ability to imagine alternative energy systems. The history of energy thus shows how energy and work became tethered to each other, and how this connection is continually reproduced in global industrial politics. The contingency and historicity of this binding are rarely acknowledged, much less contested.[10]

Therefore, if we are not critical of the ethics and politics of energy and work, if we do not stop to be critical about the relation of the good life to fuel consumption, we will struggle to break out of the fossil fuel cultures that continually sanction the exploitation and destruction of life and our planet.

Daggett's contributions are certainly important for articulating the political and economic aspects of the genealogy of energy, particularly as they pertain to sustaining a relationship of continued exploitation with nature and normalizing an ontology/epistemology of work that serves the continual accumulation of capital. Furthermore, both Daggett and I agree in thinking that energy is not an actual substance that you can point to in nature, but a figuration that foregrounds some discourses while backgrounding others, thus bringing certain worlds, symbols, and images into being through historical interactions. This is not to say that I take the position

[9] Daggett, 6.

[10] Ibid., 195.

that energy is a purely human/political construct. Rather, I take the view, influenced by new materialism, that energy is a material/discursive entanglement, a series of historical interactions equalized under the heading of energy. To this end, the genealogy I am developing will foreground energy discourse in western physics and metaphysics by emphasizing energy's fundamental relationship to theories of time, and how the latter have often been grounded in the temporality of *ressentiment.* Although I focus on this ontological dimension for the most part, I also argue that Daggett's conclusions concerning energy and the politics of work expose *ressentiment* on the level of culture and economics. Thus, although I do not claim to provide a "truer" account of the genealogy of energy than Daggett, I do believe that my analysis provides a broader overview of the ontological aspect of the problem, i.e., imaginaries of work and labor in the age of modern energy also betray an orientation grounded in *ressentiment* (further discussion of *ressentiment* and the politics of work is left for the fourth chapter).

In *Of Modern Extraction*, Terra Rowe exposes the theological, racialized, and gendered assumptions underlying our extractive culture's totalizing conception of energy as a ubiquitous potentiality in nature to be extracted as efficiently as possible for the sake of the progress of the neoliberal capitalist machine. Rowe's work is another example of a genealogy of energy that attends to how energy discourse, rather than being an objective outgrowth of the experiments of physicists, has been used historically to construct identity and order humanity according to theological, gendered, and racialized assumptions. Crucially, Rowe's approach, like mine, is influenced by Karen Barad's work on material/discursive entanglements, which is to say that neither Rowe nor I take the position that energy is a purely constructivist concept. Rather, material discursive entanglements are grounded in theories of new materialist performativity, where words and things are material assemblages that are constantly being made and remade,

and where "[m]eaning is made possible through specific material practices."[11] Importantly, Rowe shows how such material/discursive entanglements in western thought have been complicit with the development of an extractive economy in its subjugation of energy and human labor to the whims of capital, while also providing other avenues for theorizing energy anew in ways that highlight the relationality of bodies and energy, disrupting the dominant discourse.

One of Rowe's basic claims is that "energy—even modern energy science—has been profoundly enchanted and that often-unconscious theological investments play a key role in maintaining high-energy lifestyles even as mounting evidence demonstrates their danger."[12] Rowe is deeply skeptical of the energy exuberance that is characteristic of neoliberal society and its popular conceptions of the good life. In particular, she looks at how "[e]nergy values, gender distinctions, racial hierarchies, and conceptions of divinity have been mutually informed and constructed in the West" to show how energy (rather than being a reified thing-in-itself) and energy systems have been used in the West for the domination of people and nature. This domination isn't simply territorial, but cultural—that is, epistemological. This epistemological domination is what Rowe, following Sylvia Wynter, calls "enchantment." Rowe claims that exuberant fulfillment, from a decolonial feminist perspective, has defined what Wynter has identified as "overrepresented Man." According to Wynter, the figure of Man is the "first purely secular and therefore non-transcendentally guaranteed model of human being/identity."[13] Wynter here refers to the tradition of western humanism which sees the world as being created for Man and in Man's image. Crucially, this man is European, white, Christian, and rational—Man

[11] Karen Barad, *Meeting the Universe Halfway* (Durham: Duke University Press, 2007), 148.

[12] Terra Schwerin Rowe, *Of Modern Extraction: Experiments in Critical Petro-theology* (New York: t&t clark, 2023), 30.

[13] Sylvia Wynter, "Disenchanting Discourse," *Cultural Critique*, no. 7 (1987): 217.

believes to possess all these traits by right, as an exception to the animality of nature and the ontological Other, such as women, black people, indigenous people, queer people… the list goes on. The epistemology of the figure of Man has underwritten Western domination for hundreds of years, and Rowe claims that this epistemology, which has enchanted the West for so long, is extractive. This epistemology betrays a striving to dominate the Other, a process undertaken physically and epistemologically. The extractive epistemological violence of Man consists in his construction of identity according to theological, gendered, and racial lines that work to efface ontological differences in service of the perpetuation of Man and the impression of his will on the world. Man's striving to dominate nature for his own means, and his belief in the endless progress of his domination, has seen the development of the most energy consumptive society in history, and Man's pride in this exuberance and the expectation of its never-ending increase is the ideological engine that moves it forward.

Energy exuberance is Man's creed, which is also the creed of ecomodernism, one of the schools of thought that Rowe is most critical of. Ecomodernism is an environmental philosophy for the Anthropocene which argues that humans should decouple economic growth from environmental impacts.[14] In other words, ecomodernists think that the best way to move forward regarding the climate crisis is to replace fossil fuels with other energy sources without sacrificing the economy and the energy exuberance that we have grown used to. Rowe articulates a devastating criticism of ecomodernism, arguing that

> [s]uch approaches risk merely expanding the available options for energy consumption while also failing to address the ways that energy systems are tied to social and political structures that have rendered certain modes, rhythms, and patterns of being human exceptional to the interdependence of material existence.[15]

[14] Cf. "An Ecomodernist Manifesto" on ecomodernism.org.

[15] Rowe, 161.

For Rowe, exploring alternate energies means breaking from the energy-lavish mode of living, feeling, and thinking grounded in the extractive epistemology of the figure of Man, which is far beyond the narrow and naïve scope of ecomodernism, which remains at a superficial level of analysis. Rowe's genealogical excavation of the theological, gendered, and racialized assumptions that ground modern extractive energy epistemologies resonates with and provides evidence for many of the claims that are made in this work, particularly with regard to her material-discursive approach that emphasizes how Western energy imaginaries cannot be divorced from the violence and domination that have flourished under their tutelage—an early hint towards the connection between energy and *ressentiment*.

Michael Marder's *Energy Dreams: Of Actuality* is an important work since, much like my own project, his analysis of the concept of energy is largely informed by his familiarity with the continental tradition of philosophy, specifically Heidegger and Nietzsche. The implication of this is that both Marder and I are more interested in the genealogy of energy from an ontological, rather than ontic, point of view. Beginning with Aristotle's creation of the term *energeia*, which denoted the energetic rest of a being whose potentiality (*duanmis*) has been exhausted according to the ends proper to that being's essence and their place in the Being of beings, Marder shows how for us moderns, the meaning of energy is basically the opposite of Aristotle's original conception of the term *energeia* (a concatenation of the Greek words *en* + *ergon* = something like putting to work or activation) which Marder translates as "enworkment." Marder offers a framework for energy that not only restores energy's ontological dimension but, crucially, an *ethical* dimension, in that the proper fulfillment of a being's essence as *energeia* is a process guided by a teleological process that aims at the highest Good. Marder writes that "[t]he Aristotelian economy is care for beings according to their being, guided from what they are in

potentia to their enacted liberation as and for themselves, the enworkment [energeia] of their ends. Reunited with their essence carried through to actuality, they energetically rest in it and are preserved."[16] My concern, however, is not to argue over what energy really is, i.e., I do not argue that Marder's/Aristotle's energy concept is the "right" one. Rather, in showing how the meaning of energy has evolved since Aristotle, Marder's genealogy tracks how the hermeneutic lens of western philosophy, and western culture's relation to nature, has changed over time. Put another way, Marder's genealogy underscores the material and phenomenological conditions under which energy has been theorized; the orientation of the philosopher of energy to her world. It is this history, the inner-history of *Dasein*, as Heidegger might put it, that is crucial for the connection I am attempting to make between energy as a physical phenomenon and energy as a concept created by philosophers and scientists through the hermeneutic lens of *ressentiment*. My genealogy also puts more emphasis on the science of energy than Marder's, which is useful considering that, at times, he makes sweeping or outdated claims about physics. Furthermore, while Marder's focus is on showing how Aristotle's *energeia* has been lost to us, and on recovering it by reinterpreting the history of energy through the lens of *energeia*, I am interested in western philosophy's axiological bias towards the eternal rather than the ephemeral, and how, since the Pre-Socratics, this guiding value has crystallized itself into the concept of energy as we know it today.

[16] Marder, 60.

CHAPTER 2

GENEALOGY OF ENERGY

Ancient Greek Roots of Energy

Physicist Robert Bruce Lindsay claims that "[t]he key idea [to understanding energy] is simple: *constancy in the midst of change*."[17] I am in agreement with Lindsay on this point, and this is the thread that guides the development of this genealogy. Thus, I take my departure from the same place as Lindsay: Greek philosophy. More specifically, Lindsay focuses on Parmenides, going so far as to call Parmenides "the ancient patron saint of the concept of energy."[18] Lindsay contrasts Parmenides with Heraclitus. Although, Lindsay claims, Heraclitus does foreshadow in some sense our current understanding of the dynamism of energy through his philosophy of becoming, Lindsay believes that Parmenides comes closer to the modern understanding of energy by positing a more fundamental, unchanging reality—the One— beyond the apparent illusion of change. According to some commentators on Heraclitus, if there really was nothing that is invariant through time, knowledge would be impossible, because it would be impossible to grasp something in thought (that is, to have knowledge of something) before it became something else. Parmenides' conception of the One, then, solves this problem by positing a stable, eternal, thinkable, more fundamental reality beyond the world of becoming that we perceive with our senses, allowing for stable objects of knowledge and, therefore, the possibility of knowledge itself. Furthermore, Parmenides' philosophy resonates to some extent with the original conception of energy in thermodynamics, in that energy in the 19th century was often understood as the eternal substance or ground of existence whose presence and quantity

[17] Robert B. Lindsay, *Energy: Historical Development of the Concept* (Stroudsberg: Dowden, Hutchinson, & Ross Inc., 1975), 5.

[18] Lindsay, 16.

remain unchanged over time and guarantee the possibility of change by grounding it in a prior sameness. Thus, the key idea that resonates between these distinct metaphysical frameworks is invariance in the midst of change. Nietzsche's incisive description of Parmenidean thinking is helpful here:

> And then [Parmenides] really dipped into the cold bath of his awe-inspiring abstractions. That which truly is must be forever present; you cannot say of it "it was," "it will be." The existent cannot have come to be, for out of what could it have come? Out of the nonexistent? But the nonexistent is not, and cannot produce anything. Out of the existent? This would reproduce nothing but itself. It is the same with passing-away. Passing away is just as impossible as coming-to-be, as is all change, all decrease, all increase.[19]

Thus, ultimate reality or Being, for Parmenides, is unchangeable, unmovable, and eternally present, and we can only glean this reality of Oneness through contemplation—we are hindered by the body and its attachment to ephemeral sensations that keep us from seeing what truly *is*.

Another contribution of Parmenides to the history of philosophy serves as a point of resonance with modern energy. Heidegger argues that Parmenides was the first philosopher in the western tradition to ask the question of Being by making explicit the difference between beings and Being.[20] What are beings? What do they all have in common? Being! If it were not for the unity of Being, beings could not stand out against each other as distinct beings. When we distinguish one being from the other, we have already distinguished beings from Being as such. Heidegger argues that "without [the distinction between Being and beings] their being different would remain hidden from us."[21] In other words, according to this logic, beings can only *be*

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[19] Friedrich Nietzsche, *Philosophy in the Tragic Age of the Greeks*, trans. Marianne Cowan (Washington DC: Regnery Publishing, 2014), 78.

[20] Martin Heidegger, *Aristotle's Metaphysics Θ 1-3*, trans. Walter Brogan and Peter Warnek (Bloomington: Indiana University Press, 1995). "But what are beings? Now this means: What is being? The reply to this question is really just the complete answer to the question concerning beings. To be sure. And the first one we know of to have asked about beings in such a way as to have tried to comprehend being, and who also gave the first answer to the question, What is being? Was *Parmenides*," 18.

[21] *Aristotle's Metaphysics*, 20.

because Being *is*. If Being were not, then beings could not be. Thus, Being is determined at the outset of western philosophy as that which is invariant and eternally present. This echoes our modern understanding of energy in that we too speak of energy as something universal (Being) of which we only ever experience particular manifestations of energetic flux (beings). We should not, however, project the materialism of 19th century energy onto Parmenides. The materialism of the former would make it so that the sum of all the energy in the universe would be equal to the universe itself, which does not track with Parmenides. In other words, the sum of all beings in Parmenides is not equal to Being[22], as it would be for a purely materialistic account of the universe.

Discussing Plato's *Parmenides*, Lindsay argues that the dialogue's "emphasis on unity and the importance of abstract ideas, of which energy is certainly a prime example, justifies"[23] his inclusion of a fragment from the *Parmenides* into his volume of the most significant historical documents in the development of the concept of energy. Though I do agree with Lindsay's statement, his very brief paragraph justifying his inclusion of the *Parmenides* barely scratches the surface. I believe Lindsay is alluding to the standard textbook interpretation of Plato, which emphasizes what commentators of Plato have called the "doctrine of ideas." We have heard this story often: "we must suppose then an ideal world containing eternal and perfect prototypes of the natural world. Whatever of quasi-existence our changing world possesses, it owes to an imperfect participation in the full and perfect existence of the other."[24] I think the

[22] "Individual beings do not first yield what we call the beings by means of summation; rather, beings are that from which we have always proceeded when counting off and adding up, whether or not we determine the number or leave it indeterminate. The beings permit the countability of individual beings; the sum of these, however, does not at all constitute being." *Aristotle's Metaphysics*, 18.

[23] Lindsay, vii.

[24] William Guthrie, *The Greek Philosophers: From Thales to Aristotle* (New York: Harper & Row, 1975), 90.

connection Lindsay is trying to make here is that Plato's metaphysics presages the concept of energy because it posits that reality, at its most fundamental level, can only be understood abstractly—as a unified whole—and that a proper grasp of the essence of this unity can only be achieved by discovering the principle or concept of unity that *a priori* unites all seemingly disparate phenomena. To put it simply, it seems that Lindsay is implying that, in Plato's conceptual schema, the 'forms' functioned in a similar manner to how 'energy' functions in the conceptual schema of physics. Again, I do not disagree with this[25], but that Lindsay holds this simplistic view is no surprise when one considers that the basic metaphysical assumptions of modern science were inherited from its past of Scholastic, Roman, and Greek philosophy, which it tries so hard to disavow.[26] The most basic of these metaphysical faiths is the one that founds Ancient Greek philosophy, and, therefore, western intellectual history: "[p]hilosophy started in the faith that beneath this apparent chaos there exists a hidden permanence and unity, discernible, if not by sense, then by the mind."[27] Socrates said it himself: "philosophers are those who are able to grasp what is always the same in all respects."[28] Indeed, we see that the history of the

[25] I also do not think, however, that he is entirely correct. I would argue that, if we're looking for the fundamental concept that establishes the unity of Plato's conceptual schema, it would be the 'Good.' Consider what Socrates says in Book VI of the *Republic*: "say that not only being known is present in the things known as a consequence of the good, but also existence and being are in them besides as a result of it, although the good isn't being but is still beyond being, exceeding it in dignity and power," 189. It also makes perfect sense, however, that Lindsay would prioritize the forms over the Good because of his training as a modern physicist. One of the fundamental traits of modern science, as we explore later, is the schism between ethics and ontology—a result of modern science's strong materialistic bent and the denial of teleology. So, even if Lindsay were aware of Plato's teaching of the Good, it is unlikely that he would have accepted it as a precursor to energy, due to the good's inherently ethical connotation. (From Allan Bloom's translation of *The Republic of Plato*, (New York: Basic Books, 2016.))

[26] Nietzsche never tired of emphasizing this. Consider a fragment from aphorism 344 of *The Gay Science*, "How we, too, are still pious": "But you will have gathered what I am driving at, namely, that it is still a *metaphysical faith* upon which our faith in science rests—that even we seekers after knowledge today, we godless anti-metaphysicians still take our fire, too, from the flame lit by a faith that is thousands of years old, that Christian faith which was also the faith of Plato, that God is the truth, that truth is divine," 283. From Walter Kaufmann's translation of *The Gay Science* (New York: Vintage, 1974).

[27] Guthrie, 24.

[28] *The Republic of Plato*, 163.

concept of energy is the history of the re-uttering of this metaphysical faith in western thought, and in later chapters we explore why this faith has resonated with western thinking for over 2000 years (this is our bridge to *ressentiment*.)

Concerning the influence that Plato had on the concept of *energeia*—the etymological root of 'energy'— Stephen Menn argues that, while the concept of *energeia* has no precedent in the work of any other philosopher but Aristotle, Plato's attempt to make sense of the Parmenidean problem of being, not-being, and coming-to-be, offered Aristotle some of the conceptual tools he needed to coin *energeia*. Although Menn goes into great detail about the Platonic influences on *energeia*[29], for our purposes it is sufficient to look at what he has to say about the *Parmenides* dialogue mentioned above. Menn argues that, before Aristotle's attempt to account for potentiality and actuality, the only other serious discussion of this question prior to Aristotle is "in the fifth hypothesis of Plato's *Parmenides*, where Plato discusses 'a one which is not'… Plato says there that this thing that is hypothesized not-to-be 'must also participate somehow in being'… if we are to distinguish it from other non-existent objects, or even to affirm truly that it is non-existent."[30] What Menn is referring to is the question of the being of that which-is-not but could potentially be, e.g., like the potentiality of an acorn to be an oak tree—what do we make of the *being* of this potentiality, which is neither something nor nothing? Certainly, the future oak tree *is-not*, and yet, the very fact that we are able to speak of that future oak tree indicates that it is *not-nothing* either. In other words, what is the being of the not-being of what is-potentially? Menn further notes that "Plato concludes that a non-existent object both *is*

[29] Menn argues that the Platonic influence on the creation of the distinction between *energeia* and *dunamis* (actuality and potentiality) goes back to the "*Theatetus* image of the aviary, and the *Euthydemus* image contrasting the craftsman who has acquired the tools of his trade but does not use them with the craftsman who is practicing his craft," (Stephen Menn, "The Origins of Aristotle's Concept of *Energeia*," in *Ancient Philosophy* 14, no. 1 (1994): 87.

[30] Ibid., 94.

in one sense and *is not* in another sense, but he does not try to establish a terminology for these different senses of being."[31] Aristotle's creation of the distinction between *energeia* and *dunamis* (actuality and potentiality) thus attempts to account for the different senses of being which Plato, according to Menn, could not satisfactorily resolve. In doing so, Aristotle becomes the first thinker in the west to inaugurate a systematic science of change: "Indeed, Aristotle uses the actuality-potentiality distinction to secure the very possibility of a science of physics, by explaining the possibility of coming-to-be, and resolving the contradictions that Plato, following the Eleatics and the Sophists, had detected in changeable things."[32]

The thread that guides my discussion of Aristotle's concept of *energeia* (and its crucial counterpart: *dunamis*) is guided by the discussion initiated above regarding the metaphysical problems associated with coming-to-be and not-being, alluded to in Plato's *Parmenides*. In this regard, Menn notes that "Plato defies Parmenides, and says that a thing X may come-to-be from not-being; Aristotle agrees, but insists that Plato has not properly explained the kind of not-being from which X can come-to-be."[33] In other words, although Plato points out that things may come to be from not-being, by not explaining the kind of not-being, Y, from which a thing, X, comes, the concept of coming from not-being (that is, being potential) collapses back into actual being, lest we admit that something can come from nothing. By creating the concept of *dunamis*, Aristotle offers a new solution to the problem of coming-to-be:

> everything changes from something that has being in potency [*dunamis*] to something that has being-at-work [*energeia*]… so that things are able not only to come into being from what, in an incidental sense, is not, but also everything comes into being from what is, though from what is potentially but is not at work [1069b 15-20].[34]

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[31] Menn, 94.

[32] Ibid., 73.

[33] Ibid., 74.

[34] Aristotle, *Aristotle's Metaphysics*, trans. Joe Sachs (Santa Fe: Green Lion Press, 1999), 232.

Thus, for Aristotle, being is spoken of in two distinct ways: as being potential (*dunamis*) and as being-at-work [*energeia*]. Being-at-work is how translator Joe Sachs chooses to translate *energeia*. This is due to Aristotle's concatenation of the prefix *en-* (in; within) and the Greek word *ergon* (commonly translated as 'work'). Michael Marder similarly translates *energeia* as 'putting to work' or 'activation.'[35]

Aristotle claims that the sense in which this sort of being-at-work or activation can be understood is best grasped by analogies and examples rather than by strict definitions [1048a 39-40].[36] An activity that can properly be called *energeia* is one in which the end of the activity is present in the activity itself and not only as its end. Vision is an example of *energeia*. When one opens her eyes, she is seeing and has already seen; the activity pursues no aim outside of the activity itself. Another famous example is contemplation, an activity whose end is itself, whose end is always present in the activity.[37] An activity that does not possess its end in itself is how Aristotle refers to 'motion.' Aristotle states that motion is incomplete, that is, it does not possess its end in its activity. An example that Aristotle uses to describe motion is house-building. Unlike vision, which is accomplished at every moment that one is seeing, one cannot be building a house and have built the house at the same time: the end of the activity only comes to be when the activity has exhausted itself. David Bradshaw writes that activities that are *energeia* are

[35] Michael Marder, *Energy Dreams: Of Actuality* (New York: Columbia University Press, 2017), 3.

[36] *Aristotle's Metaphysics*, 173-174.

[37] In the *Nicomachean Ethics*, Aristotle famously opposes the life of contemplation (complete in-itself) to the life of pleasure and the life of politics. A life devoted to pleasure is lost in endless consumption; its activities are always a means to (external) pleasurable ends that must be endlessly renewed. The end of the political life is honor, which can only be bestowed upon the politician by others. Therefore, honor, the end of political life, is external to the political activity itself.

actual in "the sense that they contain their own end and thus are fully complete at each moment of their existence, rather than requiring a stretch of time for their completion."[38]

Marder makes the very interesting argument that our modern understanding of energy is the inverse of Aristotle's. He says that "our conception of energy, qua a potentiality waiting to be unleashed into a wide spectrum of activities, is the inverse of Aristotle's."[39] What Marder means is that, whereas the modern understanding of energy is something like the pure potential to accomplish a wide variety of ends, *energeia* for Aristotle denoted completion, fulfillment, and rest. Marder further argues that "[s]o long as something still persists in actuality, it is taken as an invitation to a work yet to be carried out, the suicidal work of separating and releasing energy from matter and dissolving the temporarily stabilized structures of our phenomenological lifeworld into dynamic processes."[40] In other words, whereas Aristotle's *energeia* is defined by the exhaustion of potential/*dunamis* in some definite end, the modern conception of energy is grounded in pure dynamism devoid of any stable ends. Marder later argues that this reversal is a symptom of modern nihilism, an important point which we examine later on when looking at the connection between *ressentiment* and energy. For now, let us continue the genealogy by examining how *energeia* was taken up and modified by thinkers after Aristotle.

Energeia and the Difference between Western and Eastern Christianity

After Aristotle, I want to briefly point to how the concept of *energeia* was largely taken up by the Neoplatonists and Christianity. The reason for this brief interlude in the theological history of *energeia* is to show that the Ancient Greek philosophical preoccupation with

[38] David Bradshaw, "The Concept of the Divine Energies," in *Philosophy and Theology* 18, no. 1 (2006): 95.

[39] Marder, 7.

[40] Ibid., 9.

constancy over time, as exemplified through *energeia*, is taken up by and closely associated with the idea of divinity in western theology. Rowe puts this well:

> As early as Parmenides, Western thinkers had perceived that beneath the seemingly constant surface-level change of the material world, something was retained or remained the same. The law of energy conservation associates this constant, static remainder with energy. Historically, though, Western thought has consistently associated the constant amidst all (presumably surface-level) changes with divinity.[41]

Thus, I want to acknowledge this association of energy, constancy, and divinity by briefly pointing to how variegated understandings of energy and the divine have been decisive in the development of Christianity.

Bradshaw points out that the difference between Eastern Orthodoxy and Western Christianity comes down in large part to a difference in understanding between divine energies and divine essences. To understand how this is, we must take a quick look at Aristotle's theological concept of the "unmoved mover." Aristotle posits the unmoved mover as the ultimate source of motion in the cosmos; it is the solution to the infinite regress of the causes of motion. The question of the original cause of motion in the cosmos is a paradoxical one because if, at the beginning of time, there was no-body in motion, what could have been the original source of motion in the universe? Aristotle attempts a way out of this paradox by accepting that the original source of movement could not have come from a material body, because that body, in turn, would have needed to have motion imparted to it by some other body and so on, infinitely. One could venture the solution that bodies are the self-cause of their own change. This, however, would be an absurdity, since the "statement that something is the cause of its own motion, then translated into Aristotelian terms, would mean that it was both actual and potential in respect to

[41] Rowe, 32.

the same act of change."[42] There are two clues here that lead us to Aristotle's unmoved mover. The first, as pointed out by the quote, is that bodies cannot be the cause of their own movement because that would imply the logical contradiction of that body being simultaneously potential and actual with respect to its activity (we should remember that for Aristotle, the activity of matter is described as *kinesis*, which is *dunamis*, and not the being-at-work of *energeia*). This leads to the second and decisive clue: the original cause of movement in the universe could not have been a kind of *kinesis*, because if the original cause of motion possessed any potentiality, then we would be led further down the ladder of the regress of motion. Thus, the *ousia* (essence) of this prime mover must be *energeia*, because

> since the Prime Mover is posited to explain motion, it cannot itself be subject to motion, and thus it is pure actuality in the sense of having no potentiality to change or be acted upon. Second, because its activity of causing motion must be continuous and eternal, it can have no unrealized capacities to act; everything it can do it already does and has done from all eternity, all at once and as a whole. In this sense too it is pure actuality.[43]

This is Aristotle's unmoved/prime mover. It is the eternal, perfect, and fully actual movement of the unmoved mover, whose activity is self-contemplation, that serves as the perfection to which all teleological processes in the Aristotelian universe aspire in the imperfect motion of *kinesis*, from *dunamis* to *energeia*.

At the risk of getting ahead of myself in this analysis, I want to note that it is interesting that, while Aristotle's explanation of the metaphysical causes of motion is not as philosophically reductive as the modern materialist view of energy, it still resonates with modern energy in that we might try to understand the prime mover as the sort of "pure energy" that energizes and constitutes the being of all moving bodies. This view, as I show, might be traced to Thomas

[42] Guthrie, 136.

[43] Bradshaw, "Divine Energies," 96.

Aquinas' employment of *energeia* as *potentia*—"pure act"—resulting from his refusal to make a distinction between the divine essence and divine energies. Although any attempt to conceptualize the unmoved mover in terms of modern physics inevitably leads to a materialist reduction, they resonate in their rendering of the totality of being as intelligible to human understanding through the actuality of an Unmoved Mover on the one hand—which represents the totality of what can be apprehended by noetic activity—and the law of the conservation of energy on the other, subordinating flux to a prior sameness that is not subject to change. More specifically, these concepts are part of "an *ontology* that accounts for that which all beings have in common (universal or fundamental being) and a *theology* that accounts for that which causes and renders intelligible the system of beings as a whole (a highest or ultimate being or a first principle)."[44] We must not forget this point, which reverberates through this entire genealogy and constitutes the thread of *ressentiment* that runs through this genealogy.

As I have alluded to, there is a marked difference in the way *energeia* has been taken up in Western and Eastern Christianity. The innovative usage that Plotinus and St. Paul make of *energeia* are key for glimpsing this difference. In line with the Aristotelian double connotation of the *energeia* of the Unmoved Mover as including what it is and what it does (the Unmoved Mover is its own eternal and fully actual contemplation), "Plotinus refined this picture by distinguishing between internal and external act, but he does not overthrow it."[45] The external act refers to the first hypostases of the One (which is to be understood as identical with Plato's notion of the Good): the emanation of Intellect. Bradshaw writes that the "object of Intellect's

[44] Matthew C. Halteman, "Ontotheology," *Routledge Encyclopedia of Philosophy* (1998), doi: 10.4324/9780415249126-K115-1, https://www.rep.routledge.com/articles/thematic/ontotheology/v-1.

[45] Bradshaw wrote another unpublished paper by the same title "The Concept of the Divine Energies," 10, url: https://web.archive.org/web/20170809082838id_/http://www.thedivineconspiracy.org/Z5205D.pdf. I refer to this paper in the following footnotes as "Divine Energies II."

thought is in a sense the One, but since Intellect cannot apprehend the One in its unity it instead refracts it into a vast array of separate intelligibles… which are the Forms."[46] Whereas the Forms for Plotinus are energies (i.e., actualities) that emanate from the One, there is also an energy that is characteristic of the One in-itself: "Intellect as an energy is dependent upon the One. However, Plotinus is too deeply steeped in Aristotle to think that substance itself is not a kind of *energeia*… Hence, he also posits an *energeia tēs ousias*, an internal act or energy constituting the substance, of which the external act is a kind of image."[47] The distinction between the internal and external energies emanated from the One square well with Plato's description of the One in the *Republic* as beyond 'being,' which implies that a total account of the Good is impossible, since it serves as the ultimate object of thought for the Intellect while fundamentally exceeding all noetic capacity.

Another important development in the history of *energeia* is St. Paul's novel restriction of the concept to divine agents. Whereas *energeia* was commonly understood as the fulfillment or actualization of a capacity through its exercise (e.g., vision), "Paul restricted it to spiritual agents: God, Satan, Christ, angels, or demons."[48] This is tied to the Paulinian idea that one only becomes fully human by embracing the divine energies, which manifest through actions that offer a glimpse of the divine nature of God working through humans.[49] Bradshaw points to Colossians 1:29 as a place where Paul describes his working (*energeia*) towards his mission of spreading the Gospel of Jesus Christ and thus allowing the divine energy to work through him:

[46] Divine Energies II, 7.

[47] Ibid., 7-8.

[48] Rowe, 39.

[49] Divine Energies II, 6.

"whereunto I also labour, striving according to his working, which worketh in me mightily,"[50] where 'working' is the translation of *energeia* and 'working' denotes actuality—*energoumenēn*.[51] As such, Rowe writes that for "early Christians energeia was not just the activity of the exercise of a capability, but a capacity associated with the presence of the Judeo-Christian God and associated with human fulfillment."[52]

Rowe follows Bradshaw in pointing to St. Paul's novel usage of *energeia* as the seed for the Eastern Orthodox understanding of deification, understood as "an ongoing and progressively growing participation in the divine energies."[53] This interpretation of the divine energies grows out of the distinction made by the Cappadocians, and inherited by St. Palamas, between divine energies and divine essence. Rowe explains that "Palamas emphasized a distinction between divine essence (*ousia*) and divine energies (*energeia*), or the ways God manifests Godself in divine action. While God remains unknowable in God's essence, God is knowable in God's energies, or manifestations of divine action."[54] The manifestation of divine energies is closely tied to the practice of Hesychasm developed by Palamas, which he presents as a series of spiritual exercises that enable us "to receive the energies of the divine surface… There, in a calm heart, divine energies will set themselves to work."[55] It is important to note that the distinction made between the divine energies and divine essence by the Cappadocians—while informed by Plotinus' distinction between the One and Intellect as separated by hypostasis and therefore as separating the interiority and externality of God—is in opposition the idea that God's essence is

[50] King James Version.

[51] Divine Energies II, 5.

[52] Rowe, 40.

[53] Divine Energies II, 13.

[54] Rowe, 40.

[55] Marder, 43-44.

entirely unknowable, since the emanation of divine energies are not a separate moment of hypostasis radically unrelated to the interiority of God's essence, but rather offer a glimpse, however partial, of the divine essence.

According to Bradshaw, the energy/essence distinction was crucial in the break between Western and Eastern Christianity, where the former refused to embrace the distinction between divine energies and divine essence. This rejection is epitomized by St. Thomas Aquinas, who Marder credits with playing a key role in moving the Western understanding of energy away from the original Aristotelian connotation of *energeia* away from fulfillment and rest in the actualization of a capacity, and towards the understanding of energy as *potentia,* as "actus purus, a pure act."[56] Marder argues that this 'infelicitous' translation of *energeia* has contributed to the West's view of energy as insatiable *potentia,* an understanding of energy that Marder sees as indispensable for the development of the West's extractive and exploitative relationship to nature, seen as a latent reserve of unused energy akin to Heidegger's notion of *Gestell* or standing reserve. Rowe, too, argues that "that modern energy is distinctly infused and informed by *potentia.*"[57] Whereas theologians like Aquinas and Augustine maintained that the divine omnipotence of God (divine *potestas*) was bounded by "goodness, reason, love… and so on,"[58] in the late Middle Ages divine power comes to be seen as not constrained by anything, since an omnipotent God can make and remake the very categories that once were seen to bound Him.

Thus, the coupling of Aquinas' notion of *energeia* as unlimited *potentia,* informed by an unbounded concept of *potestas*, and coupled with modern science's rejection of final causes and divinity, would inform the modern scientific understanding of force and ultimately the concept of

[56] Marder, 34-35.

[57] Rowe, 67.

[58] Ibid., 70.

an instrumentalized form of energy which aims at no end or fulfillment; a purely dynamic means for the production and destruction of forms with no end.[59]

The energy of nineteenth century thermodynamics would be made possible by the synthesis of Leibniz's concept of *vis viva* and his science of dynamics, directly related to the Aristotelian distinction between *energeia* and *dunamis*, with the idea of 'work' and, crucially, heat. However, before arriving at this synthesis, I explore the transition from ancient to modern science and the early history of modern physics, which eventually takes us to the birth of modern energy in classical thermodynamics.

From Ancient to Modern Science

Although the honor of introducing the concept of energy into the canon of physics is commonly awarded to Thomas Young in his 1807 work *A Course of Lectures in Natural Philosophy*, where he proposed the Greek word *energeia* as a substitute for the concept of 'living force,' it was Johann Bernoulli who seems to have introduced it in 1717 in a letter to Pierre Avignon—Young was simply the first to use the term since Bernoulli nearly 100 years prior. Bernoulli, however, could not have reached this conclusion without the work of the natural philosophers that laid the conceptual groundwork for the physics of energy. There are four thinkers in particular that I would like to call attention to: Galileo Galilei, René Descartes, Isaac Newton, and Gottfried Wilhelm Leibniz. A brief overview of the contributions of these thinkers to the question of the motion of physical bodies, a field of study that Leibniz—in a reversal of the Aristotelian distinction between *dunamis* and *energeia*—would later call 'dynamics,' lays the

[59] For both Rowe and Marder, this fact helps establish the extractive culture of western modernity, where human fulfillment comes to be defined along lines of energy exuberance which aims at the increasingly efficient and copious utilization of energy through increasingly sophisticated methods of extraction and control of natural resources.

groundwork for the appearance of the concept of energy in Bernoulli and Young's work, and, later, the decisive introduction of the concept into thermodynamics, where energy became physics' most powerful concept for describing movement and change. I also explore the difference between the creation of concepts in ancient and modern science to highlight the paradigm shift that occurs in western intellectual history with the advent of physics.

Galileo is often regarded as one of, if not *the* father of modern physics. One of the distinctive features of Galileo's work is its marked differences from the traditional Aristotelian approach to natural philosophy. A quip from Galileo is instructive on this point. He says that the Aristotelian "must believe that if a dead cat falls out of a window, a live one cannot possibly fall too, since it is not a proper thing for a corpse to share in qualities that are suitable for the living."[60] What I believe Galileo is saying is that, whereas Aristotelians would attempt to explain natural causes teleologically on the basis of the essential qualities of bodies, Galileo proceeds by measurement and experiment, without reference to final or formal causes, but only efficient and material causes. Galileo did not just look or contemplate the qualities of physical phenomena, but ventured to measure and, importantly, quantify differences in measurements to explain natural causes. Thus, rather than explain the motion of the falling cat on the basis of qualities such as 'alive' and 'dead' or 'high' and 'low,' he proceeded by way of experiments and mathematics. This would not have been possible without Galileo's introduction of 'time' as a physical parameter. As Jennifer Coopersmith put it, "that time could be put into a mathematical relationship, that it could be brought into comparison with distances travelled, that it was a 'dimension in physics'—this was new."[61] This would be decisive in the history of energy, since

[60] Galileo Galilei, *Two New Sciences, Including Centres of Gravity and Forces of Percussion*, trans. Stillman Drake (Madison: University of Wisconsin Press, 1974), 166.

[61] Jennifer Coopersmith, *Energy, the Subtle Concept* (Oxford: Oxford University Press, 2015), 16.

the quest for that which remains unaltered (conserved) through time makes no sense without some conception of duration or persistence through time. Galileo, who "tried and tried again for *over 20 years* to find a link between"[62] the distances traversed in his famous experiments with free-falling objects, found that link when he introduced time as a physical parameter to establish a relationship between the velocity of the objects and the heights from which they fell. He discovered that the distance covered by the objects in free-fall were related to the square of the time that it took them to traverse those distances. In other words, he discovered the following mathematical relationship: $v^2 \propto h$.[63] Recall that kinetic energy would eventually be defined as mass times velocity squared: mv^2. But perhaps Galileo's most important contribution to physics is the idea that motion is relative, meaning that "speed cannot be determined absolutely; only motion *between* bodies is important."[64] Coopersmith argues that this could be considered the start of modern physics, laying the groundwork for the work of the likes of Descartes, Newton, and culminating with Einstein's relativity.

Descartes was one who appreciated the idea that motion is relative. He anticipated Newton's first law of motion (the one about inertia, that a body in motion will stay in motion unless acted on by an outside force) by arguing that the natural movement of bodies was not straight down (to a gravitational center) or circular, as Aristotle and Galileo had argued, but a straight line that remains unaltered unless the moving body is acted on by another body. It is not the inherent motion of the body itself that is interesting—this is just an infinite straight line—it is the motion of that body relative to the motion of other bodies it interacts with that is of interest to

[62] Coopersmith, 16.

[63] Ibid.

[64] Ibid., 19.

the modern physicist, i.e., what causes a body to deviate from its "natural" rectilinear motion. Descartes famously developed analytic geometry to study the rectilinear movement of matter, an analysis that is performed on what we now call the Cartesian grid. The Cartesian grid frames space as a homogenous set of points spanning every direction on the x,y, and z axis. No point is privileged; every point is the same; the entirety of space is homogenous, and empty, unless filled with matter. Indeed, Descartes' universe was one completely filled to the brim with matter. The philosophical implications of the homogenization of space that occurs with the advent of the Cartesian coordinate system is further analyzed in the third chapter when we look to Bergson's critique of the spatialization of time.

Another significant contribution of Descartes' to the history of energy were his ideas concerning the conservation of movement in the universe, which anticipated the law of the conservation of energy by two centuries. In *Principles of Philosophy,* part II, section 36 titled "Quantity of Motion," Descartes defends the following cosmological/theological argument:

> As for the first cause [of motion], it seems to me evident that it is nothing other than God, Who by His Almighty power created matter with uniform motion and rest in its parts, and Who thereafter conserves in the universe by His ordinary operations as much of motion and of rest as He put in it in the first creation.[65]

Here we get a glimpse of the clockmaker God of Newton and Descartes who, once setting the universe in motion at the beginning of time with a powerful act of creation, infuses the universe with motion and lets it run according to His immutable laws.

Like Aristotle, Descartes resorts to a theological argument in positing an answer to the first cause of motion. Aristotle posited actuality as the essence of the Unmoved Mover, which grounds and provides the conditions of possibility for *kinesis*, the movement of matter, where

[65] Lindsay reprinted this quote in his anthology from *A Source Book in Physics*, ed. W. F. Magie (New York: McGraw-Hill Book Company, 1935), 50-51.

potentiality chases actuality. Descartes posits an original act of creation that imbues the universe with a divine jolt of motion that, although cosmic in its magnitude, is finite and, most importantly, *unchanging* in quantity. It is interesting that the difference in the theologies that we see between these two thinkers betrays the difference between Aristotelian and modern science. Implicit in the difference between the motions of these universes is the absence of teleology. Aristotelian movement always has an end which energizes the movement itself, setting the end-towards-which that movement goes (i.e., what drives an acorn to grow is the telos of becoming an oak tree). Modern physics, in Aristotelian terms, is concerned only with efficient and material causes. The idea that motion occurs purposively is tossed out. Furthermore, it seems that, in Descartes' philosophy, since there is no distinction between different kinds of motion (*kinesis* versus *energeia*, for example), all motion is homogenized, just like Cartesian space. We could say that Descartes looked at all motion as *kinesis*, which in fact continues to be the *modus operandi* of physics, with the notable exception of Leibniz, who attempted to reconcile mechanism and teleology. This foreshadows the impoverishment of *energeia* in the hands of thermodynamics in that Descartes had already removed from the concept of motion any ideas relating to quality or kind of motion, retaining within the concept of motion only that which can be measured by the human subject.

Heidegger, in "Modern Science, Metaphysics, and Mathematics," claims that it is the mathematical character of modern science that distinguishes it from the science of the ancients. "Mathematical" is derived from the Greek expression *ta mathēmata,* meaning "what can be learned and thus, at the same time, what can be taught."[66] Furthermore, the "*mathēmata* are the

[66] Martin Heidegger, "Modern Science, Metaphysics, and Mathematics," in *Basic Writings*, ed. David Farrell Krell (New York: HarperCollins Publishers, 2008), 274.

things insofar as we take cognizance of them as what we already know them to be in advance."[67] Heidegger is referring here to how, in Descartes' philosophy, the thinking subject and their mental capacities become the measure of all knowledge, knowledge which can only be considered legitimate if it can be cognized with the clarity and distinctness of the subject's recognition of her own self-awareness. Descartes believed that the clear and distinct perception of one's awareness of their own thinking was only matched by the certainty of mathematics.

Heidegger compares Newtonian to Aristotelian science, much like how we have been comparing Aristotle to Descartes and Galileo. Isaac Newton's work surpassed the work of Descartes, pushing the latter's work to its logical conclusions. Heidegger argued that we can clearly see the mathematical character of modern science by comparing Aristotle's understanding of "motion" and "nature" with Isaac Newton's. For Aristotle, "[t]hose bodies which belong to 'nature' and constitute it are, in themselves, movable with respect to location."[68] Within this conception, a body's motion has its basis (*archē*) in itself, and the character of this motion is what determines its "nature." Furthermore, a body's movement strives towards its place, which is determined by the nature of the body—"[t]he earthly has its place below, the fiery above."[69] When a body moves towards its place, it is in accordance with its nature; motion against its nature (such as a rock being thrown upward) is violent motion (*bia*). Furthermore, the purest motion for Aristotle was circular motion, because it contains its place in itself—such is the movement of the celestial bodies. Earthly motion is always incomplete because it is in a straight line, mixed, or violent. Furthermore, the domain of motion matters, as is evidenced by the difference in the distinction between earthly and celestial bodies. The Earth is not the place for

[67] Heidegger, "Modern Science, Metaphysics, and Mathematics," 275.

[68] Ibid., 283.

[69] Ibid., 284.

pure, circular motion. This shows that, for Aristotle, space is not homogenous, but different spaces are associated with certain motions and therefore certain beings. Thus, "[a]ccording to Aristotle the basis for natural motion lies in the nature of the body itself, in its essence, in its most proper Being."[70]

This is not the case for Newton. We take our cue here from Newton's first law of motion: "[e]very body continues in its state of rest, or uniform motion in a straight line, unless it is compelled to change that state by force impressed upon it."[71] In contrast with Aristotle's doctrine of motion, Newton does not distinguish between the natures of different bodies and their movements, as is evidenced by the language at the very beginning of the first law: "every body," implying that "[a]ll natural bodies are essentially of the same kind."[72] Even circular motion in the Newtonian framework is the sum of infinitesimal, tangential, and thus, linear, movements. Furthermore, since all motion is of the same kind, there is no such thing as violent motion. In this framework, there is no difference between the celestial realm and the earthly realm; no priority of circular motion over movement in a straight line. Space in this context is experienced as the homogenous three-dimensional Cartesian plane, where each point is no different from any other. Therefore, "place no longer is where the body belongs according to its nature, but only a position in relation to other positions."[73] When we take these considerations into account, our concept of "nature" must change.

> Nature is no longer the *inner* principle out of which the motion of the body follows; rather, nature is the mode of the variety of the changing relative positions of bodies, the manner in which they are present in space and time, which themselves are domains of

[70] Heidegger, "Modern Science, Metaphysics, and Mathematics," 285-286.

[71] Ibid., 279-280.

[72] Ibid., 286.

[73] Ibid.

> possible positional orders and determinations of order and have no special traits anywhere.[74]

Newtonian physics, like Cartesian physics, eliminates teleology from nature; it homogenizes bodies and space. For Aristotle, the parts of a whole moved as a function of the nature of the latter; for Newton, the whole is an illusion constructed by individual forces acting on its parts. Nature is no longer the inner-principle of a being, but the differential relations that exist among identical bodies in space and time; no motion is special; no location is special; no body is special. What is curious here is that the first law of motion is grounded in the image of a body existing by itself, independent of any forces. Heidegger notes that this body does not exist! It requires significant abstraction from our experience of the world to conceive of it. Thus, the first law of motion, one of the fundamental axioms of Newtonian physics, is not grounded in any empirical evidence, but in the imagination, and projected onto the universe. This, giving oneself a cognition about a determination of beings, is an example of *mathēsis*, whereas Aristotle would never have posited as a fundamental law of nature a phenomenon that one never observes in it.

One of Newton's major innovations here was introducing force as a central concept for understanding all changes in motion. With Newton, force "was given a cosmic role—a similar sort of cosmic role that 'energy' would acquire [later on]."[75] Furthermore, "[f]or the first time, the force did not reside *in* the body but was external to it, impressed *on* the body… the effect of this true force was not to maintain motion but to *change* ."[76] Newton, like Descartes, was of the opinion that 'natural' motion was rectilinear. Within the Newtonian framework, it is the impetus from external forces that changes the motion of a body, and Newton was precise in defining how

[74] Heidegger, "Modern Science, Metaphysics, and Mathematics," 288.

[75] Coopersmith, 39.

[76] Ibid., 33.

this change occurred.[77] Newton's second law stipulates that the force acting on a body is equal to that body's mass times it's acceleration: $F = ma$. In other words, the effect of external forces is to accelerate a body along the direction that the force is acting on. Within the Newtonian framework, motion is indeed relative since, in accordance with his first law of motion, the motion of a body left on its own is uninteresting and can only be measured in relation to the motion of another body. However, although motion is relative, acceleration is absolute, since it can be measured to yield a definite, not relative, effect. The positing of absolute acceleration required that there be an absolute space within which acceleration could occur. Coopersmith explains that "[a]n absolute acceleration opened the way for the possibility of an absolute force, as Newton required. However, the absolute acceleration seemed to rely on there being an absolute space that was itself absolutely unaccelerated."[78] This is the absolute space that we mentioned earlier in our discussion of Descartes, Newton, and Heidegger; the xyz-plane. Lindsay also notes that the second law was an important piece of the energy puzzle, noting that

> although Newton stated the laws of motion he never wrote down the second law as a differential governing the motion of a particular system. If he had done so, it seems almost certain that he would have been led to what we now call the energy equation of the system, as was his great successor Lagrange 100 years later.[79]

Newton's contributions to physics are extraordinary, but in terms of wresting something absolute from time, it would be Leibniz that would make the most significant step towards the theory of energy in classical mechanics in his coining of the concept of *vis viva*.

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[77] Despite Newton's mathematical formulation of force, there is no clarification as to what 'force' *is*, being almost magical in its invocation despite its practical precision. Nietzsche calls attention to this problem in *The Will to Power*, complaining that physicists have failed to provide a metaphysical account of what 'force' really is within the Newtonian framework. Cf. footnote 199.

[78] Coopersmith, 34.

[79] Lindsay, 99.

Although Leibniz is now more well-known in philosophy than in physics[80], this doesn't reflect the significance of his contributions to physics. In particular, Leibniz spotted an error in Newton's description of inelastic collisions. Quoting Leibniz, Coopersmith points to Leibniz's objection that inelastic[81] bodies do not lose any force upon impact with each other.[82] What Leibniz was getting at is that, for example, although it seems like a dart loses all the force that it has upon impact with a board, it does not mean that the force it once possessed somehow disappears. Rather, Leibniz maintained that 'active forces' were conserved in the world, meaning that the active force of the dart could not simply have disappeared. Rather, Leibniz claims that the active force lost by the movement of the whole dart is transferred to its parts. Indeed, it is possible to throw a dart hard enough at the board that the dart breaks from the force of impact. This would be impossible if the active forces that once propelled the dart completely disappeared. Leibniz called these active, that is, dynamic forces *vis viva*, which he defined as the mass of a body times the square of its velocity: mv^2. Leibniz's *vis viva* was only a factor of two greater than what we now call kinetic energy: $\frac{1}{2}mv^2$. Lindsay notes that

> In 1686 Leibniz published in the *Acta Eruditorum* in Leipzig a brief note explaining his point of view in terms of the simple case of a body falling freely under gravity, and insisting that it is the product of mass times velocity squared which is the invariant quantity and the true measure of force. He named this quantity *vis viva* or living force, that is, force connected with motion, as distinct from *vis mortua*, or the dead force of statics. This was the most important paper in the modern theory of energy as a concept in mechanics.[83]

Crucially, Leibniz was arguing against Descartes' claim that the quantity of motion conserved

[80] As a physics student, the only time I heard Leibniz's name was in differential calculus, where we learned the difference between "Leibniz notation" and "Newton's notation."

[81] The current definition of an inelastic body is one that retains momentum, but loses kinetic energy upon impact.

[82] Coopersmith, 40.

[83] Lindsay, 109.

was not the mass times the velocity of the body, but the mass times the square of the velocity—the, rather comical, title of this seminal essay was "A Brief Demonstration of the Memorable Error of Descartes and Others Concerning the Natural Law According to Which They Claim That the Same Quantity of Motion Is Always Conserved by God, a Law That They Use Incorrectly in Mechanical Problems."[84]

With *vis viva* and *vis mortua*, Leibniz got close to the modern conceptions of kinetic and potential energy. However, Leibniz argued the measure of *vis mortua* is what we now call momentum (mass times velocity) which Descartes believed was the conserved quantity of motion.[85] There was also much controversy surrounding Leibniz's introduction of *vis viva*. Lindsay notes that this "polarized natural philosophers in two camps, those who preferred Descartes' quantity of motion as the really important element connected with force and those who were impressed with the fundamental significance of [*vis viva*]."[86] The French *energie* here would be used to refer to the French word *travail* meaning 'work,' which got Bernoulli very close to the modern conception of energy as the capacity to do work, i.e., the product of the force acting on a body and the displacement of that body in space. However, Bernoulli's *energie* took more after *vis mortua* than *vis viva*, since *energie* referred to the domain of statics (systems in equilibrium; *vis mortua*) rather than dynamics (*vis viva* as momentary accumulations of *vis mortua*). In a letter to Pierre Avignon, where he introduces *energie*, Bernoulli states the

[84] In this essay, Leibniz states the following: "And so it may be in agreement with reason that the same total motive power (*potentia*) is conserved in nature and is not diminished inasmuch as we never see a force given up by one body without being transferred to another, nor increased, because perpetual mechanical motion never takes place and no machine, not even the world as a whole, is able to maintain its force without an additional external impulse," Lindsay, 119. This quote is from Lindsay's translation of the original Latin essay: *Acta Eruditorium*, Leipzig, 1686, in *Leibniz Mathematische Schriften*, Vol. 2, C.I. Gerhardt, ed., Halle, Druck und Verlag von H.W. Schmidt, 1860, pp. 117-119.

[85] Coopersmith, 43.

[86] Lindsay, 110.

following: “In every case of equilibrium of forces, in whatever way they are applied, and in whatever directions they act on one another, either mediately or immediately, the sum of the positive energies will be equal to the sum of the negative energies, taken as positive.”[87] Notice that he introduces energy within the context of the equilibrium of forces. It would be nearly a century before Thomas Young tied *vis viva* to the concept of energy.

Lindsay writes that Young, in his lectures on natural philosophy, claims that “for perfectly elastic collisions the *vis viva* or living force is conserved. At this point Young proposed that the term *energy* be used to denote the *vis viva*.”[88] In his *Course of Lectures on Natural Philosophy and the Mechanical Arts*, in the eighth lecture “On Collision,” Young, at last, expresses the correct formulation for what we now call kinetic energy: “The term energy may be applied, with great propriety, to the product of the mass or weight of a body, into the square of the number expressing its velocity.”[89] Young’s stipulation became kinetic energy, while Bernoulli’s became what we now think of as potential energy. Interestingly, however, Young makes mention of some precursors of the energy concept, such as Leibniz, but makes no mention of Bernoulli, so it is unclear if he was inspired by Bernoulli’s *energie*, especially since energy was already a common term among poets and theologians in England. The conceptual stage is now set for energy’s synthesis with ‘work’ and ‘heat’ in thermodynamics, where it becomes the single most powerful concept for describing motion and its conservation in the universe.

Classical Thermodynamics

The subject of thermodynamics is vast, not simply because of the complexity of its

[87] Lindsay, 34. Reprinted from *A Source Book in Physics*, pg. 48-50. Cf. footnote 64 for full citation.

[88] Ibid., 117.

[89] Young. In Lindsay, 160. Reprinted from Thomas Young, *Course of Lectures on Natural Philosophy and the Mechanical Arts*, Vol. 1 (London, 1845), 57-61.

subject matter, but also due to the historical context which served as the soil for its flourishing and the cementing of energy's place in the cannon of physics. British historian Crosbie Smith, in *The Science of Energy: A Cultural History of Energy Physics in Victorian Britain*, pursues the claim that the "construction of the science of energy should be understood in intimate relation to its audiences."[90] Being of relevance to more than just a scientific audience, there are two main groups that had a stake in addressing the problems that energy and thermodynamics helped resolve: 1) optimizing the efficiency of heat engines for industrial production and the expansion of the British empire, and 2) reconciling Protestantism with the new findings of modern science, which challenged religious doctrine. Cara Daggett explores this nexus of energy, capitalism, and Christianity in *The Birth of Energy*, arguing that "our commitment to growth and productivity has been reinforced by a geo-theology of energy that combines the prestige of physics with the appeal of Protestantism in order to support the interests of an industrial, imperial West."[91] A comprehensive account of the science of thermodynamics would require an interdisciplinary exposition, meaning that the challenge for this genealogy is choosing one thread out of the many that were involved in the birth of energy. The thread emphasized in this genealogy is energy science, rather than the history of energy sources/transitions. This should not be understood to imply that one is more important than the other, or that energy is a purely scientific concept—one of the central assumptions of this work is that energy is both a scientific and cultural creation. In fact, cultural narratives regarding energy transitions, sources, extraction, justice, distribution, etc., might have played an even more active part in shaping material reality, by informing economic, environmental, and energy policies, than the science of energy itself.

[90] Crosbie Smith, *The Science of Energy: A Cultural History of Energy Physics in Victorian Britain* (Chicago: University of Chicago Press, 1999), 3.

[91] Daggett, 190.

Furthermore, Barri Gold has shown that even before its introduction in the physical sciences, energy was a term used by poets and theologians in Victorian England, where there was a reciprocal influence between literature and thermodynamics as regards the concept of energy. Gold argues that although Isaac Newton's disdain for incorporating the concept "made energy a faux pas in physics through the early nineteenth century… [thought of as] a metaphor, a word to describe people, a pathetic fallacy, a word predominantly for poets,"[92] it found its way "back into the good graces of science, it did so by building on a well-established reputation of social and metaphorical usage."[93] Indeed, if the science of energy had not been particularly successful at generating capital and reconciling an old Protestant world with a new scientific one, it is doubtful whether it would have gained as much traction as it did. Nevertheless, the scope of this work is focused on what Daggett would consider the epistemology of energy. Referring to the work of historian and philosopher of economic thought Philip Mirowski and French epistemologist Émile Meyerson, Daggett argues that

> the conservation of energy reflects the scientists' desire to know and understand the world, which requires that the world is know-*able*. Energy points to the enduring faith in nature as divinely designed to be accessible to human perception. In order to be knowable, the world must have some constancy through time—pure, random chaos would mean prediction and calculation are impossible.[94]

Here we can still hear echoes of the problem that Plato inherited from Parmenides and Heraclitus, namely, the problem of the possibility of knowledge in a world where the objects of knowledge are seemingly in constant flux, implying the impossibility of having knowledge of a real object at any given time—as soon as we have formed knowledge of the object, that object has changed, meaning that our knowledge inherently lags behind reality. Plato thought that

[92] Barri Gold, *Thermopoetics* (Cambridge: MIT Press, 2010), 4

[93] Ibid., 5.

[94] Daggett, 41-42.

knowledge could only be possible if there were some knowable and timeless structure to reality that guaranteed the possibility of knowledge. Plato attempted to solve this problem by positing eternal forms which ground and govern the appearances of ephemeral nature. Although thermodynamics provides a different answer to this question, the fundamental ontotheological assumptions regarding the relation of stasis to change that inspired the development of *energeia* remained the same. Thermodynamics was still caught up in the fundamental epistemological conundrum that has driven the history of energy: the stipulation of the need for some timeless ontological ground underlying physical reality, which serves as the ground for all motion and change. This is the crucial question that this genealogy seeks to foreground as the crucial driver in the history of energy.

The power of thermodynamics comes from its insights into the nature of heat. Clayton Crockett notes that "one reason that thermodynamics was so difficult to work out, [was] because until the mid-1800s many scientists confused the conservation of *energy* with the conservation of *heat*."[95] Understanding the relationship between heat and energy would be key to the advancement of thermodynamics and the understanding of heat engines that converted coal into mechanical work. A crucial breakthrough was made by William Thomson (Lord Kelvin) when he introduced his dynamical theory of heat, which proposed that heat is actually the kinetic energy (half the *vis viva*) of the molecules of a body or substance. The dynamical theory of heat replaced the caloric theory of heat which dominated the thought of 18th century physics. The caloric model treated heat as a fluid called 'caloric' which flowed from hot to cold, creating the sensation that we experience as heat. Smith points to John Dalton—who is most famous for

[95] Clayton Crockett, *Energy and Change: A New Materialist Cosmotheology* (New York: Columbia University Press, 2022), 44.

introducing atomic theory into chemistry—a famous supporter of the caloric theory of heat, who claimed that caloric is an elusive, elastic fluid whose constituent particles repel each other but are attracted to other bodies.[96] The caloric theory of heat was famously challenged by Benjamin Thomson (Count von Rumford), father of physicists William Thomson and James Thomson. Count Rumford argued that heat could not be a material substance, since it can be produced endlessly from the friction generated by mechanical work, which would violate the ancient law that something cannot come from nothing. Rather, Rumford thought that understanding heat as a form of 'motion' was closer to the truth than thinking of heat as a fluid. But "Rumford… was reluctant to specify the particular kind of motion involved, preferring instead 'to investigate the laws of its operations'."[97] Rumford's claims were met with skepticism by a great part of the scientific establishment at the time, who supported the caloric theory of heat and claimed that Rumford had not properly demonstrated the legitimacy of his claims experimentally. It would be nearly four decades before Rumford's theory of the mechanical equivalence of heat was vindicated by Lord Kelvin's dynamical theory of heat and the experiments of James Prescott Joule in 1843. To gain greater insight into Kelvin's thermodynamic theory, we should look at how he combined the insights of Sadi Carnot, Joule, and, another giant of thermodynamics, Rudolf Clausius, in his dynamical theory.

Sadi Carnot was the son of Lazare Carnot, a famous French mathematician, physicist, and politician. His contributions to the understanding of heat engines were critical for the strides made in thermodynamics after his early death in 1832. To Daggett's point about the inherently cultural (that is, industrial/imperial/theological context within which energy is born) aspect of the

[96] Smith, 56.

[97] Ibid., 67.

concept of energy, Coopersmith also alludes to the Carnot family's inherently political motivations in pursuing a scientific understanding of heat engines and their conviction that the improvement of the engine would restore the glory of France to something of the greatness of the British Empire, the dominant world-political power at the time and also the empire at the forefront of the development of engines. "Coming from a famous political family, Sadi was motivated to improve the economic and political standing of France. He understood the huge importance of the heat engine."[98] To this end, Sadi certainly made strides towards his political goals in his scientific work. Some of the most notable contributions of Sadi to physics include the concept of an idealized heat engine operating through the now famous mechanism of the Carnot cycle, the idea of directionality of physical processes through concepts like reversibility and efficiency of heat engines, and his contributions towards a theory of the motive power of heat that would eventually be taken to its logical conclusion with the work of James Joule, Rudolf Clausius, and Lord Kelvin, whose dynamical theory of heat tied it to kinetic energy, or half the *vis viva*, of molecules in a substance.

Sadi seems to have been the first to argue that the laws governing the dynamics of heat engines applied to *all* heat engines in nature, not just mechanical ones, and that this is due to the fact that the essential mechanism at the heart of heat engines is heat transfer falling between a higher and a lower temperature, which produces work like that of a piston: "the essential method of a heat-engine [is that] heat flows from a high temperature to a lower temperature while doing work (for example, causing a volume change against an external pressure)."[99] The efficiency of a heat engine does not depend on the substance of the engine (e.g., gas or liquid) or variations in

[98] Coopersmith, 205.

[99] Ibid., 222.

pressure, or any other factor besides the fall in temperature. This conclusion regarding the equality of all ideal heat engines came from his denial of the possibility of perpetual motion, and the conclusion that he reaches based on this belief, that there are no better or worse ideal engines because all engines have to work according to the same laws of physics that stipulate the conditions for an idealized heat engine: temperature difference. In other words, Sadi realized that heat transfers could be converted into mechanical work: this is the motive power of heat. Sadi's idealized heat engine optimized this conversion of heat into mechanical work. It came to be known as the Carnot engine, which works according to the mechanism of the Carnot cycle, a cycle that minimizes waste by reducing to a minimum the amount of heat lost to the environment, friction, and other thermal processes—Sadi was also influenced by his father's emphasis on the reversibility of thermal processes. Inspired by his father's adherence to the Principal of Continuity, Sadi argued for the idea of infinitesimal reversibility, meaning that since changes of state (a term coined by Sadi) occurred through infinitesimal variations, individual processes of infinitesimal variation could then be reversed, running backwards through the same process of infinitesimal variations back to the original state of the system—this is the beginning and end of the idealized Carnot engine. Carnot's insights revolutionized the study of engines and heat, but for all he got right, it is curious that one of his central axioms, the caloric theory of heat, was wrong. There is evidence that Carnot began to doubt the legitimacy of the caloric theory in his lifetime, but it would take a couple of decades and the work of many physicists to overthrow the caloric theory of heat and place energy at the center of thermodynamic research.

One of the key figures in this process was James Prescott Joule. Joule's experimental work concerning the economic duty of electromagnetic engines yielded conclusions that seemed to disprove the caloric theory of heat. By economic duty is meant "the amount of useful work

obtainable from a given quantity of fuel,"[100] where the chemical reactions of batteries served as fuel for Joule's engines. Despite Joule's groundbreaking work on electromagnetic engines, it took him a while to gain the renown which we associate with his name today. At the time, the demand for electromagnetic engines was not nearly as great as it was for steam engines. At one point, Joule's experiments with an electromagnetic engine yielded one fifth of the economic duty of the Cornish steam-engines, an industrially standard engine of his time. However, the insights that Joule gained from his work with electromagnetic engines would lead to great strides towards the fateful union of energy and thermodynamics.

Driven by the search for the causes of the inferior economy of electromagnetic engines compared to steam engines, Joule "noted that both the mechanical and heating powers of a current were proportional to its intensity or electromotive force and therefore the mechanical and heating powers were proportional to one another."[101] In his paper "On the Calorific Effects of Magneto-electricity, and on the Mechanical Value of Heat," Joule makes sense of this proportionality between mechanical power and heat by considering the possibility that heat, rather than being a substance like caloric, is, rather, a state of vibration.[102] This conclusion followed from Joule's findings that heat, though not conserved as the caloric theory stipulates, can be directly converted into mechanical work and vice-versa. Thus, heat is not the transfer of the caloric fluid, but the communication of motion between the atoms and molecules of different bodies. Having recognized the equivalence of heat and mechanical power, Joule also posited that the total mechanical value of heat is conserved.

It is interesting to note that his assumption of the conservation of mechanical force and

[100] Smith, 60.

[101] Ibid., 64.

[102] Ibid., 65.

heat was grounded in ontotheological assumptions about the nature of matter. Joule believed that "the grand agents of nature are, by the Creator's fiat, *indestructible*; and that wherever mechanical force is expended, an exact equivalent of heat is *always* obtained."[103] In retrospect, Joule's statement seems to foreshadow the first law of thermodynamics. The ontotheological aspects of energy is further analyzed in the following chapters, but at this juncture it is necessary to note that Joule's work would prove fundamental for another of the great founders of thermodynamics: Rudolf Clausius.

Clausius' contributions to thermodynamics cannot be understated, and, between the insights of Clausius and Kelvin, we may arrive at the laws of thermodynamics. According to Crockett,

> Clausius reconciled Joule and Carnot and affirmed the conservation of energy by doing away with the conservation of heat while preserving the central insights of the Carnot cycle. Clausius also dispensed finally with the caloric theory of heat, establishing the dynamic theory of heat. When Thomson [Lord Kelvin] read Clausius' paper, he finally and fully understood that Joule and Clausius were right, that heat is not conserved and that heat is not a caloric. Oh, and Clausius also invented or discovered entropy, which is the basis of the second law.[104]

According to Coopersmith, Kelvin and Clausius were "the final players in [the] history of energy."[105] Between these two figures and their incorporation of the work of Joule and Carnot, we can provide an adequate overview of the laws of thermodynamics. We should specify that the thermodynamics developed in the 19th century is equilibrium thermodynamics, as opposed to the non-equilibrium thermodynamics that is explored through the work of physicist Ilya Prigogine in the third chapter. The foundation for equilibrium thermodynamics is the oft-forgotten "zeroth"

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[103] James Joule, "On the calorific effects of magneto-electricity, and on the mechanical value of heat," *Phil. Mag.* 23 (1843): 442. Quoted in Smith, 68.

[104] Crockett, 47.

[105] Coopersmith, 277.

law of thermodynamics, which basically states that if a body A is in thermal equilibrium with a body B, and that body B is in thermal equilibrium with body C, then body A is in thermal equilibrium with body C. The zeroth law provides the basis of equilibrium thermodynamics, but does not apply to non-equilibrium thermodynamics, where, instead of closed systems, there is constant exchange of energy between bodies and their environment, which is the case, for example, for living beings.

The significance of the zeroth law, though seemingly trivial for the modern reader, is the "fact that the systems can be related in terms of thermal equilibrium means that equilibrium is not based primarily on anything else, like the size, weight, volume or pressure of the system. That is why heat is so important and why temperature is a fundamental measure."[106] This absolute relation in terms of temperatures of different bodies is what would allow Kelvin to develop the Kelvin scale of temperature, which has as its lower limit absolute zero, i.e., the point at which motion comes to a complete stop. Kelvin's temperature scale is really just a logical consequence of Carnot's finding that the efficiency of a heat engine is only a function of the difference in temperature between the hot and the cold reservoirs of the engine.

Kelvin's absolute temperature scale leads to the third law of thermodynamics, which postulates that it is impossible to cool a body to absolute zero, "the state where all atomic movement ceases… The temperature of absolute zero is a limit that cannot be reached in actual finite processes."[107] However, Coopersmith notes that "[w]hile developing the absolute scale of temperature, Thomson still (in 1849) hadn't come round to accepting that heat could be *converted* into work. He thought that Carnot's conclusions would come crashing down if the

[106] Crockett, 43.

[107] Ibid., 46.

axiom of the conservation of heat was abandoned."[108] This hesitation on Kelvin's part to accept the convertibility of heat into work has to do with a schism he identified between two of his greatest influences: Carnot and Joule. Although Carnot's framework was fundamental for Kelvin's understanding of thermal physics, he could not reconcile one of Carnot's fundamental axioms (the conservation of heat as caloric) with the experiments of Joule that indicated that heat could converted into work, and therefore is not conserved. It would be Clausius that would help Kelvin overcome this conundrum.

Clausius understood that Joule's theory of the mechanical equivalence of heat had to be correct, and that the caloric theory of heat that Carnot subscribed to had to be rejected, but Clausius did this without jeopardizing Carnot's law for the maximum efficiency of heat engines. Clausius, convinced by Joule's work on the interconversion of heat and work, "saw that these were ultimately explained by the dynamical theory of heat—that heat is a motion of the microscopic constituents."[109] Although Clausius had found that Carnot's conservation of heat did not hold, he did find another conserved quantity. Clausius found that "between any pair of start and final states, the total heat taken up, ΔQ, plus the total work done, ΔW, *together* summed to a *constant* quantity, ΔU: $\Delta U = \Delta Q + \Delta W$."[110] U would later be called the internal energy of the system, and the mathematical statement above would later be recognized as a statement of the first law of thermodynamics. What this equation tells us is that the change of the internal energy of a system is exactly accounted for by the total heat and work done in the change from one state to another, meaning that no energy is lost in the process, it is either transferred into the

[108] Coopersmith, 280.

[109] Ibid., 282.

[110] Ibid., 283.

mechanical work done by the system or the heat lost in the process due to phenomena such as friction, where internal energy, rather than being converted into work, is lost to the environment as heat. Thus, Clausius' statement about the change of the internal energy being equivalent to the total work done and heat taken up by the system, is a statement of the conservation of energy. Another way to put it is that the energy of a closed system (a system that does not exchange energy with its environment) is constant. As Crockett notes, "[i]t is the constancy of energy that is conserved, and that is why the first law concerns the conservation of energy overall, even though it is expressed here in terms of an isolated system."[111] The law of the conservation of energy implies that all physical processes are at bottom the result of the transfer of energy, but the question still had to be answered as to why energy would flow one way rather than another.

Once again, Clausius clarified the conundrum. He realized that even though there were theoretical situations in which energy could be distributed such that heat would flow from a cold body to a warm body without violating the law of the conservation of energy, Clausius, appealing to common sense experience, denied that this was possible in nature without any outside work being done to 'force' heat from a cold body to a warm body. What Clausius was pointing to is the directionality of thermal processes, that the natural direction of thermodynamic processes is for heat to flow from hot to cold. According to Coopersmith, "[t]his statement, of Clausius', that heat cannot flow from a low temperature to a higher temperature unless aided by work, was the first appearance of the Second Law of Thermodynamics."[112] Nowadays, we typically associate the second law of thermodynamics with entropy, and it was Clausius, too,

[111] Crockett, 43.

[112] Coopersmith, 285.

who came up with this term. Clausius came up with the idea of entropy in trying to overcome the following difficulty:

> [i]f energy is conserved across all transformations, then science still could not explain why heat engines—or life itself—could not run in reverse… Conservation was predicated on an understanding of time as reversible, and if energy was conserved, there was no reason why these exchanges could not happen both backward and forward. Furthermore, if heat *was* mechanical and molecular, as Joule and Thomson were coming to suspect, then why did it not obey Newtonian mechanics, which are also reversible? This proved a thorn in the side of the new science of energy.[113]

Entropy was the key to solving this issue because it proposed a definite, irreversible direction in time for the flow of energy.

Henri Bergson famously called the second law of thermodynamics the most metaphysical of the laws of physics because it refers to something form-less: the directionality and passage of time, rather than the properties of extended bodies.[114] The flow of entropy goes from lower to higher states of entropy. A low state of entropy is one in which energy is more 'useful,' i.e., has a greater potential to do work than energy in a state of higher entropy, where it is less useful. For example, when you burn a lump of coal, you are burning chemical energy in a 'useful' (highly organized, low entropy state) and converting it into heat. This energy, after it is lost as heat to the environment, is in a more disorganized and therefore less 'useful' state where work can no longer be extracted from it, i.e., a state of higher entropy. It should be noted, however, that there are natural processes where entropy flows from higher to lower states, such as is the case with the non-equilibrium thermodynamics of life. What distinguishes life thermodynamically is that it is able to take energy from higher to lower states of entropy. That is, it is able to *decrease* entropy locally, but this comes at the cost of an even greater increase in entropy of the

[113] Daggett, 43.

[114] Henri Bergson, *Creative Evolution*, trans. Arthur Mitchell (New York: Random House, 1944), 264-265.

organism's environment. Thus, not even living beings violate the second law of thermodynamics. Basically, for every decrease in entropy in the universe, there is always an even greater increase in entropy occurring somewhere else to compensate for it. The word Kelvin preferred to describe it is *dissipation*, more specifically, the dissipation of mechanical energy. The idea of dissipation combines all the laws of thermodynamics, the first and second in particular. The idea is that useful energy at low entropy is always dissipating, due to the second law of thermodynamics. However, although energy passes from more organized states of low entropy to more disorganized states of higher entropy, that energy does not vanish or disappear according to the second law of thermodynamics, and it can never cease to be in motion either, according to the third law. Thus, although it is true that free (useful) energy diminishes over time, the total quantity of energy is always conserved.

Kelvin and Clausius would go on to project the laws of thermodynamics on to the entire universe, a generalization that had repercussions beyond the realm of natural science, bleeding into theology, metaphysics, ethics, and politics. I provide a sketch of the mechanistic view of nature that arises out of the progress of physics in the 19th century. Putting these scientific findings in the context of the culture they influenced helps later on, when we examine the connections between science and *ressentiment* in the next chapter.

Conclusion: The Entropic Universe

The concept of energy arose within a very specific cultural space and time, where the pressures of industrial capitalism, imperial expansion, scientific progress, and Protestant doctrine all played a decisive part in influencing the development of the concept. However, the cultural genesis and contingency of this concept have remained obscured beneath the cosmic significance extended to energy by Lord Kelvin, "who, seemingly out of the blue, extended the canvas of the

Second Law to... all of nature."[115] But Kelvin was not alone. The scientists that first promoted the concept of energy within scholarly and engineering circles used the authority granted them by their positions and their supposed objectivity to speak on nature's behalf. As Smith notes,

> [t]ransforming the science of work from its initial industrial contexts, the promoters of the science of energy gave it universal character and universal marketability transcending local customs and conventions... These practitioners presented themselves as responsible for interpreting and directing the grand economy of nature upon which the wealth of nations ultimately depended.[116]

As regards the second law, Thomson and others believed that dissipation was the reality for the whole universe; that from terrestrial to planetary scales, energy would gradually lose its useful mechanical value (for humans in particular) as the universe inevitably moves towards higher states of entropy. Since entropy is also understood to provide time with an irreversible direction—the direction of dissipation and decay—we can understand why many scientists like Thomson maligned the eschatology of the second law. Entropy, as it was conceived in the nineteenth century, correlates the passage of time with the dissipation, decay, and the supposed eventual heat death of the universe. Thus, it should not be surprising that scientists like Lord Kelvin could not help but ponder the moral implications of entropy and energy for human life and the cosmos.

This is where it becomes crucial to understand the theological context within which energy was theorized. Daggett notes that with many of the early energy scientists being Scottish Presbyterians, British scientists like "[Macquorn] Rankine, [Peter Guthrie] Tate, and [James Clerk] Maxwell, contributed to imparting a Protestant grammar into energy that traveled easily in Anglo-European contexts, and that mapped onto more generic Christian theologies that

[115] Coopersmith, 286.

[116] Smith, 128.

privileged asceticism and thrift."[117] In particular, Thomson's interpretation of the second law as being responsible for the dissipation and decay of everything in the universe, and thus everything that humans could possibly hold dear, painted a picture of the depravity of matter that resonated with Calvinist views of the fallenness of nature, which could only be redeemed by human labor and work on nature itself to wrest the potential value of nature from the hands of time. Waste was an existential fear within Protestant circles, because entropy stipulated that a waste of useful energy is a wholesale waste of time. Did this mean that God, too, was subject to entropy? For Thomson, God was the source of all energy and was thus exempt from the laws of thermodynamics, while at the same time guaranteeing the continual existence of His creation. Only He can oppose the dissipation of the universe by acts of creation. Thus, it seemed that it was possible to rescue God from a "mechanistic universe by reasserting the separation between God and the world... because God was outside processes of decay, then decay was associated with evil. As a result, goodness was realized by wresting progress from decay, by using human knowledge of the first law to fight back the second."[118] This implied the choice of turning nature's decay to the benefit of humanity or letting it go to waste forever. Furthermore, here it is the eternal existence of God, as the source and guarantee of the existence of energy, that guarantees the ephemeral and eschatological temporality of matter.

This is the constant theme, from the Pre-Socratics to Lord Kelvin, that we find throughout the history of energy. Namely, the separation between the ephemeral temporality of the universe and an eternal ground that energizes the passage of time that we experience, without being affected in turn by the very passage it produces—much like Aristotle's Unmoved Mover.

[117] Smith, 70.

[118] Daggett, 74.

What I hope to have shown is that the history of energy has been the attempt on the part of western philosophers and scientists to find the boundary that separates the temporal from the eternal, the material from the divine. In every case, the eternal is seen as more valuable than the ephemeral, the former often seen to possess a higher degree of 'truth' than the latter, due to the epistemological faith that knowledge needs to be grounded on something unaffected by the passage of time—what Nietzsche called a 'will to truth,' as we see in the next chapter. Although the relationship between ephemeral nature and the eternal cosmos has been theorized in many ingenious and creative ways in the history of western philosophy and science, the horizon within which the question of the passage of time has been theorized remained essentially unaltered for over 2000 years—this is what I believe Whitehead meant when he said that the history of philosophy, including natural philosophy which we now call physics, is a footnote to Plato. In other words, the question that Plato and Aristotle tried to resolve, that of the reconciliation of the eternal and the ephemeral, has perpetuated itself in many different forms from Greek philosophy to the rest of European intellectual history. The solution found by the early scientists of energy is that, although energy cannot be destroyed (the eternal), entropy ensures that energy is always in flux (the ephemeral) in the direction of dissipation of useful mechanical work. But what of the origin of energy? Where did it come from and how does it remain in existence? The God of Christianity (more specifically the God of Protestantism) ensures the continued existence and flux of energy by his divine omnipotence, but He does not abide in our universe because His omnibenevolence excludes him from the dissipation and decay of nature resulting from the passage of time. Like Aristotle's Unmoved Mover, whose essence is *energeia* or actuality, the concept of energy is meant to point to that which is always actual, that which is forever and always present, despite the passage of time; it is the fruit of philosophical and scientific attempts

to excise the passage of time from our determination of the fundamental nature of reality. Unlike Aristotle's *energeia*, however, energy paints a skewed picture of the actuality of *energeia*. That is, early energy science paints a picture of a mechanistic universe where the 'actuality' of energy is reduced to the conservation of its quantity over time. This distorted conception of actuality misses the purposiveness and qualitative reality of living beings by reducing them to mechanistic processes where life is nothing but an illusion, an epiphenomenon that could be unmasked if only we had the correct theoretical and experimental tools. This way of dealing with nature granted European scientists and civilization unprecedented control over nature at the expense of alienating life from its ground in material reality. This alienation manifests itself as nihilism. We explore this nexus of science and nihilism in the next chapter, and I would like to show how thinking through this problem can lead philosophers and scientists to a more robust conception of energy that overcomes the seemingly insoluble dichotomies (e.g., mind/body, eternal/temporal, good/evil) that we find in the history of philosophy and physics.

CHAPTER 3

NIETZSCHE AND HEIDEGGER: SCIENCE, TIME, AND *RESSENTIMENT* (THE SPIRIT OF REVENGE)

> *[A]ll of modern science is supposed to bear witness to that—modern science which, as a genuine philosophy of reality, clearly believes in itself alone, clearly possesses the courage for itself and the will to itself, and has up to now survived well enough without God, the beyond, and the virtues of denial. Such noisy agitators' chatter, however, does not impress me: these trumpeters of reality are bad musicians, their voices obviously do not come from the depths, the abyss of the scientific conscience does not speak through them—for today the scientific conscience is an abyss—the word "science" in the mouths of such trumpeters is simply an indecency, an abuse, and a piece of impudence. The truth is precisely the opposite of what is asserted here: science today has absolutely no belief in itself, let alone an ideal above it—and where it still inspires passion, love, ardor, and suffering at all, it is not the opposite of the ascetic ideal but rather the latest and noblest form of it. Does that sound strange to you?*
>
> Nietzsche, *On the Genealogy of Morals*

Ascetic Ideals

This genealogical investigation takes its cue from the quote above. Indeed, this project may be seen as a meditation on Nietzsche's "strange" claim that science is the latest and noblest form of the ascetic ideal, which is the topic of the third essay of the *Genealogy of Morals*: "What is the Meaning of Ascetic Ideals?" He opens the essay with a discussion of how ascetic ideals are employed by artists and philosophers, offering examples of how the ascetic ideal is not a rare or inherently pernicious fact of human life and culture; ascetic ideals become poisonous when they stem from *ressentiment*. But before discussing how ascetic ideals can be born from *ressentiment*, I must make a few preliminary points about the history of ascetic ideals, Nietzsche's epistemological perspectivism, and his concept of "will to power."

Bernard Reginster argues that the ascetic ideal "expresses the view that what is most valuable in life transcends, and therefore excludes, in whole or in part, the satisfaction of natural

human "instincts," and of the desires to which they give rise."[119] This is helpful for understanding Nietzsche's claim that "[a]scetic ideals reveal so many bridges to *independence* that a philosopher is bound to rejoice and clap his hands when he hears the story of all those resolute men who said No to all servitude."[120] Here, Nietzsche is alluding to a pattern that spans cultures: that of philosophers engaging in ascetic practices for the sake of their spiritual progress. He cites many examples of this ascetic behavior: Buddha's reference to a newborn baby as a "fetter"[121]; his claim that philosophers typically abhor marriage;[122] or the supposed rancor of philosophers against sensuality, epitomized by the figure of Arthur Schopenhauer.[123] The point here is that a life devoted to contemplation and knowledge demands a certain level of abstinence from other distractions, which demands a high level of control over one's "natural instincts." For this, a confrontation with and stifling of the natural inclinations of the will is needed if one is to dedicate her life to philosophical questioning. This is not just the case for philosophers, however. Nietzsche cites examples of athletes and artists who must tame their desires either to compete at the highest level or to hone the focus needed to carry one's artistic endeavors to the end. Thus, Nietzsche claims that "a certain asceticism, a severe and cheerful continence with the best will, belongs to the most favorable conditions of supreme spirituality, and is also among its most natural consequences."[124] A certain level of asceticism is needed for developing talents and capacities that transcend the "natural" human bondage to biological self-preservation and

[119] Bernard Reginster, *The Will to Nothingness* (Oxford: Oxford University Press, 2021), 156.

[120] Friedrich Nietzsche, *On the Genealogy of Morals,* trans. Walter Kaufmann (New York: Vintage Books, 1989), 107.

[121] Ibid.

[122] Ibid.

[123] Ibid., 106.

[124] Ibid., 112.

reproduction—the will to power overcoming itself, as we see later on. Thus, it is life-denying ascetic ideals, not asceticism as such, that Nietzsche is critical of and goes to great lengths to undermine in the *Genealogy*.

The philosopher "does *not* deny "existence," he rather affirms *his* existence and *only* his "existence.""[125] Here, despite the conflict between ascetic ideals and the natural inclinations of the will, the purpose of this conflict is life-affirming in that it aims at the "most appropriate and natural conditions of [the philosopher's] *best* existence, their *fairest* fruitfulness."[126] However, ascetic ideals are not created equally, and it is in the "ascetic priest" that Nietzsche claims to uncover ascetic ideals that are nihilistic and life-denying. We cannot, however, provide an adequate account of the origin of ascetic ideals without a discussion of the concept of "will to power." To this end, we must also make a few observations here about Nietzsche's genealogical approach and his epistemology to explain how nihilistic ascetic ideals are born out of *ressentiment*.

Nietzsche's genealogical method, by focusing on the conditions within which moral concepts arose and the function they serve in the lives of those who create them, challenges the "self-evidence that has become associated with them."[127] But more than this, Nietzsche's critique of morality aims to assess the "value of moral values," particularly as they pertain to the concepts of "good and evil" and "truth" in the history of western philosophy and Christianity. Nietzsche asks the following: "under what conditions did man devise these value judgments good and evil? *And what value do they themselves possess*? Have they hitherto hindered or

[125] Nietzsche, *Genealogy of Morals*, 108.

[126] Ibid. We should note here the ambiguity of the word "natural." Natural is used both to refer to instincts and to the nature of the philosopher. The nature of philosophy, and thus what is most natural to those disposed to it, requires repressing certain natural instincts; what is natural to philosophy is opposed to certain natural human instincts.

[127] Reginster, 12.

furthered human prosperity? Are they a sign of distress, of impoverishment, of the degeneration of life?"[128] This is relevant to our distinction between "life-affirming" and "life-denying" ideals above, where the ideals that an individual subscribes to are indicative of an individual's "health" in a broad sense, which is also what he meant when he wrote that "our ideas, our values, our yeas and nays, our ifs and buts, grow out of us with the necessity with which a tree bears fruit."[129] Another crucial aspect of the genealogical approach is that it seeks to explain "moral values in terms of their functional usefulness in serving some of the moral believer's emotional needs,"[130] and I attempt to extend this analysis, focused on the function concepts serve for the individual, to science, but more clarification is needed before I can show this.

Babette Babich calls Nietzsche's approach to searching for the origins of concepts in the conditions out of which they arose, rather than in the subjectivity of the individual, an "ecophysiological" perspective on knowledge. Babich writes that an ecophysiological approach regards a "perspective [as] determined not only by the physiological or physical constitution of the interpreting perspective but also its ecology or relative world-circumstance… the ecophysiological perspective is reciprocally determined by a physiology and an ecology that are not opposed but continuous."[131] In other words, the origin of concepts expresses something about the ecophysiological health of the individual that creates them. This means that, as far as ascetic ideals go, life-affirming ideals are indicative of a lust for life, pride, strength, courage, and health, whereas life-denying ideals indicate life on the decline, physiological/psychological distress, impoverishment, and the stifling of an individual's needs, desires, and instincts by their

[128] Nietzsche, *Genealogy of Morals*, 17.

[129] Ibid., 16.

[130] Reginster, 13.

[131] Babette E. Babich, *Nietzsche's Philosophy of Science*, (Albany: SUNY University Press, 1994), 120.

environment. Indeed, Nietzsche argues that life-denying ideals might indicate a "will to nothingness," a will that would "rather will *nothingness* than *not* will."[132]

We should also note here that the ecophysiological perspective betrays what Babich refers to as Nietzsche's epistemological nihilism, that is, the belief that absolute truth is a fiction. But we should be careful not to read here a Kantian distinction between the noumenal and the phenomenal, as if the truth existed numinously "out there," but forever out of our reach. Nietzsche's claim is more radical than that. For Nietzsche, truth as such is a fiction:

> Nietzsche affirms not that human beliefs are "lies" opposed to an unique possibility of truth but rather that reality can only be known from our organic perspective. Thus, he affirms nothing but the inescapable fact of perspective. The truth beyond perspectives is the ambiguity… of existence.[133]

This is a statement of Nietzsche's perspectivism, which is the idea that all knowledge is perspectival, and that all perspectives are a result of the perspectival nature of a relational world.

Whose perspective is more truthful, that of the bird, the insect, or the human, Nietzsche asks in the posthumous *Will to Power*?[134] The question, in fact, is senseless, because this question "would have to [be] decided in advance in accordance with [a] criterion *which is not available.* Apart from this relational chain and web, there is nothing."[135] In other words, we possess no pre-established criterion for right perception or truth because reality itself, not just our knowledge of it, is perspectival. For this reason, Nietzsche's perspectivism demands a rethinking of the concept of 'objectivity.' Nietzsche calls for a definition of objectivity not as "the adequate

[132] Nietzsche, *Genealogy of Morals*, 163.

[133] Babich, 78.

[134] Cf. ibid., 94.

[135] Ibid., 90.

perception of the object in the subject,"[136] which is impossible when one considers the organically imposed limits of the perception of every subject. Rather, "[t]here is *only* a perspective seeing, *only* a perspective "knowing"; and the *more* affects we allow to speak about one thing, the *more eyes*, different eyes, we can use to observe one thing, the more complete will our "concept" of this thing, our "objectivity," be."[137] It does not follow, therefore, that no interpretation is better than any other. Interpretations can be better to the degree that they incorporate a diversity of perspectives on the same object. However, 'truth in itself' has no meaning for Nietzsche, for there is no 'in itself,' no self-contained perspective, or truth, or object that remains unchanged or unaffected by this relational chain and web—this is the world as 'will to power.' We now turn to the concept of 'will to power' and how it gives rise to *ressentiment* in order to explain the relation of ascetic ideals to *ressentiment*.

The world as 'will to power' is a relational ontology that reflects the ecophysiological ground of knowledge, where every perspective is the expression of an individual will to power and its relation to the rest of the perspectival totality that is the world as 'will to power.' In this sense, "the world as will to power may be read both in the singular and plural forms."[138] In the singular form, this is indicative of Nietzsche's rejection of metaphysics; the rejection of ontological dualism, of Platonism, of transcendence, and the affirmation of immanence—the world as will to power and nothing else. In the plural, it refers to the finite forces that actually make up the world. Individual manifestations of the will to power, that is, every perspective, is expressed as interpretation: "[t]he will to power *interprets*… it defines limits, determines

[136] Friedrich Nietzsche, "On Truth and Lies in a Nonmoral Sense," in *The Nietzsche Reader*, ed. Keith Ansell Pearson and Duncan Large (Malden: Blackwell Publishing, 2006), 119.

[137] Nietzsche, *Genealogy of Morals*, 119.

[138] Juliano C.S. Neves, "Nietzsche for Physicists," *Philosophia Scientiæ* 23, no. 1 (2019), 189.

degrees, variations of power."[139] Nietzsche does not mean to anthropomorphize reality by extending the human activity of subjective interpretation to the rest of the world—his intention is quite the opposite. The fact that the will to power is interpretive by nature is indicative of the fundamental relationality of the will to power. Beings only are what they are by virtue of their relations, and these concrete relations of affecting and being affected are what Nietzsche meant by interpretation, meaning that interpretation here must be understood at an eco-physiological level as the capacity to affect and be affected by other beings. Indeed, Nietzsche's eco-physiological perspectivism is a result of the will to power being an eco-physiological interpretive activity; *bodies* form the locus of the perspective of a will to power, the locus cannot be reduced to a mind or subjectivity. Salt dissolves in water, while alkali metals might explode in it. One person may love eating shrimp, while another's body rejects it and enters anaphylactic shock. These examples, though mundane, illustrate how different beings or entities "interpret" each other differently through the way they affect each other. For Nietzsche, then, to interpret does not mean to form a subjective explanation in one's mind that transcends the materiality of what is being interpreted. Rather, interpretation as the fundamental activity of the world as will to power is expressed as the concrete material relations that we encounter in everyday living, where every being, every perspective, is what it is by virtue of its capacity to affect and be affected by other bodies, i.e., how they interpret and are interpreted by other wills to power.

The Relation of Ascetic Ideals to *Ressentiment*

But what does the will to power want? What "power" does it will? It is instructive here to recall Nietzsche's criticism of Darwinism. Nietzsche criticized Darwinian evolution for making

[139] Friedrich Nietzsche, *The Will to Power*, trans. Walter Kaufmann and R.J. Hollingdale (New York: Random House, 1967), 342.

evolution a function of self-preservation and declaring that the "strong" or "fit" are those that succeed in holding on to life for as long as possible. Rather, in an aphorism titled "Anti-Darwin," Nietzsche argued that "I always see before me the opposite of that which Darwin and his school see or *want* to see today: selection in favor of the stronger, better-constituted, and the progress of the species. Precisely the opposite is palpable: … the inevitable dominion of the average."[140] We get a sense here of Nietzsche's "elitism," in the sense that he favored rare, "higher," and extravagant individuals who are not afraid to squander life, as opposed to the average or mediocre individuals that make up the "herd" and that cling to (an average) life at all costs. For him, neither fitness nor evolution were grounded in self-preservation. Rather, Nietzsche thought that "[i]t can be shown most clearly that every living thing does everything it can not to preserve itself but to become *more*."[141] Rather than being the driving force for evolution, the will to self-preservation proscribes the drive to become more, i.e., self-overcoming, leveling those who are exceptional to the average, for the sake of the longevity of the herd. The will to self-preservation thus proscribes self-overcoming, which is the ultimate goal of the will to power and thus antithetical to it. Although Nietzsche denies teleology, for him the exceptional human being, who risks life for the sake of becoming *more*, is more worthy of the title of "strong" than those who manage to achieve self-preservation by conforming to the herd and finding safety in numbers; that it is the exceptional individual that is indicative of evolutionary "progress," not the ones who live the longest. Nietzsche argued, then, that the driver of evolution, the fundamental impetus of living beings, is not self-preservation, but increase in "power," as it is defined in the context of the will to power. However, assuming for a second that Nietzsche is correct about his criticism of

[140] Nietzsche, *Will to Power*, 364.

[141] Ibid., 367.

Darwinism, how is it that the interpretation of evolution as a function of self-preservation came to hold such sway with scientists and philosophers? Nietzsche points his finger at *ressentiment*, which he saw as the driving force for the development of modern science.

In the *Genealogy*, Nietzsche brings up *ressentiment* in relation to the "slave revolt in morality." Nietzsche introduces *ressentiment* in the first essay of the *Genealogy*:

> [t]he slave revolt in morality begins when *ressentiment* itself becomes creative and gives birth to values: the *ressentiment* of natures that are denied the true reaction, that of deeds, and compensate themselves with an imaginary revenge. While every noble morality develops from a triumphant affirmation of itself, slave morality says no from the onset to what is "outside," what is "different," what is "not itself"; and *this* No is its creative deed.[142]

The slave revolt in morality indicates the birth of the dichotomy of "good" and "evil," which Nietzsche argues is not something inherent to reality but rather the historical creation of morality on the part of the weak and impotent. Nietzsche argues, tracing the etymological roots of these words to ancient Greek, that "good" and "bad" did not possess the connotation of moral judgment associated with "good" and "evil." The good were the healthy, strong, wealthy, aristocratic members of society, while the bad were seen as the poor, the impotent, and the humble. The "bad" inevitably suffered a stifling of their will to power, as a result of their inability to fulfill their ambitions and inspire respect for their person by way of deeds. Thus, what makes the slave revolt in morality an imaginary revenge is a transfiguration of the concepts of "good" and "bad" into the dichotomy of "good" and "evil." This imaginary revenge occurred when the *ressentiment* of the stifled will to power of the many, having no way of imposing itself through concrete action, became "creative" and developed a purportedly objective system of morality, whereby those characteristics that distinguished the weak from the strong (such as

[142] Nietzsche, *Genealogy of Morals*, 36.

humility, impotence, poverty) became virtues, while those features that characterized the strong (such as power, pride, wealth) became *evil*. Having nowhere to go and incapable of performing deeds that would enhance the feeling of one's power, the will to power drowning in *ressentiment* is left with no option but this psychological or "imaginary" revenge.

At this point, it would be useful to refine the Nietzschean concept of 'power' a little more. Deleuze calls attention to the fact that many have misinterpreted Nietzsche's idea of power by equating it to a vainglorious Hobbesian desire to dominate others: to portray power as the "object of a representation, of a *recognition* which materially presupposes a comparison of consciousnesses."[143] Nietzsche himself anticipated this misunderstanding and called attention to the fact that there are two interpretations of power, corresponding to a master and a slave morality. It is the latter that identifies power with the representation of one's superiority over others: "[a]t least to *represent* justice, love, wisdom, superiority—that is the ambition of the "lowest," the sick."[144] Nietzsche's idea of power has much more to do with the capacity to endure suffering, to set an aim for oneself and overcome the obstacles that stand in one's way, and, most of all, the capacity to accept reality as it is without denigrating it with ideals and values that transcend this life: "I entreat you, my brothers, *remain true to the earth*, and do not believe those who speak to you of superterrestrial hopes… They are despisers of life, atrophying and self-poisoned men, of whom the earth is weary: so let them be gone!"[145] Therefore, what is characteristic of *ressentiment* and slave morality is that it draws its power primarily from negation: "[w]e can guess what the creature of *ressentiment* wants: he wants others to be evil in

[143] Gilles Deleuze, *Nietzsche & Philosophy*, trans. Hugh Tomlinson (New York: Columbia University Press, 1983), 80.

[144] Nietzsche, *Genealogy of Morals*, 123.

[145] Friedrich Nietzsche, *Thus Spoke Zarathustra*, trans. R.J. Hollingdale (New York: Penguin, 2003), 42.

order to be able to consider himself good. *You are evil, therefore I am good*; this is the slave's fundamental formula."[146] Whereas the will to power of slave morality requires the condemnation of the other as evil as a prerequisite for its own affirmation, master morality begins with an affirmation of itself: "I am good, therefore you are evil."[147] This qualitative difference of the will to power of slave and master morality, the former being defined by what it opposes and the latter being defined by self-affirmation, is indicative of the *reactivity* of the former and the *activity* of the latter.[148] Remember, the slave revolt in morality consists of a *ressentiment* that has become creative. The product of its creativity is an objective system of moral values designed to sequester power from the "good," who are now deemed "evil." This value system is grounded in the negation of reality as it is; a reality that is in need of being corrected. Thus, the values that come out of *ressentiment* are life-denying and symptomatic of an aversion towards reality itself, the world of change and becoming, betraying an imaginary attachment to a more perfect world beyond this life. Unable to deal with reality as it is, the actor of *ressentiment* attempts to make reality answer to their values and concepts, rather than the other way around.

Returning to the ascetic priest, Nietzsche claimed that "if one wanted to express the value of the priestly existence in the briefest formula it would be: the priest *alters the direction of ressentiment*."[149] The reactive *ressentiment* of the actor of slave morality needs someone or

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[146] Deleuze, *Nietzsche & Philosophy*, 119.

[147] Ibid.

[148] Referring to Fyodor Dostoevsky's underground man from *Notes from Underground*, Richard Sugarman thinks of *ressentiment* as a distorted form of Platonic eros, which is defined by what it hates as opposes to what it loves: "[The underground man] will not knowingly deceive himself. Defined by that which he resists and stands against, he cares for nothing. Here is the appearance of the radical inversion and embodiment of the Platonic concept of eros. Deformed eros is known by what it scorns not by what it loves. The underground man pursues the absence of self-deception. This is the single and controlling maxim by which he lives, the one fact that spares his life from scorn." Cf. Richard Ira Sugarman, *Rancor Against Time: The Phenomenology of 'Ressentiment'* (Hamburg: Felix Meiner Verlag, 1980), 15.

[149] Nietzsche, *Genealogy of Morals*, 127.

something to blame for its misery. In projecting the blame for its dejection outside of herself, the actor of slave morality, along with the rest of the herd, can then take their "imaginary" revenge by holding their supposed assailant morally culpable, and therefore *guilty*, for the misery of the former. What the ascetic priest does, however, is interiorize that revenge:

> "I suffer: someone must be to blame for it"—thus thinks every sickly sheep. But his shepherd, the ascetic priest, tells him: "Quite so, my sheep! Someone must be to blame for it: but you yourself are this someone, you alone are to blame for it—*you alone are to blame yourself!*"—This is brazen and false enough: but one thing at least is achieved by it, the direction of *ressentiment* is *altered*.[150]

What emerges out of this interiorization is the concept of "sin," where the one affected by *ressentiment* re-interprets their suffering as punishment. Thus, the actor of *ressentiment* must search for the cause of her suffering in the past: "he must seek it in *himself*, in some *guilt*, in a piece of the past, he must understand his suffering as a *punishment*."[151] We should note that this ascription of guilt to one's self depends on the assumption that the past could have been *otherwise*, an assumption that is symptomatic of a reactive will to power. This "*otherwise*" will be key when thinking about how *ressentiment* directs its revenge towards time.

To assume that oneself or someone else could have acted *otherwise* is what allows the victim of *ressentiment* to denounce the "crimes" of their purported assailant. As Deleuze demonstrates, referring to the discussion of the lamb and the bird of prey in the first essay of the *Genealogy*[152], "it is assumed… that the bird of prey is able to not manifest its force, that it can hold back from its effects and separate itself from what it can do: it is evil because it does not hold itself back."[153] In this way, what makes the bird of prey culpable for attacking the lamb,

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[150] Nietzsche, *Genealogy of Morals*, 128.

[151] Ibid., 140.

[152] Ibid., First Essay, Section 13.

[153] Deleuze, *Nietzsche & Philosophy*, 123.

from the perspective of the lamb, is the assumption that the bird of prey could have chosen to act otherwise. This also implies that the lamb, which "chooses" to hold itself back rather than inflicting harm, is virtuous. The truth, however, is that the lamb never had the power to take revenge or defend itself in the first place, but nevertheless the lamb represents its impotence as a virtue, rather than the weakness that it is, which further reinforces this weakness of the will in the lamb. Of course, "lamb" and "bird of prey" are stand-ins for slave and master morality, respectively. This is what Deleuze called the "paralogism," of *ressentiment*, and what I call *ressentiment* as epistemological obstacle: "*the fiction of a force separated from what it can do*,"[154] as if the bird of prey had a choice in willing and acting as it wills. The actor of *ressentiment* thus denies the identity of the activity with the actor, claiming that the actor could have acted otherwise and is thus culpable on moral grounds.

At its height, *ressentiment* accuses life itself as its assailant. The resentful actor could not possibly accept the contrary hypothesis, since this would 1) preclude the idea of free will that is needed to hold someone morally culpable for their actions and 2) would force the resentful actor to admit their own impotence, rather than re-interpret it as a virtue. The ontological schism placed between the actor and her actions implies the dualisms of mind/body and being/becoming, both of which smell of the moralization of the world inaugurated by the concepts of "good" and "evil," since all these dualisms require the separation of an actor from its activity—the paralogism of *ressentiment*. Thus, the "process of accusation in *ressentiment* fulfills this task: reactive forces "project" an abstract and neutralized image of force; such a force separated from its effects will be *blameworthy* if it acts, *deserving*, on the contrary, if it does not."[155]

[154] Deleuze, *Nietzsche & Philosophy*, 123.

[155] Ibid.

Ressentiment then reaches its pinnacle when it no longer holds a single entity as its enemy, but interprets life itself as the guilty party.[156] When the will to power of the resentful agent latches on to life-denying ascetic ideals, "the ascetic ideal proves to be destructive to life, and thereby to the very will to power that motivated its appropriation in the first place."[157] Since it is the basic conditions of life itself that obstruct the impotent will to power, the dwindling will to power turns on itself and wills its own dissolution—a will to nothingness—which progresses by way of ideals that command her to will the weakening of life as the victory of her distorted will to power. *Ressentiment*, then, when it gives birth to nihilistic ascetic ideals, takes its revenge on life by interpreting it as something whose "character no longer constitutes [an] insuperable, and thereby demeaning resistance to my ability to impose my will on the world."[158] Nietzsche claims that the character of this revenge has been so totalizing in western history that it continues to pervade western culture, particularly in the form of Christianity and modern science, which, for Nietzsche, is simultaneously a logical outgrowth of, and the dissolution of, Christianity. We will now see how the ontology projected onto the world by modern science represents the latest form of the ascetic ideal.

Science and the 'Will to Truth'

In aphorism 344 of the *Gay Science* ("How we, too, are still pious") Nietzsche identifies the evolution of the "will to truth" as the driving will to power of Platonism, Christianity, and, subsequently, modern science (Nietzsche famously claimed that Christianity is "Platonism for

[156] "For an ascetic life is a self-contradiction: here rules a *ressentiment* without equal, that of an insatiable instinct and power-will that wants to become master not over something in life but over life itself, over its most profound, powerful, and basic conditions," *Genealogy of Morals*, 118.

[157] Reginster, 185.

[158] Ibid., 83.

the masses.") The will to truth is the ultimate nihilistic ascetic ideal in that it seeks for an otherworldly truth to justify this-worldly life, which indicates the preference for an imagined reality beyond life over the world as one knows it. This might sound strange, but Nietzsche makes a profound point when he asks "[w]hat do you know in advance of the character of existence to be able to decide whether the greater advantage is on the side of the unconditionally mistrustful or of the unconditionally trusting?"[159] Indeed, if we consider that survival and fortune often side with those with a knack for deception, how could it be that the desire to not deceive others or oneself came about evolutionarily, if the former is often more useful for life? "But if both should be required, much trust *as well as* much mistrust, from where would science then be permitted to take its unconditional faith or conviction on which it rests, that truth is more important than… every other conviction?"[160] These questions led Nietzsche to suspect that "truth," rather than being an inherent good or a fact of reality, represented the consummation of *ressentiment*, expressed as the resentful actor's faith that they have replaced opinion with truth, giving one the appearance of power to speak for and pass judgment on/against life. This is indicative of modern science's will to rid itself of convictions, a will which is reflected in the dedicated practitioners of science. The scientist proceeds in the faith that, ideally, we would be able to replace all our human-all-too-human convictions with scientific truths. This, in another sense, betrays the nihilistic desire to rid oneself of having to have any convictions at all: "[w]ould it not be the first step in the discipline of the scientific spirit that one would not permit oneself any more convictions?"[161] What is implied in this aphorism, then, is that modern science, too, possesses a faith, a faith in "truth:" "[b]ut you will have gathered what I am driving at,

[159] Friedrich Nietzsche, *The Gay Science*, trans. Walter Kaufmann (New York: Vintage, 1974), 281.

[160] Ibid.

[161] Ibid., 280.

namely, that it is still a *metaphysical faith* upon which our faith in science rests… that Christian faith which was also the faith of Plato, that God is the truth, that truth is divine."[162] Therefore, while science on the surface seems to be the epistemological project to replace convictions with true knowledge, it is driven by the overpowering conviction of the will to truth that strives to replace all other convictions with itself. To secure its power, science must have unwavering belief in itself as an objective description of reality, which leaves it blind to the contingency of its own will to truth.

Science, ironically, by inheriting Christianity's will to truth, searches for God and morality in vain, leading to the suspicion that "God is dead." But, in failing to find God or morality, can science still find consolation in "truth?" The following quote by Babich is instructive:

> The effective or practical recognition of limits to knowledge combined with the absolute ideal of truth (progress toward truth) is an expression ("the latest and noblest") of (ascetic) nihilism in Nietzsche's view. In this nihilism, we have the duplicity of a science abhorring contradictions, but in all innocence, absolving its own project from this stricture.[163]

The contradiction that science absolves is the one discussed above, where science, presuming itself to be on a mission to rid itself of convictions, is driven by the conviction of the will to truth, "that truth is divine." The contradiction becomes apparent when one considers the impossibility of attaining the ideal of the will to truth, given the insuperable limits of ecophysiological perspective. If we are limited by an ecophysiological perspective, and are thus not entitled to assume that we know the character of "truth" in advance, how is it that, in being aware of the finitude of our knowledge, science can make the immodest claim that its

[162] Nietzsche, *The Gay Science*, 283.

[163] Babich, 211.

interpretation of the world is the true one, claiming the authority of transcendental truth once claimed by Christianity?

This contradiction remains largely overlooked due to science's incredible power to provide mastery over nature. Many have taken modern science's unprecedented capacity to manipulate nature through technology as sufficient proof for the truth of its claims. But the utility of a description of nature for human ends does not a truth maketh. This is what Nietzsche meant when he said that science attempts to humanize nature: "[h]ow is explanation to be at all possible when we first turn everything into a *picture*—our picture! It is enough to view science as an attempt to humanize things as faithfully as possible; we learn to describe ourselves more and more precisely as we describe things and their succession."[164] Nietzsche here begins by alluding to the limited eco-physiological perspective of humans. Then, in positing the objective existence of discrete, manipulable entities in nature, such as atoms, science does not provide an exhaustive description of phenomena that yield their truth but, rather, it mistakes entities as they appear to an eco-physiological perspective for reality in-itself, when they are really human footholds for action projected onto nature for the sake of its mastery[165]—"[t]o humanize the world, i.e., to feel ourselves more and more masters within it."[166] In describing physical phenomena, science makes natural phenomena intelligible *for us* by positing discrete unities within the flux of becoming, making nature amenable to human control. However, it does not for that reason provide an exhaustive explanation that could be considered "truth" in-itself; but, nevertheless, this has not taken away from science's proven capacity to yield mastery over natural processes, and therefore

[164] Nietzsche, *The Gay Science*, 113.

[165] "We need "unities" in order to be able to reckon: that does not mean we must suppose that such unities exist. We have borrowed the concept of unity from our "ego" concept—our oldest article of faith. If we did not hold ourselves to be unities, we would never have formed the concept "thing,"" Nietzsche, *Will to Power*, 338.

[166] Ibid., 329.

does not seem to pose a practical problem for scientific progress. However, this should make us wonder whether the unities that science posits as "real" must actually exist in order for science to work.

Finally, we arrive with Babich at the connection between *ressentiment*, ascetic ideals, and science:

> the impulse of the ascetic to deny nature and the body is converted to the interests that mark the development of science. The original opposition is retained: the scientist is in the business of mastering or subduing nature. The drive to dominate nature is not an accidental one: it too grows out of *Ressentiment* and fear.[167]

Nietzsche argued that science's drive to master nature is reminiscent of the will to truth of Christianity that searched for salvation from suffering, change, and death in a more perfect world of being. Science, similarly, searches for its salvation in "truth." It's faith in truth has been such that it overthrew "God" when it realized that God could never be proven by the high standards of truth set by scientific methodology. However, instead of positing divinities, science posits discrete entities in the flux of becoming and immutable "laws" of nature as the causes of real motion. The logic of a law of nature follows the logic of the paralogism of *ressentiment* in its dependence on the neat distinction between cause and effect, as if matter were a passive substance requiring the command of a transcendental law of nature to direct its motion. It is because the development of laws of nature follows the logic of the paralogism of *ressentiment* that Nietzsche claimed that we moralize nature when we declare that it is lawful.[168] Nietzsche traced the belief in laws of nature to an originary faith in grammar, that is, that every action is predicated on the intention of an enduring subject that carries out said action:

> [t]he separation of the "deed" from the "doer,"… of the process from a something that is not process but enduring, substance, thing, body, soul, etc.—the attempt to comprehend

[167] Babich, 202.

[168] Nietzsche, *Will to Power*, 336.

> an event as a sort of shifting and place-changing on the part of a "being," of something constant: this ancient mythology established the belief in "cause and effect" after it had found a firm form in the functions of language and grammar.[169]

We can then see how science itself pursues an "imaginary" revenge against life by claiming to find enduring truths that lie beyond life and direct the deceptive appearances of becoming, all the while believing that if one could only obtain an exhaustive knowledge of truth, one could in theory overcome all the mundane suffering of the human condition through the manipulation of nature. Science devotes itself whole-heartedly to the discovery of these truths, holding the regard for truthfulness at all costs as the greatest of all values, and thereby judging the value of the ontologically "immobile" to be of far greater value than that of the "mobile," as we see Henri Bergson put it in the next chapter. In giving explanatory precedence to the atemporal over the temporal, science holds an extratemporal reality of truth to be of greater worth than the world of becoming and passing away that we invariably live and breathe. Nietzsche, however, pushes science to go a few steps further and confront the nihilism that lurks in its heart. That is, to deal with the implications of the fact that science has no right in advance to take "truth" for granted (given the perspectival and eco-physiological character of the world as will to power) and to come to grips with the fact that ontological explanations of natural phenomena that require positing enduring transcendental unities as the cause of real motion have become untenable.

The Temporality of Science and *Ressentiment*

Nietzsche's philosophical assault on truth also has implications for how we think about time. *Ressentiment* entails an axiological rejection of the ephemeral world of becoming in which our lives take place, projecting a more perfect reality beyond life. Much of western intellectual

[169] Nietzsche, *Will to Power*, 336.

history has been devoted to this pattern of thought, both in the philosophic quest for transcendental concepts and science's commitment to searching for static unities and enduring laws of nature that direct materiality while standing outside of it. The more truthful reality of the eternal is then used as the measure for this life, which is as messy as the former is ordered.

Deep in the heart of *ressentiment* festers frustration with the inability to accept or change the past, as we referred to above when we mentioned that *ressentiment* wills that the past be *otherwise*: "this alone is *revenge* itself: the will's antipathy towards time and time's 'It was'… *The spirit of revenge:* my friends, that, up to now, has been mankind's chief concern."[170] One could read this quote as Nietzsche denouncing western philosophy and science as manifestations of the will to truth which has directed contemplation towards "*eternal* goods, which stand out of the order of time."[171] Unable to overcome time and its "it was," the reactive will to power of *ressentiment* sublimates its aversion to the passage of time into the creation of eternal concepts and values that transcend this world and are therefore untouched by time— "I take my revenge against time or life by making it the case that their character no longer constitutes insuperable, and thereby demeaning, resistance to my ability to impose my will on the world."[172] Recall now the thesis of this project: that the history of the concept of energy is the history of attempts to grasp what is constant through time. It is from this connection between the genealogy of energy and Nietzsche's critique of *ressentiment* that this work takes its namesake: *The Birth of Energy from the Spirit of Revenge*. To solidify this point, I now analyze Richard Ira Sugarman's *Rancor Against Time: The Phenomenology of 'Ressentiment*', to explain in more detail what the

[170] Friedrich Nietzsche, *Thus Spoke Zarathustra*, trans. R.J. Hollingdale (New York: Penguin, 2003), 162.

[171] Reginster, 83.

[172] Ibid.

"revenge against time" entails and how it has left traces in physics' conceptualization of nature as energy.

Sugarman's work defends the thesis that the root of *ressentiment* lies in an existential rancor against the passing of time. In attempting to prove that *ressentiment* is fundamentally the expression of rancor against time, Sugarman grapples with four thinkers: Dostoevsky, Scheler, Nietzsche, and Heidegger. Sugarman notes that the "ultimate source of all 'ressentiment', the rancor against time itself, originates for Nietzsche, with the birth of philosophy."[173] This is in keeping with our analysis in the previous chapter which traces the genealogy of energy all the way back to Parmenides. Nietzsche, however, identified the source of *ressentiment* in Anaximander's metaphysical utterances, a point he made in *Philosophy in the Tragic Age of the Greeks*, which Sugarman considers to be Nietzsche's meditation on the dawn of *ressentiment* in Pre-Socratic thought. Nietzsche credits the following quote to Anaximander, "[w]here the source of things is, to that place they must always pass away, according to necessity, for they must pay penance and be judged for their injustices, in accordance with the ordinance of time."[174] Here, Anaximander recognizes the fundamental tragedy of all coming-to-be. But more than this, there is also the recognition that that "which truly *is*… cannot possess definite characteristics, or it would come-to-be and pass away like all the other things."[175] Primal being must be indefinite in order for the incessant becoming of a world of beings, that come-to-be with definite qualities, to be possible.[176] Primal being, the "indefinite," is then seen as the eternal ground for all coming-to-

[173] Sugarman, 56. Cf. footnote 30 for full citation.

[174] Friedrich Nietzsche, *Philosophy in the Tragic Age of the Greeks*, trans. Marianne Cowan (Washington D.C.: Regnery Publishing, 2014), 45.

[175] Nietzsche, *Tragic Age*, 47.

[176] This reminds us of Heidegger's critique that western philosophers have failed to adequately address the (ontological) question of Being by pursuing the question in terms of the (ontic) qualities of definite beings.

be; the eternity of the former makes room for and ensures the continual renewal of the latter. Nietzsche argued that what is decisive in Anaximander's privileging of indefinite being over definite becoming is his moralization of coming-to-be: "[i]ts existence becomes a moral phenomenon. It is not justified, but expiates itself forever through its passing."[177] Unable to accept a world that is indifferent to the suffering of ephemeral beings and, therefore, that there is no meaning or justification for suffering, Nietzsche argued that Anaximander felt it necessary to find a reason for the suffering accrued from the passing of time:

> [the existence of the 'many'] becomes for him a moral phenomenon. It is not justified, but expiates itself forever through its passing…eternal coming to be can have its origin only in eternal being; the conditions for the fall from being to coming-to-be in injustice are forever the same; the constellation of things is such that no end can be envisaged for the emergence of individual creatures from the womb of the "indefinite.""[178]

For Anaximander, coming-to-be is a *fall* from the formless, serene eternity of the indefinite, where what comes-to-be must pay for its transgressions by suffering and passing away. This rancor against time set the tone for the venture that would become western philosophy: "[t]he rancor against the ordinance of time delivers, out of the spirit of revenge, the aboriginal devaluation of existence, that is to become the subterranean and controlling structure in the historicity of philosophy."[179] Here, then, is where Nietzsche identifies the genealogical origin of western philosophy's affinity for metaphysics; the birth of the will to truth that devalues the ephemeral appearance of becoming and searches for truth somewhere beyond life.

One of the consequences of western philosophy's origin story is that it has framed the activity of thinking as "a flight from the temporal character of human existence. Implicit in this flight is a submerged anger against that which appears to mandate its necessity, human

[177] Nietzsche, *Tragic Age*, 49.

[178] Ibid., 49-50.

[179] Ibid., 57.

transience."[180] Sugarman points to Aristotle's understanding of active *nous* as the *energeia* of human beings as further evidence for his argument, noting that "[a]ctive *nous* is arrested in the moment of its triumph, i.e., when *nous* is possessed by that which no longer moves."[181] Thought, as it is conceived by the spirit of revenge, aims at the cessation of its own coming-to-be so it may, for however long, transcend its ephemeral condition and partake of the eternity of the ideas grasped by active *nous*. The appropriation of eternal truth, "the perfect union of knower and known,"[182] is the *energeia* of Aristotle's 'rational animal,' which finds its greatest fulfillment in fleeing its bodily nature and transcending its temporal condition; here we find more evidence of *energeia* as flight from time's passing, a result, as we have seen, of philosophizing from the perspective of the spirit of revenge.

Heidegger and Sugarman's Criticism of the Eternal Return

Sugarman claimed that one of the great merits of Nietzsche's thought was his recognition of and extensive struggle with the flight from the temporality of human existence that is characteristic of western philosophy and science. Thus, he claimed, the "task which Nietzsche bequeaths to philosophy is to found an ontology that will do justice to his insight concerning the rancor against time."[183] However, Sugarman argued that Nietzsche's proposed solution to the problem of *ressentiment*, the 'eternal return of the same,' failed to resolve the problems that Nietzsche recognized in philosophy's flight from the temporality of human existence—*ressentiment*. Sugarman claims to find a solution in Heidegger's later thought, which is supposed to accomplish the ontological task bequeathed to philosophy by Nietzsche. What follows is an

[180] Sugarman, 79.

[181] Ibid., 78.

[182] Ibid.

[183] Ibid., 98.

exposition of Sugarman's criticism of the eternal return and his subsequent endorsement of Heidegger's solution to 'the spirit of revenge,' which he finds in *Time and Being* and *What is Called Thinking?* I contrast Sugarman's interpretation of the eternal return with Deleuze's in the final chapter, to show how Deleuze's interpretation vindicates the eternal return's victory over *ressentiment* within Nietzsche's thought, while simultaneously accounting for the Heideggerian solution that Sugarman endorses. I argue that, despite Sugarman's misguided criticism, he still found a legitimate solution in Heidegger's criticism of western philosophy/science's static account of time. In other words, Deleuze's interpretation of the eternal return as the eternal return of 'difference,' and Heidegger's call to rethink the being of past and future as positive, rather than negative, modes of absence, are not mutually exclusive but, rather, must be combined. In fact, as we see in the final chapter, Deleuze's analysis of the three syntheses of time in *Difference & Repetition* incorporates both criticisms in an attempt to rethink temporality beyond the old conception of western philosophy and science, paving the way for a reconceptualization of the temporality of energy.

Sugarman introduces the doctrine of the eternal return with an aphorism titled "The Convalescent" from *Thus Spoke Zarathustra*: "behold, *you are the teacher of the eternal recurrence*… that all things recur eternally and we ourselves with them, and that we have already existed an infinite number of times before and all things with us."[184] Nietzsche at times talks about the eternal recurrence as an ethical doctrine, at others as a cosmological one; Sugarman criticizes both of these. Ethically, insofar as *ressentiment* is the rancor against time and its 'it was,' the thought of the eternal recurrence is meant to break the chains of resentment that tie one to the past by seeing that same past in an affirmative light: "[t]o impose upon becoming the

[184] Nietzsche, *Zarathustra*, 237.

character of being—that is the supreme will-to-power… That *everything recurs* is the closest *approximation of a world of becoming to a world of being*."[185] The eternal recurrence places the stamp of being on becoming through a radical affirmation of all that has happened and will happen to oneself; the eternal recurrence wills that the past have happened exactly as it did, that the present be exactly as it is, and that we embrace, nay, love the future that is to come as a result, for life could not and cannot be otherwise. Thus, one wills time both backwards and forwards, completing the circle of the eternal return. Willing that the past had been different is to will another reality where I am not who I am, for I would not be who I am had the past not transpired exactly as it did. The radicality of Nietzsche's thought consists in willing that one's life be replayed in exactly the same way for all eternity, which celebrates the idea that everything that happened once will happen again in exactly the same way, forever. For Nietzsche, the thought of eternal recurrence is thus "the heaviest weight:"

> [i]f this thought gained power over you, as you are it would transform and probably crush you; the question in each and everything, 'Do you want this again and innumerable times again?' would lie on your actions as the heaviest weight! Or how well disposed would you have to become to yourself and to life *to long for nothing more fervently* than for this ultimate eternal confirmation and seal?[186]

The weight of the eternal recurrence is that, if we cannot find a way to reconcile ourselves with life, nay, to *love* all that happens to us, then resentment towards life is compounded eternally. However, from a life-affirming perspective, the eternal return represents the highest affirmation of life indicated by Nietzsche's idea of *amor fati* (love of fate): "I want to learn more and more how to see what is necessary in things as what is beautiful in them—thus I will be one of those who makes things beautiful. *Amor fati*: let that be my love from now on!"[187] Thus, according to

[185] Nietzsche, *Will to Power*, 330.

[186] Nietzsche, *Gay Science*, 194-195.

[187] Ibid., 157.

Sugarman, the eternal return is meant to portray time not as a "slippage from the wheel of eternity, nor a fall from divine to terrestrial habitation… but the many and recurring expressions on the face of eternity itself,"[188] the affirmation of these eternal faces being the supreme victory of one's will to power.

Sugarman interprets the eternal return as a cosmological doctrine insofar as it projects the view that the past, present, and future of the universe all recur infinitely in an endless loop of becoming. Thus, the present moment "as characterized by Zarathustra is conceived as the ever-recurring "it is" within time. What is now, the presence of the now, is preserved from eternal destruction because it will come again, and forever."[189] This quote contains the crux of Sugarman's claim that the eternal return does not in fact overcome *ressentiment*. In Sugarman's view, the eternal return implies that eternity is compressed in every self-contained 'now', which actually follows the logic of *ressentiment* because the presence of past and future in every 'now' depicts the present moment as the moving image of eternity, which is a static account of time, insofar as becoming is derivative of the progression from past to future of moments that in-themselves are eternal. (Interestingly, this interpretation of the eternal return anticipates Einstein's block universe, where all moments of time are said to coexist with each other simultaneously in four-dimensional spacetime.) It would seem, from this point of view, that the eternal return is guilty of the very problem it tries to solve because it "sets out to reconcile man with the death of meaning by revaluing life as deathless and time as endless."[190] If what is characteristic of *ressentiment* is the flight from the finite temporality of life, then transfiguring the finitude of life into immortality and compressing eternity into every 'now' hardly seems like

[188] Sugarman, 92.

[189] Ibid., 86.

[190] Ibid., 95.

a more honest view of the fleeting nature of time. Furthermore, Sugarman argues that "it is philosophically incomprehensible how anything at all can meaningfully be said to *become*, let alone recur, under the doctrine of eternal recurrence of [the] same,"[191] if the present is only the moving image of eternity.

Sugarman's refutation of the eternal return is inspired in part by Bernd Magnus' refutation of its cosmological formulation. Strikingly, Magnus argues that the formulation of the eternal return was grounded in Nietzsche's assumptions regarding the nature of energy, time, and space. Magnus takes the following quote from Nietzsche's unpublished journals, the *Nachlass*:

> The amount of total energy is determined, not infinite… Consequently, the number of states, changes, combinations and developments of this energy is incredibly large and practically unmeasurable, but nonetheless determined and not infinite. However, time, in which the totality exerts its energy, is infinite. That is, energy is eternally equal and eternally active. Up to this moment an infinity has passed, i.e., all possible developments must already have come to pass. Consequently, the present development must be a repetition and also the one which bore it and the one which will originate from it, and so on forward and backward! Everything has come to pass in so far as the total configuration of all energy eternally recurs.[192]

This quote sees Nietzsche implicitly accept the first and third laws of thermodynamics that frame the amount of energy in the universe as finite but, nevertheless, eternal. It is not clear however whether Nietzsche accepted the second law of thermodynamics, given that it led to the conclusion that the universe will eventually end in a heat death from which it will not recover, against Nietzsche's assumption of infinite time. In a universe of absolute space, where space is seen as a finite container permeated by a finite amount of energy, given an infinite amount of time, Nietzsche seemed to conclude that a finite number of energy states will recur. This is one of the reasons for Sugarman's endorsement of Heidegger's critique of Nietzsche as the last

[191] Sugarman, 93.

[192] Bernd Magnus, "Nietzsche's Eternalistic Counter-Myth," *Review of Metaphysics* 26, no. 4 (1973), 605.

thinker of western metaphysics, not the first beyond it, as Nietzsche seemed to think. Sugarman notes that, for Heidegger, Nietzsche's thought is the "culmination of occidental metaphysics rather than a new beginning… Heidegger's existential analytic aims, in part, at demonstrating that the entire history of philosophy from Plato to Nietzsche rests upon the confusion of the existence of man with that of natural objects."[193] In leveling all phenomena to different configurations of a single substance, energy, and making no distinction between the lived time of human experience and the homogenous, mathematical time of physics, Sugarman claims that Nietzsche eschews the ontic-ontological distinction that is at the heart of Heidegger's critique of western metaphysics, and thus mistakes an ontic account of beings for a fundamental ontology of Being.

Ecstatic Temporality

In his compiled lectures on *Nietzsche*, Heidegger argued that Nietzsche's thought stretches back to the two fundamental insights of Parmenides and Heraclitus that founded the history of western philosophy: that *being is* and that *being becomes*, respectively.[194] The fact that *being is* corresponds to the eternal recurrence of the same, and the fact that *being becomes* corresponds to the will to power, the two central concepts of Nietzsche's philosophy that must be grasped together. Thus, Heidegger argued that for Nietzsche "being is *both* of these, not in an extrinsic way… rather, being is in its very ground perpetual creation (Becoming), while as creation it needs what is fixed."[195] Heidegger argued that Nietzsche was still beholden to the Parmenidean fixation on Being as the unchanging, which is symptomatic of the rancor against

[193] Sugarman, 101.

[194] Martin Heidegger, *Nietzsche: Volumes One and Two*, trans. David Farrell Krell (San Francisco: HarperOne, 1991), 200.

[195] Ibid., 200.

time: "that *being is*… that very response determines for the first time and for all thinkers to come, including Nietzsche, the meaning of *is* and *Being*—permanence and presence, that is, the eternal present."[196] What Heidegger implies is that Nietzsche's philosophy is an inverted Platonism[197] that overturns the axiological valuation of being over becoming while still being beholden to the original Platonist position that Being is being present, the 'it is' of time. Thus, although Nietzsche closes the circle of western philosophy—that is, metaphysics—and in doing so opens the possibility of a new ground for thinking, Heidegger claimed that Nietzsche's thought remained within the ground of the idea of Being as permanence/presence, which placed Nietzsche's thought at the end of, but still within, the history of western metaphysics. Regarding energy, then, its eternal presence would constitute the *being is* of the universe, while its flux and finite configurations constitute the fact that *being becomes*. We should note however that Nietzsche never systematically expressed the difference between energy and will to power, though there is an aphorism in the *Will to Power* that indicates that perhaps the will to power would be the inner-complement to force and, thereby, energy, since energy is commonly defined in physics as the "ability to do work," which requires force: "[t]he victorious concept "force," by means of which our physicists have created God and the world, still needs to be completed: an inner will must be ascribed to it, which I designate as "will to power.""[198]

Heidegger's critique of the 'metaphysics of presence' offers the solution that Sugarman endorses for the rancor against time. Heidegger was critical of the idea of the presence of an eternal 'now,' an idea that he argued came to light in the thought of Parmenides and remained unquestioned through the history of western philosophy and science. "The facing, the idea of

[196] Heidegger, *Nietzsche: Volumes One and Two*, 200.

[197] Ibid., 205.

[198] Nietzsche, *Will to Power*, 333.

what is, judged from what is, is always beyond what is—μετά [meta]. To have seen this μετά, that is, to have thought it, is the simple and thus inexhaustible meaning of all Greek thought."[199] In privileging the presence of what is present as constitutive of the nature of the Being of beings and, indeed, of Being itself, western metaphysics has only found eternity in the eternal 'now,' which itself is not an ontic being which we face but is seen as the eternal vessel for the passage of time: the present moment. This has been decisive for the direction of western metaphysics, which attempts to think that which is beyond the passage of time, and thus that which always remains present despite the passage of time into its 'it was.' The concept of an eternal 'now' is rooted in what Heidegger called the 'mathematical' conception of time that we find in physics. Sugarman notes that mathematical (or 'static') time "treats all time as 1) homogenous, 2) continuous, and, at least from a theoretical standpoint, consisting of 3) units that are infinitely divisible."[200] Static time is thus indifferent to the authentic (or, as Heidegger liked to call it, 'primordial') experience of time, i.e., 'ecstatic' time, which refers to the passage of time from the perspective of human concern. For Heidegger and Sugarman, ecstatic time takes ontological priority over mathematical time in Dasein's temporal horizon because the latter is an abstraction of the former. The abstraction consists of reducing ecstatic temporality to an ever recurring sequence of momentary 'nows' characteristic of mechanical causality: "[w]hat is characteristic of the 'time' which is accessible to the ordinary understanding, consists, among other things, precisely in the fact that it is a pure sequence of "nows", without beginning and without end, in which the ecstatical character of primordial temporality has been levelled off."[201] Ecstatic

[199] Martin Heidegger, *What is Called Thinking?*, trans. J. Glenn Gray (New York: Harper Perennial, 1976), 98.

[200] Sugarman, 101.

[201] Martin Heidegger, *Being and Time*, trans. John Macquarrie and Edward Robinson (New York: Harper Perennial, 2008), 377.

temporality, then, is heterogeneous, qualitative, "measured in terms of human care."[202] Whereas static temporality refers to a series of self-contained 'nows' moving linearly through time, ecstatic temporality denotes the fact that Dasein stands outside of herself in time, not being simply contained in the present but always looking towards the future, her concern being informed by her past which never ceases to encounter the future through her forward-looking concern in the present.

Importantly, Sugarman offers as evidence for his claims that an ecstatic conception of time provides a better explanation of the phenomenon of human speech than static time: "[t]he temporality of speech for the living moves from future to past through the present. The orientation towards that which remains to be said is the aperture through which the world of the speaker opens. Speech becomes incoherent just as it becomes… unable to control where it is going."[203] Here, Sugarman points to the intentionality of human speech, which implies Dasein's ability to stand outside of her immediate present in her concern for the future. A static account of time would proscribe the possibility of the intentional character of Dasein. If speech moved from past to present to future, then intentionality on the part of Dasein would always emerge after speech, which is clearly not faithful to the phenomenological experience of speech itself:

> [p]henomenologically, we do not form complex units of meaning out of simpler particles. We do not move from privately held thoughts to words to the expression of words in combination. Much less do we go from letters of the alphabet to words and then sentences and combinations of sentences… The static, chronological model of human temporality which moves in strict fashion from past to present to future through a series of successive now-points simply cannot do justice to the actuality of human speech.[204]

For Sugarman, thus, the transition to an ecstatic view of time from a static one is a necessary

[202] Sugarman, 102.

[203] Ibid., 106.

[204] Ibid., 107.

condition not just for describing the phenomenology of human speech, but also for overcoming the rancor against time. The static/mathematical conception of an eternal 'now' implies that the absence of the past and future are to be considered ontologically negative—nothingness—since only what is 'now,' what is present, possesses Being in any meaningful sense in a static account of time. The challenge, then, for an ecstatic account of time is to provide an alternative account of the absence of past and future as ontologically *positive*, rather than *negative*, absences.

Sugarman asks us to inquire along with Heidegger "how it can be that time lived and spent can be rendered distinguishable from a time that has never been."[205] What is being pointed to here is that the absence of the past, as one of the ecstases of time, presences in the form of memory. Memory protrudes into the present with the character of absence; its absence being a form of presencing, not an imperfect kind of presence. The future is an absence that, nevertheless, calls to Dasein and asks the question of how she will comport herself towards that which is coming her way (e.g., the Being of Dasein as care, where "[c]are is Being-towards-death"[206]). Thus, the absence of the ecstatic past and future "enables Being to withhold itself, and therefore unfold as time. The act of devaluing the meaning of absence, the reduction of absence to nothingness, serves to represent Being as that which appears only in the momentary "now.""[207] But how is it that placing time on ecstatic ground, where the absence of the past and future are ontologically positive, can overcome *ressentiment*; the rancor against time and its 'it was?'

In his discussion of Nietzsche's concept of the spirit of revenge, Heidegger characterized the spirit of revenge as "the will's revulsion against the passing away [*sic*] and what has passed

[205] Sugarman, 121.

[206] Heidegger, *Being and Time*, 378.

[207] Sugarman, 127.

away, against time and its "It was." The revulsion turns not against the mere passing, but against that passing away which allows what has passed to be only in the past,"[208] allowing what has passed to perish into non-Being. Heidegger argues that this conception of the spirit of revenge betrays Nietzsche's answer to the question of the essential nature of time as the same answer as Aristotle's and the entirety of the western tradition,[209] that is, the idea of time as the temporal, i.e., as that which perishes in the non-Being of the 'it was.' In this way, the devaluation of absence as nothingness is what is essential to the rancor against time. However, Heidegger notes that presence could not be what it is without the extension of presence to the absence of past and future: "[a]pproaching, being not yet present, at the same time gives and brings about what is no longer present, the past, and conversely what has been offers future to itself. The reciprocal relation of both at the same time gives and brings about the present."[210]

The rancor against time draws its power from denying presence to the absence of what is not present in the eternal 'now.' In reconceiving of the absence of the past and future as having their own form of presencing, we obtain an ecstatic view of time which is characterized by the interplay of the three dimensions of time with each other, made possible by the simultaneous withdrawal and extending of presence of each one from and towards the others, i.e., what Heidegger called *Ereignis*, or "the event of Appropriation."[211] In reconceiving of the absence of past and future as ontologically positive forms of absence, where time is given by the event of Appropriation, Sugarman argues that we can now solve the riddle that Nietzsche posed at the very beginning of the second essay of the *Genealogy of Morals* in anticipation of the overcoming

[208] Heidegger, *What is Called Thinking?*, 103.

[209] Ibid., 101.

[210] Martin Heidegger, *On Time and Being*, trans. Joan Stambaugh (Chicago: University of Chicago Press, 2002), 13.

[211] Ibid., 19.

of the rancor against time: "[t]o breed an animal *with the right to make promises*—is not this the paradoxical task that nature has set itself in the case of man? Is it not the real problem regarding man?"[212] Time, as given by the event of Appropriation that relates its three ecstases, rather than perishing in the 'it was,' offers a path beyond *ressentiment* through the possibility of 'promise:'

> To promise is the shape of the perfect structural deed. To promise is to bind the absent deed to the word spoken in the present. It represents the existential triumph over the rancor against time. To make good on the word spoken is to remain faithful to a two-fold absence: that of the being I am to become and that of the other, for whom I shall become past and deed. In the act of promising I bind together the ecstatic phases of human temporality, and become one.[213]

Thus, the solution endorsed by Sugarman in *The Rancor Against Time* is the one endorsed by Heidegger, which reconceives of the being of the absence of past and future as ontologically positive forms of absence related to the present through an ecstatic conception of time as being given by the event of Appropriation. The act of promising overcomes the rancor against time, as it offers the possibility of unifying who I will become with who I am, and who I was. In doing so, I may achieve a threefold ecstatic unity of past, present, and future: an affirmation of life. In offering Dasein the possibility of wholeness through the ecstatic unity of past, present, and future through the perfect structural deed of promising, this account of time has overcome *ressentiment* by transfiguring the nothingness of the 'it was' and the 'it will be' into the ontologically positive absence—i.e., an absence that presences—of the past and future. This allows for the possibility of presencing in the first place, and thus the possibility of promising—the possibility of the wholeness of Dasein in ecstatic time. From this perspective, the meaning of what it is 'to be' is no longer to pass away, but to promise.[214]

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[212] Nietzsche, *Genealogy of Morals,* 57.

[213] Sugarman, 127.

[214] Sugarman, 127.

Conclusion: What Does This Mean for Energy?

Heidegger's criticism of the eternal return elucidates the relationship between the temporality of *ressentiment* and Nietzsche's claim that modern science aims at mastery over nature. In suffering from time and its 'it was,' the spirit of revenge is expressed as the rancor against time by denying, and thus relegating to nothingness, those aspects of reality that forever remain out of reach of human control: the past and the future. It is only by positing the real as the eternal 'now,' the moving image of eternity, that science can take an objective 'view from nowhere' on nature, which makes no room for the interplay of past, present, and future in its privileging of the eternal 'now' as objective reality.

Heidegger's critique also elucidates how a static account of time does not accurately describe the temporality of speech. The phenomenon of human speech does not fit into a modern scientific ontology of energy, where the eternal present is self-contained (static), bearing no intrinsic relation to past or future. This is because the content of each moment of the universe of nineteenth century thermodynamics is a static/momentaneous state of energy distribution, a universe whose flux requires that which is permanent (energy) in order for movement to be possible. The birth of energy in nineteenth century thermodynamics thus represents a modern iteration of the ancient tendency of western philosophy to ground becoming in being, to aim for that which is constant through time. One might even say that in the interim after Nietzsche's declaration of the death of God, it is energy that takes over the throne of the eternal presence responsible for all change and becoming.[215] In the cosmology of nineteenth century physics, energy is the moving image of eternity, directed by the fundamental laws of nature that, like the

[215] This is reminiscent of Heidegger's notion of *Bestand* or 'standing-reserve,' where to be is to be as energy reserve available for human utility, a notion which extends to humanity in the form of slavery, human capital, or market/labor value, etc.

Platonic forms, stand outside the universe while somehow directing it. Energy, then, is representative of the ancient desire to explain the ephemeral by reference to the eternal—energy as that which is constant through time. As evidence for our claim, we note that in the 19th century, scientists frequently debated what this thing called 'energy' really *is*, and it was mathematician Emmy Noether in the early 20th century who provided a clear mathematical definition of energy that is still widely referred to. Her definition, too, ends up grounding energy mathematically in invariance, by way of temporal symmetry. According to her famous theorem, if a system of equations is invariant with respect to time, then there is a quantity that is preserved in that system, and this quantity is the total energy. Temporal symmetry, the idea that it does not matter whether you go backwards or forwards in time, implies the idea of an eternal present which, no matter which way you frame it, remains as the eternal 'now.'

What is unique about Nietzsche's critique of science, which I extend here to the concept of energy, is that he points out that science, for all its efficiency and explanatory power, is nevertheless an interpretation. Nietzsche denies the claim that science merely reflects the objective reality of nature, what Donna Haraway calls the image of the scientist as the "modest witness."[216] Science is in the business of creating concepts to describe natural processes, and therefore is in the business of world-building. Nineteenth century thermodynamics initially used absolute space as its canvas, which was to be colored by energy. Nietzsche sees in the cosmology of modern science the formula for nihilism. In building a world as a function of the possibility of human control, science inevitably establishes a particular relationship between the individual and nature. In counting as real only that which can be objectively measured and empirically

[216] Donna Haraway, "Modest Witness: Feminist diffractions in science studies," in *The Disunity of Science: Boundaries, Contexts, and Power*, eds. Peter Galison and David J. Stump (1996).

observed, and adhering to a static account of time, the mechanistic universe fails to make room for the human experience, establishing an artificial schism between the experience of being alive (relegated to the status of epiphenomenon) and (mechanistic) reality. This is evidenced by the fact that a static account of time cannot explain the ecstatic temporality of human speech. The nihilism that Nietzsche identifies in modern science is, then, a result of *ressentiment* which has reached its height as the rancor against time, which flees from the ephemeral nature of life into the solace of eternal laws of nature, and it is this that makes science the noblest and most recent form of ascetic ideal. In fleeing from the ephemeral, the agent of *ressentiment* denies the nature of her own experience and succumbs to nihilism, willing the overthrow of her human-all-too-human convictions by the objective truths of science. This analysis thus emphasizes the need for rethinking the temporality of energy in a way that does not artificially relegate the human experience to an epiphenomenon divorced from the rest of nature like the solipsistic Cartesian mind. We might also wonder how it is that we could provide a conception of energy that accounts for the fact that certain thermodynamic phenomena (such as living speech) exhibit an ecstatic temporality, which might indicate the need to develop an ecstatic theory of energy.

CHAPTER 4

BERGSON: ENERGY AND DURATION

The History of an Error: Treating Time as Space

Like Nietzsche and Heidegger, Henri Bergson was also critical of the historical tendency in western philosophy and science to privilege the eternal over the ephemeral, subordinating the passage of time to the unchanging. One place where Bergson expounds his criticism of this tendency is through his concept of the "cinematographical mechanism of thought" that we find in *Creative Evolution*, where he critiques the proclivity to "think the unstable by means of the stable, the moving by means of the immobile."[217] However, any exposition of Bergson's philosophy of time is incomplete without a discussion of his concept of 'duration,' which is where we begin.

Bergson opposes duration to clock-time, i.e., the way clocks partition time into discreet, homogenous segments. Bergson's qualm with this notion of time is that clock-time artificially fragments the continuity characteristic of our lived experience of time, where events flow from one to the other organically with no artificial lines or segments to delineate them. Pete A.Y. Gunter notes that "[duration] is not at all like our traditional measurable time… All [clock-time] segments (for example, minutes or seconds) are the same in character as are all other time segments. But experienced time is not like this. No two moments of experienced time are identical."[218] Bergson thought that clock-time arose as a consequence of treating time like space, as if time were a geometric line that could be infinitely partitioned and measured according to discreet temporal intervals, where every segment is self-contained and thus annihilated in the

[217] Henri Bergson, *Creative Evolution*, trans. Arthur Mitchell (New York: Random House, 1944), 297.

[218] Pete A.Y. Gunter, *Getting Bergson Straight* (Wilmington: Vernon Press, 2023), 1.

passage from past segments to future ones. Bergson traces the spatialization of time all the way back to Zeno's paradoxes of motion, claiming that these were merely false problems which resulted from applying spatial reasoning to understanding temporal succession. It is important to note for our purposes Zeno of Elea's connection to Parmenides, whom we saw Bruce Lindsey call the 'the patron saint of energy' in the first chapter. With his paradoxes of motion, Zeno attempted to show "that ontological pluralism—a belief in the existence of many things rather than only one—leads to absurd conclusions."[219] For example, one of the paradoxes, known as the "dichotomy," states that to get from one point in space to another (e.g., from A to B) one must always traverse half the total distance before making it all the way to point B. Similarly, before traveling half the distance between point A and point B, one must first travel a fourth of the distance between A and B (halfway between point A and the halfway point between A and B). Logically, this operation of halving the distance between two points can go on to infinity, and so, Zeno argued, the resulting paradox is that one would have to traverse an infinite number of intervals in order to move a finite distance—this was supposed to serve as evidence that motion is a logical impossibility.

Bergson, on the other hand, argued that this paradox is but an illusion, which "consists in making time and movement coincide with the line which underlies them, in attributing to them the same subdivisions as to the line, in short in treating them like that line."[220] This only seems like a paradox because Zeno treats time as the geometric line that traces the trajectory of the movement from point A to point B, which he is then able to infinitely partition. It is always possible, in retrospect, to trace the trajectory of any movement in space, but it would be naïve to

[219] Nick Huggett, "Zeno's Paradoxes," *The Stanford Encyclopedia of Philosophy* (Winter 2019 Edition), ed. Edward N. Zalta, URL = <https://plato.stanford.edu/archives/win2019/entries/paradox-zeno/>.

[220] Henri Bergson, *Matter and Memory*, trans. N.M. Paul and W.S. Palmer (Brooklyn: Zone Books, 1988), 191.

reduce the passage of time to the discreet segments of that line, since all real motion is indivisible and unfragmented, what Bergson would call 'real duration.'

Referring to the distinction between clock-time and duration, Deleuze explained that these concepts represent two different kinds of multiplicities. Clock-time refers to a quantitative/numerical multiplicity, while duration as Bergson conceives of it is a continuous, and thus qualitative, multiplicity.[221] Numerical multiplicities refer to the domain of "objective" phenomena, which "denotes not only what is divided, but what, in dividing, does not change in kind. It is thus what divides by differences in degree. The object is characterized by the perfect equivalence of the divided and divisions, of number and unity."[222] The domain of materiality, Descartes' domain of spatial extension, is the domain of numerical multiplicities. This is further exemplified by the line that Zeno traces behind the movement of objects in space, a line that can be partitioned at will without fundamentally altering the nature of that line, which is what Deleuze meant in referring to the perfect equivalence of the divisions and the divided. Thus, we can see that thinking of time as a geometric line moving from past to present—spatialized time—with discreet temporal intervals, frames time as a numerical multiplicity, and it is this mistaken view of time which Bergson claims leads to Zeno's (false) paradox. Furthermore, the idea of time as a numerical multiplicity naturally leads to the idea of the reversibility of time, due to the perfect equivalence of parts to the whole characteristic of numerical multiplicities. In the case of numerical multiplicities, then, directionality (the "arrow of time") is ontologically irrelevant, an epiphenomenon, since a numerical multiplicity retains its identity whether we put its parts together from back to front or front to back. In other words, reversible time is the idea that reality

[221] Gilles Deleuze, *Bergsonism*, trans. H. Tomlinson and B. Habberjam (Brooklyn: Zone Books, 1988), 40.

[222] Ibid., 41.

would look exactly the same whether we move forward or backwards in time; (a view of time which, we should note, is outdated and disproven by developments in physics, specifically non-equilibrium thermodynamics, which is discussed later in this chapter). The passage of time as a numerical multiplicity thus leads to the conclusion that the arrow of time adds nothing new to reality, a conclusion which Bergson goes to great lengths to criticize in *Creative Evolution*.

On the other hand, for Bergson, duration constitutes a qualitative multiplicity. Deleuze explains that "duration divides up and does so constantly: That is why it is a *multiplicity*. But it does not divide up without changing in kind, it changes in kind in the process of dividing up: This is why it is a nonnumerical multiplicity, where we can speak of "indivisibles" at each stage of the division."[223] Whereas spatialized time differentiates by differences in degree, that is, according to a common metric of discreet segments, duration proceeds by differentiation of differences in kind. Duration is the time of interiority, where moments, rather than being discreet, are blurred into each other; where the past is always accumulating as memory, and whose absence constantly protrudes into the present. Importantly, we should note that "on the one hand, the aspect of space, by which the thing can only ever differ in degree from other things *and from itself* (augmentation, diminution); and on the other hand, the aspect of duration, by which the thing differs in kind from all others *and from itself* (alteration)."[224] Deleuze offers the example of a lump of sugar to illustrate this point. The lump has a spatial configuration that can be measured according to a standard unit of measurement which can then be compared to the extension of any other extended object in space. In this sense, the fact of spatial extension constitutes the lump of sugar's difference in degree from other extended objects. It can differ

[223] Deleuze, *Bergsonism*, 42.

[224] Ibid., 31.

from other objects in degree if we compare their extension in space and we can also divide the lump into multiple pieces such that it differs from itself in degree, but it can always be reconstituted and brought back to its original state. But, Deleuze notes, "it also has a rhythm of duration, a way of being in time that is at least partially revealed in the process of its dissolving, and that shows how this sugar differs in kind not only from other things, but first and foremost from itself."[225] The process that dissolves a lump of sugar cannot be reversed to reconstitute the original lump of sugar. Rather, there is a definite way by which the sugar differs from itself *in kind*, such that the process of dissolving leads to something new. The sugar cube possesses no underlying or enduring essence. Rather, it might be better to use a gerund, "sugaring," rather than a noun, "sugar," to describe how the sugar cube exists in time. There is no sugar in-itself, just a process that temporarily takes the form of a sugar cube and its subsequent dissipation. We can only carve duration into discreet objects retrospectively, but any attempt to think duration without concepts that follow its ceaseless movement and changes in kind, are inevitably prone to spatializing differences in kind, turning them into differences in degree.

The Cinematographic Mechanism of Thought

The fragmenting of duration into differences in degree is characteristic of what Bergson called the 'cinematographic mechanism of thought.' The cinematographic mechanism of thought replaces infinitely varied *kinds* of movement with movement *in general*, whereas the becoming characteristic of duration—its differentiation of differences in kind—is infinitely varied. An analysis of this epistemological model is therefore necessary as it provides some insight into the genesis of western philosophy and science's tendency to prioritize being over becoming in its

[225] Deleuze, *Bergsonism*, 32.

accounts of change. This tendency is a natural result of the objectifying tendency of the human intellect to offer the world up to consciousness in terms of footholds for the intelligent being's potential actions over its environment. I argue that Bergson identifies in the cinematographical mechanism the evolutionary origins of our spatialized conceptions of time and energy. In doing so, Bergson also offers the method of intuition as a solution for thinking becoming on its own terms, rather than having to reduce movement to an aggregate of static moments. We find, then, a path for reconceptualizing energy as change itself. Later, we also see that the dynamic of intellect and instinct resonates with the dynamics of *ressentiment* and science described in the previous chapter.

Here is how Bergson described the epistemological model in question:

> the process [of the cinematographical method] consists in extracting from all the movements peculiar to all the figures an impersonal movement abstract and simple, *movement in general*, so to speak: we put this into the apparatus, and we reconstitute the individuality of each particular movement by combining this nameless movement with the personal attitudes. Such is the contrivance of the cinematograph… We take snapshots, as it were, of the passing reality, and, as these are characteristic of the reality, we have only to string them on a becoming, abstract, uniform and indivisible, situated at the back of the apparatus of knowledge, in order to imitate what there is that is characteristic in this becoming itself.[226]

In other words, the cinematographical mechanism of thought frames movement as the passage of immobile, discreet frames that transition smoothly from one to the other much like the unwinding of a cinematograph that creates a motion picture through the passage of static frames. This is what is meant by becoming in general: it is motion supplemented to the static. However, similar to how Aristotle distinguishes between different kinds of motion, such as *kinesis*, *dunamis*, and *entelecheia*, Bergson makes a distinction between the various kinds of becoming that we encounter in the world. For example, there is extensive movement, referring to the

[226] Bergson, *Creative Evolution*, 332.

motion of extended objects in space. There is qualitative movement, referring to changes in intensive qualities such as changes in color, and there is evolutionary movement, such as the transition from larva to nymph.[227] The cinematographic mechanism extracts from these movements the concept of movement in general, emptying them of the actual, living content that renders these different kinds of movement actually distinct from one another. Duration here is fragmented into a composition of distinct, instantaneous states strung together by an impersonal becoming such as that of the rolling cinematograph, whose motion bears no intrinsic relation to the actual content of the frames it unwinds. This is different, for example, from the evolutionary movement of the larva, whose evolution depends on a plethora of environmental and genetic factors that determine the where, when, and how of the larva's evolution in time. The impersonal time of the cinematograph, on the other hand, is the passage of time entirely emptied from the actual events and relational contexts that determine the becoming of living beings and the world. The frames of the cinematograph represent different states of an empty space that serves as the container for the content that unfolds from one frame to the next. Thus, the cinematographical mechanism of thought as an epistemological model for conceptualizing change works by reproducing mobility out of static moments.

Bergson was critical of the implicit epistemological assumption of the cinematographical mechanism, which claims to see through or behind the flux of nature, grasping that which remains unchanged in time—this is precisely the founding assumption of western philosophy and thus of our genealogy of energy. As Bergson points out, however, this is a misguided assumption. Bergson explains in the final chapter of *Creative Evolution* that the intellect's disposition to responding to the necessities of its environment make it so consciousness, forming

[227] Bergson, *Creative Evolution*, 30.

itself into intelligence, is drawn along lines that are suited to the potential action of our bodies. For Bergson, the intellect needs to project terminal points of action within the flux of its surroundings in order for the intelligent being to be able to function and survive in its environment. Thus, as Pascal Blanchard explains, in Bergson's model of perception "*nous nous renvoyons à nous-mêmes dans la perception le tableau de nos possibilités des actions*."[228] The assumption that philosophy and science work by disclosing the existence of discreet entities in nature, then, is confused because it models truths about reality itself on the needs of human action. Bergson argued that "[t]he essential function of intelligence is therefore to see the way out of a difficulty in any circumstances whatsoever, to find what is most suitable, what answers best the question asked."[229] Bergson elaborates: "all the elementary forces of the intellect tend to transform matter into an instrument of action… [Intelligence] is life looking outward, putting itself outside itself, adopting the ways of unorganized nature in principle, in order to direct them in fact."[230] There is, then, an intimate relationship between intelligence and the cinematographical mechanism of thought. In fact, Bergson argued that the cinematographical mechanism is the "mechanism of our ordinary knowledge,"[231] since intelligence is characterized by the carving of the ceaseless flux of materiality into discreet objects. Modern mechanistic science, then, can be seen as intelligence extending its reach beyond its immediate environment and projecting itself into the whole of nature. Here we have the birth of the modern notion of objectivity, the idea that there are discreet objects that can be known objectively and in-

[228] "We return to ourselves, in perception, the picture of our possibilities for action," (author's translation). Pascal Blanchard, "La métaphysique de la matière," in *Annales bergsoniennes IV* (Paris: Presses Universitaires de France), 511.

[229] Bergson, *Creative Evolution*, 166.

[230] Ibid., 178.

[231] Ibid., 332.

themselves within the flux of becoming, independently of human pathos or bias. This is to be expected, as intelligence pushes the boundaries of what it can know and control beyond its immediate environment and into the totality of the universe, thus taking objectivity as an inherent quality of the totality itself.

On the other hand, thinking duration in-itself requires what Bergson called the method of "intuition," whose condition of possibility depends on the suppression of intelligence by its counter tendency: "instinct." Thus, an understanding of intuition requires some clarification of the relationship of instinct to intelligence.

Vladimir Jankélévitch defined Bergsonism as a "monism of substance and a dualism of tendency."[232] The substance here is duration, i.e., pure temporality. Bergson argued that duration possessed a dual tendency towards materiality/stability and change/novelty, which further corresponds to the dual tendency of matter/consciousness, respectively. Duration manifests an admixture of these tendencies, since we can never reach the limits of one tendency or the other. Similarly, "instinct" corresponds to the tendency to change, and intelligence corresponds to the tendency to materialize. Importantly, Bergson noted that the presence of one indicates the absence of the other, such that wherever instinct is suppressed, there is intelligence, and wherever intelligence is suppressed there is instinct. While instinct is unconscious, for human intelligence there is the possibility of intuition through the suppression of intelligence that leads to a self-conscious form of instinct—intuition. Bergson argued that

> consciousness, in shaping itself into intelligence, that is to say in concentrating itself at first on matter, seems to externalize itself in relation to itself; but, just because it adapts itself thereby to objects from without, it succeeds in moving among them and in evading the barriers they oppose to it… Once freed, moreover, it can turn inwards on itself, and awaken the potentialities of intuition which still slumber in it.[233]

[232] Vladimir Jankélévitch, *Henri Bergson* (Paris: Presses Universitaires de France, 2011), 174.

[233] Bergson, *Creative Evolution*, 200.

We see now that intuition is a result of the refinement of human intelligence by its foil: instinct.

Instinct in its extreme form represents the perfect coincidence of consciousness with action. This squares with the common understanding of a human as being self-conscious and rational. The evolution of human behavior has seemed to follow the path of intelligence to a much greater degree than that of the honeybee, a result of a high suppression of instinct by intelligence. This is because "*the consciousness of a living being* [is] *defined as an arithmetical difference between potential and real activity. It measures the interval between representation and action*".[234] For pure instinct, the arithmetical difference between potential and real activity is null. The great achievement of human intelligence is the greater power of deliberation that it has offered humans to stop before an obstacle and ponder multiple possibilities of action as opposed to behaving almost automatically through instinct. Thus, "while instinct and intelligence both involve knowledge, this knowledge is rather *acted* and unconscious in the case of instinct, *thought* and conscious in the case of intelligence."[235] The method of intuition must then thwart intelligence to a certain extent, whose interaction with the world is mediated by stable concepts and objects, in order re-place the mind within duration.

While intelligence conceives of the contents of duration with symbols external to the objects themselves, intuition leads to "the very inwardness of life […] by intuition I mean instinct that has become disinterested, self-conscious, capable of reflecting upon its object."[236] This task is not impossible for philosophers, as Bergson offers the example of the artist as someone whose task it is to follow intuition into the inwardness of life. Bergson argued that the difference between science and metaphysics traces the distinction between "analysis" and

[234] Bergson, *Creative Evolution*, 160.

[235] Ibid., 160.

[236] Ibid., 194.

intuition, respectively. Bergson defines analysis as "the operation which reduces the object to elements already known, that is, to elements common both to it and other objects."[237] Conversely, metaphysics grounded in the method of intuition is "*the science which claims to dispense with symbols*,"[238] which places the mind within the flux of duration, rather than viewing it from without as scientific analysis does. Therefore, whereas intelligence understands reality by passing from concepts to the objects of experience, intuition moves from things to concepts; it is therefore an attempt to grasp objects from within, rather than forcing them into the ready-made concepts of intelligence. Intuition, then, resists the tendency of intelligence to make reality fit into its neatly delineated and generic concepts. Reconceptualizing energy in terms of duration thus requires an effort akin to the method of intuition described by Bergson.

Bergson and the Critique of Energy

Bergson never attempted to reconceptualize the concept of energy *in toto*, but it is clear in *Creative Evolution* that Bergson did not blindly think of energy as the substance which grounds the objective permanence of the universe. He pointed out that "[t]he law of the conservation of energy would express indeed that *something* is preserved in constant quantity. But there are, in fact, energies of various kinds, and the measurement of each of them has evidently been so chosen as to justify the principle of conservation of energy."[239] What Bergson is pointing to here is the suggested equivalence that thermodynamics makes between various energetic phenomena which, though being different in kind from each other (e.g., heat, electricity, magnetism) are all united under the banner of energy, which levels differences in kind to differences in degree.

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[237] Henri Bergson, *An Introduction to Metaphysics*, trans. T.E. Hulme (Indianapolis: Hackett Publishing, 1999), 24.

[238] Ibid.

[239] Bergson, *Creative Evolution*, 264.

Accordingly, Bergson argued that this traditional conception of energy did not account for the different kinds of phenomena that exist in reality. In his allusion to different kinds of energy, Bergson refers to French physicist and philosopher Pierre Duhem who, in *Évolution de la mécanique* (*The evolution of mechanics*) criticizes the mechanistic reduction of all energetic phenomena to figure and quantity, noting that this reduction is blind to the qualitative features of reality. He claimed that "*nous sommes contraints de regarder comme une qualité premiere et irréducible ce par quoi un corps est chaud, ou éclairé ou électrisé ou aimanté.*"[240] In other words,

> since energy is not merely quantitative but presents qualitative characteristics that cannot be subsumed by its quantification, the principle of the conservation of energy is conventional insofar as it *de jure* applies a common unit of measurement to different kinds of energies, thereby leveling the qualitative differences that exist *de facto* in energetic processes.[241]

This is why Bergson argued that energy cannot express a prior correspondence to an objective permanence or unchanging quantity of a certain substance. Rather, the conservation of energy only expresses the fact that every change is counterbalanced by a change moving in the opposing direction.[242] This would imply that the fact that we are able to quantify certain phenomena mechanically, in terms of the conservation of energy, does not imply that all processes in nature are mechanical. This is clear if we recall Bergson's analogous distinctions between differences in degree vs. differences in kind, and spatialized time vs. duration, respectively. These distinctions

[240] "We are forced to regard as a first and irreducible quality that by which a body is warm, or illuminated, or electrified, or magnetized," (author's translation). Pierre Duhem, *Évolution de la Mécanique* (Paris: Librarie Scientifique A. Hermann, 1905), 197-198.

[241] Pedro Brea, "Critique of the Concept of Energy in Light of Bergson's Philosophy of Duration," *Thaumàzein – Rivista di Filosofia* 12(1).

[242] Bergson, *Creative Evolution*, 264-265.

remind us not to the relegate non-extensive aspects of phenomena to being secondary qualities to extension and movement.

Unlike the first law of thermodynamics, Bergson did not think that the second law (that the entropy of the universe increases with time) depended on convention or utilitarian artifice. It stipulates that all physical changes have the tendency to be degraded into heat and that this heat tends to be diffused in a uniform manner. Bergson claimed that the second law of thermodynamics is "the most metaphysical of the laws of physics since it points out without interposed symbols, without artificial devices of measurements, the direction in which the world is going."[243] Thus, whereas the first law depends on the conventional leveling of non-extensive aspects of matter to secondary qualities, thereby reducing differences in kind to differences in degree, the second law traces the flow of duration itself; the tendency for energetic processes to be degraded into heat does not depend on artifice or convention. Bergson's observations regarding the connections between entropy and life anticipated and helped inspire the work of Nobel Laureate Ilya Prigogine, who found that entropy—rather than being the arrow that 19th century thermodynamics believed pointed to the degradation of all complex forms in nature towards the heat death of the universe—can actually be productive of organized and dynamic forms in open, non-equilibrium thermodynamic systems with a constant energy input (such is the case for living beings, for example). Bergson anticipated this difference between entropy in closed systems (*à la* 19th century thermodynamics) and open, far-from equilibrium thermodynamic systems. He argued that what distinguishes life from sheer materiality is "that life is possible wherever energy descends the incline indicated by [the second law of

[243] Bergson, *Creative Evolution*, 265.

thermodynamics] and where a cause of inverse direction can retard [sic.] the descent."[244] Here, Bergson points to the fact that energetic flux does not always point in the direction of degradation but can lead to the creation of organized and dynamic structures—and life is precisely the kind of thermodynamic system that evolves towards higher degrees of novelty and organization. However, we should note that this does not imply that life forms violate the second law of thermodynamics. Although it is true that the maintenance of life is only possible by reducing entropy locally (what Bergson meant by the ascent of the decline indicated by the second law), this must be compensated by an even greater increase in the entropy of the life form's external environment, meaning that the total entropy of the universe still increases despite the creation of local pockets of higher organization and lower entropy.

It is clear that Bergson was critical of the energy discourse of his time, given his insistence that there are differences in kind between different energetic processes and not just differences in degree, as well as his critical insight that living beings oppose the incline indicated by the second law of thermodynamics. Although he did not go as far as to attempt a complete upheaval of the concept of energy, it is one of the essential arguments of this project that his philosophy of duration does pave the way for this kind of work. Discussing the problem of the origin of energy and motion in the universe, Bergson argued that

> the problem remains insoluble as long as we keep on the ground of physics, for the physicist is obliged to attach energy to extended particles, and, even if he regards the particles only as reservoirs of energy, he remains in space: he would belie his role if he sought the origin of these energies in an extra-spatial process. It is there, however, in our opinion, that it must be sought [267].

Here, Bergson criticizes the physicists' concept of energy on the grounds that the idea that energy is somehow supplemented to particles represents the spatialization of motion (i.e., the

[244] Bergson, *Creative Evolution*, 279.

external supplementation of motion to static, passive matter).[245] The idea that energy or motion is something supplemented to passive matter is a result of human intelligence's carving of discreet objects in an empty space within the flux of duration. If we assume that nature is constituted by objective entities, movement is then inevitably seen as a supplement to their extension in space. Once we recognize this, however, the position that movement or energy is something supplemented, and thus external to matter, becomes untenable. If time reigns supreme, if all that can be said with certainty of nature is that it is a process of ceaseless flux, then we must recognize that the lines projected by human intelligence on to duration are merely footholds for our potential action over matter. We finally reach the conclusion, then, that energy and matter must be reconceptualized as pure flux, and not that which remains conserved or unchanged through time. Thus, Bergson's work offers us an invitation to reconceptualize energy as process, as change itself.

Bergson's criticism of the ontological priority given to the idea of constancy through change that is prevalent in the history of western philosophy and science complements our analysis of the genealogy of energy in the first chapter in that it identifies the cinematographic mechanism of thought as the epistemological model responsible for grounding energy concepts in constancy rather than change. Bergson's analysis of the cinematographic mechanism of thought in *Creative Evolution* critiques the assumption that mobility can be derived from the immobile; temporality from spatiality. Bergson identifies the origin of this epistemological bias in the suppression of instinct by the intellect, where the latter possesses the tendency to carve discreet objects out of duration, which indicate footholds for human action over our

[245] Quantum field theory (QFT) has moved beyond this difficulty and in fact conceptualizes sub-atomic particles as energetic excitations of quantum fields.

environment, offering to consciousness a world of static objects. From the cinematographic mechanism of thought we inherit a spatialized conception of energy, where energy is the motion supplemented to passive matter, and whose direction in time is determined by the arrow of entropy that points the universe to an eventual heat death. What we find at the birth of modern energetic cosmology introduced by Lord Kelvin and Clausius, then, is that energy is an eternally self-same quantity of motion, in accordance with the first law of thermodynamics. Energy is always in flux with a definite direction in time indicated by the second law of thermodynamics, which leads to the dissipation of free (i.e., useful) energy over time, since the universe must always move from lower to higher states of entropy. Lord Kelvin's 19th century thermodynamic cosmology, where time indicates the march towards heat death and the degradation of God's creation, is oddly reminiscent of the descent in levels of reality from perfection to nothingness that we find in Greek metaphysics, the modern iteration resulting from modern physics' incorporation of time as a physical variable in its description of the universe.

Indeed, Bergson noted that the idea of the degradation of divine perfection to nothingness, which is implicit in 19th century thermodynamic cosmology, is already present in Greek philosophy—from Plato to Plotinus—and laid bare in Aristotle's theology, where the latter's description of the essence of the Unmoved Mover is *energeia.* Referring to the Unmoved Mover, Bergson argued that the characterization of the essence of the Unmoved Mover as *energeia* grounds change in the immutability of an eternal, fully actual contemplation: "[a] perpetuity of mobility is possible only if it is backed by an eternity of immutability, which it unwinds in a chain without beginning or end."[246] However, we should note that modern energy is a distorted form of Aristotle's account of *energeia*. Early energy science paints a picture of the

[246] Bergson, *Creative Evolution*, 353.

universe where the actuality of energy is reduced to the conservation of its quantity of motion over time. On the other hand, Aristotle's distinction between *energeia*, *kinesis*, and *dunamis*, suggests he meant to account for differences of kind and motion. Nevertheless, referring to the first law of thermodynamics, Cara Daggett argues in her genealogical study of energy that:

> the conservation of energy reflects the scientists' desire to know and understand the world, which requires that the world is know-*able*. Energy points to the enduring faith in nature as divinely designed to be accessible to human perception. In order to be knowable, the world must have some constancy through time—pure, random chaos would mean prediction and calculation are impossible.[247]

Daggett's claim supports the conclusions of Bergson's analysis of the dynamics of intelligence and intuition, whereby the suppression of instinct by intelligence offers the world to human perception in terms of static footholds for action which we perceive as objective entities. Furthermore, Bergson's analysis of the cinematographical mechanism of thought gives us conceptual tools to interpret the genealogy of energy as the history of attempts to spatialize time by deriving mobility from the immobile. This realization paves the way for the project outlined by Clayton Crockett, and taken up in this study, of reconceptualizing energy as change itself,[248] rather than the immutable 'something' whose flux is responsible for movement in the cosmos.

The project of thinking energy as change itself requires that we bring this concept into the Bergsonian domain of duration. Insofar as modern energy, grounded in a spatialized conception of time, arises in the context of the mechanistic/materialistic worldview of modern science, it

[247] Cara Daggett, *The Birth of Energy* (Durham: Duke University Press, 2019), 41-42.

[248] "We cannot change our nature. It is fixed, immutable, a death sentence; just like life. We have to change our nature, but that is impossible. *But what if our nature is change?* That is the thesis of this book. We talk about change, but what if we do not really understand change? In material terms, change and transformation are connected to the flow of energy. Our lives and activities depend on energy, but what is energy?" Clayton Crockett, *Energy and Change* (New York: Columbia University Press, 2022), 17.

remains at the limit of duration's tendency to materialize.[249] Within duration—characterized by the swelling of the past into a present that is "absolutely new"[250]—materiality is the point at which the past loses its connection to the present, and duration is decomposed into pure spatiality; the simultaneity of frames/states which are characteristic of the cinematographical mechanism. Bergson argued that at this limit, "we get a glimpse of an existence made of a present which recommences unceasingly—devoid of real duration, nothing but the instantaneous which dies and is born again endlessly."[251] (This should recall the discussion of the eternal "now" in the previous chapter). This is the limit near which we encounter energy discourse. I say near because even at the smallest scales all we seem to find are fluctuations of energy, a point which is not lost on Bergson when he notes that matter, though tending toward perfect spatiality, never quite reaches that limit: "[i]s the existence of matter of this [perfectly spatial] nature? Not altogether, for analysis resolves it into elementary vibrations, the shortest of which are of very slight duration, almost vanishing, but not nothing."[252] It is therefore human intelligence that projects a Cartesian space and material causality onto the whole of duration, and this for the sake of control over natural processes. Geometric Cartesian space is not a representation of space as it is but, rather, a representation of the limit at which duration tends towards perfect spatiality, that is, the perfect juxtaposition and mutual independence of distinct objects which we associate with impenetrable matter. Barry Allen provides a very clear elucidation of this point: "[t]ime becomes

[249] I am referring here to the characterization of Bergsonism above as a monism of substance and a dualism of tendencies toward matter and consciousness.

[250] Bergson, *Creative Evolution*, 219.

[251] Ibid., 220.

[252] Ibid., 220.

spatial as it loses interpenetration with the past, and space becomes temporal as it loses externality and begins to interpenetrate."[253]

I want to be explicit about how space and time differ in my account, so I am not taken to be positing a transcendental notion of energy apart from space and time, or a strict dualism between space and time. It is helpful here to point to what I see as similarities between Bergson's account of the genesis of matter and Karen Barad's theory of 'agential realism.'

In Barad's account of agential realism, they deny the representationalist model of philosophy and science which posits an atomistic world of discrete entities, whose identities or essences preexist their relations with other relata; a model which frames thought and language as the "power… to represent preexisting things."[254] Rather, building on physicist Niels Bohr's idea of complementarity, Barad (a theoretical particle physicist by training) wants to show that agents do not ontologically precede their relations: "relata do not preexist relations; rather, relata-within-phenomena emerge through specific intra-actions. Crucially then, intra-actions enact *agential separability*—the local condition of *exteriority-within-phenomena*."[255] Barad offers the concepts of 'intra-action' and 'agential separability' in opposition to the representational ontology that posits an inherent distinction between subject and object, where the identity of the thinking subject with herself, and objects with inherently determinate boundaries, are already assumed prior to the subject-object relation. For Barad and Bohr, the basic units of ontological analyses are not discrete objects, but 'phenomena,' in the technical sense that the observer and experimental apparatus must be taken into account in the act of observation, rather than being

[253] Barry Allen, *Living in Time: The Philosophy of Henri Bergson* (Oxford: Oxford University Press, 2023), 36.

[254] Karen Barad, *Meeting the Universe Halfway: Quantum Physics and the Entanglement of Matter and Meaning* (Durham: Duke University Press, 2007), 133.

[255] Barad, 133.

effaced and constructing an illusion of perfect objectivity. In this view, the observer and the experimental apparatus form an inextricable part of the phenomenon in question, as discovered by Bohr and other scientists in their study of quantum phenomena. Bohr noted that concepts such as 'position' or 'momentum' did not ontologically preexist measurement, but were given meaning through the constraints (agential cuts) enacted by the measuring agencies, that is, the physical constraints of the experimental apparatus imposed by the scientist, which constrains, for example, whether a photon can be observed as a particle or a wave. Thus, by 'intra-agencies' Barad attempts to show how objectivity and significance can arise from agential cuts-within-phenomena, without assuming a Cartesian dualism where relata are always already ontologically given. This process, for Barad, is how matter (and energy, if we consider the equivalence of matter and energy posited by Einstein) comes to matter; how matter, rather than being a passive receptacle for action, is intra-active, in that space and time do not preexist the material entanglements of intra-active matter, but emerge and are given significance through material intra-actions, which constitute relational contexts of significance as a function of agential cuts enacted within phenomena. This is what Barad refers to as 'spacetimemattering.'

Similarly, for Bergson, time and space are not empty receptacles for matter/energy. Rather, where Barad looks to the concept of spacetimemattering to describe how objects and meaning can emerge from agential cuts enacted *within* the primary ontological unit of the phenomenon, Bergson describes space and matter as tendencies emerging immanently within duration (we should think here again of Jankélévitch's description of Bergsonism as a monism of substance and dualism of tendency). In this view, discreet material entities are not ontologically given. Rather, as we have seen, it is the function of intelligence to offer the world up to consciousness along lines of utility and potential action for the intelligent being. *In other words,*

Bergson, like Barad, held the view that the lines that delineate seemingly discrete material things from one another do not preexist their relations with a subject, but arise and are given meaning within a wider contextual field of significance which inextricably includes the observer and other measuring agencies. Furthermore, for Bergson, space and its contents are not divorced from time, since the former only represents a limit where, as Allen noted, time loses its interpenetration with the past; where the attenuation of extension in time leads to a temporal relaxation that results in spatial extension. Energy and matter, on this view, materialize the dynamic becoming of duration, working at the limit of duration's tendency to materialize.

The implication of Bergson's account of the genesis of matter is that, similar to how Newtonian physics became only a special case of relativity theory, expanding the concept of energy into the sphere of duration would imply that modern energy—what Adam Briggle would call the "energy orthodoxy"[256]—is only a special case within the wider context of duration. Expanding the concept of energy to account for a broader set of phenomena, such as those involving differences in kind and not just the mechanical movement of matter (i.e., memory and thought), would require incorporating historicity into energetic flux. Because duration is characterized by the novelty of forms resulting from the creative evolution of the past that swells into the present, the process of creative repetition associated with the flow of duration is the only thing that can be said to be constant in time. In other words, change is the only constant, a claim that reminds us of Nietzsche's eternal return, where becoming is stamped with the seal of being. However, before comparing Bergson's criticism of spatialized time with Nietzsche and Heidegger's ideas on *ressentiment* and the rancor against time, I would like to call attention to how Bergson's philosophy, rather than being hostile to science, has inspired and even anticipated

[256] Adam Briggle, *Thinking Through Climate Change* (Cham, Switzerland: Palgrave Macmillan, 2021).

developments in 20th century science, indicating the fruitfulness of his work for rethinking essential scientific and metaphysical concepts such as energy.

Bergson's Influence on Contemporary Physics

The general lack of recognition of Bergson's criticism of classical physics both in the world of academic philosophy and physics is perplexing, to say the least, given Bergson's prescience regarding the direction which classical physics would take in the 20th century. This is especially so in relation to quantum physics and non-equilibrium thermodynamics, and how these fields have changed the way physicists think about matter and time. In this section, I briefly discuss the influence of Bergson on two Nobel prize-winning scientists: Louis de Broglie (physics, 1929) and Ilya Prigogine (chemistry, 1977). Both men found in Bergson's philosophy of duration insights that were ahead of their time, and which influenced their own views on the nature of physical reality. I end with a brief note on Bergson's confrontation with relativity, epitomized by his public debate in Paris with Albert Einstein in 1922.

Gunter notes that, towards the end of nineteenth century physics, it was widely held that "it was possible to show both how many kinds of ultimate particles exist and what are their characteristics. Physics was able to demonstrate not only the nature of the ultimate entities in nature but to classify them in detail."[257] With the prevailing atomistic worldview and the development of the periodic table, the idea that the ultimate entities (fundamental building blocks) of reality could be known and understood according to the laws of classical physics held sway over the *zeitgeist* in the late nineteenth century. There was the sense towards the end of this century that Newtonian physics, along with thermodynamics, the theory of electromagnetism,

[257] Gunter, *Getting Bergson Straight*, 103.

and chemistry, could account for virtually all observable material processes; the task of the physical sciences henceforth would be simply to iron out the details of these theories. Bergson, however, was one of the few thinkers who anticipated the eventual upheaval of classical physics in the twentieth century.

Louis de Broglie

Louis de Broglie was a French theoretical physicist and key contributor to the development of quantum mechanics in the early twentieth century. In his doctoral thesis of 1924, he proposed that electrons are wave-like in nature, rather than being point-particles, leading to the conclusion that all matter possessed wave-like behavior. For this discovery, in 1929 he received a Nobel Prize in Physics. De Broglie's findings famously helped lead Erwin Schrödinger to his formulation of the wave equation, inaugurating the study of what came to be known as 'wave mechanics.' De Broglie's work also lent credence to Bergson's attacks against the spatialization of matter, and it is no coincidence that de Broglie himself was an admirer of Bergson's ideas. Bergson held that matter "cannot be represented as an aggregate of discrete, static particles having absolutely precise location."[258] Bergson's position was vindicated by the wave-like, probabilistic nature of matter that was found by quantum mechanics, as de Broglie's work helped show.

In 1947, de Broglie published an essay translated as "The Concepts of Contemporary Physics and Bergson's Ideas on Time and Motion" in his book *Physics and Microphysics*, where he remarks that "we have been struck by the analogy between certain new concepts of

[258] Louis de Broglie, "The Concepts of Contemporary Physics and Bergson's Ideas on Time and Motion," in *Bergson and the Evolution of Physics*, ed. and trans. P.A.Y Gunter (Knoxville: University of Tennessee Press, 1969), 45.

contemporary physics and certain brilliant intuitions of [Bergson's] philosophy of duration."[259] Although de Broglie is careful not to go as far as to claim that Bergson had discovered certain principles of quantum mechanics, he is quick to refer to the fact that Bergson's attack on the spatialization of time and matter presaged developments in the study of wave mechanics by forty years. De Broglie focuses especially on foregrounding Bergson's claim that human intelligence misrepresents the nature of time, as well as the affinity between Bergson's belief in the fundamentally temporal nature of reality with Heisenberg's uncertainty principle. Referring to the latter, de Broglie wrote that one "of the most important results of the development of the new quantum and wave mechanics has been to demonstrate the impossibility of simultaneously attributing to an elementary particle a well-defined state of motion and an entirely determinate position."[260] In other words, if we measure the actual value of a particle's momentum, we lose all information about its location in space, and vice-versa. This phenomenon is a result of wave-particle duality, where it has been found that whether a quantum entity, such as a photon, is observed as a wave or a particle, depends on the structure of the experimental apparatus, as I noted above in the discussion of Barad's agential realism (we should note that, according to Niels Bohr, the concept of a 'wave' in wave mechanics "represents motion in a pure state with no spatial location."[261]) However, on the macroscopic scale of reality[262] in which humans dwell, de Broglie notes that

> [b]y contrast, if one makes only macroscopic observations, experimental uncertainties and the imperfections of our senses can give us the *illusion* of simultaneously knowing

[259] De Broglie, 46.

[260] Ibid., 52.

[261] Ibid., 54.

[262] This is not to say that quantum phenomena cannot be observed at the macroscale. The energy emitted from the Sun comes from nuclear fusion, which would be impossible without quantum tunneling. Lasers rely on the phenomena of stimulated emission to emit a coherent beam of light. Quantum entanglement has been measured to occur between very large distances—much greater than the order of the Planck length.

> the position and momentum of a particle… But this will be only an approximative image and, if we can analyze things more precisely by measuring positions with more precision, we can now grasp only a succession of localizations between which the motion will escape us.[263]

The fact that we experience a world of seemingly solid, discreet objects is thus due to the lessening of quantum mechanical effects at an anthropogenic scale, an illusion intensified by the interaction of human perception with its environment, a claim that should remind us of Bergson's claim that human intelligence offers duration up to consciousness in terms of static objects. We have found that the more we increase our resolution of the fundamental entities of reality, the more we seem to encounter mobility and uncertainty, rather than solid, predictable structures.

It is of utmost importance that we note here that the uncertainty of the Heisenberg relation is ontological, not epistemic. That is, it is not that a quantum entity is already a wave or a particle beforehand and that the measurement reveals this hidden information. Rather, a quantum entity like an electron or a photon is fundamentally undetermined with regard to its being a wave or a particle prior to measurement.[264] Before observation, a quantum entity exists in a probabilistic superposition of states—it is both a wave and a particle. Its future is not determined, but probabilistic; we can only know the probability of finding a quantum entity at a particular time and place, but we can never with absolute certainty predict where we will measure it. Quantum mechanics thus discloses a world where the fundamental constituents of reality are not solid, impenetrable atoms that move according to the determinism of classical physics. Rather, quantum entities are wave-like, superposed, and probabilistic; their future is open, rather than closed like the deterministic universe of classical physics. We hear the ring of Bergson's words

[263] De Broglie, 53.

[264] This was proven by what physicists call the "Bell Test," named after American physicist John Bell.

from *Matter and Memory*: "the nearer we draw to the ultimate elements of matter… [the more we will observe] the vanishing discontinuity which our senses perceive on the surface."[265]

Thus, there are three main points of affinity that de Broglie identifies between Bergson's philosophy of duration and quantum physics: 1) the overcoming of the problem of mobility and localization that we find in matter; 2) the rejection of atomism, i.e., that the ultimate entities of reality are discreet and infinitely hard; 3) that duration is fundamentally incomplete in that its flow consists of a "hesitation" between alternative choices, rather than predetermined results. Gunter writes that "[t]he most fundamental feature of Louis de Broglie's essay on Bergson is its acceptance of the Bergsonian problematic: that there is a dramatic contrast between the mobility of things and our mathematical description of them."[266] Both Bergson and quantum physics affirm that reality is not constituted by solid point-like particles. When we make this latter assumption, we substitute discrete mathematical entities for actual duration. However, as Bergson had predicted, the closer we have gotten to the ultimate constituents of matter, we have discovered that quantum entities, and indeed all matter, exhibit a continuous, wave-like behavior; that they overlap with each other and dissolve the continuity associated with discreet, solid objects. Furthermore, the time of quantum physics is one where the future is undetermined, and therefore open to infinite possibilities. Regretting that Bergson did not get to study quantum physics in detail, de Broglie wrote that, given the chance, Bergson would "doubtless have observed with joy that in the image of the evolution of the physical world which it offers us, at each instant nature is described as if hesitating between a multiplicity of possibilities, and he

[265] Allen, 101.

[266] Ibid.

would doubtless have repeated, as in *The Creative Mind*, that "time is this very hesitation or it is nothing."[267]

Ilya Prigogine

Prigogine was a Russian-Belgian chemist who won the Nobel Prize in 1973 for his work on dissipative structures within the field of non-equilibrium thermodynamics. Before giving a general overview of his scientific work, I would like to call attention to Prigogine's life-long interest in the relationship between science, philosophy, and time. In *The End of Certainty*, Prigogine shares a sentiment shared by the author of this present work: "[t]he dream of my youth was to contribute to the unification of science and philosophy by resolving the enigma of time."[268] Unlike many before him who either rejected philosophical speculation outright or, conversely, avoided a confrontation with the sciences at all costs, Prigogine set out to bridge the gap between science and philosophy. Regarding his philosophical interests, Prigogine displayed an admiration for the process philosophies of Bergson and Alfred North Whitehead. He rejected (as did Bergson) the Kantian rift between positivistic science on the one hand and philosophy, concerned with freedom and ethics, on the other.[269] Prigogine's wager was that non-equilibrium physics and process philosophy offered a path towards the unification of scientific and philosophic speculation of temporality; his work on dissipative structures attests to this belief.

Before explaining dissipative systems, it helps to explain the shift from equilibrium to non-equilibrium thermodynamics. The nineteenth century theory of thermodynamics covered in the first chapter is in the domain of equilibrium thermodynamics. Equilibrium thermodynamics

[267] De Broglie, 57.

[268] Ilya Prigogine, *The End of Certainty* (New York: The Free Press, 1997), 72.

[269] Ilya Prigogine and Isabelle Stengers, *Order out of Chaos* (New York: Bantam Book, 1984), 89.

involves closed systems (i.e., a system isolated from its environment). Closed systems tend to thermal equilibrium, meaning that there occurs a reduction of the thermal gradient generated by a difference in temperature. The entropy of a closed system tends towards its maximum as the system acts to reduce the temperature gradient and homogenize the temperature distribution of the system—thermal equilibrium. One of the problems with equilibrium thermodynamics is that it only works for idealized cases, since closed systems are the exception not the rule in nature. Clayton Crockett points to the apparent incompatibility of equilibrium thermodynamics with another groundbreaking scientific theory of the nineteenth century: evolution.[270] This is due to the fact that the concept of entropy, as it was conceived in equilibrium thermodynamics, associated the passage of time with the degradation of organization and form. And yet, we observe precisely the opposite in the evolution of life, which seems to run counter to the direction of entropy towards higher degrees of organization and complexity. Schrödinger referred to life's ascent of the ladder of entropy by the term "negative entropy."[271] The apparent dissonance between entropy and evolution is dispelled by non-equilibrium thermodynamics, and this is where Prigogine comes in.

One of the innovations of non-equilibrium thermodynamics is that temperature gradients are no longer considered fundamental for the flow of energy. Gradients can be set up by pressure or chemical reactions, for example. What is important here is not so much what kind of gradient is set up, but that there is a gradient to be minimized. One of the great innovations of non-equilibrium thermodynamics is that, whereas the reduction of gradients in equilibrium thermodynamics is associated with homogenization and degradation, "in special cases in systems

[270] Crockett, 51.

[271] Erwin Schrödinger, *What is life?* (Cambridge: Cambridge University Press, 1992), 71.

that are not in a state of equilibrium, the flow of energy and the reduction of gradients produces and sustains patterns, forms, and structures."[272] It is also important to add that these systems are not closed, but open, with a constant input of energy flowing into the system. Biological life is an example of this kind of open, non-equilibrium thermodynamic structure. Prigogine called these thermodynamic systems dissipative structures. Whereas near equilibrium thermodynamics "predicts that from increasing energy exploitation there can only be two results: crystallization… or turbulence,"[273] in the case of dissipative structures, gradient reduction (i.e., entropy maximization) leads to self-organizing, dynamic structures. It turns out that these self-organizing thermodynamic systems are more efficient at maximizing entropy (i.e., gradient reduction) than near-equilibrium isolated systems. Referring to the work of Eric D. Schneider and Dorian Sagan in *Into the Cool*, Crockett notes that non-equilibrium thermodynamics leads to a new conceptualization of entropy, where the definition of the second law is no longer limited by the degradation of free energy and the establishment of thermal equilibrium that is characteristic of closed systems, but the reduction of gradients, which need not be thermal but can also be, for example, barometric or chemical.[274] In other words, non-equilibrium thermodynamics reveals a dual aspect to entropy. Whereas in closed, near-equilibrium systems the second law of thermodynamics leads to homogenization and disorder, in dissipative systems the production of dynamic order is a consequence of maximum entropy production.

Prigogine claimed that "[t]he results of nonequilibrium thermodynamics are close to the views expressed by Bergson and Whitehead. Nature is indeed related to the creation of

[272] Crockett, 50.

[273] Gunter, 75.

[274] Crocket, 52.

unpredictable novelty, where the possible is richer than the real."[275] This vindicates Bergson's essential claim that the passage of time is synonymous with emergent novelty, against mechanistic and classical teleological theories of nature where the effect is already contained in the cause;[276] where the new is simply a rearrangement of the parts of a whole that is given *a priori*. Non-equilibrium thermodynamics also clarifies Bergson's claim alluded to above that life ascends the decline indicated by the second law of thermodynamics. Non-equilibrium thermodynamics tells us that life is indeed characterized by a local decrease in entropy, but that this is a consequence of the second law of thermodynamics leading to different kinds of structures in an open system with constant energy flow versus a closed system near thermal equilibrium.

Dissipative structures are proof that one need not posit a schism between matter on the one hand and intelligence or life on the other. Life is immanent to material reality, as is characteristic of Bergson's monism of substance and dualism of tendency. The dualism of tendency that Bergson posited seems closely related to the dual aspect of the second law of thermodynamics, leading to degradation of form on the one hand, and complex, self-organizing structures on the other.

The Einstein/Bergson Debate

Here, I would like to quickly point to what is probably the most high-profile encounter between Bergsonism and contemporary physics, which occurred in 1922 when Bergson was asked to debate Albert Einstein at the *Société française de philosophie* in Paris. As historian of

[275] Prigogine, 72.

[276] Prigogine endorses Bergson's view on this point: "[a]s Bergson emphasized… both the technological model and the vitalist idea of an internal organizing power are expressions of an inability to conceive evolutive organization without immediately referring it to some preexisting goal," Prigogine and Stengers, 174.

science Jimena Canales notes, it is hard to understate the importance of this event for the often inimical institutional relationship between physics and philosophy, science and the humanities, in contemporary academia—an enmity foreshadowed in Einstein's famous quote from the debate that "the time of the philosophers does not exist."[277] What was at stake in this debate was the nature of time itself: is time what the physicist measures with clocks by the variable *t*, or does our experience of the passage of time also say something essential to the nature of temporality? Bergson, of the latter opinion, objected that Einstein's theory of relativity, though scientifically sound, had led the physicist to make erroneous metaphysical assumptions about what time is by reducing it to what clocks measure. Bergson's objections were so consequential that, besides leading to the fateful debate in 1922, Bergson's challenge to relativity had been cited by the chairman of the Nobel Prize committee as contributing to Einstein receiving the 1921 Nobel Prize in physics for his work on the photoelectric effect, not relativity. Svante Arrhenius, chairman of the Nobel Committee for Physics at the time, noted in his presentation of Einstein's Nobel Prize that Einstein had become well-known for his work on relativity, but that relativity "pertains to epistemology" rather than physics, and almost in the same breath Arrhenius says that it is "no secret that the famous philosopher Bergson in Paris has challenged this theory."[278] I think it is important to briefly sketch the details of this confrontation and its repercussions to show that we should be skeptical of giving physics the final word in our understanding of time,

[277] "Il n'y a donc pas un temps des philosophes." Jimena Canales, *The Physicist & the Philosopher: Einstein, Bergson, and the Debate That Changed Our Understanding of Time* (Princeton: Princeton University Press, 2015), 5. Canales' citation for the quote is as follows: "La Théorie de la relativité: séance du 6 avril 1922," *Bulletin de la Société française de philosophie* 22, no. 3 (1922). Rephrased as "More Einsteinian than Einstein" in Henri Bergson, *Durée et simultanieté: á propos de la théorie d'Einstein*, ed. Élie During, 4th ed. (Paris: Presses Universitaires de France, 2009), 55.

[278] Svante Arrhenius, "Award Ceremony Speech," Nobelprize.org, Nobel Prize Outreach AB 2024, Accessed: April 17, 2024, https://www.nobelprize.org/prizes/physics/1921/ceremony-speech/.

and how it would be a mistake to dismiss Bergson's work as antithetical to physics, as many of Einstein's supporters defended.

Canales notes that Einstein's theory of relativity dismissed the idea that there was a single universal time within which the universe and the entities within it endure. "Einstein's special relativity work dispensed with these prior notions [of a single universal time] since it was based on the variables of t_1 and t_2, which could be expanded in an infinite series represented by t_n… time could be described perfectly by simple recourse to clocks."[279] Relativity physics posits that the passage of time is relative to the inertial reference frame of an observer. Whereas the idea of a single universal time puts forward the view that all events in the universe happen simultaneously at the same universal moment of time *t*, one of the consequences of the theory of relativity is that the concept of "simultaneity" needed to be revised: "[r]elativity scientists argued that our common conception of "simultaneity" needed to be upgraded: two events that seemed to occur simultaneously according to one observer were not necessarily simultaneous for another one."[280] A classic example is that of two observers, one on a train and one on the platform, observing a bolt of lightning strike the moving train. According to the equations of special relativity, the observers will not see the lightning strike in the same moment of time *t*. Rather, one will observe the lightning strike at a certain time t_1 and the other at another time t_2. Which time, then, actually refers to real time? "According to Einstein, *both*—that is, all frames of references should be treated as equal. Both quantities referred equally to time."[281] There is no single privileged moment of time, only the time that is measured by a clock relative to an inertial frame of reference. The logical consequence of this view, as I have alluded to already, is

[279] Canales, 221.

[280] Ibid., 11-12.

[281] Ibid., 11.

Eisntein's block universe, which contains all events—past, present, and future—and where each observer moves through this four-dimensional block universe (with time added as a fourth axis to the three spatial dimensions) according to their worldline, and thus can only ever measure time relative to their own clock. But the clock of an individual observer is no better at telling time than any other, since the succession and simultaneity of events is entirely relative to the observer, and no observer's time possesses any more or any less reality than any other. The passage of time in the block universe is finally revealed to be an illusion. As de Broglie notes,

> events in their entirety will in some manner be given a priori: it will only be through a sort of infirmity of our means of perception that we will discover them successively in the course of our own duration. Such a purely static vision of the universe, which excludes all novelty and spontaneity, Bergson always rejected with the greatest energy.[282]

Simultaneity in Einstein's relativistic universe is thus sacrificed at the level of individual observers, but preserved in the form of a static simultaneity from the perspective of the block universe in its entirety, where past, present, and future are always already given.

The concept of simultaneity is so important for understanding the Bergson/Einstein debate that Bergson titled the book, in which he gave a detailed reply to Einstein's metaphysical conclusions from the theory of relativity, *Duration and Simultaneity*. Here, Bergson stressed that he had no qualms with the physics or mathematics of relativity, but with the metaphysical conclusions regarding the nature of time that some of the theory's proponents had advocated. Bergson wrote that "[a] confusion seemed to have arisen, not in the case of Einstein himself, to be sure, nor among the physicists who were making use physically of his method but among some who were giving this physics, just as it stood, the force of a philosophy."[283] The crux of

[282] De Broglie, 50.

[283] Henri Bergson, *Duration and Simultaneity*, trans. Leon Jacobson (Indianapolis: Bobbs-Merrill Company Inc., 1965), 6.

Bergson's argument in *Duration and Simultaneity* has to do with the twin paradox, a thought experiment based on the mathematics of relativity, where one twin (A) remains on Earth, while the other (B) travels away from the Earth on a spaceship close to the speed of light. Upon returning from their space voyage, twin B is concluded to have aged less than twin A, due to the significant effect of time dilation, which occurs at speeds close to that of light, and causes the clock in twin B's reference frame to move slower than twin A's clock on Earth. Bergson did not deny that these clocks, once in sync, would no longer show the same time once twin B returns to Earth. Rather, Bergson refused to identify time *as such* with the variables t_1 and t_2 measured by the twins' clocks.

Bergson's point is that t_1 and t_2 are purely symbolic; they do not refer to the passage of time as it is actually lived by twin A and twin B (Bergson uses Peter and Paul, respectively, for his example). This is because from the perspectives of Peter and Paul, they experience their own reference frames as inertial, meaning that the dilated time measured by one twin relative to another is purely symbolic, and is not the actual time lived by the traveling twin within their own reference frame. Bergson explains this well:

> If we consider the time which the physicist Peter, situated in S, attributes to system S', we see that this time is, indeed, slower than the time recorded by Peter in his own system. The former time is therefore not lived by Peter. But we know that it is not lived by Paul either. It is therefore not lived by either Peter or Paul… when Peter attributes a slowed time to Paul's system, he is no longer thinking of Paul as a physicist or even a conscious being. He is emptying Paul's visual image of its inner, living consciousness, retaining of the person only its outer envelope (it alone, in fact, is of interest to physics).[284]

Thus, the slowed time of Paul in relation to Peter is the one measured when Peter takes Paul as an object of observation relative to his own reference frame; it is not the passage of time as experienced by Paul as a living subject. Thus, even though one of the central postulates of

[284] Bergson, *Duration and Simultaneity*, 71-72.

relativity is that there is no privileged reference frame, we are always forced to take up, and thus privilege, one inertial reference frame whenever we want to make a measurement. Thus we are forced to introduce an immobility into nature from which to measure relative motion. For Bergson, the introduction of this immobility into nature pointed to the cinematographic epistemology of relativity. The effects of time and length dilation thus observed from Peter's inertial reference frame on Earth is a symbolic representation of Paul, who does not experience his own time in this way. For Bergson, though there are a multiplicity of flows of time, such as the difference in the flow of time as experienced by Peter and Paul, these multiplicities must coexist within a single, universal Time. Time (with a capital T, as opposed to the lower case time of t_1 and t_2) for Bergson, is the duration which contains the multiplicity of times within a virtual whole: "[t]here is only one time (monism), although there is an infinity of actual fluxes (generalized pluralism) that necessarily participate in the same virtual whole… In short: [n]ot only do virtual multiplicities imply a single time, but duration as virtual multiplicity is this single and same Time."[285] This should not be confused with the Newtonian idea of absolute time where the universe runs according to a single clock, but as the monism of duration, containing many fluxes or clocks, described above. Thus, Bergson's critique of the metaphysical conclusions drawn from relativity, particularly the idea of a block universe, centers on the point that Einstein and others confuse numerical/spatial multiplicity with virtual temporal multiplicity—"Einstein has merely invented a new way of spatializing time."[286] This, again, has no bearing upon the success of the physics and mathematics of relativity, but the conclusions drawn from special relativity about the nature of time as such. (I further develop the concept of the 'virtual' later in

[285] Deleuze, *Bergsonism*, 82-83.

[286] Ibid., 85.

this chapter, as it is a central theme in my analysis of Deleuze's *Difference & Repetition*).

Bergson's criticism in *Duration and Simultaneity* was met with mixed reception. In fact, it has often been argued that Bergson misunderstood relativity in positing that there is a single universal time. Indeed, even sympathizers of Bergson, such as Louis de Broglie, have looked negatively upon Bergson's reply, claiming that *Duration and Simultaneity* is "the least estimable of his books."[287] However, others, such as Hendrik Lorentz and Henri Poincaré, two of the crucial figures that developed the mathematical framework that inspired Einstein's development of special relativity, sided with Bergson in thinking that experimental results related to relativity "did not lead directly to Einstein's [metaphysical] conclusions."[288] Among the defenders of Bergson was also Alfred Whitehead, who developed criticisms of Einstein's work inspired in part by Bergson's criticisms.[289] Despite the high-profile support for Bergson, the debate was widely interpreted as a victory for the physicist. This is largely in part due to Einstein's public propagation of the idea that Bergson did not understand the physics of relativity, despite Bergson's claim on the contrary that he did not contest the physics and mathematics of the theory. Canales notes that in his private correspondences, however, Einstein believed that Bergson had indeed "grasped the substance of relativity theory."[290] Although Bergson's reputation lost its legitimacy in the eyes of many physicists and philosophers, many of the developments in quantum mechanics seem to lend credence to the Bergsonian view of time, as we have already noted, for example, in the work of Louis de Broglie. Furthermore, many saw the fact that Bergson, in his first edition of *Duration and Simultaneity*, only addressed the special

[287] De Broglie, 50.

[288] Canales, 66.

[289] Ibid., 179.

[290] Ibid., 373. Canales refers in her bibliographic entry to "Einstein's travel diary to Japan, Palestine, and Spain [6 October 1922 to 12 March 1923]. See the entry for 9 October 1922."

theory of relativity, without addressing the general theory of relativity, as another weakness in the French philosopher's position. This ignores the fact that Bergson published appendices to *Duration and Simultaneity* which addressed the problem of acceleration (and thus problems related to the general theory of relativity, which posits gravity as arising from the acceleration of a reference frame), appendices which have largely been ignored by Bergson's critics. Indeed, whereas Bergson thoroughly worked through the mathematics of special relativity in his reply to Einstein, there was significantly less effort on Einstein's part to engage with the philosopher's ideas. Whether or not Bergson was right, it is clear that the question of who *won* the debate remains contested, depending on who you ask. Perhaps rather than attaching ourselves to binary categories and assigning full legitimacy to the position of the one at the expense of the other position, it is certainly more beneficial to consider what these positions, taken together, carefully studied and nuanced, can teach us about the nature of time and the universe: "[i]nstead of simply siding with one over the other, we can consider our universe filled with clocks, equations, and science as much as with dreams, memories, and laughter."[291]

Diffracting *Ressentiment* through Bergson's Philosophy

This section is dedicated to a diffractive reading of the ideas discussed in the previous chapter, concerning *ressentiment*, through the lens of Bergson's philosophy of duration. The reason for undertaking a diffractive reading is to show how Bergson, in his own work, identified the need to develop an ecstatic theory of temporality based on concerns similar to those highlighted in the previous chapter regarding spatialized theories of time.

The term "diffraction" comes from physics, where it refers to the phenomenon of waves

[291] Canales, 358.

bending around obstacles they encounter. It is distinguished from reflection, where, in the case of a photon, the wave hits an obstacle and is reflected, unaltered, at exactly the same angle it came from. With diffraction, on the other hand, the obstacle has an observable effect on the wave and the diffracted ray of light bears the signature of where it came from. Diffracted rays of light can develop interference patterns where overlapping waves can constructively or destructively interfere with each other depending on their phase difference. Thus, through a diffractive reading of Bergson through the ideas of Nietzsche and Heidegger in the previous chapter, I hope to show patterns of interference where Bergson's ideas concerning the nature of time resonates with the work of the German philosophical giants while also bringing something entirely new to the conversation. Furthermore, through this method of reading I hope to show that if we would like to move forward with our project of conceptualizing energy on the ground of ecstatic temporality, that it would be more fruitful to take up this endeavor by way of Bergson's framing of the problem, considering that he engaged much more positively with physics than Nietzsche and especially Heidegger. As we have seen, Bergson wanted to account for developments in the physics of his time within his metaphysical framework, making his philosophy of time more amenable to the ends of this project. Therefore, a diffractive reading of *ressentiment* through the concept of duration places the problem of energy and ecstatic temporality on Bergsonian grounds, which allows for a natural pivot to Deleuze's critique of classical thermodynamics and his development of the concept of 'intensity' as a promising alternative conception of energy.

In other words, I attempt to illuminate the temporality of *ressentiment* by reconstructing it using Bergsonian concepts. I outline the temporal structure of *ressentiment* by framing it within the context of duration. To this end, I outline the affinities that exist between the ideas of Bergson, Nietzsche, and Heidegger. I argue that, between these three thinkers, we are led to a

more authentic interpretation of time that does not require spatializing it (i.e., grounding mobility in the immobile) or reducing the absence of past and future to ontological nothingness, as is the formula for the rancor against time. In this way, I argue that we are led to Deleuze's solution of the three syntheses of time in *Difference & Repetition*. The fourth chapter explores the idea of the three syntheses of time and its relationship to Deleuze's concept of intensity alluded to above.

Nietzsche and Bergson

The most obvious point of affinity between Nietzsche and Bergson is their privileging of becoming over being:

> il est bien évident qu'on retrouve chez [Nietzsche et Bergson] cette même orientation philosophique qui commence à s'affirmer au XIXe siècle, en opposition avec l'intellectualisme traditionnel: la tendance à mettre en relief non plus des essences et des structures logiques, mais des poussées dynamiques.[292]

Both thinkers painted a Heraclitian picture of reality where becoming is the rule. For them, the stability of what seems to possess being is also the result of stable, but fleeting, processes. Comparisons have also often been made between their philosophies of life and their concepts of will to power and *élan vital*. Regarding Darwinian evolution, both Nietzsche and Bergson are in agreement that "life cannot be understood uniquely as adaptation to internal circumstances; it also refers to an internal movement,"[293] that internal movement being will to power for Nietzsche and *élan vital* for Bergson. Both agreed that an active/creative inner-drive was needed to complement selection due to adaptation to external circumstances.

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[292] "It is very evident that we find in [Nietzsche and Bergson] this same philosophical orientation which begins to establish itself in the nineteenth century, in opposition to the traditional intellectualism: the tendency to put into relief neither essences or logical structures, but dynamic forces," (author's translation). François D'Hautefeuille, "Schopenhauer, Nietzsche, et Bergson," in *Archives de Philosophie* 28, no. 4 (1965), 553.

[293] Arnaud François and Roxanne Lapidus, "Life and Will in Nietzsche and Bergson," in SubStance 36, no.3 (2007), 101.

It is less common, though not entirely unheard of, to see the Nietzschean question of *ressentiment* taken up in Bergsonian terms. Perhaps no philosopher did more to revive interest in Nietzsche and Bergson in the twentieth century than Deleuze, for whom Bergson and Nietzsche's ideas concerning the nature of temporality were decisive in the trajectory of his thought. However, it is unclear whether Deleuze at any point explicitly took up the question of *ressentiment* utilizing the Bergsonian framework,[294] though these themes are implicit in his corpus. Surprisingly, a literature review of works which explore *ressentiment* and Bergsonian temporality reveals that scholars have taken an interest in questions of resentment and temporality in a political, rather than purely metaphysical, context.[295] I point to these papers as offering evidence that the Bergsonian temporal schema is capable of taking up and elucidating the polemic of *ressentiment*. I then turn to the recent work of Barry Allen, *Living in Time: The Philosophy of Henri Bergson,* where he insists that Nietzsche and Bergson are pioneers in their critique of western philosophy's conception of spatialized time, to assist me in developing an original description of *ressentiment* based on Bergson's philosophy of duration.

As I have shown, spatialized interpretations of time can be traced back to *ressentiment*, specifically the paralogism of *ressentiment* that separates an agent from its activity and posits an identity or static substratum beneath movement, i.e., what Deleuze referred to as "*the fiction of a force separated from what it can do*."[296] Both thinkers would agree that this paralogism is unavoidable in one sense, due to the humanizing function of the intellect that we saw Nietzsche point to in modern science and in Bergson's analysis of intelligence in *Creative Evolution*; the

[294] Bergson himself, as far as we know, did not write anything about *ressentiment*.

[295] See also William Connolly's *Capitalism and Christianity, American Style* (Durham: Duke University Press, 2008).

[296] Deleuze, *Nietzsche & Philosophy*, 123.

intellect offers the world up to consciousness in terms of stable objects which serve as footholds for action. Barry Allen points to this affinity between the two philosophers: "[p]erception, evolved and species-specific, introduces these stops, though they are not literally stops but synchronies, rhythms, stable correlations an organism can perceive and act on, making them as good as stops."[297] Considering the similarity between the humanizing role of intelligence that we find in both thinkers and how in both cases this humanization taken to its extreme leads to the positing of spatialized time and an ontology of essences, there seems to be a correlation between the dominance of intelligence over instinct that we find in *Creative Evolution* with the dynamics of *ressentiment* and science described by Nietzsche.[298]

Bergson's analysis of Zeno of Elea's paradoxes of motion is an example of the paralogism of *ressentiment*. As we have seen, Bergson argues that the paradoxes emerge out of the confusion that occurs retrospectively of substituting for movement its path through space, reducing motion to the static points traversed by an object's trajectory. In this instance, the paralogism consists of reducing the passage of time to a geometric line connecting static points in space. Deleuze, referring to *Matter and Memory*, notes that in the passage from our perception of change to an utterance about it, that is, in the translation of our perception of motion into static concepts used to describe said motion, we lose in translation what is most authentic to our experience of reality: movement.[299] We thus separate movement from its object. Again, in one sense, this is inevitable, since language and communication are bound to the use of concepts. However, the reification of a concept into a thing-in-itself or an essence, results from the

[297] Allen, 163.

[298] It would be interesting to compare the dynamics of intelligence and intuition with the Apollonian and Dionysian spirit in Nietzsche.

[299] Gilles Deleuze, *Cinema 2*, trans. Hugh Tomlinson and Robert Galeta (Minneapolis: University of Minnesota Press, 1997), 27.

confusion of static concepts with the duration of the events they are supposed to denote. When this occurs, we have once again fallen into the trap of the paralogism of *ressentiment*. We see then that Bergson's concern with saving time from spatialization is akin to Nietzsche's concern with the paralogism of *ressentiment* that separates an actor from its activity. In terms of the Bergsonian critique of spatialized time, the paralogism of *ressentiment* consists in enacting a schism between a static object on the one hand, and its trajectory through space on the other, making the passage of time derivative of the geometric relation between an inert object and its path through static points in a Cartesian space. On the other hand, for both Nietzsche and Bergson, the 'essence' of an actor *is* its activity, such that no distinction can be made between activity and an actor 'beneath' it. Activity and change are, in this sense, the 'thing-in-itself,' and this is one of the fundamental insights of both Nietzsche and Bergson.

One article titled *Politics and Affect*, by Lita Crociani-Windland and Paul Hoggett, takes its cue from Deleuze's description of *ressentiment* in *Nietzsche & Philosophy*. They argue that *ressentiment* is "based on a sickness, which involves a predominance of remembering over forgetting, where the response to life is based on old grudges, which can never be properly digested, rather than on immediacy of experience."[300] They then relate this description of *ressentiment* to Bergson's description of psychic disturbances:

> [t]hat which is commonly held to be a disturbance of the psychic life itself, an inward disorder, a disease of the personality, appears to us, from our point of view, to be an unloosing or breaking of the tie which binds this psychic life to its motor accompaniment, a weakening or an impairing of our attention to outward life.[301]

From Bergson's point of view, the phenomenon of *ressentiment* might appear to an external observer as a form of trauma, in the sense that the actor of *ressentiment* finds it difficult to be

[300] Lita Crociani-Windland and Paul Hoggett, "Politics and Affect," in *subjectivity* 5, no. 2 (2012): 166.

[301] Bergson, *Matter and Memory*, 14-15.

present due to an extreme attachment to memories from the past that interrupt the actor's involvement with the immediate present.

Bergson's image of the memory cone is helpful for illustrating the connection between *ressentiment* and psychic disturbance. At every level of the cone there exists the totality of all our memories, an open totality which grows ceaselessly with the passage of time. The circular base of the cone represents pure memory, the ideal limit at which memory loses its connection with the present and remains motionless—the past in its purest form. The tip of the cone represents perfect inherence in the present moment where a stimulus is immediately followed by a reaction without the intervention of memory to redirect the response. Thus, the levels in between the ideal limit of the present and the past do not differ based on the content of the memories, since each level contains the entirety of one's past. What differentiates the different levels of the cone is their attachment or detachment from the present or the past. For example, someone who lives only in the present, always at the tip of the cone, Bergson calls a "man of *impulse*."[302] On the other hand, someone who "lives in the past for the mere pleasure of living there, and in whom recollections emerge into the light of consciousness without any advantage for the present situation, is hardly better fitted for action: here we have no man of impulse, but a *dreamer*."[303] Bergson claims that between these two extremities "lives the happy disposition of memory docile enough to follow with precision all the outlines of the present situation, but energetic enough to resist all other appeal. Good sense, or practical sense, is probably nothing but this."[304] Thus, the different levels of Bergson's memory cone represent the degree of inherence, or lack of it, in the present. Good sense or a healthy psychological disposition would

[302] Bergson, *Matter and Memory*, 153.

[303] Ibid.

[304] Ibid., 153.

appear to us as an active individual who can take what she needs from her past in order to respond effectively to the present moment, without getting too caught up in ruminations that would thwart action or, conversely, being mindlessly impulsive and not applying the lessons of the past to respond effectively to a present situation. It is clear then that what makes *ressentiment* a kind of psychological disturbance is that it tends to the disposition of the dreamer, who is unable to meet the demands of the present and the passage of time, and thus suffer from them. They seek refuge from the present in the past due to their inability to overcome memories or grievances that intrude upon present consciousness, leading to an obsessive attachment to the past represented by the levels of the memory cone closest to the circular base, where the past's inherence in the present begins to falter. Thus, the agent of *ressentiment* begins to lose touch with external reality.

Analogously, an aversion to the present can also manifest as *ressentiment* against the future. In *The Ticking Bomb: Speed, liberalism, and* ressentiment *against the future,* Simon Glezos points to the connection between *ressentiment* and authoritarian political tendencies. He points to the acceleration of modern life with its constant cultural upheavals and new technologies as often "producing a general existential anxiety, and this anxiety becomes crystalized into a general *ressentiment* against the future."[305] Glezos associates this form of resentment with the desire for expansion of executive powers in government in order to preserve familiar notions of identity and custom that are threatened by the rapid pace of change: "[t]his *ressentiment* against an open future—against an ateleological future—then expresses itself through an attempt to *impose* a telos on the future."[306] This *ressentiment* attempts to deny the

[305] Simon Glezos, "The ticking bomb: Speed, liberalism and *ressentiment* against the future," *Contemporary Political Theory* 10, no. 2 (2011): 163.

[306] Ibid., 163.

open futurity and creativity associated with the Bergsonian description of the passage of time, by subsuming the narrative of history under the narrative of a *telos* supposed to preserve the reactionary political vision of the actor of *ressentiment*.

It is clear that the application of the concept of *ressentiment* in this political context has many similarities to our previous analysis of the relation between *ressentiment* and science. One of the points of affinity is the imposition of an eminent teleological account of temporality, which we find in both mechanical causality (where the effect is already contained in the cause) and in classical teleology or vitalism (where causality is subordinated to a predetermined, immutable end, as opposed to Bergson's non-determinate/creative vitalism). Both mechanism and vitalism preclude the creative spontaneity which Bergson insists is the most authentic characteristic of the passage of time. Thus, the positing of a *telos* governing history, or of truths beyond the influence of time, would not be possible without the disjointed relation between the present and the past described above, *ressentiment* being an extreme case of a chronic, disjointed manner of enduring in time. Thus, the possibility of forming concepts of entities such as laws of nature, an immortal soul, or of absolute truth imply the capacity of the human mind to detach itself from the immediate present; they have the persistence of memory as their original model. Considering the impossibility of altering the past, memories are examples *par excellence* of entities that endure despite the flux of time. As we see later, Bergson argues that the past is no longer that which no longer exists, but that which no longer acts.

The analysis of *ressentiment* through a Bergsonian lens now leads us to a few conclusions regarding Nietzsche's fundamental concept of the eternal return. Barry Allen draws from Deleuze's interpretation of the eternal return, which we examine in more depth in the following chapter, when he claims that "Deleuze offers the most convincing demonstration of Bergson's

value for reading Nietzsche."[307] Allen argues that if we think of time spatially, "as if it were an axis in Cartesian space… Nietzsche's "eternal return of the same" becomes the idea proposed by Pythagoreans and Stoics in antiquity."[308] This spatialized version of the eternal return, where past, present, and future always already coexist in eternity, is the view of the eternal return espoused by the Pythagoreans and Stoics, and it is also the interpretation that Sugarman advances of the eternal return—Allen calls this kind of 'return,' characteristic of the spatialized interpretation, a 'geometric repetition' of extensional forms. Allen finds this interpretation perplexing, given that Nietzsche, with all his knowledge of Greek and Roman philosophy, certainly knew about the old concept of the eternal return, yet still claimed that his idea of eternal return is an original concept in the history of philosophy. Another reason to push back against a spatialized interpretation of the eternal return is that, as Sugarman noted, it does not offer a solution to the problem of *ressentiment* as Nietzsche claimed it did. However, we reach a different conclusion, one that vindicates the eternal return as a solution to *ressentiment*, when we read the eternal return through the lens of duration. Although this might seem like an anachronistic way to read Nietzsche, I would argue that it is not, given that both thinkers emphasized novelty and creation as a fundamental aspect of the temporal evolution of will to power and *élan vital*, a view which does not square with spatialized temporality as has already been shown.

Bergson's memory cone is helpful here. The memory cone illustrates how the whole of one's past, incessantly swelling with memory, is continuously repeated, but this repetition repeats differently every single time, since every repetition is in light of a new present. As Allen

[307] Allen, 165.

[308] Ibid.

argues, "[w]ith time as duration, repetition repeats the whole past, which is different every time, making every repetition of duration inherently, qualitatively different. The same over and over means different and different again, eternal return means eternal singularity, a future that is always new."[309] Repetition in this sense is not geometric, but qualitative and intensive, in that this form of repetition is not a function of spatial extension. As Sugarman argued, geometric repetition repeats the formula of *ressentiment* in its positing of the eternal 'now.' Time in the sense of duration is no longer the moving image of eternity that *ressentiment* clings to, but a principle of creative repetition, of open futurity, where the past is repeated, and thus affirmed, in its openness to a future that is truly original and not contained in its past or in a teleological principle imposed on the movement of history.[310] Therefore, "if time were duration and rhythm, then Nietzsche's thought on eternal return is Europe's first non-spatializing, properly temporal reflection on creative repetition."[311] In creative repetition, past and future no longer constitute an ontological nothingness, but virtual tendencies of habit and novelty, respectfully, which we further examine in the following chapter on Deleuze. The concept of the 'virtual' is our bridge from the following section on Heidegger and Bergson into the concluding chapter of this work.

Heidegger and Bergson

Recalling that a crucial move made in my argument was identifying, along with Heidegger and Sugarman, the need to develop an ecstatic conception of time to overcome the paradoxes and difficulties arising from spatializing accounts of time, I turn to Bergson to show that we need not remain within the Heideggerian problematic of ecstatic temporality to proceed

[309] Allen, 165.

[310] Interestingly, Allen associates the geometric interpretation of the eternal return with the 'spirit of gravity,' a sister concept to the 'spirit of revenge,' (Ibid., 166).

[311] Allen, 167.

with the project of placing energy on ecstatic grounds. In doing so, I also argue that Bergson's challenge to the privilege of presence with his theory of memory offers an analogous solution to the rancor against time outlined in the previous chapter.

Although there are many angles from which Heidegger could be compared to Bergson, I would like to briefly focus on one point of affinity between the two thinkers: their calling into question of the privilege of presence in ontological accounts of time. Heidegger would have denied this affinity, since he repeatedly claimed that Bergson did not call the privilege of presence into question. Heidegger claimed in *Being and Time* that his thesis on time is "against Bergson's thesis that the time one has in mind [is really] space."[312] This quote is really odd in light of what been said about Bergson's view of time in this chapter, where Bergson is at pains to disentangle time from space. For Bergson, the absolute space of Newton is never actually given but is, rather, one of the asymptotic tendencies of duration.

Heath Massey attempts to clear up the confusion between Heidegger and Bergson's views on time in *The Origin of Time: Heidegger and Bergson*. Here, he argues that some of Heidegger's criticisms of Bergson might be valid with regard to ideas found in Bergson's earliest work, *Time and Free Will*, where Bergson considers the passage of time from a primarily psychological perspective. However, Massey claims that Heidegger's lack of engagement with other of Bergson's works, especially *Matter and Memory*, renders his criticisms of Bergson misguided and outdated. This especially pertains to Heidegger's claims that Bergson neglected the question of Being and failed to problematize the priority of presence in western intellectual history. Regarding the first question, Massey writes that Bergson takes up the question of Being in his "definite turn toward ontology in *Matter and Memory*. He first raises the question of the

[312] Heidegger, *Being and Time*, 18.

being of consciousness by asking about the difference between being and being consciously perceived."[313] In stipulating that there is only a difference in degree between perception and materiality, but a difference in kind between memory and perception, Bergson takes up the question of Being and challenges the privilege of the present by distinguishing between the Being of what has-been and the Being of what is.[314] Massey writes that Bergson anticipated "Heidegger's interpretation of the "having-been" (*Gewesenheit*) of Dasein, whose modes are forgetting (*Vergessenheit*) and repetition (*Wiederholung*)."[315] In distinguishing the kind of being of what has been from what is, Bergson anticipates Heidegger's focus on ecstatic time: "Bergson thinks of duration not simply as a feature of consciousness or interiority, but as a movement toward the outside, an *ecstasis*."[316] And further, "[i]n fact, he has introduced some of the very features of originary temporality that Heidegger presents as his own discoveries in *Being and Time*."[317] Of course, this comparison is not without nuance; there are also crucial difference between the two thinkers (e.g., Bergson did not consider the anticipation of our death to be a crucial feature of our experience of time) and I do not mean to equate Heidegger's understanding of time with Bergsonian duration.

However, considering that the project at hand is to reconceptualize energy in light of criticisms of spatialized time, what concerns us most is the affinity noted above between the two philosophers. Recall that, in Heidegger and Sugarman's framing of the problem, the rancor against time represents the devaluation of absence which is reduced to nothingness, thereby

[313] Heath Massey, *The Origin of Time: Heidegger and Bergson* (Albany: SUNY University Press, 2016), 206.

[314] "'To be no longer' means not to be active, which is not the same as not to exist," ibid., 206.

[315] Ibid.

[316] Ibid., 207.

[317] Ibid.

leading to the view of time as a series of momentary 'nows'; that only what is present is real. The solution given was the ecstatic interpretation of time, which provides an ontologically positive account of the absence of the past and future. It frames time not as a series of nows but as a movement of temporalization where one comes towards oneself out of what one has been, which offers time as the event of Appropriation.

Massey argues that Bergson recognized this movement of temporalization even before Heidegger in his description of the double movement of memory, which consists of "the expansion and contraction of recollection, as the condensation of vibrations and the prolongation of the present, and as the opening up of space and closing off of the past."[318] I argue then that Bergsonian duration also provides a solution to the rancor against time brought about by the spirit of revenge in his description of memory as an ontologically positive form of absence. Furthermore, Bergson is a better candidate to help us rethink the temporality of energy given his positive engagement with the physical sciences, compared to Heidegger's gatekeeping of philosophy from what he considered to be 'ontic' sciences. Thus, we take our cue from Bergsonian concepts in our attempt to reconceptualize the temporality of energy. In other words, rather than focus on the Heideggerian conception of ecstatic temporality through the event of Appropriation, we focus on the ecstatic temporality of what Bergson called the "virtual."

Conclusion: The Existence of the Virtual

For Bergson, as for Heidegger, we cannot conceive of the Being of memory in the same way we conceive of the Being of what is present and actual. To this end, Bergson makes an important distinction between perception, recollection, and memory. We have already seen

[318] Massey, 217.

Bergson's view of perception, that it is only different in degree from matter and offers an image to a perceptive being of the external world that has been simplified and parsed according to the organism's potential action and specific needs. On the other hand, recollection "is an actual image, not perceived (as present) but recollected as past, for instance, you now recollecting Barack Obama's face."[319] Recollection occurs when a specific memory protrudes into present consciousness, but recollections are distinct from the totality of memory from which they are drawn. Memory, then, "is not an image or a collection of images, but instead a nonsurveyable field of potential recollection, like all the images of childhood that you *could* recall once you start reminiscing."[320] The example of childhood is instructive, in that, though memories of your childhood are always virtually available for recollection, we do not recollect the entirety of our childhood at once. Recollections are thus drawn from the store of memories, which exist as a virtual field of potential recollections. The function of recollections then are to supplement present perception with memory. Bergson explains that the "progress by which the virtual image realizes itself is nothing else than the series of stages by which this image gradually obtains from the body useful actions or useful attitudes."[321] Bergson uses the term 'virtual' to describe the ontological status of memory which, though not present or actual, nevertheless exists and possesses its own distinct mode of presencing.

On the flip side, we can also think of the future in terms of the virtual. A comparison to Aristotle's *energeia* and *dunamis* is instructive in this context. Recall that Aristotelian potential aims at the fulfillment of accomplished form. As Allen explains, "[m]atter, the matrix of Aristotelian potential, engenders nothing that did not already exist as form. Aristotelian

[319] Allen, 70.

[320] Ibid., 70.

[321] Bergson, *Matter and Memory*, 131.

actualization is not creation because what materializes, a sense-perceptible expression of a timeless essence, is nothing new."[322] Aristotelian potential, impotent on its own, aims at the actualization of an already accomplished form. This is distinct from Bergson's idea of virtual tendencies. For example, Allen argues that virtual particles in quantum physics are virtual in the Bergsonian sense. Recalling Heisenberg's uncertainty principle, Allen points to the fact that it is impossible to observe a perfect vacuum in nature. According to the uncertainty principle, "it is not possible for both the state of a field and its rate of change to be fully determined. If a field has definite value at a moment, *even zero*, then its rate of change becomes random."[323] This checks out with experimental observations of vacuums where, rather than encountering absolute nothingness, physicists encounter traces of what are called 'virtual particles' popping in and out of existence. This might seem like a violation of the conservation of energy since you are technically observing creation *ex nihilo*, but the conservation of energy is an average, not an absolute, and the particle/anti-particle pairs borrow enough energy just long enough to come into existence, but almost immediately annihilate each other, returning the energy they borrowed. Speaking from Bergson's perspective, the particles are actual insofar as they emerge, but the tendency that produces these particles is virtual. Thus, vacuum's are actually empty but are "full of tendency."[324] The potentiality of tendencies are not determined by already actualized form, as in the case of *energeia* and *dunamis*, but are virtual. For Bergson, "[a] tendency is the forward thrust of an indistinct multiplicity."[325] Tendencies thwart each other and tend to become all that they can be. The metaphysics of tendency and virtuality leads to an immanently teleological

[322] Allen, 74.

[323] Ibid., 72.

[324] Ibid., 73.

[325] Henri Bergson, *The Two Sources of Morality and Religion*, trans. R. Ashley Audra and Cloudesly Brereton (South Bend: Notre Dame University Press, 1977), 294.

temporality, in the sense that the final cause of motion is not an already accomplished form that transcends temporality and matter. Rather, as we saw in the example of virtual particles, tendency is immanent, in a virtual sense, to the actual, pervading it through and through.

Thus, when we diffract *ressentiment* through Bergson's world of duration, what we find is that the rancor against time is analogous to the suppression of the virtual nature of memory and tendency. This squares well with Nietzsche and Heidegger's intuition that modern science is in the business of the domination of nature, since it reduces all of reality to what is material and measurable, present and actual, and thus subject to human control. This is akin to Bergson's claim that perception is inherently utilitarian and subtractive, and that human intelligence is attuned to the manipulation of its external environment and not to a noumenal truth. The virtual, on the other hand, "is not within the power of man, and is nevertheless a power."[326] Therefore, overcoming *ressentiment* may be interpreted as reconceptualizing energy in light of what we have learned about the creative repetition and virtuality that are characteristic of Bergsonian duration. If this interpretation of time offers a more adequate account of becoming than static time in its challenge of the privilege of presence, any future energy concept must account for creative repetition and its actualization of the virtual. The concluding chapter of this project is devoted to offering Deleuze's original theorization of the concept of 'intensity' as an example of doing just that.

[326] Gilbert Simondon, *On the Mode of Existence of Technical Objects*, trans. Cécile Malaspina and John Rogove (Minneapolis: Univocal, 2016), 168-169.

CHAPTER 5

DELEUZE: ENERGY BEYOND THERMODYNAMICS AND CONCLUDING REMARKS

> *This is the constant theme of Bergsonism from the outset: The confusion of space and time, the assimilation of time into space, make us think that the Whole is given, even if only in principle, even if only in the eyes of God… In any event time is only there now as a screen that hides the eternal from us, or that shows us successively what a God or superhuman intelligence would see in a single glance. Now this illusion is inevitable as soon as we spatialize time.*
>
> Deleuze, *Bergsonism*

Setting the Stage: Summary of the Previous Chapters

I turn here to Deleuze's critique of classical thermodynamics and his discussion of the three syntheses of time in chapters 5 and 2, respectively, of *Difference & Repetition*, to offer a solution to the problems identified in the previous chapters regarding how energy has been theorized in relation to static temporality. Therefore, it would be instructive to first provide a summary of the main points of my argument thus far to show how this inquiry naturally leads to Deleuze's metaphysical framework.

In the first chapter I developed a genealogy of energy running from Pre-Socratic philosophy, through modern science, and up to nineteenth century thermodynamics. The thread that holds together the history of ideas developed in that chapter is the hypothesis that "[t]he key idea [to understanding energy] is simple: *constancy in the midst of change*."[327] By focusing on this connecting thread, I attempt to show that there is a similar metaphysical logic that energy and proto-energy concepts follow, such as Parmenides' idea of the 'One,' Plato's Forms, Aristotle's *energeia*, and Leibniz's *vis viva*. The birth of the concept of energy as we understand it takes place in 19th century Britain, where energy is used to explain change by reference to a

[327] Lindsay, 5.

quantity of motion that is eternally conserved. Of course, the modern concept of energy was not solely a result of scientific or philosophical speculation, but also a product of the culture where it originated. As historian Crosbie Smith argued, the history of energy sciences cannot be separated from the vested political and economic interests of the British Empire and of the individual scientists responsible for its development. It can also not be understood apart from the theological biases of early energy scientists, who found in energy a way of reconciling Protestant doctrine with the findings of modern science. According to Cara Daggett, this has led to what she called "a geo-theology of energy that combines the prestige of physics with the appeal of Protestantism in order to support the interests of an industrial, imperial West."[328] Daggett's description of energy science as a 'geo-theology' lends credence to my claim that the concept of energy and its history betrays a bias towards grounding ephemerality in the eternal, the latter often being synonymous with the 'divine' in western philosophical and theological history. However, rather than focusing on the history of energy sources/transitions, in the second and third chapters I focused on criticizing the metaphysical framework within which energy and its proto-concepts were developed, particularly the tendency to spatialize time and ground metaphysical accounts of change in stasis.

Chapter 2 can be seen as the wellspring of this dissertation, given that the initial motivation for this inquiry was to decipher Nietzsche's mysterious claim that modern science is the latest and noblest form of the ascetic ideal. Inspired in large part by the work of Babette Babich, I undertook the unique task of outlining Nietzsche's philosophy of science, an aspect of his work not often foregrounded in commentaries and analyses of his work. I traced the origin of ascetic ideals back to the phenomenon of *ressentiment*, which Nietzsche also refers to as "the

[328] Daggett, 190.

spirit of revenge" in *Thus Spoke Zarathustra*;[329] hence the title of this project: *The Birth of Energy from the Spirit of Revenge*. One of the crucial moves I make is to identify what Deleuze called the "paralogism of *ressentiment*" as an epistemological obstacle to thinking change in itself without grounding movement in stasis. The paralogism of *ressentiment* is "*the fiction of a force separated from what it can do,*"[330] meaning that, as in the example of the lamb and the bird of prey in the second chapter, beneath every activity there is an ontologically distinct actor or subject responsible for said activity. Deleuze and Nietzsche argue that this separation of activity from actor is a fiction because both deny that there is any essence or noumenal substratum beneath phenomenal appearances. Thus, from this perspective, the pervasiveness of *ressentiment* in western philosophy and science make this paralogism an obstacle for a proper metaphysical understanding of processes *qua* processes.

Importantly, the 'will to truth,' which Nietzsche identifies as the life-denying ascetic ideal which has served as the impetus for the development of western philosophy and science, follows the conceptual logic of the paralogism of *ressentiment* in positing a substratum or 'beyond' of eternal truth underneath an ephemeral world of appearances. Whereas Platonism posits essences beyond appearances and Christianity posits God and heaven 'above' our ephemeral world, the will to truth of modern science posits discrete entities and immutable laws of nature as fundamental ontological entities. I argue that the concept of energy as it was initially conceived is guilty of the same logic. In the cosmology of nineteenth century thermodynamics, change is a result of differential flows of energy. However, as Cara Daggett notes regarding the conservation of energy, "[e]nergy points to the enduring faith in nature as divinely designed to be

[329] Nietzsche, *Zarathustra*, 162.

[330] Deleuze, *Nietzsche & Philosophy*, 123.

accessible to human perception. In order to be knowable, the world must have some constancy through time—pure, random chaos would mean prediction and calculation are impossible"[331]—another example of the ephemeral having its ground in the eternal. There is, then, a temporal logic to the will to truth, in that its characteristic feature is privileging the eternal over the ephemeral in metaphysical accounts of reality.

I thus turn to Sugarman's work in *The Rancor Against Time: The Phenomenology of 'Ressentiment'*, to develop an account of the temporality of *ressentiment*. Sugarman identifies the source of *ressentiment* in the rancor against time and its 'it was,' which ultimately amounts to positing the absence of the past and future as ontologically negative forms of absence. This description of the temporality of *ressentiment* also highlights the affective drive to reduce nature to those aspects that are amenable to human control. Positing ontologically eternal truths accessible to human thought and deeming only the present moment to be real (at the expense of reducing past and future to ontological nothingness) reduces reality to those aspects that are knowable and amenable to human control—a view of the scientific project shared by both Nietzsche and Heidegger. As Babich wrote, "the scientist is in the business of mastering or subduing nature. The drive to dominate nature is not an accidental one: it too grows out of *Ressentiment* and fear."[332] Furthermore, Sugarman lauds Nietzsche for recognizing the history of western philosophy's birth out of the will to truth and the rancor against time, but argues that Nietzsche's interpretation of the eternal return, which Nietzsche offered as a path for the overcoming of *ressentiment*, did not provide a satisfactory solution to the problem. We see in this chapter how Deleuze's unique interpretation of the eternal return as the return of 'difference'

[331] Deleuze, *Nietzsche & Philosophy*, 41-42.

[332] Babich, 202.

vindicates Nietzsche's claim that the eternal return is a solution to the rancor against time. Sugarman's interpretation of the eternal return is reminiscent of Einstein's block universe, where past, present, and future all coexist with each other and are compressed in the eternal 'now.' Sugarman argues that the eternal return offers a static account of time, insofar as becoming in an eternal universe is an illusion, since the future and the rest of eternity are always already given. Thus, if the problem of *ressentiment* is the rancor against time which makes the past and future out to be ontologically negative forms of absence, the eternal return, as described by Sugarman, relegates the passage of time to an illusion relative to the observer, since eternity is always already given in the eternal now, meaning that the past and future are still ontologically empty concepts.

Static temporality, the implicit temporal logic of the will to truth that Nietzsche argued has driven the historical development of western philosophy and science, is thus the horizon within which energy concepts have been theorized. Again, by static temporality I mean accounts of change that explain the ontologically mobile by reference to the ontologically immobile. The task of this dissertation is to begin to imagine energy concepts beyond static temporality, which is why Sugarman's critique of static temporality and its origin in *ressentiment* is a crucial component of my argument. Though I do not agree with Sugarman's interpretation of the eternal return, I do agree with his belief that an ecstatic account of temporality is more adequate for thinking about the passage of time since it makes room for real becoming. An ecstatic account of time is where the past and future—rather than being a past-present or a future-present—are different *in kind* from each other and the present moment. In an ecstatic account of time, there is an interplay between past, present, and future, where the past and future have their own form of 'presencing.' They are therefore ontologically positive forms of absence. Heidegger explains that

"[a]pproaching, [that is] being not yet present, at the same time gives and brings about what is no longer present, the past, and conversely what has been offers future to itself. The reciprocal relation of both at the same time gives and brings about the present."[333] Sugarman argues that this ecstatic account of time not only overcomes the rancor against time by establishing the possibility of promise, i.e., the unity of the three ecstases (past, present, and future) of time, but also provides a more adequate account of the temporality of human speech, which is simultaneously intentional (forward-looking) and informed by memory, which is the manner in which the past presences. However, I am not satisfied with remaining within the Heideggerian problematic of ecstatic temporality, given Heidegger's resistance to the 'ontic' sciences of physics and biology. If we are going to attempt to think energy in terms of ecstatic temporality, it is not enough to remain within the domain of Heidegger's anthropocentric concern.

In chapter 3, I argue that Bergson's philosophy of duration offers a better way forward for the project at hand. I do this by pointing to Bergson's more positive engagement with physics and biology, and by arguing that the problems identified with the static temporality of the will to truth, and the subsequent solution of ecstatic temporality, are problems that Bergson also addressed in his metaphysical framework. In *Creative Evolution*, Bergson identified the epistemological tendency to think of time as a series of (static) present moments linked together by an impersonal becoming as the 'cinematographical mechanism of thought,' which he argued served as the epistemological model for the development of western philosophy and science, and is therefore the epistemological model within which western energy concepts have been developed. Bergson opposed the idea of 'duration' to the 'clock-time' associated with the cinematographical mechanism, which partitions time into discreet, static frames. For Bergson,

[333] Heidegger, *On Time and Being*, 13.

everything exists in duration, which is a relentless becoming; thus, everything endures. However, there exists within duration a dual tendency towards materialization and novelty, which correspond to the duality of matter and consciousness. Analogously, consciousness contains immanently within itself the dual tendencies of instinct and intelligence, corresponding to the dual tendency of novelty and materialization, respectively.

Recall that for Bergson "the consciousness of a living being [is] defined as an arithmetical difference between potential and real activity. It measures the interval between representation and action."[334] So, whereas instinct inheres within the flux of duration and is characterized by the perfect coincidence of consciousness with action, human consciousness is characterized by the suppression of instinct by intelligence, which allows for a greater degree of freedom and thus a greater power of deliberation to hesitate between potential actions. In resisting its foil (the destabilizing and creative tendency of duration) intelligence projects a spatial schema behind the becoming of duration, "an abstract homogenous grid projected onto material extension that freezes its movements and empties out its temporal rhythms; this cuts up the flow of the material universe and solidifies it into countable objects."[335] Thus, in identifying the objectifying tendencies of the human intellect, Bergson provides a systematic account of the genesis of the epistemological tendency to think the mobile in terms of the immobile, and therefore the origin of spatialized energy concepts. He offers the method of intuition, characterized by the refinement of intelligence by instinct, i.e., instinct that has become self-conscious and deliberative. So, whereas science proceeds by the method of analysis "which reduces the object to elements already known, that is, to elements common both to it and other

[334] Bergson, *Creative Evolution*, 160.

[335] Alia Al-Saji, "*Dureé*," in *Fifty Concepts for a Critical Phenomenology*, eds. Gail Weiss, Ann V. Murphy, and Gayle Salamon (Evanston: Northwestern University Press, 2019), 100.

objects,"[336] intuition would be the method of metaphysics proper, and thus a science which dispenses with symbols—whereas science moves from concepts to things, metaphysics should move from things to concepts. Bergson therefore proposes his method of intuition as a means to thinking duration in itself; becoming *qua* becoming.

I then turn to Bergson's analysis of the concept of energy and the laws of thermodynamics in *Creative Evolution*. Bergson's critique focuses on the laws of thermodynamics, the leveling of qualitative differences of energetic phenomena to differences of degree, and the spatialization of energetic processes. Bergson argued that the first law of the conservation of energy is a conventional utilitarian artifices that applies a common unit of measurement to energetic processes that are different in kind, thereby effacing the latter in favor of the former. For Bergson, the conservation of energy is rather a specific instance of the basic metaphysical truth that a change in a certain direction is balanced by a change in the opposite direction, but these changes need not be purely quantitative and mechanical, as evidenced by the division of differences in kind. On the other hand, Bergson postulates that the second law of thermodynamics is the most metaphysical of the laws of thermodynamics in that it does not depend on a utilitarian artifice for its framing and stipulates the direction of movement for energetic processes, thereby tracing the flow of duration. Finally, Bergson recognized one of the fundamental problems that this dissertation addresses: the conflation of energy and motion with space. Bergson was against the idea that energy is a quantity of motion somehow supplemented to spatial entities, which would be another instance of motion being grounded in spatial extension. As I mentioned at end of the previous chapter, Bergson hints in *Creative Evolution* that a proper understanding of energy and its origins should be sought in extra-spatial processes,

[336] Bergson, *An Introduction to Metaphysics*, 24.

which would seem to imply that he believed a better account of energy and motion should be sought in relation to the concept of duration, where spatiality is an ideal limit/tendency and not a timeless container for extension and, derivatively, change.

Crucially, the end of the third chapter is devoted to a diffractive reading of the concept of *ressentiment*, as developed in the second chapter, through Bergson's conceptual framework of duration. The reason for this diffractive reading is due to my conviction that, while the analysis of *ressentiment* in the works of Nietzsche and Heidegger provided the inspiration for this project and was useful for laying bare the problems associated with static notions of time and their relation to western energy concepts, Bergson's philosophical framework is better suited to answering the problems posed at the end of chapter 2. In particular, I applied Bergson's philosophy of duration developed in the third chapter to interpreting the central argument of chapter 2: i.e., that static notions of time, which Nietzsche and Heidegger associated with *ressentiment*, must be replaced with an ecstatic account of time where the past and future are seen as ontologically positive forms of absence instead of being relegated to ontological nothingness in the name of an eternal present—the metaphysics of presence.

I point to an affinity between Bergson and Nietzsche in their criticism of static notions of time that ground becoming in being. Both thinkers point to the physiological and cognitive conditions of the body as responsible for the perception that there are static metaphysical unities in nature, as well as the connection between the scientific enterprise with the utilitarian demands of biological life and the mastery of nature. I also allude to Deleuze's reading of Nietzsche's interpretation of the eternal return, which seems to have been influenced by the former's reading of Bergson. I develop this concept later on in this chapter, but suffice it to say that Deleuze's interpretation of the eternal return is the eternal return of 'difference.' In this instance, the eternal

return does not refer to the geometric repetition of the Stoics, where the future and the past are already given in an eternal present, but a principle of creative repetition which guarantees that no two moments in time are exactly the same, and that gives primacy to becoming over being. Reading Nietzsche through Bergson (as Deleuze seems to do), the eternal return of difference would align with the flow of duration, which retains the past virtually, while at the same time repeating it in light of a new present, which is made possible by the virtual past's ecstatic opening to a future which makes room for creative repetition. The idea of virtuality is crucial here because the virtual existence of the past as memory and the future as tendency is what allows Bergson to challenge the privilege of presence characteristic of static accounts of time—I develop further the notion of the 'virtual' when I turn to Deleuze's concept of 'intensity.' The brief section on Heidegger focuses on clearing up Heidegger's misguided claims that Bergson does not challenge the privilege of presence and that time in Bergson's account reduces it to space. Rather, the affinity I point to consists in both thinkers' attempts to provide a generative account of the past and future—and the interplay of these with each other and the present.

Thus, the main theme that my analysis of Deleuze's *Difference and Repetition* inherits from the foregoing chapters is the problem of ecstatic temporality, i.e., the question of how to provide 1) an account of change that does not ground it in some prior immobility or eternal principle, and 2) conceptualizes the past and future as ontologically positive modes of absence. In order to do this, we need to develop an account of the virtual status of the past as memory and the future as tendency and eternal return. My hope is that in undertaking this endeavor we may find the conceptual tools to theorize energy ecstatically, as change. I hope to show below how this task cannot be divorced from Deleuze's metaphysical project of offering an account of difference in-itself without grounding difference in a more primordial identity, since the

metaphysical primacy of identity over difference inevitably engenders the tendency to subordinate change to the timeless.

Deleuze's Critique of Classical Thermodynamics

I conclude this project by pointing to Deleuze's criticism of classical thermodynamics to show how he attempts to resolve the problems identified in the previous chapters regarding how energy has been theorized in relation to static notions of time. This move has a precedent in Clayton Crockett's work, from whom I have inherited the mission of conceptualizing energy as change. Crockett explains that Deleuze wanted to provide an account of being and energy transformations that did not epistemologically ground either one in a prior identity, but provided an account of the genesis of identity in terms of difference, and thus to think difference in-itself.[337] Consequently, Deleuze does not provide a static account of time which constructs mobility from the immobile, but rather describes the genesis of identity through the differentiation of intensive differences. The crucial concept I focus on, then, is 'intensity,' and how it extends the concept of energy beyond its typical employment in physics.

In the fifth chapter of *Difference & Repetition*, Deleuze claims that "[w]e know only forms of energy which are already localised [sic.] and distributed in extensity, or extensities already qualified by forms of energy"[338]—the difference between the intensive and spatial extension is thus crucial for understanding how Deleuze employs the concept of intensity. What Deleuze is referring to here is how classical thermodynamics frames the flow of energy as always moving towards the cancellation of intensive differences, as discovered by Carnot in his realization that mechanical work is not generated by the consumption of caloric, but by the

[337] Crockett, 37.

[338] Deleuze, *Difference & Repetition*, 223.

equalization of differences in temperature. This natural tendency towards the cancellation of differences in temperature is encapsulated by the laws of thermodynamics, which posit that thermodynamic systems always tend to homogenize differences in temperature in a closed system (what would eventually be identified with the zeroth law), and the direction of this change is determined by the second law of thermodynamics, which points thermodynamic systems in the direction of increasing entropy and the degradation of free energy (not to be confused with the loss of energy). We saw in the first chapter that the cosmological projection of these laws to the rest of nature led many physicists to conclude that the universe is fated to end in heat death, a state of maximum entropy where there are no longer any differences in temperature and therefore no more work is possible.

James Williams explains that the problem for Deleuze is that this picture of reality endorses a view where "energy or intensity has to be cancelled out and distributed spatially in order to be understood and in order to have an effect."[339] Importantly, he notes that energy is defined by two factors: one intensive and one extensive, respectively, as, "for example, force and distance for linear energy, surface tension and surface area for surface energy, pressure and volume for volume energy, height and weight for gravitational energy, temperature and entropy for thermal energy."[340] In every case, intensive differences are inseparable from extension and are in fact covered over by them, such that intensities are interpreted as qualitative aspects of extensional phenomena. Thus, Deleuze argues that "we know intensity only as already developed within an extensity, and as covered over by qualities."[341] This is a crucial problem in the context

[339] James Williams, *Gilles Deleuze's Difference and Repetition: A Critical Introduction and Guide* (Edinburgh: Edinburgh University Press, 2013), 169.

[340] Ibid., 223.

[341] Ibid.

of his mission in *Difference & Repetition* to develop a metaphysical account of difference in-itself that does not subordinate difference to a prior identity, as Aristotle does, for example, in positing that any conceptual definition of an entity requires a difference and a genus which grounds differences in a prior sameness.[342] In a similar fashion, in thermodynamics, difference is "the sufficient reason of change only to the extent that the change tends to negate difference."[343] The subordination of difference to its negation is a challenge for Deleuze's project of developing an idea of difference in-itself as prior to identity. Deleuze wants to flip the script and show how identity does not ground difference but, rather, describe the genesis of identity and extension through intensive differentiation, without presupposing constituted subjects and objects. In other words, "the problem with the logic of classical thermodynamics is that it ignores the way in which intensity actually *engenders* extensive states."[344]

Deleuze's account of thermodynamics is relevant for this project because it demonstrates the connection between energy and spatialized accounts of time. My argument here is that because classical thermodynamics only knows forms of energy that are already localized in extensity, it implicitly adheres to the framework of the cinematographical mechanism discussed in the previous chapter. Similar to the thermodynamic model, the temporal frames of the cinematographical mechanism are already constituted, and no account of the genesis of these frames is given because they are tied together by an impersonal becoming that has no bearing on the actual content of the frames strung together. Thus, the cinematographical mechanism does not offer an account of the genesis of the static frames or extensities it presupposes, since the

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[342] Henry Somers-Hall, *Deleuze's Difference and Repetition: An Edinburgh Philosophical Guide* (Edingburgh: Edinburgh University Press, 2013), 37.

[343] Williams, *Difference & Repetition*, 223.

[344] Dale Clisby, "Intensity in Context: Thermodynamics and Transcendental Philosophy," in *Deleuze Studies* 11, no. 2 (2017): 247.

content of the frames of the cinematographical mechanism are forms of energy already developed as extensity. This subordinates difference to identity, movement to extension, because it is the "extensive component [of energy which] allows the intensive component to be identified and compared… [therefore] energy has a non-spatial intensive side that must be completed by a spatial side where the energy is extended over a particular surface or a particular volume."[345] The problem then is that the genesis of the space within which energy extends itself remains presupposed, like a container of absolute/timeless space, with no account of its genesis, rendering space, like time, as static. The project of developing a concept of energy as change thus requires that we provide an account of the genesis of the extensive states presupposed by the cinematographical mechanism's inertial frames, rather than presupposing each present moment as already given, as the static present which allows energy to be explicated in extension. This is impossible so long as change is subordinated to the annihilation of difference and, in the end, the cessation of change altogether.

Deleuze traces the view of the cancellation of intensity in the production of extensity to what he called the 'transcendental illusion' of entropy. In classical thermodynamics, entropy is an extensional quantity in relation to intensive temperature, where entropy moves in the direction of the cancellation of intensity: "intensity, or energy, is *cancelled* in changes of entropy in the production of states of equilibrium."[346] On the other hand, Deleuze argues that "[w]e cannot conclude from this that difference is cancelled out, or at least that it is cancelled in itself. It is cancelled in so far as it is drawn outside itself, *in* extensity and *in* that quality which fills that extensity. However, difference creates both this extensity and this quality."[347] Deleuze thus

[345] Williams, *Deleuze's Difference and Repetition,* 181.

[346] Clisby, 248.

[347] Williams, *Difference & Repetition,* 228.

wants to invert the thermodynamic model which cancels intensity under extensity and quality to show how intensity engenders extensity and quality while remaining *implicated* in them. That is, intensity is not cancelled under extension and quality. Rather, it makes possible "the general movement by which that which is implicated explicates itself or is extended."[348] Deleuze wants to show that the production of extensity, resulting from intensity being drawn outside itself in extensity and quality, does not lead to intensity being used up—an idea whose logical cosmic consequence is the eventual heat death of the universe. Rather, intensity constitutes extensity and quality while remaining implicated in them: "[i]ntensive difference cancels itself out, but it reserves itself and persists in driving further repetition. There is always a remainder, and that is what Deleuze calls intensity or intensive difference."[349] Thus, although difference is cancelled out in extensive surfaces and covered by quality, it remains implicated as a generative force that unceasingly relates difference to difference onto infinity, which is what Deleuze calls *disparity*, and this, for Deleuze, would be "the sufficient reason for all phenomena."[350]

However, we cannot understand what this means if we remain within the framework of static time which posits only the present moment as actual. In the static present, intensity is always already drawn outside itself in extension and quality. As alluded to above, the problem with the cinematographic present is that in divorcing the mechanism of impersonal becoming from the actual content of the frames it unwinds, an account of the genesis of these states and the source of their movement remains obscured. This is closely related to what Deleuze calls the paradox of entropy: "entropy is an extensive factor but, unlike all other extensive factors, it is an extension of 'explication' which is implicated as such in intensity, which does not exist outside

[348] Williams, *Difference & Repetition*, 229.

[349] Crockett, 58.

[350] Williams, *Difference & Repetition*, 222.

the implication or except as implicated."[351] In other words, entropy has a foot in both worlds of extensity and intensity; it represents both the cancellation of intensive difference in extensity and the dynamism of intensive differentiation. However, the static present can only explicate intensity, i.e., cancel out intensive difference, obscuring its creative dynamism. In this framework, entropy would play the role of the arrow time whose direction is determined by the eschatological goal of the cancellation of intensive difference, but this comes at the cost of missing the generative capacity of entropy, a fact we have described in looking to Ilya Prigogine's work in non-equlibrium thermodynamics. In other words, a static temporal framework cannot provide an adequate explanation of how the dynamism of entropy remains implicated beyond its explication in extension and quality. This, then, is what constitutes the transcendental illusion of entropy: the idea that intensity is cancelled under extension and quality, and "rushes headlong into suicide."[352] Deleuze, on the other hand, will attempt to provide an immanent account of how intensity remains implicated in extension and quality, such that there is always an intensive remainder which is not cancelled out under extensity and quality, and remains as the dynamic principle for further differentiation and flux. Crucially, he will have to develop an account of the virtual and its relation to the actual, since it is the virtual which will provide intensity with the non-spatial (and therefore non-actual or present) depth necessary to overcome the problems associated with static accounts of time.

Intensity, the Virtual, and the Three Syntheses of Time

The task now is to show how intensity—rather than being emergent from, and therefore ontologically secondary to, extensity and quality—constitutes extensive states and emergent

[351] Williams, *Difference & Repetition*, 229.

[352] Ibid., 224.

qualities. Deleuze notes that "[e]xtensity can emerge from the depths only if depth is definable independently of extensity."[353] We must therefore search for the genetic principle of the constitution of physical systems outside of space and extension. This will also force us to reconsider the temporality of these systems, to show how intensive depth requires a spatial depth that cannot be contained in the present.

I have argued above that taking the constitution of extensive states for granted is characteristic of the cinematographical mechanism of thought, which derives the passage of time from the passage from one static state to another. This argument ties in well with Deleuze's description of the temporal model assumed by the transcendental illusion of entropy, i.e., the first synthesis of time: habit.[354] What is characteristic of the first synthesis of habit is the process of 'contraction,' which Deleuze considers the originary synthesis of time. According to James Williams, contraction does not take place in time, but time itself *is* contraction.[355] Referring to examples from Hume and Bergson, Deleuze describes habit as the contraction of similar instances that form an anticipation of the future based on the expectation developed from similar contracted instances, such as when we expect the appearance of the element 'AB' upon contracting the previous instants of the chain 'AB – AB – AB.' In habit we thus move from the less general to the more general, which is key to remember when we relate the synthesis of habit to thermodynamics. Another example used by James Williams is how our body progressively learns to pump water out of a well after the contraction of previous successful attempts, and the repetition of those successful movements which become habitual and mindless after some

[353] Williams, *Difference & Repetition*, 230.

[354] Ibid., 79.

[355] James Williams, *Gilles Deleuze's Philosophy of Time: A Critical Introduction and Guide* (Edinburgh: Edinburgh University Press, 2011), 24.

practice.[356] However, it is important to note that Deleuze did not limit the process of contraction to biological beings. Rather, the contraction of habit is characteristic of what he called the 'living present.' In the living present, past and future are constituted as dimensions of the present, where retention leads to anticipation of future instants in the present. This is an important step in Deleuze's attempt to develop and account of repetition for itself, i.e., repetition not *of* something, which assumes a prior identity, but repetition for itself, which assumes the repetition of difference in-itself: "if we are to have an account of time resistant to the problem of the independence of the instants of time, that is, to the problem of what allows for the connection of those instants, then we must explain how they are brought together in repetition."[357] Without deriving time from a prior immobility or deriving it from an already constituted space, the first synthesis establishes the living present as the process of contraction.

Having provided an account of the first synthesis of time, it might seem confusing, or even wrong, to claim that the first synthesis of time grounds the transcendental illusion of entropy, particularly because I have argued that the transcendental illusion is grounded in the cinematographical mechanism of thought which takes the constitution of extension and space for granted. The living present, as we have seen, does not derive movement from immobility, but is an attempt to conceive of time as process, as the process of contracting habits, and it interacts with the past and the future, rather than existing in static solitude. To really emphasize the difference between the first synthesis of habit and the cinematographical mechanism of thought, in order that I may not be accused of conflating them, I would like to point once again to Williams' opinion on the subject:

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[356] Cf. the beginning of the second chapter of Williams, *Deleuze's Philosophy of Time*.

[357] Ibid., 25.

> [t]he future and past as living present become conditions for the past and future conceived as separate from the present, because without the living present they are not synthesised [sic.] and have no existence as a time that unfolds and coheres. By stretching the present into syntheses of past and future events, Deleuze thus goes beyond the traditional idea that past and future have to be thought from a present instant, the 'now.'[358]

Clearly, whereas the cinematographical mechanism paints a static account of time, Deleuze's account of the present is ecstatic in positing past, present, and future as interacting dimensions that are different in kind from each other. Therefore, we might wonder why it is that Deleuze considered the first synthesis of time to be the model for the transcendental illusion of entropy, considering that the whole illusion is that extensive states are always already constituted, thereby closing off any possibility of an ecstatic interaction between the three dimensions of time by taking the constitution of physical systems for granted.

The solution to this riddle lies in the connection Deleuze establishes between the first synthesis of time and 'good sense.' Without diving into an exhaustive discussion of the concept, it is enough here to describe good sense as the habit of "viewing difference as that which is cancelled out."[359] Deleuze explains that good sense attaches the 'feeling' of the absolute to partial truths, such that partial truths are just instances of an absolute and that the passage of time moves from the particular (the partial) to the general (or absolute).[360] He goes as far as to say that good sense is thermodynamic, because "it recognises difference just enough to affirm that it negates itself, given sufficient extensity and time."[361] Good sense, then, is grounded in the first synthesis of time because it is itself a contracted habit of subordinating difference to its

[358] Williams, *Deleuze's Philosophy of Time*, 25-26

[359] Williams, *Deleuze's Difference and Repetition*, 182.

[360] Ibid., 224-225.

[361] Ibid., 225.

cancellation in extension, not denying difference, but always seeing it as moving in the direction of its cancellation, thereby missing its genetic power to generate the extensive states and eschatological passage of time that it presupposes. The cinematographical mechanism, then, seems also to be wedded to the habit of good sense, which takes the constitution of physical states for granted, without problematizing the very genesis of the states it presupposes, and from which it derives a conception of time from the reconstruction of mobility from immobile states. Deleuze, however, moves beyond and furthers my argument concerning the cinematographical mechanism by describing the temporal process of contraction that it arises from, and explicitly tying this epistemological habit to thermodynamics.

The discussion of the first synthesis of habit and its relation to good sense and thermodynamics has been necessary in order to address the problem of intensive depth stated above, i.e., the need to identify a non-extensive space from which extension and quality can arise without presupposing them. Deleuze notes that although "the explication of extensity rests upon the first synthesis, that of habit or the present… the implication of depth rests upon the second synthesis, that of Memory and the past."[362] The second synthesis of memory is directly indebted to Bergson's work on memory and the virtual, which I discussed in the previous chapter. I mentioned previously in that chapter that for Bergson, materiality is the point at which the present tends to lose its connection to the past. Referring to Bergson's concept of duration, Deleuze writes that "[d]uration is only the most contracted degree of matter, matter the most expanded (*détendu*) degree of duration."[363] The contracting movement of duration implies the contraction of time passed into memory, whereas in the movement towards materiality duration

[362] Williams, *Deleuze's Difference and Repetition*, 230.

[363] Deleuze, *Bergsonism*, 93.

expands; the tension resulting from the contraction of moments of duration loosens and the past loses its connection to the present; such is the nature of matter for Bergson. In this sense, "Memory is essentially difference and matter essentially repetition."[364] Extensity, then, is constituted by the cyclical movement between the pure past as Memory and the present as materiality, where extension and the tension/contraction of memories in duration have an inverse relationship. A helpful example to make this point is to apply this conception of time to the relation between body and mind, where the human body represents our duration at its most expanded—recall the memory cone from the previous chapter, where the tip of the cone represents the point at which memory gains access to the present. The memory cone, in turn, the entirety of our contracted duration, for Bergson, constitutes the mind. There is then a ceaseless movement between the body and mind, which is always contracting duration, but also repeating memories via recollections, which I described in the previous chapter as memory gaining access to the present via bodily mechanisms.

Recall now that I described the existence of memory, the pure past which Deleuze writes as 'Memory,' as a 'virtual' existence. The virtual is not that which is not real, but that which is not actual; that which does not act in the present. We can now see how the virtual nature of Memory provides the non-extensive depth required to provide an account of the genesis of extensive states. This depth *is* intensity as such: "[u]nlike extensity, which measures the relational difference between external identities and therefore reduces difference to homogenous identities, intensity concerns an internal dimension – or in other words, depth – which is not an extension but rather the 'heterogenous dimension' from which extensity emerges."[365] Or, in

[364] Deleuze, *Bergsonism*, 93.

[365] Lundy, 184.

Deleuze's own words, "[d]epth is the intensity of being, or vice versa."[366] It then becomes clear to see that the cancellation of intensity in extensity does not tell the full story of the genesis of extensive states. The cancellation of intensity in materiality is a moment of a more originary movement between matter and Memory, where intensive difference moves between the virtual and the actual without ever being fully cancelled by the latter, given that the latter does not ground intensive difference but is rather a result of it. Accordingly, Deleuze credits the synthesis of Memory for providing the depth that makes possible the actualization of the virtual in quality and extensity.[367]

Before explaining the third synthesis of time, it is helpful here to elaborate a little more on the process by which the virtual is actualized. It is important here to introduce the notion of individuation, and how it relies on the notion of the virtual. Individuation implies an intensive field of differences that includes virtual multiplicities characterized by a set of differential relations which organize disparate elements and processes in the actualization of entities in terms of extension and quality. Let's take a hurricane, for example. In this instance, "[t]he differential elements… [are] driven by intensive differences in temperature and pressure but undetermined in form… and function."[368] Furthermore, "[t]hese flows qua differential elements enter into relations of reciprocal determination linking changes in any one element to changes in the others; temperature and pressure differences will link changes in air and water currents to each other."[369]

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[366] Williams, *Deleuze's Difference and Repetition*, 231.

[367] Ibid., 239. "This fundamental differenciation (quality-extensity) can find its reason only in the great synthesis of Memory which allows all the degrees of difference to coexist as degrees of relaxation and contraction, and rediscovers at the heart of duration the implicated order of that intensity which had been denounced only provisionally from without."

[368] Daniel Smith, John Protevi, and Daniela Voss, "Gilles Deleuze," in *The Stanford Encyclopedia of Philosophy* (Summer 2023 Edition), eds. Edward N. Zalta and Uri Nodelman, <https://plato.stanford.edu/archives/sum2023/entries/deleuze/>.

[369] Ibid.

This example is meant to demonstrate that even though hurricanes are explicated by the differential relations of material flows, such as that of temperature and pressure, the genesis of the hurricane is indebted to the intensive field of individuation which provided a direction for the actualization of the hurricane through the cancellation of intensive differences. This intensive field provides the direction of actualization of the hurricane through virtual lines of intensive difference and the reduction of gradients established by these differences (e.g., temperature and pressure gradients). Deleuze called the movement from the virtual totality to lines of actualization 'differenciation,' in order to distinguish it from 'differentiation,' which is meant to denote "the movement from actual tendencies to the Virtual whole."[370] The hurricane is thus a clear example of Deleuze's claim that "individuation precedes differenciation in principle, that every differenciation presupposes a prior intense field of individuation."[371] (Another example often mentioned in *Difference & Repetition* is that of embryology and the individuation of the embryo through lines of actualization of a field of intensive differences).[372]

Now we turn to the third synthesis of time to complete this synoptic outline of the relation between energy/intensity, the virtual-actual relation, and the three syntheses of time. Conveniently, Deleuze devotes a section of the fifth chapter to the relation of energy and eternal return. I have already alluded to Deleuze's account of the eternal return as the eternal return of difference, a principle of creative repetition, in the previous chapter when discussing the similarities between Nietzsche and Bergson's philosophies of time. Indeed, Deleuze's eternal return is an interpretation of the concept as it was conceived by Nietzsche, where the 'Same' in eternal return of the Same is said of difference in-itself. Referring to the novelty of Nietzsche's

[370] Lundy, 188.

[371] Williams, *Deleuze's Difference and Repetition*, 247.

[372] Cf. Ibid., 214-17, 249-51.

eternal return, which is not the geometric return of spatial forms of the Ancients criticized by Sugarman in the second chapter, Deleuze asks, "[w]hy did Nietzsche, who knew the Greeks, know that the eternal return was *his* own invention, an untimely belief or belief of the future? Because 'his' eternal return is in no way the return of a same, a similar or an equal."[373] Deleuze's interpretation is helpful in resolving the apparent paradox in Nietzsche's philosophy: where the latter paints a metaphysical picture of the world such that there are no identities or essences, and yet one of the central concepts of his philosophy is the eternal return of the *Same*. Deleuze claims that the eternal return is not qualitative or extensive, but intensive, and insofar as intensity for Deleuze denotes difference in-itself, it becomes clear how the return of the Same as intensity is the return of difference in-itself: "Eternal return is the being of this world, the only Same which is said of this world and excludes any prior identity therein."[374] The apparent anachronism of reading Nietzsche's eternal return through intensity is dispelled when one considers that eternal return is fundamentally connected to the will to power as a genetic principle of differentiation, as a perspectival relational ontology that Nietzsche developed precisely to dispel the old metaphysics which takes identity and essence as its fundamental principles—the will to truth.

The eternal return can be read as both an ethical and cosmological selective principle: ethical insofar as it is the ultimate test—the heaviest weight—of the affirmation of life. Deleuze follows Nietzsche in also reading it as a cosmological principle. The temporality of eternal return as selective principle for Deleuze entails that only that which is affirmed returns, and we have already seen that in this interpretation the return is intensive, meaning that only difference is affirmed in the eternal return. Therefore, what does not return is that "which denies eternal

[373] Williams, *Deleuze's Difference and Repetition*, 242.

[374] Ibid., 243.

return… It is quality and extensity which do not return, in so far as within them difference, the condition of eternal return, is cancelled… [So too] repetition when it is subject to the condition of the identity of a same quality, a same extended body, a same self."[375] The synthesis of eternal return thus allows for the possibility of creative repetition, of the repetition of difference, without relying on a prior identity or essence. The past, present, and future are thus all forms of Repetition (the capital 'R' is meant to signify ontological repetition) but in different ways: "[t]he present is the repeater, the past is repetition itself, but the future is what is repeated."[376] The eternal return guarantees that the past is always repeated differently in the present, thereby overcoming spatialized accounts of time which construct movement out of the immobile. Deleuze summarizes his account of the three syntheses of time in the second chapter:

> [w]e see, then, that in this final synthesis of time, the present and [past] are in turn no more than dimensions of the future: the past as condition, the present as agent. The first synthesis, that of habit, constituted time as a living present by means of a passive foundation on which past and future depended. The second synthesis, that of memory, constituted time as a pure past, from the point of view of a ground which causes the passing of the one present and the arrival of another. In the third synthesis, however, the present is no more than an actor, an author, an agent destined to be effaced; while the past is no more than a condition operating by default.[377]

The intensive return of the Same, insofar as the Same is said of the different—difference in itself—thus completes the three synthesis of time and provides a coherent framework in which Deleuze can provide a full-blooded account of time, that is, time as pure becoming, as opposed to the moving image of eternity.

[375] Williams, *Deleuze's Difference and Repetition*, 243.

[376] Ibid., 94.

[377] Ibid., 93-94.

Conclusion: Energy After Deleuze

All that is left to consider is what becomes of the concept of energy in light of Deleuze's philosophy of time and metaphysics of difference. Deleuze writes that there are two ways of talking about energy in the context of his work.[378] There is the empirical notion of energy, which refers to forms of energy already explicated in extensity and grounded in the principle of conservation of energy, which points to the conservation of 'something' from which change is derivative—the spatialized form of energy that has been the object of critique of this work. And then there is energy as intensity: a more ontologically fundamental notion of energy that serves as the genetic principle for the first kind of energy. Energy as intensity is implicated in the explication of extensity and quality through the cancellation of intensive difference, but there is always an intensive remainder that ensures perpetual becoming and return of difference. Thus, within the context of Deleuze's philosophy, the classical notion of energy developed in physics is subsumed within the wider umbrella of intensity in a manner foreshadowed in the third chapter on Bergson, where I argued that Bergson's philosophy of duration promised the possibility of developing a new concept of energy, where the energy of physics is simply a special case of a much broader energetic paradigm, much like Newtonian physics went from being a universal theory to simply a special case of general relativity and quantum mechanics. We are finally poised to make the claim that thermodynamic energy "occupies the position of intensity with regard to physical systems."[379] In this way, a distinction is drawn between energy as an empirical principle and energy as a transcendental principle.

[378] Williams, *Deleuze's Difference and Repetition*, 240.

[379] Clisby, 254.

The empirical energy of physics is constituted in "a qualified and extended partial system, governed in such a manner that the difference of intensity which creates it tends to be cancelled within it (*law of nature*)."[380] For Deleuze, thermodynamic energy is constituted in domains where intensive differences have been cancelled under extension and quality. Laws of nature in this case do not determine the cancellation of intensive differences, but emerge from them. The regularity of laws of nature is not a result of their being timeless laws that govern passive materiality, but from being constituted by the relative stability of domains where intensive difference has already been cancelled: "[m]oreover, while the laws of nature govern the surface of the world, the eternal return ceaselessly rumbles in this other dimension of the transcendental."[381] Laws of nature in a Deleuzian ontology are thus better thought of as historical regularities in how intensive differences are related to each other within a particular domain.[382] Energy as intensity, as transcendental principle, on the other hand, is an answer to the question of the *being* of the sensible.

If, as Crockett and I contend, being is energetic flux and energy is change, an empirical account of energy has to be supplemented by a transcendental one, since, as I have shown, the history of energy grounds energy in spatialized notions of time which fail to give an account of the genesis of the physical systems and the eternal present which scientific and philosophical accounts of energy have traditionally presupposed. Deleuze notes that when we ask "[w]hat is the being *of* the sensible? Given the conditions of this question, the answer must designate the paradoxical existence of a 'something' which simultaneously cannot be sensed (from the point of view of the empirical exercise) and can only be sensed (from the point of view of the

[380] Williams, *Deleuze's Difference and Repetition*, 241.

[381] Ibid., 241.

[382] Cf. Manuel DeLanda's *Intensive Science and Virtual Philosophy* for a Deleuzian critique of laws of nature.

transcendent exercise)."[383] Empirical energy explicates the sensible, offering it up to the senses, but when we ask of the being of the sensible, Deleuze offers energy as intensity, the form of difference in-itself, as the being of the sensible, intensity which lies beyond the senses and at the limits of thought—"the noumenon closest to the phenomenon."[384]

The concept of intensity solves a further problem. Scientists for over two centuries now have conceived of being as energetic flux, but have limited the application of the concept of energy to the domain of natural science. If we insist on understanding the whole universe in terms of energy, then how can we think of cultural phenomena, for instance, in terms of energy? How can we describe history, memory, intersubjectivity, and language as energetic phenomena in their own right? There is a seemingly unbridgeable abyss in the modern scientific worldview between objectivity and subjectivity. We are stuck so long as we remain within the domain of empirical energy, which has only been successfully applied to understanding nature by reducing it to matter, omitting any account of subjectivity or mind (human or otherwise). Deleuze's conception of intensity on the other hand offers an account of mind that is immanent to materiality, which is largely indebted to Bergson's identifying the dualistic tendency of consciousness and matter in duration. Furthermore, the concept of intensity is central to Deleuze and Félix Guattari's celebrated work, *A Thousand Plateaus: Capitalism and Schizophrenia*, where "[i]n fourteen plateaus of intensity—productive connections between immanently arrayed material systems without reference to an external governing source—Deleuze and Guattari develop a new materialism in which a politicized philosophy of difference joins forces with the sciences explored in *Difference & Repetition*."[385] There is thus a precedent in Deleuze's own

[383] Williams, *Deleuze's Difference and Repetition*, 236.

[384] Ibid., 226.

[385] *Stanford Encyclopedia of Philosophy*.

work for approaching social, political, economic, linguistic, and psychological questions in terms of energy (understood as the transcendental principle of difference in-itself: intensity) without alienating the concept from its origins and usage in physics. In this sense, the empirical energy of physics constitutes just one plane of intensity among many overlapping planes of intensive difference, whose dual movements towards actualization or 'back' to the virtual totality, provide the intensive depth necessary for the constitution of the sensible world of space and extended things with which we are so familiar.

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