A UNIVERSE OF FORCES: ENERGY IN EARLY TWENTIETH-CENTURY
THEORY AND LITERATURE

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ABSTRACT

Lynn Ann Badia: A Universe of Forces: Energy in Early Twentieth-Century Theory and Literature
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Focusing on the historical conjuncture at the turn of the twentieth century, this dissertation examines how theorists in the humanities and social sciences were engaging with energetics and thermodynamic theory in their work. Following the radical developments of nineteenth-century physics, philosophers, sociologists, and literary authors reconceived “non-material” phenomena (mind, society, culture) as part of the natural world through related concepts of energy, force, vibration, and rhythm. An energetic materialism emerged in which theorists reimagined matter as energy and contended with the dynamic relationships this ontology implied. While dynamic and developmental accounts of nature are often associated with evolutionary theory in the nineteenth century, this study demonstrates that the science of energy contributed equally to a metaphysics of transformation. Both philosophical and literary naturalism are considered in this analysis with a focus on Henri Bergson’s theory of mind and matter, Emile Durkheim’s theory of the social, Henry Adams’s theory of history, and Jack London’s aesthetics of force and rhythm. In each case, important developments in twentieth-century thought emerged as revised notions of matter and interaction were elaborated in a new discourse of energetic materialism.
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Introduction

In 1867 mathematical physicist James Clerk Maxwell (1831–1879) posed a hypothetical scenario that seemed to violate the law of thermodynamics. In his thought experiment, a little being — known as Maxwell’s demon — stood at an opening between two chambers of a gas filled container. The demon’s job was to open the passage to allow fast-moving particles to move into one chamber and slow moving particles to pass into the other. Eventually, as the slow particles accumulated in one chamber and the fast particles in the opposite, the system would become thermodynamically more organized. In this scenario, it seemed that the decrease in entropy (i.e. increase in organization) was made possible simply by the demon judging the speed of the particles and differentiating the fast from the slow. Since no additional mechanical energy was added to the system, how was the decreased entropy possible without violating the second law of thermodynamics?

The puzzle of Maxwell’s Demon was still unsolved 1929, when Leo Szilard (1898–1964), a scientist in physics and molecular biology, made an important contribution to the problem in an effort to explain how this scenario still fit within thermodynamic theory. Szilard’s insight was deceptively simple; he realized that the demon’s mental calculations required energy. In other words, the energy used by the demon’s brain was the additional energy added to the system, bringing it to a less entropic and more organized state. In his paper, “On the Reduction of Entropy in a Thermodynamic System by the Intervention of
Intelligent Beings,” Szilard states, “of course, it remains to be decided whether we do not make an error if we do not consider the interfering subject himself, in the system, along with his life processes” (Szilard 2). Szilard’s real revelation was in stating that intelligent thought was not detached from the material world but just as embedded in it as bodies and particles.

I open with this anecdote to frame the metaphysical problem regarding energy that animated the work of all of the theorists discussed in this dissertation. In her account of Szilard’s answer to Maxwell, Melanie Mitchell observes that, “from our twenty-first-century vantage, it may seem obvious (or at least unsurprising) that the acquisition of information requires expenditure of work. But at the time of Maxwell, and even sixty years later when Szilard wrote his famous paper, there was still a strong tendency in people’s mind to view physical and mental processes as completely separate” (46). In other words, during the time leading up to Szilard’s paper, there remained a strong philosophical dualism that divided the material body extended in space from a mind that was not. This puzzle of the demon, then, was as much a philosophical problem as a scientific one. In the space of those six decades that puzzle of Maxwell’s demon stood without Szilard’s insight, theorists in the social sciences and humanities were preparing the way for Szilard through the discourse of energetics, in which the human body and mind were conceptualized as deeply embedded within a variety physical and energetic systems.

This study examines how theorists outside of the sciences were contending with questions of mind, meaning, and social life through a new energetic materialism, which reimagined matter as energy and contended with the dynamic relationships this ontology implied. Over the course of the nineteenth century, theories of energy, fields, radiation,
and electromagnetism were radically changing physics and ontology and notions of matter and interaction. As Herbert Wildon Carr describes in his Preface to Henri Bergson’s *Mind-Energy*, “a change almost amounting to a revolution has overtaken the general concept of the nature of physical reality. This is due to the development of the electromagnetic theory of matter. In modern physics we may say that the old concept of stuff has been completely displaced by the new concept of radiant energy” (Carr v). Henry Adams also describes the transformation of nineteenth century science in *The Education of Henry Adams*: “The man of science must have been asleep indeed who did not jump from his chair like a scared dog when, in 1898, Mme. Curie threw on his desk the metaphysical bomb she called radium” (377).

This dissertation, then, deals with both philosophical and literary naturalism, focusing on how phenomena that were held distinct from physical nature (mind, society, culture) were reincorporated in it through a science of dynamic energetics, which sidestepped a material reductionism associated with earlier scientific paradigms in the physical sciences. While dynamic and developmental accounts of nature are often associated with the emergence of evolutionary theory in the nineteenth century, the following chapters demonstrate that the science of energy contributed equally to a metaphysics of transformation and to epistemologies and ontologies of constructivism that emerged from this conjuncture. During the first two decades of the twentieth century (preceding Szilard’s paper), philosophers, social scientists, and literary authors reconceived the “non-material” (mind, social life, culture) as part of the natural world through the connected concepts of energy, force, vibration, and rhythm. Specifically, I examine Henri Bergson’s theory of mind and matter, Emile Durkheim’s theory of the social, Henry
Adams’s theory of history, and Jack London’s aesthetics of force and rhythm. In each case, important developments in twentieth century thought emerged as revised notions of matter and interaction were elaborated in a new discourse of energetic materialism.

It is helpful to begin by briefly reviewing the developments of nineteenth-century physics that contributed to an energetic picture of both matter and interaction. The term *energy* has its roots in antiquity and the fundamental concepts involved in its modern theorization (motion, force, pressure, heat) have been in continual development since their emergence in ancient philosophy. However, the modern understanding of energy as the organizing concept of physical mechanics was not formalized until the nineteenth century. The two laws of classical thermodynamics that are significant to the present study – the first and the second laws – describe the conservation of energy and the theory of entropy (in total there are four laws, including the zeroth and the third law). The first law of thermodynamics states that energy is not created or destroyed as it transforms from one state to another within isolated systems; energy is conserved. In other words, the amount of energy in the universe (the total system) remains constant.

In thermodynamic theory, energy is defined as a system’s ability to do work. In the industrial context of the nineteenth century, it was quickly observed that physical systems loose energy in the form of heat as they produce mechanical work. The second law of thermodynamics developed from this observation, and it states that the energy of isolated systems will always move from a more organized to a less organized state, in which energy cannot be recuperated by the system in a usable form for doing work. Entropy, then, is the movement of energy from an organized to a chaotic and unusable state. The second law of thermodynamics indicated a bleak future for the universe; as a physical system, the
universe was also moving towards an energetic state of maximum disorganization and
dissipation and, as a consequence, it would inevitably end in “heat death.”

Thermodynamic theory was not the only development, however, that contributed
to an energetic picture of the physical universe.

By the later nineteenth century, electromagnetism had joined
thermodynamics in radically challenging prevailing conceptions of physical
reality. A succession of highly publicized discoveries and inventions in the
1890s, including X-rays, and wireless telegraphy, focused attention on
radiant energy in the form of electromagnetic waves vibrating at various
frequencies in the luminiferous ether, the hypothetical medium credited
with the transmission of such waves. (Clarke and Dalrymple Henderson, 2)

These developments in physics changed, fundamentally, how basic properties and causal
lines were imagined: causality that was previously understood as force between objects
was reimagined as an exchange among rhythmic, transforming, energetic systems. In such
a picture, the demarcations between entities and environments were altered to incorporate
new modes of influence and exchange. In Matter and Memory (1896), Henri Bergson
describes the new vision of energetic matter in this way:

If you abolish my consciousness … matter resolves itself into numberless
vibrations, all linked together in uninterrupted continuity, all bound up with
each other, and traveling in every direction like shivers. In short, try first to
connect together the discontinuous objects of daily experience; then, resolve
the motionless continuity of these qualities into vibrations, which are
moving in place…You will obtain a vision of matter that is perhaps
fatiguing for your imagination, but pure and stripped of what the requirements of life make you add to it in external perception. (208)

Given a fuller picture of nineteenth century physics, I argue that a metaphysics of development and transformation, which is often read in relation to evolutionary theory (and in opposition to Newtonian physics), also needs to be understood in relation to the physics of energy and an energetic materialism more generally.

Recent scholarship in a number of disciplines in the humanities and social sciences has focused on the developments of nineteenth-century thermodynamic theory and its far-reaching implications for fields in and outside of the sciences. For sake of convenience, I will group these studies into three primary categories, although significant overlap exists therewithin: 1. studies that consider the link between thermodynamic theory and the rise of information science, cybernetics, the science of complexity, and the epistemological shift that complexity necessitates; 2. studies that examine thermodynamic theory and energetics as fundamental to the conditions of twentieth century modernity, especially relating to notions of the human body, labor, time, and the representational schemes in literature and art; and 4. studies that examine and trace the history of “force” and “energy” as complicated and shifting concepts which bear the imprint and strain of these developments. The following review is not intended to be comprehensive but to provide a map through these conversations, which, in various ways, identify thermodynamic theory as an origin.

1. Information, Complexity, and Epistemological Shift

In two recent works, “Complexity Studies and the Transformation of the Structures of Knowledge” (2007) and Life and Times of Cultural Studies: The Politics and
Transformation of the Structures of Knowledge (2004), Richard E. Lee has provided a wide-angle view of the changes in twentieth century epistemology that link back to thermodynamic theory.¹ Lee begins by identifying the developments in seventeenth-century science and philosophy (emerging with Newton, Bacon, and Descartes) that “led to the solidification and separation of the sciences from the humanities” (“Complexity Studies” 12). In Lee’s account, the settlement of this disciplinary division remained relatively stable until the twentieth century, when particular intellectual and historical developments began to undermine the traditional epistemological systems that operated on the premise of a separation between “truth” (in the sciences) and “value” (in the humanities). Consequently, the coherence and purpose of the corresponding “hierarchical separation between the ‘sciences’ and ‘humanities’” were also upset, particularly within the developing social sciences (12). This revolution in the structures of knowledge (“the categories through which we make sense of the world we live in, the groundings that give authority to explanatory frameworks, the rationales for the organization of intellectual disciplines”) where accelerated in the 1950s and 1960s, with the development of cultural studies (originating in the humanities) and complexity studies (with roots in the sciences). (11).

In regards to thermodynamics, Lee cites the development of complex system theory (also known as neocybernetics or second-order systems theory) for undermining long-stable concepts such as agency, determinism, and freedom, along with the conceptual structures that produced them (“Complexity Studies” 16). “Developments in the sciences and mathematics, especially the study of the thermodynamics of open systems and of

¹ See also, Richard E. Lee et al., Overcoming the Two Cultures (2004), and Lee, “Readings in the ‘New Science.’ A Selective Annotated Bibliography” (1993).
certain ordered mathematical systems with few degrees of freedom whose evolution is Nonetheless unpredictable, broke down disciplinary barriers...and reformulated the bases on which the debates over determinism and predictability in human systems had developed” (14). For Lee, the epistemological transformation created an alliance between complexity and cultural studies, in that both call for the dissolution of strict disciplinary borders and the knowledge systems that created them. The alliance between complexity and cultural studies in this epistemological reorientation is rendered visible through the shared methodological approaches and theoretical questions of each field:

Social analysts may (indeed must, I would argue) henceforth make the shift from fabricating and verifying theories to imagining and evaluating the multiple possible consequences of diverse interpretive accounts of human reality and the actions they entail...As work in cultural studies and complexity studies so strongly suggests, the definition of valid knowledge claims in terms of ‘who, what, when, where, why’ and the ‘view from nowhere’ is being reformulated in terms of ‘for whom, for what, for when, for where’ and ‘from whose point-of-view. (19)

The path from classical thermodynamics to neocybernetics (and the thermodynamics of open systems) that Lee references is anything but straightforward, and it maps through a number of disciplines. However, we can look at few historical moments from this history, which are important for understanding how thermodynamic theory stands as the origin of complexity theory and how it necessitated the reconceptualization matter and interaction.

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2 There are several accounts of this history, which are focused on differing questions and disciplinary concerns. For accounts that pertain to the present study and for more extensive bibliographies see: Bruce Clarke, “From Thermodynamics to Virtuality,” in From Energy to Information; Mitchell, Complexity, p. 15-87; and Bruce Clarke and Mark Hansen, Emergence and Embodiment, p. 1-24; and Katherine Hayles, How We Became Posthuman.
This history also demonstrates not only the array disciplinary interactions that Lee describes but also the heterogenous modes of inquiry that contributed to the theoretical field known as complexity. First, I would point again to Leo Szilard’s contribution to the puzzle of Maxwell’s Demon in 1929, as it incorporated human intelligence with the picture of physical thermodynamic systems. As Melanie Mitchell has noted in *Complexity: A Guided Tour* (2009), Szillard was the first to make a link between entropy and information, a link that later became the foundation of information theory and a key idea in complex systems” (45), even though the debate over Maxwell’s demon remains unsettled. Not long after Szilard, Claude Shannon published his famous paper, “A Mathematical Theory of Information” in 1948, which theorized information in close analogy with Boltzmann’s definition of entropy and statistical thermodynamics. The consolidation of cybernetic theory and the Macy Conferences directly followed Shannon’s publication.

The transition to neocybernetics began in the 1960s, with an array of developments in physics, chemistry, biology, and the cognitive sciences, that emerged in conversation with cybernetics and thermodynamic theory. Work from the biological, cognitive, and social sciences (initially from Ludwig von Bertalanffy, Heinz von Foerster, Niklas Luhmann, Gregory Batson, Humberto R. Maturana, and Francisco Varela) contributed

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3 For an account of Heinz von Foerster’s response to Maxwell’s thought experiment, see Bruce Clarke, “Heinz von Foerster’s Demons: The Emergence of Second-Order Systems Theory” in Clarke and Hansen, *Emergence and Embodiment*.

4 The fact that information theory was initiated through a carefully constructed analogy to thermodynamics remains a point of interest for the history of science. “Although information theory was inspired by notions of entropy in thermodynamics and statistical mechanics, it is controversial whether or not information theory has had much of a reverse impact on those and other fields in physics. In 1961, communications engineer and writer John Pierce quipped that ‘efforts to marry communication theory and physics have been more interesting than fruitful.’ Some physicists would still agree with him. However, there are a number of new approaches to physics based on concepts related to Shannon’s information theory (e.g. quantum information theory and the physics of information) that are beginning to be fruitful as well as interesting” (Mitchell 55).
theories of self-referential systems, emergence, and autopoiesis as the thermodynamics of open, living, and social systems were examined. At the same time, contributions from chemistry and physics are cited to Ilya Prigogine’s work on open thermodynamic systems that function far from equilibrium.

The epistemological shift that Lee sources to complexity and cultural studies (a shift from “verifying theories” to “evaluating multiple possible consequences of diverse interpretive accounts”) has been echoed by other theorists and historians of complexity. In their introduction to *Emergence and Embodiment: New Essays on Second-Order Systems Theory* (2009), Bruce Clarke and Mark B. Hansen recount the development of neocybernetics and its primary concepts while explaining how this shift mirrored “a related shift from a representationalist to a constructivist epistemology and ontology” (12). Clarke and Hansen also claim (as does Lee) that the boundaries “among science, technology, sociology, psychology, history, literature, and the art” are begin reshaped through neocybernetics using concepts of “narrative, medium, assemblage, information, noise, network, and communication” (6). Clarke and Hansen place Michel Serres, Gilles Deleuze, Donna Haraway, and Bruno Latour as central figures that have “deployed neocybernetic discourse extensively and transformatively” (5). Indeed, Manuel De Landa, who may also be included here, has offered, for instance, a materialist account of history in light of Prigogine’s revised, non-linear thermodynamic theory in *A Thousand Years of Nonlinear History* (2000). De Landa seeks to provide a history that avoids the linearity he sees in classical evolutionary and thermodynamic theory, as “these two theories incorporated a rather weak notion of history” and “admitted only one possible historical outcome, the reaching of thermal equilibrium or of the fittest design” (13). Instead, De
Landa turns to Prigogine’s thermodynamics and notions of feedback, bifurcation, and emergence. De Landa describes his “renewed materialist history” this way:

In a real sense, reality is a single matter-energy undergoing phase transitions of various kinds, with each new layer of accumulated “stuff” simply enriching the reservoir of nonlinear dynamics and nonlinear combinatorics available for the generation of novel structures and processes. Rocks and winds, germs and words, are all different manifestations of this dynamic material reality, or in other words, they all present the different ways in which this single matter-energy expresses itself. (21)

De Landa’s description of “a philosophical approach to history which is as bottom-up as possible” (18), resonates with how M. Norton Wise explains the influence of complexity on the nature of scientific explanation in a broad array of fields. In his edited collection Growing Explanation: Historical Perspectives on Recent Science (2004), Wise focuses on scientific discourse and claims that, “in place of the drive to reduce phenomena from higher-order organization to lower-lying elements as the highest goal of explanation, we seen a new focus on understanding how elementary objects get built up — or better, are ‘grown up’ — into complex ones and even a reconsider of the nature of things regarded as elementary, like particles and genes” (Wise 1). In biology as well as physics, Wise argues that “repeatedly we find objects understood as dynamical processes rather than static units, objects defined by their topological or morphological properties….Instead of particles all the way down, it would be dynamics all the way up” (19).
2. Modernity and Representation

While the review above considers the history of complexity as a lens to examine thermodynamic theory and its significance within twentieth century epistemology and ontology, there is also a growing body of scholarship that considers the relationship of thermodynamic theory and the conditions of twentieth-century modernity and its modes of representation. In addition to *Emergence and Embodiment*, Bruce Clarke has published two important volumes centered on questions of representation, literature, and visual media. The first, *Energy Forms: Allegory and Science in the Era of Classical Thermodynamics* (2001), can be grouped with other recent studies that draw attention to the analogical interactions of nineteenth-century thermodynamics, narrative, and poetic form. Clarke makes larger claims with Linda Dalrymple Henderson in their edited collection, *From Energy to Information: Representation in Science and Technology, Art, and Literature* (2002), which characterizes the concepts of energy and information as “discursive operators” that shape thought in the twentieth century. The primary aim of this volume is to “demonstrate the centrality of the theme of energy in modernist discourse” and to align a shift from modernity to postmodernity with the shift in discourse from energy to information (1). Unlike *Emergence and Embodiment*, which is focused on questions of epistemology and ontology, Clarke and Dalrymple Henderson address the

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intersection of science, aesthetics, and critical theory through issues of representation (literary and visual), ideological constructions, and discourse in “the cultures of thermodynamics.” The volume considers the modernist literary preoccupation with energy as seen in Walt Whitman’s poetry; the various texts, images, and sculptures produced by the Futurists and Vorticists; the narrative preoccupation with cosmic catastrophe and “heat death” (entropic decline) at the turn of the century; and the literary techniques developed by T. S Eliot and Ezra Pound that worked by “oblique suggestiveness” via the rhythms of physical energies and wave motions. Clarke and Dalrymple Henderson also consider visual art and the formal strategies developed in painting during the first two decades of the twentieth century that aimed to both represent and register on the canvas the “invisible, vibrating forms of energy” implied by the thermodynamic picture and technologies such as the X-ray and telegraph.

Clarke and Dalrymple Henderson’s argument is closely aligned with Michel Serres’s commentary on energy and information theory, as examined in Feux et Signaux de Brume: Zola (Fires and Foghorns: Zola) (1975). Serres’s un-translated volume relates energy (“fires”) and information theory (“foghorns”) to explain how “thermodynamics and information theory were linked…through the notions of circulation, network, entropy, and disorder” (Bell 659). Furthermore, through an extended analysis of Emil Zola’s work and literary naturalism, Serres critiques simplified notions of “influence” as the mode of relation between science and the humanities; Serres argues that “scientific structures are mobilized and theoretical questions raised in literary text[s]” (659). Ultimately, Serres claims “thermodynamics had a cultural richness during Zola’s period that regularly outpaced its own formalization in scientific publication” (659).
As is already suggested in the discussion above, Clarke and Dalrymple Henderson argue that the primary technologies developed from advances in nineteenth-century physics — namely the steam engine, dynamo, X-ray, and telegraph — created a circuit of influence between scientific theory and material culture.

In the case of historical sequence from the nineteenth-century sciences of energy to the twentieth-century sciences of information, experimental and theoretical developments have fed into technological innovations, which in turn have been commodified and distributed as cultural practices throughout modern society. With regard to thermodynamics, the development of the steam engine produced both the technological reorganization of manufacturing and transportation and, at the beginning of the nineteenth century, a new research emphasis on the mechanics of heat. At mid-century, the development of thermodynamics was consolidated in the modern energy concept. (1)

In *The Human Motor: Energy, Fatigue, and the Origins of Modernity* (1992), Anson Rabinbach provides a similar account of the exchanges among physics, the science of the body, and industrial modernity. Rabinbach claims that the idea of “labor power” emerged in the nineteenth century as the body was reconceived as “a field of forces capable of infinite transformation and conversion” of energy. Through its energetic nature and capacity, the body thus came to be understood as mediating “the laws of nature with the laws of production” (87). In this context, the body “became labor power, a concept emphasizing the expenditure and development of energy as opposed to human will, moral purpose, or even technical skill” (4). For Rabinbach, these developments arose most
centrally through the work of Hermann von Helmholtz and Etienne Marey, for whom the
concept of force (energy) unified science and made all physical bodies “subject to motion”;
conversely, all bodies became, by definition, “theaters of motion.” Rabinbach places
Helmholtz at the center of a new scientific materialism in Germany, which “rejected any
distinction between the laws of inorganic and organic nature” as matter was increasing
understood as energy (49). Rabinbach discusses Gaston Bachelard’s description of this
“dematerialized materialism” and offers his own concept of “transcendental materialism”. Gaston Bachelard once described nineteenth-century scientific materialism
as a ‘dematerialized materialism,’ a materialism embodied in the primacy of energy….The new scientific materialism was predicated on a single, indestructible, and invisible Kraft [energy, power], which could be perceived only in terms of its effects — in the material form of different kinds of mechanical work. Although energy was the source of all motion and matter, the materiality of the physical universe — energy — was nowhere to be encountered except in the manifest consequences of its enormous labor power. Materialism became, in a word, ‘transcendental.’
(Rabinbach 48)

Both Robert Brain and Michael Golston have published detailed studies concerning how

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6 See Bachelard, The New Scientific Spirit

7 In Chapter 1 of this dissertation, I discuss Rabinbach’s analysis further and argue for the term “energetic materialism.”

the body reconceived through energy, vibration, and rhythm shaped modernist aesthetics.

3. Concepts of Force and Energy

As the laws of thermodynamics were being formulated in the nineteenth century, the concepts of “force” and “energy” (within science itself and the larger discourse) were often used interchangeably. For instance, Hermann von Helmholtz’s early contributions to the theory of thermodynamics utilize the vocabulary of force – “The Law of the Conservation of Force.” Energy’s definition as a system’s ability to do work, exert force, or have external effects lent a natural coherence between these two terms. The complicated histories of “force” and “energy” examined by philosophers and historians of science as well as cultural theorists are interesting for how they shed light on the history of physics, theorize the relationship between science and cultural context, and for how they comment on the relationship between physics and metaphysics. Concepts of Force (1957) by physicist and philosopher of science Max Jammer, provides one of the first histories of the concept of force from ancient philosophy to the physics of the mid-twentieth century. Jammer summarizes the trajectory of his study:

It is pointed out how ancient thought, with its animistic and spiritual interpretation of physical reality, laid the foundations for the development of the concept [of force] and how in preclassical science the concept of force became invested with a multitude of extra scientific connotations that greatly influenced the interpretation of the concept until very recent

9 See Golston: Rhythm and Race in Modernist Poetry and Science (2007) and “Im Anfang War Der Rhythmus” (1996).
times….It is explained how Kepler initiated the scientific conceptualization of our notion, how Newton groped for a clear and profound conception and how post-Newtonian physics reinterpreted the idea. The concepts of Leibniz, Boscovich, and Kant are confronted with those of Mach, Kirchhoff, and Hertz. Finally, the modern trend toward eliminating the concept of force from the conceptual scheme of physical science is fully analyzed. (viii)

More recently, in What was Mechanical about Mechanics: The Concept of Force between Metaphysics and Mechanics from Newton to Lagrange (2002), J. Christian Boudri (also trained in science and philosophy of science) argues that force is the concept through which mechanics and metaphysic continually mingle, and the mathematization of force in physics precipitated the permanent rupture between physics and metaphysics. In his study, Boudri demonstrates that by tracing the concept’s history, one not only creates the history of a scientific term, but a history of how this mingling has resulted in various theories of the cosmos and, more specifically, theories of substance/system relationality. “The key distinction in the historical connection between metaphysics and mechanics… is based on a difference as to the object of mechanics – substance versus structure – and on a difference in how ideas about that object are incorporated in mechanics – as explicit foundation or as implicit premise” (Boudri, 232). Debates (particularly those between

11 Specifically, Boudri explains that mechanics was the first thoroughly mathematicized natural science, which affected its relationship with metaphysics and larger questions of meaning. (4) In a mathematical-physical system, concepts such as force, mass, acceleration are translated into their relational value, in a formula such as $F=Ma$. Consequently, “the [modern] physicist does not in fact feel any need to speak about fundamental concepts as such, and therefore rejects questions about the essence of nature” (2). Mathematics not only shifts the nature of the concept, it also obscures elements that cannot be brought into this system of representation. For Boudri, this thorough mathematization of concepts creates a lasting rift between physics and metaphysics.
Newton and Leibnitz) situate force differently depending on the metaphysical systems that were in place – the causal property of force is either based in substance or it stands as a description of relationality; many theories between these two poles existed as well. Thus for Boudri, the metaphysical dimension of eighteenth century mechanics plays a decisive role in understanding theories of force, and consequently, Newton’s *Principia*.\(^\text{12}\)

Given the complex history of these two terms, their expansive range of meanings (both literal and metaphoric) has also been discussed in relation to literature and representation. Roland Martin has provided his own detailed history of the force concept in *American Literature and the Universe of Force* (1981)\(^\text{13}\), and its relation to early twentieth-century literature. “Viewed as a study in semantics, the career of *force* in nineteenth century science may best be understood in terms of a tension between expanded application and precise usage, between metaphor and denotation. Metaphoric expansion was sudden and extreme, and it yielded strikingly new insights about the interconnection of phenomena” (7). Martin also discusses, appropriately, how this sudden expansion in usage created problematic imprecision for scientists and social theorists alike, particularly regarding notions of causal influence. Martin traces this history to better understand what he calls “the force universe” and how the work of many writers at the turn of the twentieth century (including Jack London, Theodore Dreiser, and Frank Norris) was underwritten by


\(^\text{13}\) In particular, see the introduction to the text and the first chapter, “Nineteenth Century Science and the Conservation of Force.”
the picture of cosmos as “a system of forces,” which had been intricately modeled by
nineteenth-century scientists (xi). In framing his own study of energy and literature, Bruce
Clarke has similarly noted that the concept of energy was widely employed metaphorically
and figuratively to express what Martin describes as “interconnection of phenomena” or
causal influence. Clarke writes:

*Energy* has perennially signified the power to affect observers….The
prescientific concept of energy had not yet been abstracted from its social
and psychological import as a measure of the intensity of an event’s
reception. Classical energy is “impressive” and “efficacious”: it creates
something *for* and *within* its recipient, but on the basis of powers exercised
at its *source*. This expression-impression model of aesthetic energy is
strikingly conveyed in its long-standing rhetorical and poetic usages.
(“From Thermodynamics to Virtuality” 17)

This dissertation touches on many of the issues developed in these three lines of inquire,
although it does not easily fit within any one of them. I am focused on the historical
conjuncture at the turn of the twentieth century, when theorists from the social sciences
and humanities were writing the human into nature through a new energetic materialism.
Within this discourse, a metaphysics of development and transformation emerges, which
bears relation to nineteenth century theories of energy as much as to biological theories of
evolution. Materialist, but not reductionist, the work of theorists such as Herbert Spenser,
Henri Bergson, Emile Durkheim, William James, and Henry Adams is reexamined within
the context of energetic materialism. Furthermore, I reread literary naturalism as a mode
of representation that registered a new intercourse between bodies and environments though Herbert Spencer’s theory of force and rhythm, which prefigures energetic materialism. While much of the commentary on literary naturalism has been overwhelmed by discussions of determinism, I demonstrate that naturalist texts can also be read for how they registered a new emphasis on the details of settings and environments and how these details communicated directly to human bodies through energy and rhythm.

Chapter one, “Henri Bergson & Étienne Marey: An Energetic Materialism,” argues that thermodynamic theory and an “energetic materialism” contributed equally to Bergson’s metaphysics of transformation, which has largely been read in connection with evolutionary theory. In a close reading of Bergson’s “Life and Consciousness” from his often overlooked collection of essays, *Mind-Energy* (1920), I demonstrate how Bergson’s metaphysics closely contends with thermodynamic theory and the reconceptualization of matter as energy in developing his central concepts of duration and vital impetus. Furthermore, I claim that by focusing on his energetic account of matter, we can see a unresolved conflict in how Bergson presents the action of human intelligence in the material world; human intelligence is the special capacity that violently destroys and “dominates” matter, while it also introduces and expands free action and creativity in the material world. This chapter supports its reading of Bergson’s metaphysics with archival materials from Bergson’s and Marey’s archival files at the Collège de France and by recounting a history of the *Institute Général Psychologique* of Paris and its study of the Italian spiritualist Eusapia Palladino. I support the claim for an energetic materialism by considering a nineteenth-century scientific device created solely for the purpose of animating vibratory motions.
The second chapter, “Theorizing the Social: Émile Durkheim’s Metaphorics and Physics of Force,” provides a new interpretation of Durkheim’s *Elementary Forms of Religious Life* (1912) by tracing how concepts of force and energy (as both totemic forces/energies and moral forces/energies) are centrally developed in the text. I argue that Durkheim develops and “energetic epistemology” that conceives of the human capacity for shared meaning as a product of coordinated energy (rather than the reverse), and ultimately provides a thoroughly constructivist account of knowledge. According to Durkheim, when a member of a collective perceives a god or feels belief, she actually perceives the accumulated energy that has been channeled into the creation and maintenance of it by the social collective. Objects, images, and ideas bear the trace of collective energy the more they are carefully crafted, maintained in spaces that are specially arranged, written into strict behavioral codes, or, in other words, the more they are deeply imbricated in social networks. The moral force (the collective energy which registers like an “electric shock” in the psyche) is both the “constraining and necessitating action” of cognition that allows for coordinated perception among members of a social collective. According to Durkheim’s origin story, the experience of feeling collective moral force gave rise to the concepts of causality and force themselves, which were only later developed in the sciences. For Durkheim, belief functions similarly in religion as well as in science. In contrast to traditional interpretations of Durkheim’s sociology, this reading of *Elementary Forms* allows us to reconsider Durkheim in a lineage of social constructivist epistemologists and, particularly, in relation to Ludwik Fleck.

regarding the value of energetics for theorizing human agency and historical development.

Although Adams is often faulted for creating deterministic and reductionist accounts of human history, I provide a close reading of Henry Adams’s theory of history as sequences of force that argues against such interpretations. For Adams, the individual actor is most effective as an agent (or force) of history during the particular and momentary congruencies achieved between the constitution of the actor and the configurations of forces that the actor continually creates and transforms by the fact of being and acting in the world. The temporary alignments of agent and world are achieved through effective education; although Adams tries to formulate a universal theory of education, he fails precisely because one is “always remaking the “mis-fit” of last generation’s clothes for the “emergency” of the ever-changing conditions of the present moment.” This chapter closes by considering Adams’s and James’s divergent views on thermodynamics and the fate of the universe.

The final chapter, “Imagining a Rhythmic Universe: Jack London, Herbert Spencer, and the Science of Rhythm,” reads Jack London’s *The Sea-Wolf* (1904) and *Martin Eden* (1909) as fictive worlds that elaborate a scientific concept of *rhythm*. As much as naturalist literature helped inaugurate a post-humanistic discourse as it contended with evolutionary theory, it also registered a new way of thinking about cosmological order by imagining a thoroughly rhythmic universe. First described by Herbert Spencer in his chapter “Rhythm of Motion” of *First Principles* (1864), rhythm was the primary mover, the means by which fundamental physical forces produced matter itself and its various configurations in the universe. Since matter was, in Spencer’s account, essentially rhythmic and susceptible to rhythmic interactions, rhythm can be understood as a precursor
to the energetic materialism discussed in Chapter 1. According to Spencer, the rhythm of fundamental forces produces and moves all things, from cosmic events to the human nervous system; thus, rhythm is also the interface by which interaction between them occurs. Environments, now understood to be vitally active, were no longer static stages for human bodies; correspondingly, bodies, like other physical systems, were no longer strictly partitioned from them. In the process of imagining life in rhythmic terms, a much different picture of the cosmos emerges, and it is one in which the embeddedness of form and action within deeply connected systems of order and organization is brought into relief. In the case of London, rhythm is at once the theory of relation and the aesthetic scheme by which a particular cosmological picture is elaborated in lived experience. Perhaps more interesting than the problematic confrontations with determinism (as literary naturalism is traditionally read), then, is the way London engages with this particular epistemological shift in the plot lines and formal aesthetics of his narratives. Specifically, he elaborates contextual detail and dwells on the potential rhythmic effectivities of specific environments and their influence on human bodies.
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Chapter 1
Henri Bergson & Étienne Marey:
An Energetic Materialism

1.1. Abstract

This chapter argues that thermodynamic theory and an “energetic materialism” contributed equally to Bergson’s metaphysics of transformation, which has largely been read in connection with evolutionary theory. In a close reading of Bergson’s “Life and Consciousness” from his often overlooked collection of essays, Mind-Energy (1920), I demonstrate how Bergson’s metaphysics closely contends with thermodynamic theory and the reconceptualization of matter as energy in developing his central concepts of duration and vital impetus. Furthermore, I claim that by focusing on his energetic account of matter, we can see an unresolved conflict in how Bergson presents the action of human intelligence in the material world; human intelligence is the special capacity that violently destroys and “dominates” matter, while it also introduces and expands free action and creativity in the material world. This chapter supports its reading of Bergson’s metaphysics with archival materials from Bergson’s and Marey’s archival files at the Collège de France and by recounting a history of the Institute Général Psychologique of Paris and its study of the Italian spiritualist Eusapia Palladino. I support the claim for an energetic materialism by considering a nineteenth-century scientific device created solely for the purpose of animating vibratory motions.

1.2. The Spiritualists and the Nobel Laureates

From 1900 to 1909, some of the leading intellectuals and scientists of Europe came together under the aegis of the Collège de France to study a very unlikely subject.

Consciously working at the intersections of physics, biology, and psychology, the group included Henri Bergson, Étienne Marey (scientist and inventor of cinema), Jean Perrin (Nobel atomic physicist), Marie and Pierre Curie, Gustave Le Bon (theorist of affect and
crowd behavior), Émile Duclaux (collaborator of Louis Pasteur) and three other Nobel Laureates. Their studies commenced following the first official meeting of the newly formed *Institute Général Psychologique* in Paris in 1901, at which all the investigators named above were present among the twenty-two members in attendance (Lachapelle 75). Initially, the *Institute Général Psychologique* was created to address a growing interest in the “psychological approach to the study of psychical phenomena;” however, bitter disagreements soon erupted as scientists and occultists alike assembled to formulate a research agenda (Ibid 75). For instance, Oskar Vogt, a participating German psychiatrist, responded bitterly to presentations by the spiritualists:

> I protest first in the name of science and psychology in general. I protest then especially in the name of suggestion and hypnotism. No sooner have we succeeded in having the reality of suggestion and hypnotism recognized, no sooner have we succeeded in launching, starting with these phenomena, a psycho-pathology, a psycho-therapy, and a psycho-hygiene in a greater sense, than the spiritists invade our session and compromise it with anti-scientific communications. (qtd. in Lachapelle 76)

To accommodate the variety of investigators, the *Institute Général Psychologique* was then given a broader mission not solely focused on psychical research, but space for interest in psychic phenomena was maintained. They planned “to bring together in a monthly assembly the men of science who are occupied with the mind, its conditions, its own laws, its diseases, and its history” (qtd. in Lachapelle 77). Four sub-groups were created to consolidate research interests in collective psychology, moral and criminal psychology, psychical phenomena, and zoological psychology (Ibid 77).
Both Henri Bergson and Étienne Marey joined the group devoted to studying psychical phenomenon. The other members of this subgroup, including Arsène d'Arsonval, Édouard Branly, Marie and Pierre Curie, and Émile Duclaux, were respected scientists in physics, chemistry, and biology and held academic appointments. As stated in their mission, they were seeking to scientifically detect and identify “the manifestation of yet undefined forces” that acted on and through the mind, body, and environment.¹⁴ As part of their most ambitious project, they assembled for over forty sessions from 1905-1908 in various combinations to study a single subject: the feats of psychic power demonstrated by the Italian medium Eusapia Palladino. Palladino was a particularly interesting subject in the search for unknown forces, as it was claimed that she could move objects and change the immediate atmosphere with her mind. A well-funded project, the investigators took large-frame x-rays and photographs, set up heart monitors, used electrical sheaths to detect movement, ran chemical analyses of urine, and developed atmospheric sensors; in essence, they assembled a laboratory outfitted with the most advanced sensing and imaging equipment of the time.¹⁵ (See photographs in Appendix 1)

How did it become possible for the most respected scientists of France to turn their collective attention and resources to a subject that embodied the qualities modern science had consolidated its own identity against? This group is interesting not for its apparent


¹⁵ I am still gathering information on this group, which I became aware of while conducting research in the archival files of Henri Bergson and Étienne Marey at the Collège de France. However some information is conflicting and I am working to assemble a more reliable account. Documented information and references can be found in the following sources: Braun, *Picturing Time: The Work Of Étienne-Jules Marey (1830-1904)*; Lachapelle, *Investigating the Supernatural*; Luckhurst, *The Invention of Telepathy; 1870-1901*; Rabinbach, *The Human Motor: Energy, Fatigue, And The Origins Of Modernity*
oddity, but because it demonstrates the range of questions that became possible and worthy of serious investigation in the context of newly emerging scientific fields and disciplinary formations at the turn of the century. The context in which this study became imaginable can be described as one in which the fundamental models of matter and interaction were radically changing to incorporate theories of fields, rays, atomic particles, and, especially, energy.

In her history of nineteenth and twentieth century investigations of the supernatural in France, Sophie Lachapelle has describes the foundation of the Institute Général Psychologique as made possible by two defining factors in Paris at the turn of the century. First, Paris was one of the European centers for the newly established and evolving discipline of psychology. Second, France was occupied (from roughly 1850 to 1940) by a popular preoccupation with supernatural investigation; public demonstrations, experiments, and performances of psychic phenomena were well-attended forms of entertainment throughout France. Lachapelle categorizes several types of such investigators circulating in Paris they included spiritualists who sought to investigate exchanges between the living and the dead; occultists who wanted to combine ancient wisdom with modern science; scientists who studied the experience of the supernatural as part of the pathological; and the métapsychistes “who believed that psychical phenomena were the key to development of an entirely new science” (4). As Lachapelle describes, the members of the Institute Général Psychologique fell loosely in line with the métapsychistes, as they were seeking to develop a more complete psychological science by investigating unexplained phenomena:

The sciences of the mind were key to the most fundamental questions about
our nature. Telepathy, telekinesis, lucidity, split consciousness, suggestion, and mediumship, as well as other, similar phenomena appeared to be associated with the deeper powers of the mind. Their study would bring scientists closer to an understanding of human nature. The Institute psychique international [the 1900-1901 iteration of Institute Général Psychologique] sought to bring this about. It would be devoted to the study of psychical phenomena without any preconceptions. All schools of thought and manifestations would be admitted. Above all, men of important scientific credentials would finally study animal magnetism, telepathy, lucidity, and mediumship using proper resources and experimental methods. (Lachapelle 76)

Lachapelle places the Institute Général Psychologique, finally, as a development within a larger cultural fascination and preoccupation with the supernatural. For Lachapelle, this cultural phenomenon emerged in the Victorian context that was simultaneously undergoing a crisis of faith (and secularization of culture) and witnessing the proliferation of new technologies that “seemed to be reaching into the realm of the fantastic” (2). “Telegraphs, photographs, and trains, to name a few, had brought about changes that would have appeared impossible to previous generations. Popularizers of science played with the sense of wonder that recent inventions inspired…. Science and technology created enchantment; they made the magical seem possible” (2). While the advances made by nineteenth-century scientists certainly had a public presence as described here, Lachapelle’s account occludes more interesting questions about how the various players of the historical moment were working out new relationships and negotiations among science,
knowledge, and religion within these unexpected formations.

In *The Invention of Telepathy: 1870-1901*, Roger Luckhurst provides an impressive account of a related subject — the emergence of telepathy — and he ties it to roughly the same historical developments, namely, the expansion of professionalized science and the dislocation of church authority.16 As Luckhurst explains, Victorian Britain was part of the cultural upheaval that saw the role of science shift from a small-scale, largely individual pursuit to a large-scale, “institutional system” (10). Not only did the instatement of new scientific institutions have a “disintegrative effect on traditional social and knowledge hierarchies” (11), it also replaced the Church as the authority for knowledge about the natural world. The emergence of telepathy, then, is read within the renegotiation of previously settled authorities and institutions that regulated knowledge production; such a change produced a new social dynamic and spectrum of popular experimentalists and professionalized scientists. However, Luckhurst situates his own study by asking a different set of questions than Lachapelle about the “invention” of telepathy. Luckhurst writes:

The matrix from which telepathy develops came into conjuncture around 1870, with the materialization, in recognizably modern form, of something like an organized and broad-based scientific culture. This conjuncture begins to effect a shifting of Victorian intellectual systems, disturbing the foundations of cultural authority. My interest, however, is not in seeing psychical research as the result of some titanic clash of ‘science’ and ‘faith’, but rather in tracing theorizations like telepathy as the product of specific

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16 While Luckhurst’s study is focused on Victorian Britain, the fascination with psychical phenomena spanned Europe, Britain, and America, as is demonstrated by the range of investigators included in these investigations.
For Luckhurst, the emergence of telepathy as a site of knowledge production can be understood in relation to the particular set of conditions that made possible its production and “created its believers and sceptics” (11).

Telepathy is interesting, then, as a lens on a changing landscape of knowledge, power, and institutions; additionally, it is interesting for how its particular formation intervened in those transitions. In Luckhurst’s words, the “marginal sciences” both “capitalized on the fissures of scientific naturalism, exploiting uncertainty and transition in knowledges and institutions of cultural authority,” and they interrogated “the assumptions behind demarcations of science and non-science, proper and improper knowledge” (2).

The intellectual fissures are of particular interest for Luckhurst, as these spaces condition the creation of new lines of inquiry, such as telepathy. “The emergence of scientific culture consequently produced other, less predictable effects: strange, unforeseen knowledges, hybrid and ephemeral notions that emerged as compromise formations melding apparently discrete systems. One of these effects is the subject of this book: the emergence, in 1882, of the concept of telepathy from the new science of psychical research” (10). These intellectual fissures were also disciplinary fissures that telepathy exploited, as it fell into the “vanishing points” between disciplinary formations and required multiple specialties for its investigation, and, thus, had few or no experts of its own (3).

In spite of their emphasis on the reorganization of science and its shifting position in the cultural landscape, neither Lachapelle or Luckhurst include a discussion of the scientific debates of the nineteenth century, or the major frameworks — such as vitalism
and mechanism — that shaped much of the discourse. Nor do they consider the seismic epistemological ruptures that resulted from the nineteenth century formulation of the laws of thermodynamics, field theory, electromagnetism, quantum mechanics, and, in the biological sciences, evolutionary theory. Instead, both Lachapelle and Luckhurst focus on an account of how the changing role and status of science shifted the historical scene of the *fin-de-siècle*. While these accounts do much important critical work in accounting for the cultural occupation with the supernatural, they are not sufficient to explain how such prominent scientists were brought to the table, nor do they help us understand the particularity of the questions that framed their experiments (such as the search for “the manifestation of undefined forces”). For many of these scientists, the motivating questions were still grounded in physics, psychology, chemistry, and biology, rather than the supernatural. In the case of Palladino, for instance, the investigators were investigating how bodies and environments influenced one another because the revelations of nineteenth-century science indicated that these exchanges may be much more complex and enigmatic than previously believed. Henri Bergson, Marie and Pierre Curie, Étienne Marey, etc., fall into Lachapelles’ category of the *métapsychistes*, those who were seeking to develop a more complete science by investigating unexplained phenomena. Without considering scientific developments, Lachapelle and Luckhurst are, at times, in danger of subsuming within the context of the supernatural or spiritual, ideas of energy and force that cut across it as one of many sites of engagement. The concepts of force and energy had a

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17 Luckhurst primarily covers the British scene and discusses the intermingling of prominent scientists with spiritualists. “Imagine Charles Darwin, George Eliot, G. H. Lewes, and Frederic Myers around a séance table in 1874, or Francis Galton and the respected astronomer William Huggins begin passed copies of their own books by a disembodied spirit-hand, or Andrew Carnegie, Edmund Gosse, Oscar Wilde, Grant Allen, and William Stead Begin led by a blindfolded ‘thought-reader’ in and out of newspaper office in 1884” (Luckhurst 4). Luckhurst also discusses William James’s involvement with psychical research, an interest he took with him to Harvard.
prolific life in both the sciences and social sciences of the same era; while they participated in discussions of spiritual energy, they were in no way exclusive to it.

Luckhurst does, however, situate the interest in the supernatural within a larger epistemological transition: “I want to read the 1870s less as a passage of secularization than as a confused and confusing series of engagements over the relative value of ‘spirit’ and ‘matter.’ In what follows I trace the revitalization of spiritualism in a newly scientized form: a hybrid, popular knowledge which challenged the institutional and intellectual boundaries of a nascent scientific community throughout the 1870s” (12). Considering the scientific developments that were also part of this conjuncture, I would restate and expand Luckhurst’s formulation here. Rather than a renegotiation over the value of matter and spirit that were driven by a popular interrogation of institutional science, I would describe the conjuncture as a renegotiation of the basic principles of matter and interaction that played out in a variety of institutional spaces and social contexts. Instead of using the lens of the supernatural, this study considers how energy and force became particularly cogent concepts within this conjuncture, and it explores why the field of “energetics” became a productive discourse for these reconfigurations. By considering the transformation of nineteenth-century physics, we see that both matter and interaction are reconceptualized as dynamic processes, and elaborated within a new ontology of matter as energy, or an “energetic materialism.”

To fail to take the transformation of physics itself into account limits the explanatory reach of the analysis, and it limits the account we can provide of the statements and actions produced in the process, particularly by scientists and philosophers. For instance, when Luckhurst turns to the work of Henri Bergson and his involvement with
the Palladino sessions and other spiritualist investigations, it is only to point out the influence of spiritualism on Bergson’s philosophy. As Luckhurst writes, “in 1913, when Bergson became president of the SPR [Society of Psychical Research], the arguments of his presidential address were continuous with *Creative Evolution*: mental life was ‘much more vast than the cerebral life’ to which scientists limited it…the idea ‘of a consciousness overflowing the organism’ might account for how ‘the soul survives the body’” (260). However, reading Bergson strictly through spiritualism misses the much more interesting renegotiation of matter and spirit (or, as I would argue, matter and interaction) that Luckhurst rightly identifies but inadequately situates.

In particular, Luckhurst’s reference to Bergson’s description of “consciousness overflowing the organism” comes from Bergson’s essay “Life and Consciousness,” which appeared in the collection *Mind-Energy: Lectures and Essays*, published in 1920. This essay was, in fact, the Huxley Lecture at the University of Birmingham delivered on May 24, 1911. Bergson opens the lecture with the following statement of his subject: “if one subject more than another would have appealed with particular force to the mind of a naturalist who was also a philosopher, it is the threefold problem of consciousness, of life and of their relation” (“Life and Consciousness” 3). The essay then proceeds by theorizing consciousness (which Bergson also terms “mind” in the essay) and life (which Bergson examines through the relation between matter and the living bodies), and the nature of their interactions. Apropos the title of the volume, the concept of energy (as distinct from but related to his vitalist principal, élan vital) becomes the metaphysical framework for addressing this question and for his explanation of “duration,” Bergson’s controlling

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18 The Society for Psychical Research, which was founded in 1882, is still in existence today. [http://www.spr.ac.uk/page/past-presidents-parapsychology](http://www.spr.ac.uk/page/past-presidents-parapsychology) Before Bergson was president in 1913, William James held the office from 1894-1895.
principle for theorizing the material world. As with the Palladino sessions, “Life and Consciousness” investigates material reality and its relation to mind according to the most rigorous means of investigation available. Even though Bergson’s philosophy has a complicated and overt spiritual component, by understanding Bergson as a scientifically-minded philosopher, we are able to make sense of his final claims in the essay, which simultaneously leave open the possibility of a “beyond for conscious beings” while also making the following (although qualified) endorsement of positive science:

To conclude then, the aspirations of our moral nature are not in the least contradicted by positive science…. How could there be disharmony between our intuitions and our science, how especially could our science make us renounce our intuitions, if these intuitions are something like instinct — an instinct conscious, refined, spiritualized — and if instinct is still nearer life than intellect and science! Intuition and intellect do not oppose each other, save where intuition refuses to become more precise by coming into touch with facts scientifically studied, and where intellect, instead of confining itself to science proper (that is, to what can be inferred from facts or proved by reason), combines with this an unconscious and inconsistent metaphysic which in vain lays claim to scientific pretensions.

(34).

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19 The concept of “intuition” for Bergson is not used for its commonplace meaning; rather it is a carefully developed term that names his philosophical method. As Deleuze has explained: “Intuition is the method of Bergsonism. Intuition is neither a feeling, an inspiration, nor a disorderly sympathy, but a fully developed method, one of the most fully developed methods in philosophy. It has its strict rules, constituting that which Bergson calls ‘precision’ in philosophy” (Bergsonism 13).
In the close reading of “Life and Consciousness” that follows, I aim to demonstrate how Bergson engages with an ontology of energetic materialism for theorizing the relationship between mind and matter. Energy is the primary framework for this renegotiation, not only for Bergson, but also for the collection of theorists discussed in this dissertation. By focusing on the development of an energetic materialism, we can understand how some of the particularly difficult questions and contradictions of this historical conjuncture are worked out or brought to a temporary settlement. For Bergson, ontology is restructured around his concept of *duration*, which is not merely about time but the nature of the material (and, thus, energetic) world. In “Life and Consciousness” we see how energy informs this most fundamental concept for Bergson, while also giving shape to *élan vital* and his vitalism more generally. Perhaps most interesting, however, is that this discussion allows Bergson, in his final note, to restate the powers of positive science (since his is ultimately a materialist philosophy remade by energetic science) as well as the current limitations of science for describing the world. By incorporating the developments of science into accounts of nineteenth-century social reorganization, we can better understand how Bergson and his fellow Nobel Laureates found themselves holding hands around a table with Palladino channeling spirits, in a room full of their most sophisticated laboratory equipment.

1.3. Bergson’s Metaphysics of Energy

While it is often acknowledged that Bergson was contending with nineteenth century physics and theories of thermodynamics, interpretations of Bergson’s metaphysics
overwhelmingly focus on his interest in biology and evolutionary theory. For example, Keith Ansell-Pearson has read Bergson’s metaphysics of difference and becoming almost exclusively as emerging in conversation of with biology and a science of “living beings.” In his essay “Bergson’s Encounter with Biology: Thinking Life,” Ansell-Pearson claims:

The significance of the science of the nineteenth century is that it places at the centre of its inquiry the 'study of living beings'. He [Bergson] concedes that even here science may still be governed by mechanics but, as he makes clear a few years later in *Creative Evolution*, what we are dealing with here is a mechanics of transformation, which is a mechanics that cannot be developed by relying upon geometrical and spatialised schemas of thought. Change, transformation, and evolution are bound up with living and open systems, and the features of novelty that characterise such systems will always elude a mathematical treatment. (59)

Here, Ansell-Pearson aligns physics with mechanistic thought and biology with a science of open, developmental systems. Furthermore, he explains how “the new biology” resulted in a rejection of Aristotelian thought and an acceptance of “the modern doctrine of “transformism” (62). In essence, Ansell-Pearson claims, “he [Bergson] makes it clear that the conception of a vital impetus and of a creative evolution were only arrived by following the evidence of biology” (60). While Bergson’s engagement with biology is appropriately acknowledged, the alignment of nineteenth-century physics with mechanism equally disregards “the new physics” of the nineteenth century and Bergson’s engagement with it.

At times, however, Ansell-Pearson recognizes Bergson’s encounter with
thermodynamics (in this essay and elsewhere), but he ultimately returns to biology as the privileged source for Bergson’s metaphysics. For instance, Ansell-Pearson writes, “With respect to modern science the key intellectual figures and developments are Galileo and Kepler, modern mathematics, the theorists of thermodynamics such as Carnot and Clausius, and modern biology with Bergson engaging with the arguments of both Lamarckism and Darwinism in a precise and incisive manner (Bergson had already spoken of Darwin as the greatest of all modern naturalists in his commentary on Lucretius's *De rerum natura*)” (60). In his later essay, “Bergson,” Ansell-Pearson also notes, “[Bergson] has an impressive grasp of the history of science and of new scientific development such as thermodynamics and neo-Darwinism” (403), and “Bergson believes that there is a basis for a novel alliance between metaphysics and the new post-Newtonian sciences, insofar as both, working in concert, are able to discover the natural articulations of the universe that have been carved artificially by the intellect” (409). Even though these acknowledgments are made, the novel developments of Bergson’s metaphysics (and in particular Bergson’s conception of the individual as heterogeneous becoming in duration) are linked to evolutionary theory of living systems.

My aim here is not to deny the influence of evolutionary theory, but to fill in the equally important influence of physics (and particularly thermodynamics) in the transformation of metaphysics in which Bergson participates. I would further claim that the omission of physics in interpretations of Bergson is not unique; rather, it demonstrates a larger neglect in accounting for how nineteenth-century physics — not just evolutionary theory — influenced the development of a mechanics and metaphysics of transformation (as Ansell-Pearson describes) as well as the conception of the body as an open system of
ongoing development. Not only was the body heterogeneous through time in its
development at the level of the individual as well as the species, it was heterogeneous as,
Anson Rabinbach has described, “a theater of motion” and energetic exchange. In this
way, the influence of evolutionary theory has over-shadowed the influence of
thermodynamic theory in altering the conception of the living body.

In his Translator’s Preface to *Mind-Energy*, philosopher Herbert Wildon Carr20
situates the entire collection of essays as an attempt to incorporate the latest revelations of
physics into metaphysics and a theory of mind. Carr assures his readers that this
framework for the volume is not merely a reflection of his own interests in the
reintegration of science and philosophy, but it also reflects Bergson’s intent; *Mind-Energy*
“is not simply an approved and authorized translation, for M. Bergson has gone carefully
with me into the details of meaning and expression in order to give it the same authority as
the original French” (Carr). Specifically, Carr mentions the “electro-magnetic theory of
matter” and “radiant energy” in his discussion of physics and mind, as both phrases

20 Herbert Wildon Carr (1857-1931) closely followed and engaged with Bergson’s work throughout
his career. Carr held significant posts in both England and the US. In England, Carr was head of
the Psychology Department at King’s College University of London, and he finished his career as
Professor of Philosophy at University of California, Los Angeles, where he started “The
Metaphysical Society” in homage to the London group. His obituary, published in *Nature*, notes
Carr’s interest in Bergson, Einstein, and Leibniz, and it comments on Carr’s attempt to bring
science and philosophy into closer relation: “Not only was it philosophers he brought together; he
also brought science and philosophy into their wholesome and natural contact. He believed that
philosophy and science belongs together, and that philosophy could not be indifferent to changes in
scientific ideas such as his time had witnessed. In this he was surely right. The work of the
Aristotelian Society in the last twenty years is a standing witness to his success in this effort and to
its fruitfulness” (Alexander 99). The obituary also comments on Carr’s beliefs about the
importance of Einstein’s theory of relativity for philosophy: “He thought it [relativity] had
dethroned Newtonianism to make way for Leibnizianism; and I expect he was, in general right.
There was, however, a way of special authority about what he said when he was expounding the
new science as science, and I understand his exciting some impatience among those who knew.
But he showed philosophers the way, and that it was our duty to find material for our philosophy in
a thorough understating of this new mode of scientific thought. It would be an evil day for
metaphysics if a great change should occur in men’s minds about the science of things and we
philosophers should go our way as if nothing particular had occurred” (99).
encapsulate a range of developments in nineteenth century physics and refer to the redescription of matter as subatomic particles, which are characterized by and act according to their particular energy levels and frequencies. The term “radiant matter” was first coined by chemist Sir William Crookes in 1879; incidentally, Crookes was also dedicated to investigating unexplained psychic phenomena and served as president of the Society for Psychical Research from 1896-1899, directly after William James. For Carr, the redescription of matter within the new scientific paradigm of energy should have an equally revolutionary effect in philosophy.

The subject title, Mind-Energy, will recall the title Mind-Stuff, which W. K. Clifford in a lecture many years ago employed to denote a new theory of consciousness.\(^{21}\) Since that day a change almost amounting to a revolution has overtaken the general concept of the nature of physical reality. This is due to the development of the electro-magnetic theory of matter. In modern physics we may say that the old concept of stuff has been completely displaced by the new concept of radiant energy. An analogous change has gradually meanwhile pervaded the whole science of psychology.... Just as a dynamic concept of physical reality has replaced the older static concept in the mathematical sciences, and as this has long found expression in the term energy, so a dynamic concept of physical reality has replaced the older

\(^{21}\) William Kingdon Clifford (1845 to 1879) was Professor of Mathematics at University College London, and he was also a member of the Royal Society and London’s Metaphysical Club. Clifford’s materialistic and atomistic account of “mind-stuff” stands as the opposition to not only the theory of mind developed in Mind-Energy, but to William James’s “The Will to Believe” (1896), which was written in response and opposition to Clifford’s “The Ethics of Belief” (1877). Furthermore, Carr published a defense of Pragmatism in his review of Clifford’s book-length attack on it, in which Clifford situates Bergson’s philosophy as the ultimate consequence of Pragmatism.
concept of mind which identified it with awareness or consciousness, and
the physical analogy suggests energy the most expressive term for it. (Carr
v)

Carr suggests that mind-energy replaces outmoded notions of awareness or consciousness,
as mind-energy serves to incorporate “a dynamic concept of physical reality” in the theory
of mind. While this final statement may suggest that mind-energy may function
analogically, as a means to reference the “dynamic” nature of energy, Carr’s and Bergson’s
engagement with energy is not quite that simple. For Bergson, the activity of mind exists
through the material process of releasing and directing the energy of matter; mind,
although inherently different from matter, only finds its expression in this engagement with
the material world. Carr speaks to this new formulation in describing mind as “the
expression of an activity.” Mind emerges from the material world, as an expression of an
activity within it.

In affirming Mind-Energy the intention is not to include the activity of mind
in the system of radiant energy which constitutes the science of physics. On
the contrary, what is intended is that the science of mind, quite as much as
the science of matter, can only be constituted by means of a concept which
allows for the formulation of a law of conservation. Mind is not a
phenomenon which flares up out of nothing and relapses into nothing, it can
only be understood when it is conceived as a continuity of existence, and it
can only be conceived as a continuity of existence when its actuality is
correlated with its virtuality. Or, to express this in terms more consonant
with the method of philosophy, the special phenomena which are
manifestations of mind can only be systematized as a science of mind when they are interpreted as the expression of an activity. Activity seeking expression is the concept of Mind-Energy. (vi) [Emphasis added]

Carr is careful to explain that mind-energy does not amount to a new form of material reductionism, such as found in Clifford, and he is careful to distinguish the science of mind from the science of physics. However, like physics, the science of mind (because it one of many expressions of the energetic medium of the material world) must incorporate a thermodynamic model (as the “law of conservation”) within its picture. The continuity of existence is an energetic monism in which the potential for mind is virtually present in the material world just as the potential for matter itself, as Bergson explains in more detail. Carr, having devoted much of this own thought to claiming that the new physics had “dethroned Newtonianism to make way for Leibnizianism,” explained the larger consequences of this epistemological shift away from a dualism that holds mind and matter as ontologically distinct.

But although the term Mind-Energy does not, and is not intended to, imply a physical concept of mind, yet it is meant to imply, and it does depend upon, a metaphysical concept. Mind is not a vis vitae convertible into a vis inertiae. Equally impossible is it to conceive an ultimate dualism, — mind and matter as the co-existence of two independent realms of reality. Mind and matter are divergent tendencies; they point to an original and necessary dichotomy; they are opposite in direction; but they are mutually complementary and imply the unity of an original impulse. The new

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22 See Carr, A Theory of Monads: Outlines of the Philosophy of the Principle of Relativity (1922), and The General Principle of Relativity: In its Philosophical and Historical Aspect (1920)
concept therefore is of a reality with which life and consciousness are identical, as distinct from the concept of a reality independent of life and conditioning it, and upon which it depends. This new concept in its turn suggests a new working principle in the biological and psychological sciences. (vii)

Bergson’s “Life and Consciousness” explains the “divergent tendencies” of mind and matter while maintaining their fundamental coherence. Reconceptualizing matter and interaction made way for the account of consciousness given here, in which consciousness exists only in the activity of bringing form to energetic potentiality. As Bergson explains, mind does not prefigure this action but arises within it; as we will see, Bergson claims that consciousness can come and go in living beings depending on how they are situated in the world, in relation to the rest of material reality. Bergson dissolves a mind-matter dualism by redescribing consciousness as a particular position (or a particular relationality) within a fundamentally energetic context.

The content of this lecture builds upon the ideas his earlier works, including *Matter and Memory* (1896), *Creative Evolution* (1907), and *Time and Free Will* (1910), although the account of matter and mind differs in focus from these texts. In “Life and Consciousness,” Bergson identifies a “tension” between the shorter duration of mind in comparison to the long duration of matter, and this tension stands to explain mind’s special capacity for “efficient action,” the ability for the creative action of bringing form to the virtual. This process is further described in another of the *Mind-Energy* essays, “Intellectual Effort,” which links the energetic effort of difficult metal work to the creative impulse. In this essay, Bergson explains in more detail how consciousness functions to
convert abstract schema into concrete images (or the virtual into the actual) through mental work and bring about the “materialization of the immaterial which is characteristic of vital activity” (230). Taken together, the lectures in *Mind-Energy* provide a scientifically oriented description of both duration and becoming, and they make important distinctions in Bergson’s metaphysics regarding the energetic nature of matter, the vitalist principle of *élan vital*, and the possibility of a spiritual afterlife.

In *Mind-Energy*, Bergson makes reference to the basic concepts developed in his earlier work, and it is appropriate to begin with the description of energetic matter from *Matter and Memory* assumed in “Life and Consciousness.”

If you abolish my consciousness … matter resolves itself into numberless vibrations, all linked together in uninterrupted continuity, all bound up with each other, and traveling in every direction like shivers. In short, try first to connect together the discontinuous objects of daily experience; then, resolve the motionless continuity of these qualities into vibrations, which are moving in place; finally, attach yourself to these movements, by freeing yourself from the divisible space that underlies them in order to consider only their mobility – this undivided act that your consciousness grasps in the movement that you yourself execute. You will obtain a vision of matter that is perhaps fatiguing for your imagination, but pure and stripped of what the requirements of life make you add to it in external perception. Reestablish now my consciousness, and with it, the requirements of life: farther and farther, and by crossing over each time enormous periods of the internal history of things, quasi-instantaneous views are going to be taken,
views this time pictorial, of which the most vivid colors condense an infinity of repetitions and elementary changes. In just the same way the thousands of successive positions of a runner are contracted into one sole symbolic attitude, which our eye perceives, which art reproduces, and which becomes for everyone the image of a man who runs. (*Matter and Memory*, 208–209)

Here, Bergson attempts to undo the work of perception and present the world to us in a way that makes apparent its energetic nature, and simultaneously, its duration. As we will see, the energetic nature of matter is fundamental to duration, one of Bergson’s most important and difficult ideas. We can find an excellent illustration of duration in “Life and Consciousness” (although not framed as such) in Bergson’s description of knowledge production, and he makes an important epistemological statement in the process. For Bergson, the study of knowledge must take into account its continual becoming. Other, fruitless approaches to the study of knowledge, traditionally begin by studying “the mechanism of thinking” in order that they may be more productively applied to the problems to be solved by thought itself (this is, in essence, the approach of the logical positivists who sought to examine and purify a scientific method for language and thought in order to produce absolute facts about the world). Bergson explains the problem with such strategies: “If the knowledge we are in search of be real instruction, a knowledge which expands thought, then to analyse the mechanism of thought before seeking knowledge could only show the impossibility of ever getting it, since we should be studying thought before the expansion of it which it is the business of knowledge to obtain” (4). In other words, the mechanisms of thought change in the process of their
function and expansion; in turn, they change their relation to acquired knowledge (knowledge from the past) and knowledge in the making (knowledge of the present and the future). This process happens by the ongoing interpenetration of past and present in the span of duration. In Bergson’s discussion of duration, then, entities are heterogeneous to themselves (rather than self-same) in the span duration, as past and present continually interact in their projection into the future. A mechanical causal sequence is rendered meaningless in this account, as is a picture of knowledge production that moves in a strictly forward direction of refinement. The concept of duration, then, is a metaphysical distinction, foundational to a philosophy of becoming and multiplicity. In the passage from *Mind and Matter* above, the awareness of duration recedes as consciousness is brought back into the picture, and the continuity of duration is obscured into “the thousands of successive positions” that make up our everyday perception for forward-moving time. Thus the reality of life and matter (which exist in heterogeneous duration) is at odds with our perception of it (which works by a succession of images).

However, before saying too much about human perception, we must return to the description of energetic matter as developed in “Life and Consciousness.”

Bergson makes three major ontological distinctions in his description of the natural world in this essay: 1. matter versus life, 2. animal life versus plant life, and 3. vertebrates versus insects. For Bergson, the trajectory of universal unfolding is the process of working life

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23 It is should be noted that “Life and Consciousness” follows closely to the analysis of life developed in *Creative Evolution*. However, here, the discussion is extracted from the larger arc of *Creative Evolution* and Bergson makes slightly different distinctions in “Life and Consciousness” (his later work), which will be discussed below.
(free action) into matter (inert necessity). Matter “left to itself obeys fatalistic laws”; “matter is inertia, geometry, necessity” (17). Matter is “fatalistic” because of how its specific properties (particularly its lack of free movement) situate it in the larger continuum. “In determinate conditions matter behaves in a determinant way. Nothing it does is unforeseeable” (17). Consciousness, on the other hand, is “free action,” “choice,” “freedom,” “variation.” In this first major distinction, Bergson explains how matter and consciousness have opposite tendencies, yet they participate with one another in the same becoming. “Matter is necessity, consciousness is freedom; but though diametrically opposed to one another, life has found the way of reconciling them. This is precisely what life is, — freedom inserting itself within necessity, turning it to its profit” (17-18). But, how does this happen? How do consciousness and matter interact so that consciousness “installs itself,” “dilates” and spreads “from its point of entry”? Furthermore, why does it “not rest till it has conquered the whole, for time is at its disposal, and the slightest quantity of indetermination, by continually adding to itself, will make up as much freedom as you like” (18)? According to Bergson, consciousness finds its way into matter wherever matter shows a hint of “elasticity”, “instability”, or “indetermination” where consciousness can “bend” it just enough to introduce free action. To understand this process we must move to Bergson’s next distinction, that between animal and plant life.

Within the realm of life, the difference between the strategies of plants and animals in the natural world shows us how the energetic nature of matter allows free action to introduce itself into necessity. Like matter and life, plants and animals also diverge from one another, along “two paths which lie open before the evolution of life” (16). Plants,

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24 Or, as Bergson described it in Creative Evolution, “the root of life is an effort to engraft on to the necessity of physical forces the largest possible amount of indetermination” (127).
lacking “spontaneous movement,” are primarily preoccupied with the long process of collecting, transforming, and storing solar energy. Plants “fabricate the explosive” that is to be used and directed by animal life in the action that distinguishes them from plants — free movement. Animal movement “consists in utilizing certain *unstable* substances which, like gunpowder, need only a spark to explode them. I refer here to foodstuffs, especially the ternary substances, the carbo-hydrates and fats. A considerable sum of potential energy, accumulated in them, is ready to be converted into movement” [emphasis added] (18). Life, then, “is a double labour of slow accumulation and sudden discharge” and plants and animals have generally divided up these tasks. “That energy has been slowly and gradually borrowed from the sun by plants; and the animal which feeds on a plant…or an animal which has fed on an animal which has once fed on a plant, and so on, simply receives into its body an explosive which life has fabricated by storing solar energy. To execute movement, the imprisoned energy is liberated” (19). Because animals must always choose the direction of this energetic release, always direct the energy through some chosen action, it will “exercise a very small influence on matter.” This is the initial way free cause is “able to bend” the necessity of matter and begin to insinuate itself; as we will see, human intelligence will then be able to further “dilate” the process of freedom inserting itself into necessity.

For Bergson, this small amount of freedom is introduced by channeling and directing energy expenditure in particular actions. Free movement then accelerates the organizing principle of life because it introduces enormous range and uncertainty into the organism’s potential environment. In terms of evolution, consciousness arises from spontaneous movement because movement introduces varying environmental conditions
and necessitates the need for more frequent choice (the basis of free actions). Choice, in turn, relies on the complex process of bringing the past to bear on the present.

“Consciousness retains the past and anticipates the future…because it is called on to make a choice. In order to choose we must know what we can do and remember the consequences, advantageous or injurious, of what we have already done” (14). As consciousness arises, more energy is transformed from matter and directed through choice.

As Bergson describes in many of his texts, choice and memory are the two defining elements of consciousness. Bergson explains in detail how consciousness arises and intensifies from the demands of spontaneous movement; correspondingly, consciousness diminishes when spontaneous movement is subtracted from the organism. Because consciousness arises and diminishes depending on the necessity of choice (or, in other words, how it is situated in its environment), Bergson maintains the possibility for consciousness in all life — plant and animal alike — even if consciousness does not generally emerge in most of the organic world. “I believe all living beings, plants and animals, possess it [spontaneous movement] in right; but many of them have renounced it in fact.” “Even in the vegetable world where the organism is generally fixed to the soil, the faculty of movement is dormant rather than absent, it awakens when it can be of use” (14). For instance, as Bergson discusses, how some parasitic animals attach themselves to a host and relinquish free movement for the stable source of nutrients. In such cases, the organism has gained a relatively stabilized environment and secure source of energy, choice becomes less necessary, consciousness diminishes, and necessity takes hold. Bergson points out that the same is true for humans when action become repetitious. “We can verify the law in ourselves. What happens when one of our actions ceases to be
spontaneous and becomes automatic? Consciousness departs from it” (15). In other words, when “movements become more and more linked together and more determinate” the mind dispenses “from the need of choosing and deciding, [and] the consciousness of them diminishes and disappears” (15). In this account, consciousness is not a stable state, nor a particularly human one; as Bergson confirms, “mobility, and therefore probably consciousness also, may occasionally be awakened in plants” (16). Consciousness can come and go, even for humans, and sometimes by choice, given how one situates oneself in the world. “It appears to me therefore extremely likely that consciousness, originally immanent in all that lives is dormant where there is no longer spontaneous movement, and awakens when life tends to free activity” (15).

In Bergson’s picture, the environment is not a given setting in which the organism is placed but a relational context that the organism itself co-creates through its morphology and behavior. Movement, for example, makes the organism’s environment more complex, as the organism meets a wider range of unknown demands, stresses, and sensations. Bergson writes, “the path towards movement involves risk and adventure,” and relinquishing movement ensures “a tranquil, unenterprising existence” (16). This is how consciousness (and thus freedom) arises in particular organisms and not others, even among organisms that share some aspects of the same environment or the same morphological structure but are differently situated in the world. “The variations in the intensity of our consciousness seem to correspond to the more or less considerable sum of

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25 This statement regarding the possibility of consciousness in plants differs from that of the same discussion in Creative Evolution, where Bergson states: “We doubt whether nervous elements, however rudimentary, will ever be found in the plant. What corresponds in it to the directing will of the animal is, we believe, the direction in which it bends the energy of the solar radiation when it uses it to break the connection of the carbon with the oxygen in carbonic acid. What corresponds in it to the sensibility of the animal is the impressionability, quite of its kind, of its chlorophyll to light” (126).
choice or, as I would say, to the amount of creation, which our conduct requires. Everything leads us to believe that it is thus with consciousness in general. If consciousness means memory and anticipation, it is because consciousness is synonymous with choice” (15).

An energetic materialism is fundamental to Bergson’s account of consciousness. Energy is unstable, vibratory, convertible, mobile; in its ability to transform, matter is bent as the explosive energy accumulated within it is released, and converted once more, through directed action. The confrontation between mind and matter is necessary to the unfolding of life. Life is “matter and consciousness confronting one another;” matter brings “division and precision” to “tendencies before confused in the original impulse of life” (28). Matter is, then, necessary for development and expansion of consciousness because it is the occasion for the effort (i.e. energetic work) of consciousness. Through its encounter with matter, consciousness has “drawn out from the self more than it had already, we are raised above ourselves. This effort was impossible without matter. By the resistance matter offers and by the docility with which we endow it, is at one and the same time obstacle, instrument, and stimulus. It experiences our force, keeps the imprint of it, calls for its intensification” (29). Only by holding this picture of energy at the front of Bergson’s conception of life, can we can make sense of Bergson’s claim about artificial life, which would perhaps seem startling taken out of this context: “That the united efforts of physics and chemistry to manufacture matter resembling living matter may one day be successful is by no means improbable, for life proceeds by insinuating, and the force which drew matter away from pure mechanism could not have taken hold had it not first adopted that mechanism” (26).
Although this process of bending matter is potentially available to all life, it is only accelerated by human intelligence. Bergson writes, “I see in the whole evolution of life on our planet a crossing of matter by creative consciousness, and effort to set free, by force of ingenuity and invention, something which in the animal still remains imprisoned and is only finally released when we reach man” (23). This brings Bergson to his third ontological distinction; following that of life/matter and plant/animal, Bergson distinguishes the vertebrates (which finds its most advanced expression in human intelligence) and arthropods (which finds it most advanced expression in instincts of the insect). In its everyday form, intelligence can be recognized in the “man who leaves his mark” through action. “Is it not the momentary vision which embraces a whole course of events within one purview? The greater his hold on the past in his present vision, the heavier is the mass he is pushing against the eventualities preparing. His action, like an arrow, flies forward with the greater force the more tensely in memory his idea have been strung” (20). In this description, we see consciousness working through the span of duration, utilizing memory to bring the past in conversation with the future; “we lean on the past, we bend forward on the future: leaning and bending forward is the characteristic attitude of a conscious being” (9).

For Bergson, human intelligence is unique in the animal world precisely for its particular way of perceiving duration. Human perception — which works primarily through images — allows the mind to deal effectively with the span of durations for its own purposes. Specifically, the human mind “embraces a whole course of events within one purview;” in other words, it can fit the measureless duration of energy becoming matter into “one second” of its awareness. “Now think of our visual consciousness in
relation to the perceptual matter it apprehends. In its briefest moment consciousness embraces thousands of millions of vibrations which for inert matter are successive; if matter were endowed with memory, the first of these would appear to the last in the infinitely remote past” (20). Yet, the mind can compress this duration in relation to its own, work the duration of matter into its own duration, and ultimately lend matter to its own disposal. “Placed at the confluence of consciousness and matter, sensation condenses, into the duration which belongs to us and characterizes our consciousness, immense periods of what we can call by analogy the duration of things. Must we not think, then, that if our perception contracts material events in this way it is in order that our action may dominate them” (21)? As Bergson has explained, it is this “tension” of duration that ultimately enables human’s special ability of folding the durations of the material world into its own, for the purpose of “insert[ing] free action into this material world” by “releasing a spring or directing movement” (21).

Should we not expect to find between its duration and the duration of things a difference of tension such that innumerable instants of the material world could be held within one single instant of the conscious life, so that the desired action, accomplished by consciousness in one of its moments, could be distributed over an enormous number of the moments of matter and so sum up within it the indeterminations almost infinitesimal which each of them admits? In other words, is not the tension of the duration of a conscious being the measure of its power to acting, of the quantity of free creative activity it can introduce into the world? (21)

Human intelligence is the best strategy for inserting free action into life because it has the
ability to move in and out of a particular relationship with duration. In summary, then, the process of inserting free action into inert matter works in “two complimentary ways”: “In one, by an explosive action, it liberates instantly, in the chosen direction, energy which matter has been accumulating during a long time; in the other, by a work of contraction, it gathers into a single instant the incalculable number of small events which matter holds distinct, as when we sum up in a word the immensity of history” (or in the snapshot the continuum of body in motion) (22).

It should be noted that Bergson’s tone varies in regards to human intelligence and perception in the quotes above. We see that humans thrive because they can accomplish both the contraction of energetic duration in perception, as well as the energetic liberation of matter in the movement of directed action and creation. However, in Bergson’s previous work, the action of contracting duration in human perception is primarily presented in a negative light, as the origin of a problematic metaphysics of dualism, linear causality, and a science of logical positivism. First, Bergson shows how perception allows consciousness to process multiple material durations, precisely the action that endows humans with the ability to “dilate” free action. The mind’s ability to exist with the tension of holding “innumerable instants of the material world” in “one single instant of the conscious life” enables the special human ability for action and creation that ultimately characterizes *élan vital*. On the negative side, this action of perception takes matter as in an instant and extricates it from its span of duration, and with it, the web of relations involved in its becoming; it “dominates” matter. The relation of matter to its larger context is lost when detached from it and utilized in the action of the present moment. A tree, for instance, when viewed as firewood, can be cut down and burned for heat, but this action
ignores the duration of its form and in doing so, its relation to the forest in its very form. This “tension” of perception (aptly coined) has a double edge, and the contradictions of these positive and negatives accounts are never reconciled in Bergson’s thought.

I would argue that the potential negative reading of human life (that dominates or does violence to other forms of organization though action) is obscured by the hierarchical picture of evolutionary history that Bergson lays over nature, particularly on display in his third ontological distinction. While Bergson approaches a negative reading of life, in the same instant he pulls back and reframes it within an evolutionary picture that assigns value to human forms of being and knowing over others by encompassing them within larger frameworks of creativity and freedom.

1.4. Graphic Inscription and Energetic Materialism

Bergson’s primary illustrations for explaining the work of the human mind, which shows up in several of his texts, is the perception of movement created by the cinematic image or by animations composed of a succession of individual still frames. In “Life and Consciousness” we find yet another example of movement divided into snapshots, although Bergson does not frame this example in relation to cinema or chronophotography.

When I open and close my eyes in rapid succession of visual sensations each of which is the condensation of an extraordinarily long history unrolled in the external world. There are then, succeeding one another, billions of vibrations, that is a series of events which, even with the greatest possible economy of time, would take me thousands of years to count. Yet
these are dull and monotonous events, which would fill thirty centuries of a matter become self-conscious, occupy only a second of my own consciousness, able to contract them into one picturesque sensation of light. Moreover, just the same could be said of all the other sensations. Placed at the confluence of consciousness and matter, sensation condenses into the duration which belongs to us and characterizes our consciousness, immense periods of what we can call by analogy the duration of things. (21)

Here, rather than describing discrete imagines, Bergson asks the reader to essentially create the experience of seeing the flickering images from a film projector when it is first started and has not yet come up to speed. Rather than use this as a negative example of perception failing to account for duration (as he does in Creative Evolution), this illustration stands as an explanation of the process by which humans come to dominate matter in creative action. This ability is precisely why “the force of invention” is “only finally released when we reach man.”

Given the tension in Bergson’s assessment of the human ability to interact with various durations, we can observe a parallel ambivalence in interpretations of the role moving images has played in Bergson’s thought. As we have seen, in “Life and Consciousness,” the flickering images serve to demonstrate the power of human intelligence, while in his other texts, Bergson uses a similar illustration to critique human perception. A famous passage of Bergson’s discussion of cinema comes from Creative Evolution (1907): “Such is the contrivance of the cinematograph. And such is also that of our knowledge. Instead of attaching ourselves to the inner becoming of things, we place ourselves outside them in order to recompose their becoming artificially. We take
snapshots, as it were, of the passing reality.... We may therefore sum up...that the mechanism of our ordinary knowledge is of a cinematographical kind” (332). Here, the cinematic illusion of motion is used to illustrate how perception decomposes the continuum of movement into discrete images, or “snapshots.” In “An Introduction to Metaphysics” (1903), Bergson also discusses the same example in more detail.

Consider, for example, the variability, which is nearest to homogeneity, that of movement in space. Along the whole of this movement we can imagine possible stoppages; these are what we call the positions of the moving body, or the points by which it passes. But with these positions, even with an infinite number of them, we shall never make movement. They are not parts of the movement, they are so many snapshots of it; they are, one might say, only supposed stopping-places. The moving body is never really in any of these points; the most we can say is that it passes through them….They are not, therefore, properly speaking, positions, but ‘suppositions,’ aspects, or points of view of the mind. (48)

These snapshots of arrested movement are linked to cinema but also to cinema’s predecessor, Étienne Marey’s photographic motion studies, which were also known as chronophotography. Marey’s chief appointment was as a doctor and physiologist at Collège de France, and he is acknowledged as one of the inventors of cinema with Eadweard Muybridge. A single example of Marey’s chronophotographic images will clarify Bergson’s description of snapshots of arrested motion.
The relationship between Bergson’s and Marey’s work is often described with similar ambivalence, when it is described at all, and their personal relationship as colleagues at the Collège de France is usually mentioned in passing; their joint involvement in the Palladino sessions has never been fully explored. In *Picturing Time* (1992), Marta Braun provides one such interpretation of Marey’s cinematic images in relation to the problematic spatialization of duration:

Although Bergson’s use of the image of the camera as the ultimate emblem of false construction seems to demolish any case that could be made for the aesthetic appeal of chronophotography, artists who wished to give form to the new experience of time Bergson so articulately voice were drawn to Marey’s pictures…For artists the attraction of the photographs lay in one important particular: they were the first images to effectively rupture the perspectival code that had dominated painting since the Renaissance….Chronophotography provided a language for representing
simultaneity – what was popularly understood to be Bergson’s idea of time.

(281)

Braun’s analysis acknowledges Bergson’s clear critique of cinema but also reads against it to recognize the elements of motion and simultaneity that Marey’s images imparted. Similarly, Gilles Deleuze opens *Cinema 1: The Movement Image* (1986) with an exegesis of Bergson’s account of movement and cinema, which works to the same end as Braun’s by both recognizing Bergson’s critique but also reading the moving image as a medium that enables a Bergsonian investigation of movement and duration; by doing so, Deleuze stages his own philosophical engagement with cinema. I would agree with and extend Braun’s and Deleuze’s move to acknowledge and read against Bergson’s interpretation of cinema because it is runs parallel to Bergson’s unresolved ambivalence about human perception as both preventing our experience of duration and enabling creative action.

While accounts of Bergson and Marey’s relationship usually ends there, Bergson’s engagement with cinema and its inventor is significant for other, related reasons. Marey is an important theorist for contributing notions of development, movement, and heterogeneity to the living body through the science of energy, rather than through evolutionary theory. By understanding Bergson in conversation with Marey’s work, we can understand the centrality of an energetic materialism for Bergson’s metaphysics that has been largely obscured by readings of Bergson through evolutionary theory (or spiritualism). As Anson Rabinbach summarizes in *The Human Motor: Energy, Fatigue, and the Origins of Modernity* (1992), for Marey (thinking through his intellectual guide, Hermann von Helmholtz) the concept of force (energy) unified science and made all physical bodies “subject to motion” and, conversely, all bodies became, by definition,
“theaters of motion.” As Rabinbach writes, Helmholtz “conceived of the body as a field of force capable of infinite transformation and conversion, simultaneously linking the cosmos to the body and to the productive order of work” (87). Rabinbach places Helmholtz at the center of scientific materialism in Germany, which “rejected any distinction between the laws of inorganic and organic nature” (49); he adopts Gaston Bachelard’s26 description of matter now understood as energy as a “dematerialized” or “transcendental” materialism.

Gaston Bachelard once described nineteenth-century scientific materialism as a ‘dematerialized materialism,’ a materialism embodied in the primacy of energy….The new scientific materialism was predicated on a single, indestructible, and invisible Kraft [energy, power], which could be perceived only in terms of its effects — in the material form of different kinds of mechanical work. Although energy was the source of all motion and matter, the materiality of the physical universe — energy — was nowhere to be encountered except in the manifest consequences of its enormous labor power. Materialism became, in a word, ‘transcendental.’ (Rabinbach 48).

The term “transcendental materialism” is a carefully developed concept in Rabinbach’s study. The body was increasingly understood as the primary site of energy conversion; “a single productivist metaphysic” emerged “in which the concept of energy, united with matter, was the basis of all reality and the source of all productive power – a materialist idealism, or as I prefer to call it, transcendental materialism” (4). For Rabinbach, Marey is the neglected “savant” of this history, whose work created an energetic materialistic

26 See Bachelard, The New Scientific Spirit
account of the human body. “Marey introduced a new language to describe the body at work, a language of time and motion…. For Marey, ‘movement’ was the central fact of life” (87). Marey’s interest in blood circulation, respiration, muscle function, hydraulics, and movement required a method of investigation that could incorporate time and development in its final analysis. In addition to the development of chronophotography and moving images for this purpose, Marey also invented numerous inscription devices for translating the energetic movements of the body into a visual image. For instance, he is credited with inventing is the first graphic heart monitor, which was used in the Pallandio sessions.

As Robert Brain has described, Marey envisioned graphic inscription as a new universal language for a science redefined by energy.

For Marey, the condition for the possibility of the graphic method as a simple, clear, and universal medium of scientific exchange derived not just from its logical clarity, but rather from its capacity to inscribe, and thereby represent mechanical work, or energy. Over and over again, Marey explained how the graphic recording served as an experimental cornerstone of much of the science that comprised the emerging thermodynamic

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27 In Rabinbach’s larger argument, Marey is a central theorist for shaping the concept of labor power in the nineteenth and twentieth centuries. “Indeed, Marey’s life work can be seen as an Archimedean point at which social and cultural modernity intersected, illuminating the convergence of labor and culture in fin-de-siècle France” (87). The idea of “labor power” emerged within “transcendental materialism” as the body was conceived (particularly through Marey’s work) as “a field of forces capable of infinite transformation and conversion, simultaneously linking the cosmos to the body and the productive order of work. The body mediated the laws of nature with the laws of production” (87). As a result, the body “became labor power, a concept emphasizing the expenditure and development of energy as opposed to human will, moral purpose, or even technical skill” (4).
worldview” (157)²⁸

With this in mind, it is necessary to view Marey’s chronophotography as one of many strategies by which the energy, movement, and development were included in an analysis of the body. In Marey’s archival files, we find an array of techniques for the inclusion of time and movement in graphic representation of animal and human bodies. See images in Appendix 2:

- Figure 8. A horizontal axis of time with overlapping physical sequence, and put in relation with another line of graphical information in the fourth frame
- Figure 9. A table of successive images in which a bird’s position is roughly realigned along a vertical axis, which takes it out of a forward progression, but still depicts movement by highlighting the changes of bodily position
- Figure 10. A vertical axis of time with overlapping but discrete physical positions
- Figure 11. An ongoing tape of graphic inscription, putting various lines of inscription into relation, with no definite beginning or end

It is not surprising then, given the extent to which theories of energy foregrounded time and movement in the study of the body for Marey, that among the various apparatus for representing movement we find a nineteenth-century scientific animation device for replicating the vibratory movements commonly theorized with force and energy (See images in Appendix 3). This device, which is dated to 1896 and titled “Graphic

Representation of Vibratory Movement” is housed in the Musée des Arts et Métiers in Paris, among a vast collection of scientific and technological objects, several of which come from Helmholtz’s and Marey’s labs.\(^9\) This object provides an important material “archimedean point” connecting energetic materialism, graphic inscription, and the animation of movement. As such, it is as important for the history of cinema as the history of energetic materialism. As Brain and Rabinbach have argued, the scientific occupation with the graphic inscription of movement (through animation, moving images, various forms of inscription) is grounded in a new metaphysics of energy and rendered here as the animation of vibration itself.

1.5. Thermodynamics and the Vital Impetus

The vital impetus is Bergson’s answer to mechanistic and teleological (or “finalist”) accounts of life, which, according to Bergson fail to admit the possibility for the change and variety that characterize life and evolution.\(^{30}\) Instead of a metaphysics with determined conclusions, Bergson creates a metaphysics with a primary, vital impetus that drives life in the direction of inserting free action in the world, the destinations of which are unknown and unpredictable. Nature is an “immense inflorescence of unforeseen novelty” and “the force which animates it seems to create…for nothing, for the mere pleasure of it, the endless variety of vegetable and animal species” (“Life and Consciousness” 31). The vital impetus drives the mind-matter dynamic. Consciousness,

\(^{29}\) The records for this object in the museum’s archives were minimal. They did not indicate its owner or its exact use and only provided a very simple description of its function.

\(^{30}\) See Creative Evolution 43-52.
which is “determined to force for itself a subterranean passage [into matter], making tentative attempts to the right and to the left, pushing more or less ahead” bends matter to release the energy slowly accumulated in it for the purpose of free movement and directed action. (Ibid 27)

In “Life and Consciousness” we see how this impulse is framed, ultimately, as a force that exists outside thermodynamic law and seeks “to surpass itself” (27). It is a force that “draws much from little, something from nothing, and adds unceasingly to whatever wealth the world contains” (31).

Visibly there is a force working, seeking to free itself from trammels and also to surpass itself, to give first all it has and then something more than it has. What else is mind? How can we distinguish the force of mind, if it exist, from other forces save in this, that it has the faculty of drawing from itself more than it contains? (27)

For Bergson, the superior position of the human in the scheme of life is made clear in his final analysis of mind, which finds its best expression in “the moral man.” The moral man “is a creator in the highest degree – the man whose action, itself intense, is also capable of intensifying the action of other men, and itself generous, can kindle fires on the earth’s generosity” (32). The force of the vital impulsion is “the earth’s hidden fire” that allows the mind to create more from itself than what it originally had.

Although Bergson does not directly reference thermodynamics in “Life and Consciousness,” his confrontation with it is obvious. While it may be tempting to point to a spiritual component of the vital impetus to account for the additional energy that creation admits, Bergson’s commentary on thermodynamics in Creative Evolution, presents us with
a different account. In his discussion of the genesis of matter, Bergson argues that the law of the conservation of energy was formulated by privileging only kinetic and potential energies, both of which lend themselves well to our methods of measurement.

“Convention,” he writes, “plays a large part in this principle” (264).

Now, if there were only kinetic energy in the world, or even if there were, besides kinetic energy, only one single kind of potential energy, but no more, the artifice of measurement would not make that law artificial. The 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 the conservation of energy. (264)

However, Bergson does not fault scientists too much for this error, for he sees it as a natural tendency to create a unified picture of the cosmos from the laws of our own world, given how strongly coupled we, as living organisms, are to its particular mechanics; “so that it is not artificially, for mere reasons of convenience, that we isolate our solar system: nature invites us to isolate it” (263).

Bergson similarly critiques the second law of thermodynamics (entropy), or as he also calls it, “the law of the degradation of energy.” “It tells us that…the instability to which we owe the richness and variety of the changes taking place in our solar system will gradually give way to the relative stability of elementary vibrations continually and perpetually repeated” (265). Bergson begins with the obvious question of where the initial

31 See Creative Evolution 263-274

32 Here, Bergson cites Pierre Duhem (1861-1916), a French physicist and historian of science who wrote widely on “energetics” and thermodynamic theory. Bergson specifically references Duhem’s L’évolution de la mécanique (The Evolution of Mechanics) (1903).
“instability” or “mutability” (or fund of usable energy) originated; to answer this he offers a few radical scenarios for physics. For instance, Bergson writes, “it might be supposed that…the period in which we now are, and in which the utilizable energy is diminishing, has been preceded by a period in which the mutability was increasing, and that the alterations of increase and diminution succeed each other forever” (266). Alternatively, “it might be added that the number of worlds capable of passing mutability to each other is unlimited, that the sum of mutability contained in the universe is infinite, that there is therefore no ground on which to seek its origin or foresee its end” (266). It could be, then, that our universe passes through rhythmic phases of increasing and decreasing entropy or that our world is in energetic exchange with other, unknown world. Ultimately, Bergson claims that physics will fail to really describe the energetic nature of the universe as long as it continues to apply the physics of our world to the entirety of the cosmos and consider only a limited range of the energies and forces contained within it.

In reality, 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)

With this in mind, it no longer seems strange to find Bergson studying Palladino, seeking to find “the manifestation of yet undefined forces;” in fact, it seems more likely that these words came directly from him. It is the potentialities within the energetic picture, the possibility of finding different kinds of energies, then, where Bergson finds an opening for
the vital impetus, and other unknown forces. While our strongly coupled relationship to the physics of our world (and particularly the physics that appeals to our phenomenological experience of it) may, at times, prevent science from finding new energies, Bergson claims it is by no means impossible.

If there be a beyond for conscious beings, I cannot see why we should not be able to discover the means to explore it. Nothing which concerns man is likely to conceal itself deliberately from the eyes of man….Recollect what has happened in regard to another beyond, that of ultra-planetary space. August Comte declared the chemical composition of the heavenly bodies to be forever unknowable to us. A few years later the spectroscope was invented, and today we know, better than if we had gone there, what the stars are made of. (“Life and Consciousness” 35)
Works Cited


2.1. Abstract

This chapter provides a new interpretation of Durkheim’s *Elementary Forms of Religious Life* (1912) by tracing how concepts of force and energy (as both totemic forces/energies and moral forces/energies) are centrally developed in the text. I argue that Durkheim develops and “energetic epistemology” that conceives of the human capacity for shared meaning as a product of coordinated energy (rather than the reverse), and ultimately provides a thoroughly constructivist account of knowledge. According to Durkheim, when a member of a collective perceives a god or feels belief, she actually perceives the accumulated energy that has been channeled into the creation and maintenance of it by the social collective. Objects, images, and ideas bear the trace of collective energy the more they are carefully crafted, maintained in spaces that are specially arranged, written into strict behavioral codes, or, in other words, the more they are deeply imbricated in social networks. The moral force (the collective energy which registers like an “electric shock” in the psyche) is both the “constraining and necessitating action” of cognition that allows for coordinated perception among members of a social collective. According to Durkheim’s origin story, the experience of feeling collective moral force gave rise to the concepts of causality and force themselves, which were only later developed in the sciences. For Durkheim, belief functions similarly in religion as well as in science. In contrast to traditional interpretations of Durkheim’s sociology, this reading of *Elementary Forms* allows us to reconsider Durkheim in a lineage of social constructivist epistemologists and, particularly, in relation to Ludwik Fleck.

2.2. The 1903 Debate of Social Forces

In the fall of 1903 at the University of Paris-Sorbonne, Gabriel Tarde and his younger colleague Émile Durkheim attempted what they knew would be a contentious public debate about the newly formed discipline of sociology. Their disagreements
concerned the most foundational aspects of the emerging discipline of social science, namely, what claims it makes to natural science and how the coherence of human collectives should be theorized. Just over one hundred years later, in 2007, a reenactment of this debate was staged at CRASSH Cambridge with Bruno Latour as Tarde, Bruno Karsenti as Durkheim, and Simon Schaffer as the moderating Dean. A transcript of the original debate is no longer extant. The debate as played at Cambridge is an interpretive creation composed by present-day scholars; it is a compilation of excerpts arranged as a dialog from nineteen different texts by Durkheim and Tarde ranging in date from 1893 to 1910. Naturally, then, this work of re-imagined history is a highly constructed text, constituted by the selection and extraction of statements scattered among various arguments and shaped by one hundred years of reception history (how scholars have labeled Durkheim and Tarde and painted their camps). More interesting, however, is the reason for the production — what function is this debate playing in a current scholarly conversation among sociologists, philosophers, and cultural theorists? Why stage a debate from 1903 to make distinctions about the current state of the social sciences in the twenty-first century?

According to Latour, Durkheim was the clear champion not only of this debate, but of twentieth century sociological theory more generally. Latour recreates Durkheim’s and Tarde’s contrasting accounts of “the social” in order to clarify the problematic intellectual inheritance that stands as his incentive for inaugurating a new sociology. In place of Durkheim’s legacy, Latour would rebuild sociology from the work of Gabriel Tarde, as “an alternative precursor for an alternative social theory” (Latour 14). Recreating the debate and “defeat” of Tarde in 1903, allows Latour the rhetorical space for announcing a
new program, originating from a forgotten authority. Tarde, as summarized by Latour, built a sociology from the “ground up,” explaining how the ongoing, ever-changing relationships and actions of individual actors came to function within collectives. In *Reassembling the Social* (2005), Latour quotes Tarde as he explains his conflict with Durkheim: “I [Tarde] explain collective resemblances of the whole by the massing together of minute elementary acts — the greater by the lesser and the whole by its part” (15). A sociology that traces everyday actions in order to explain the behavior of collectives (rather than explaining individual actions by the characteristics of a larger social body), positions it to be “a science accounting for how society is held together, instead of using society to explain something else” (13). As Latour explains, this reorients sociology so that “the social” is not assumed to be a monolithic system; it is not “a stabilized state of affairs, a bundle of ties that, later may be mobilized to account for some other phenomenon,” by “providing a ‘social explanation’” of other things such as science, religion, or illness. From this perspective, Durkheim’s account has been faulted doing just that, hypostatizing the social.

However, around the same time that Tarde was being resurrected in the texts of Latour (as well as Deleuze and Guatarri), Durkheim scholarship was also experiencing a transformation. Beginning in 1972 with Steven Lukes’s widely admired monograph, *Emile Durkheim: His Life and Works*, numerous reinterpretations of Durkheim have attempted to wrest Durkheim from the shadow of his early expositors and critics. A growing number of recent volumes such as *Durkheim Reconsidered* (2001), *The Radical Durkheim* (2001), *Rethinking Durkheim and his Tradition* (2004), *The New Durkheim* (2006) explain the historical and political environment that produced the particularly
narrow and often misguided interpretations of Durkheim’s sociology. Possibly the most radical statement of reinterpretation is given by Jeffery C. Alexander and Philip Smith in *The Cambridge Companion to Durkheim* (2005), which credits Durkheim as the origin of what became known as the cultural turn in the social sciences and humanities.

The cultural turn owes everything to Durkheim. It is built almost entirely upon his legacy, which his direct and indirect disciples distributed over an extraordinary range of disciplines and channeled through an immensity of new kinds of intellectual forms. Why, then, has the debt been such a well kept secret?….The problem at once scholarly and historical, was that the sociological significance of Durkheim’s later, more cultural theory had never been properly understood. Durkheim himself did not do anything to help. Committed to the identity of sociology with natural science, he was inclined…to present his ideas as ‘writerly,’ not as changing and developing, but as unified, definitive and coherent. (12)

Alexander and Smith argue that Durkheim’s texts are, in reality, much more “readerly” in Roland Barthes’s sense of the term. They credit Durkheim with creating the first fully formalized theory of historically contingent cultural systems, which are created and maintained through coordinated structures of discourse and practice that continually evolve as they function. In their history, Saussure, Bataille, Lyotard, Baudrillard, Foucault, and Derrida are all constellated with Durkheim. “For some time, this revolution in the human sciences was speaking ‘Durkheim’ without uttering his name” (11). The unusual association of Durkheim with these theorists is made through their resonating ideas about the organizing function of the sacred, productive excess, discourse and power, embodied
experience, and the ongoing reconfiguration of social articulations through representation and material practice. Indeed, Durkheim is entirely absent from standard accounts of post-structuralism, and, for that matter, structuralism, which is generally sourced to Claude Lévi-Strauss and Ferdinand de Saussure. Equally conspicuous is the absence of Durkheim’s name from anthologies of theory and criticism of literary study (in which all the names mentioned above regularly appear), even though Durkheim develops a rich account of mimesis central to his notion of social epistemology (this will be discussed in detail below). Durkheim is, however, often a well-acknowledged source in cultural studies and anthropology, and various critics such as Strenski note that Durkheim’s work would fall more easily under the rubric of cultural studies than sociology today.

In this chapter, I argue that deeply divergent ways Durkheim has been interpreted, excluded, or utilized in theoretical debates stems from a basic confusion about his work, which makes claims to natural science and formalizes a theory of collective epistemology; in other words, it is a deeply constructivist account of meaning that claims to be a natural science. This particularly challenging aspect of Durkheim’s sociology has allowed his texts to be read as either scientifically rigid or the source of the cultural turn in theory. And, while a strong claim to science by a sociologist seems problematic when viewed from a twenty-first century (precisely because it is at odds with the insights of post-structuralism), a claim to science at the turn of the twentieth century was a way to bring the study of culture and social collectivity into serious academic investigation. It was a way to pronounce the reality of social forces (which Durkheim does unequivocally) and to incorporate them into a theory of knowledge and cognition. Rather than dismissing social forces as the surface effects of culture (often considered, at that time, a space outside the
natural world and its laws of relation) or relegating collective action to psychological phenomena, Durkheim assigns social forces an independent and natural reality and subjects them to methodical investigation. Durkheim’s claim to science can be understood as a means of endowing a reality and a new status to social life that had previously been denied.

A depiction of the social as a static system of relations that can be mobilized to explain individual behavior cannot be found in *Elementary Forms of Religious Life* (1912), which is widely acknowledged as Durkheim’s most important work. Rather, Durkheim explains how individual collectives come to coordinate knowledge and perception through the activities of on-going collective assemblage. I will argue here that Durkheim inaugurates a line of constructivist epistemology for the twentieth century by providing a radical account of the human and collective cognition through an energetic epistemology.

To realign the origin of twentieth-century constructivism with Durkheim requires that we think through his terms (as least for the moment); to do otherwise would possibly provide us with an origin story, but it would obscure the potentially alternative account of agency and knowledge that should be given room to surface. Durkheim’s choice to think through the concepts force an energy are not coincidental, nor irrelevant; indeed, that these terms make his new account of collective knowledge and agency possible. For Durkheim, it may be said that human consciousness and human agency emerge together in the moments when human collectives first came feel the “anonymous, circulating forces” of collective powers. The human mind emerged as such in the moments it felt the “accumulated energies” of the collective acting on its individual will, at once announcing the human as a social being and establishing the structures for shared cognition. This constructivist
account ultimately relies on notions of force and energy that are carefully developed
throughout the text to offer a collective epistemology best understood as an energetic
epistemology, not only for the terms Durkheim uses but for how it functions. In the
process of developing this account, Durkheim will redraw the lines between epistemology
and ontology in ways that continue to animate debates regarding knowledge and agency.
His theorization of force and energy (as both social force and totemic force) is at the very
center of his intervention.

By reading *Elementary Forms* as a study of collective epistemology (rather than a
study of religion or the sacred), we can redraw connections among Durkheim and other
theorists, such as Ludwik Fleck (and by way of his influence, Thomas Kuhn) who are
rarely put in conversation with one another. Perhaps the most productive way to read
Durkheim today, then, is to acknowledge the historical conditions that motivated him to
claim a natural reality of social force (a deceptively simple term), and then appreciate the
deeply readerly aspects of his work as he attempts redraw the lines between collective
action, representation, and cognition through concepts of force and energy.

### 2.3. Totemic Force, Moral Force, and Effervescence

*Elementary Forms of Religious Life* was published in 1912, just five years before
Durkheim’s untimely death. By that time, Durkheim had been at the Sorbonne for a
decade and managing the *L’Année Sociologique*, which he founded in 1898. *Elementary
Forms* was the last major study Durkheim published during his lifetime. In his
introduction to the text, Mark S. Cladis notes that many other scholars of his generation
had closely examined religion from the framework of the emerging social sciences:

“Sigmund Freud, Jame Frazer, William James, Lucien Lévy-Brühl, Max Muller, Hubert Spencer, E. B. Taylor, Max Weber: these and many others explored the origin and nature of religion with the tools of ‘the scientist’” (Cladis xvi). Cladis imagines the national turmoil created by the Dryfus affair as the particular historical conditions that brought Durkheim into the conversation. As France’s was in transition and new social movements were congealing before his eyes, Durkheim was eager “to discover what supplies a sense of belonging and moral scaffolding in modern societies. This venture is urgent: if religion provided moral solidarity in the past, and if religion has been in a continuous state of decline, what will take its place in the future?” (vii). Durkheim was thus prompted to “set himself the task of discovering the enduring source of human social identity and fellowship — solidarite. This led him to investigate what he considered to be the most simple form of documented religion — totemism among the Aborigines of Australia” (viii). If Durkheim is studying religion, then, it is in order to explain the fundamental nature of collective action that could continue to provide social coherence in a modern, secular world.

Durkheim explains: “We have made it [religion] the subject of our study because it seems most likely to yield an understanding of the religious nature of man, by showing us an essential and permanent aspect of humanity” (3). The “permanent aspect of humanity” is, of course, its collective nature, and Durkheim focuses *Elementary Forms* on the elements “that generate any religion,” rather than “characterize the system they produce” (36).

Theorizing collective cohesion (and I will argue collective epistemology) under the cloak of religion, then, is the primary contribution of the text: “the true justification of religious practices is not in their apparent ends but in the invisible influence they work on
consciousness, in the way they affect our mental state” (266). In a corresponding move, when Durkheim turns to explain the behavior of modern collectives (be they scientists or mobs), it is through the language of religion. Cladis notes the extent to which religion permeates Durkheim’s thought as an explanatory principle: “Regardless of what subject Durkheim was investigating — morality, law, property, education, epistemology — religion now played a central explanatory role. Indeed, as one of Durkheim’s colleagues, Paul Lapie, had murmured, ‘Basically, Durkheim is explaining everything . . . by religion’” (xv, qtd. in Pickering, Durkheim’s Sociology of Religion, 75). In the process, Durkheim boldly insists not only the reality of all religions (precisely because they are functioning epistemological systems), but also the reality of ‘moral force’ and ‘social force.’ The present study understands the entirety of Elementary Forms as working towards an explanation of the origin and efficacy of the moral force (or moral authority), the heart of Durkheim’s sociological theory. Durkheim’s way of getting there is by explicating the complement of this force — the totemic force — and its role in the emergence of the human mind. The necessary relation of these corresponding forces is the reason Durkheim will permanently link religion and collective epistemology in his sociology.

Elementary Forms can perhaps most productively be read as a long meditation on multiple notions of force and energy as power: the impersonal forces expressed through personified gods, the moral force of socially developed systems of thought, and the “social forces as real as cosmic forces” that will bring the study of culture into the realm of scientific inquiry. As is common in the texts of this period, Durkheim uses the notions of force and energy interchangeably. Durkheim primarily refers to “forces” (totemic forces,
moral forces, social forces), but he makes clear at various moments in the text that these forces are “anonymous energies” embodied by the gods, “mental energy” (156), and “psychic energy” (155) that shape thought and perception with an “electric shock” of their effect. “Energetic force” is at once the subject of the text (the energetic force of the totemic god) and Durkheim’s sociological principle (the energy that directs thought). Durkheim carefully insists on the reality of both energies; rather than metaphors, they are the forces worthy scientific study. In the origin story of human consciousness that Durkheim gives us in *Elementary Forms*, these two forces — the totemic force and the moral force — are distinct but intimately related. By explaining the relationship between the moral force and the totemic force, Durkheim is explaining the “essential aspect of humanity” which fostered the emergence of human consciousness as collective consciousness and permanently structured it in the making.

Durkheim’s study of religion is wholly organized through a close examination of totemism, or, more specifically, the “divine force” at the heart of the totemic principle. “This [the divine force] is the common principle to which the cult is in reality addressed. In other words, totemism is the religion not of certain animals, men, or images, but of a kind of anonymous and impersonal force that is found in each of these beings though identical with none” (140). As Durkheim’s analysis proceeds comparatively through several totemic societies in Australia, Melanesia, and North America, he identifies the same concept for this pervasive force under different names, such as *mana*, *waken*, and *orenda*. The whole of “Book II” of *Elementary Forms* is devoted to explaining why the pantheon of spirits that circulate in totemic religions are, in actuality, manifestations of this impersonal energy.
Broadly speaking, we might say that it [energy] is the god worshipped by every totemic cult. Only it is an impersonal god, without a name, without history, immanent in the world, diffused throughout a multitude of things . . . This is the totem’s real essence: it is merely the material form in which that immaterial substance is represented; diffused through all sorts of heterogeneous beings, this energy alone is the true subject of the cult. (141)

In Durkheim’s picture then, the totem became “the metaphor” for the impersonal, cosmic force it embodies. (141)

Although the totems are sacred because they embody the same anonymous energy, they are classified into a system of distinct totemic species, which provides a taxonomy of the living world and the clan’s place within it. These totemic species are, firstly, the means of self-definition; every individual is assigned to the clan of a particular totem (for example, the crestless white cockatoo, the tea tree, the crow), and the members of a clan share obligations of kin with one another (even though they are not necessarily defined by biological ties). Secondly, the totemic emblems are also categorical containers by which all of nature is organized. For instance, the fishing falcon totem has various objects of nature classified within it (such as smoke, honeysuckle, certain trees) according to various associations shared between objects and the totem itself (111). “For the Australian, things themselves — all things that inhabit the universe — are part of the tribe. They are among its constituent elements and its regular members” (109). To be in touch with one’s totem, then, is to be in touch with not just the sacred, but also one’s clan identity and the order of the cosmos. This is the primary function of the totemic species — to make a place for one’s kind in the order of the natural world.
The totemic clan exists to maintain the health and survival of their species, which is achieved through the continual reproduction of the totemic forces, the “anonymous energies” that constitute the totem. Nature, however, persistently demonstrates that these energies are inconstant, that the energetic forces circulate unevenly in various waves of strength.

Unfortunately, all forces, even the most spiritual, are worn away over time if nothing comes along to restore the energy they lose in the natural course of things. This creates a primary need that is, as we shall see, the underlying reason for the positive cult. The members of a totem can remain themselves, then, only if they periodically restore the totemic principle that is in them. And since they imagine this principle in plant or animal form, they will ask that corresponding plant or animal for the supplementary forces they need to renew and rejuvenate that principle. (250)

Although Durkheim does not reference Herbert Spencer here (as he does in other passages of Elementary Forms), the influence of Spencer’s force universe is clearly evident as Durkheim discusses the waves and rhythms of cosmic force. As Durkheim explains:

If sacred beings always manifested their powers in a perfectly balanced way, it would indeed seem inconceivable that man could have thought to offer them in his services, since they would appear to have no need of them. But first, as long as they are fused with things and seen as containing the principles of cosmic life, they too are subject to its rhythms. That life

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33 As will be discussed in Chapter 4, Spencer claimed that rhythm results whenever forces are not in equilibrium; all motion and matter usher forth from the inherently rhythmic state that is created by the irregular interaction of forces. Thus, rhythm is assumed to be a precondition for action in general.
proceeds in successive oscillations according to a fixed law. At times it asserts itself in all its glory; at others it is so weak that one wonders if it will continue. (255)

The clan is prompted to intervene through rites of the positive cult when faced with the inconsistent flows and rhythms of forces in the universe. The engine of the entire religious system is put in motion because the devotee must contribute to the maintenance of sacred force needed by both mortals and gods for survival.

How, then, do the members of the clan reproduce the energies of the totem, which define the structure of the cosmos and the members’ place within it? Put in different terms, how does the clan constitute itself and ensure its survival in the world? The positive cult’s most important set of rites are the “mimetic” or “imitative” rites that ensure the reproduction of the totemic species, be it the Fishing Falcon or the Witchetty Grub, and allow each member to reconnect with the totem’s essential energies. During these mimetic rites, the clan creates representational images and symbolic actions that are imitative of propagating the totemic species and restoring the supply of energy that unavoidably ebbs and flows through rhythm of yearly cycles and the actions of daily life. For example, in one rite of the positive cult, batches of symbolic dust, smoke, or sparks are produced that embody the totemic energy; these fragments are dispersed to distribute this life force among members of the cult, human and non-human alike. “The grains of this sacred dust are regarded as the seeds of life; each of them contains a spiritual principle that, incorporated into the organism of the same species, will give birth in it to a new being.” This sacred dust is released into the wind; “it flies off on every side to do its work of fertilization” (245).
The most important rites of the positive cult are those that circulate the totemic energies between gods and mortals through rites of sexual reproduction and ritual consumption. Significantly, sacred energy needs to be restored in both the devotee and the totemic spirit. For example, in ritual consumption both gods and mortals need to consume consecrated flesh made sacred by the energy embodied within it. At times, it is necessary for the devotee to offer the totemic principle up to the god herself, to “restore the energy they lose in the natural course of things” (250). Similarly, the devotee must also partake of the sacred energy; the sacred meal from a sacrifice is consumed so the “holiness is then communicated to the faithful who eat it” (249). This not only distributes the totemic energies but reconstitutes clan identity: “And meals eaten in common are thought in many societies to create a bond of artificial kinship among the participants. Kin are, in fact, beings naturally created of the same flesh and blood. But food constantly refashions the substance of the organism. A common food can therefore produce the same effects as a common origin” (249). Meals made from the first yearly harvest are particularly restorative: “the first fruits of the harvest manifest in their very appearance the energy they contain; they totemic god affirms himself in every burst of youth” (250).

More important than rituals of consumption, however, are the fertility ceremonies, which involve the symbolic reenactment of species propagation. For example, in the reproductive rites of Witchetty Grub Clan, participants enter into a specially built hut that represents the grub’s chrysalis; once inside, members of the cult chant and describe the developmental stages of the insect. Eventually, they slowly emerge from hut as the insect would from its cocoon. “The preceding examples are adequate to show the character of these ceremonies: they are dramas, but of a particular sort, which influence — or are
thought to influence — the course of nature” (279). By enacting these mimetic dramas, Durkheim claims that something much more significant than imitation transpires; rather than merely representational acts, the rite is a productive creation and re-constitution of the clan itself.

In taking a step back, Durkheim asks, “Where does he get the idea that by imitating an animal he can influence its reproduction?” (256). To answer this question, it is necessary to “reconnect it to the web of ideas and feelings that generate the rites in which it figures” (264). When members of the clan assemble to initiate a rite of the positive cult, “their first act must be to affirm to one another this quality by which they define themselves;” in other words, they must affirm themselves as real members of the totemic animal or plant species. “The totem is their rallying sign, and for this reason, as we have seen, they draw it on their body; but it is just as natural for them to try to resemble the totem in their movements, their cries, and their behavior. Since they are emus or kangaroos, they behave like the animals of that name” (264). The fate of the clan depends on the reproduction of the totemic species; this also turns out to be the literal truth of the rite for Durkheim — they perform the propagation of the totem because it recreates the bonds of the clan. “Society can revive its sense of self only by assembling” (259). “The rite is not only an expression of this kinship, but it fashions and refashions it. For it exists only insofar as it is believed, and all these collective demonstrations have the effect of supporting the beliefs on which this kinship rests” (264).

Since the constitution and survival of the clan is the purpose of the ritual, the positive cult achieves this end. The reality of the belief is tied to the pleasure of self-constitution through the play of mimesis. The rights offer testimony that they are of same
moral community, and the experience of pleasure gained form self-constitution translates into belief in the rights themselves; the community is asserted, the rite is successful. The ritual is further confirmed by the sense of “moral pleasure” or “euphoria” experienced in these acts, or what Durkheim also calls “effervescence.”

People are conscious that the ceremony is good for them; and indeed, in it they refashion their moral being. How could this sort of euphoria fail to give them the feeling that the rite had succeeded, that it was what it was supposed to be, that it achieved its goal? And since the only goal consciously pursued was the reproduction of the totemic species, this seems to be assured by the means employed, whose efficacy is thus demonstrated. So men came to attribute creative powers to gesture that are, in themselves, useless. The moral efficacy of the rite, which is real, creates belief in its physical efficacy, which is imaginary; the efficacy of the whole leads to belief in the efficacy of each part taken separately. (266)

In the process of assembling and affirming their membership to the clan, the members experience the power of collective energy or electricity among the group — the sum and substance of effervescence. “Once the individuals are assembled, their proximity generates a kind of electricity that quickly transports them to an extraordinary degree of exaltation. Every emotion expressed is retained without resistance in all those minds so open to external impressions, each one echoing the other. The initial impulse thus becomes amplified as it reverberates, like an avalanche gathering force as it goes” (162). The special character of this state of exaltation reinforces the belief in the existence of the sacred and profane realms of experience. The individual is “transported into a special
world entirely different from the ordinary, a setting populated by exceptionally intense forces that invade and transform him” (164).

Durkheim’s description of effervescence and the creation of social bonds through assembly is perhaps the most famous passage from *Elementary Forms*. In fact, Latour turns to it in his discussion of the creation and maintenance of collectives; he describes it as “Durkheim having a Tardian moment” (Latour 38). Latour affirms Durkheim’s account because the collective is produced through its ongoing performance (in other words, rather than representing the group’s identity in the fertility rites, they are producing the group through the ritual). Latour uses this theory of group cohesion to further distinguish “sociologists of the social” (for whom Durkheim is usually chief) and “sociologists of associations” (Tarde, Latour). As Latour explains, “sociologists of the social” explain group cohesion by the “the many tools with which it ‘represents’ itself or through which it is ‘reproduced.’” For them, ‘social forces’ are always already present in the background so that the precise means to achieve their presence matters a great deal — but not that crucially.” On the other hand “sociologists of association” maintain that there is “no reservoir of ties, no big reassuring pot of glue to keep all those groups together. If you don’t have the festival now or print the newspaper today, you simply lose the grouping” (37). This is, in fact, Durkheim’s argument about the purpose of the fertility cult and why Latour labels it a “Tardian moment.” Latour continues:

If a dancer stops dancing, the dance is finished. No inertia will carry the show forward. This is why I needed to introduce the distinction between ostensive and performative: the object of an ostensive definition remains there, whatever happens to the index of the onlooker. But the object of a
performative definition vanishes when it is no longer performed — or if it stays, then it means that other actors have taken over the relay. (38)

While Latour would isolate his resonance with Durkheim to a moment, this is also the argument of *Elementary Forms* in a much larger sense. As described through the rhythmic and periodic manifestation of totemic force, the members of the clan are required to intervene for precisely this reason; without intervention, without the renewal of energy, the reality of the system that serves the clan will simply diminish. Durkheim explains: “Sacred beings exist only because they are imagined as such. If we cease to believe in them, they will cease to exist. If we think of them less keenly, they count less for us and we could less for them; they exist to a lesser degree. Again, from this point of view man’s services are necessary to them.” In other words, “if religious ceremonies have any importance, it is because they set the collectivity in motion — groups gather to celebrate them” (258). “In order to justify our view of the efficacy attributed to rites as something other than the product of humanity’s chronic delirium [in other words, in order to claim that all religions are real and not simply delusion], we must be able to establish that the cult really does periodically recreate a moral entity on which we depend, as it depends on us” (258). Thus the engine of the religion (the need to replenish the uneven expression of force in its various rhythmic sequences) is the need to restore the investment of energy in the collective, to keep the dancer dancing. So the collective must be continually performed or it will simply cease to exist as surely as its gods. Durkheim explains that the demands of everyday life pull the members of the clan in various directions of individual pursuit, such as when they disperse to hunt or fish. The collective energy of the clan is “constantly countered and held in check by antagonistic tendencies, which the demand of daily
struggle awaken and sustain” (258). The periodicity of the rites, then, ensure the continual performance of the collective. “The essence of the cult is the cycle of festivals that regularly recur at fixed periods. We are now able to understand the source of this periodicity; the rhythm religious life obeys merely express the rhythm of social life and results from it. Society can revive itself only by assembling” (259).

In this picture, “social forces” are continually produced through action and do not merely represent reified social bonds that are applied to the individual. Durkheim’s sense of force is, in fact, aligned with Latour’s definition of performative meaning. Indeed, meaning and force are brought in very close proximity in what I will describe as Durkheim’s energetic epistemology.

2.4. An Energetic Epistemology: Social Force is not a Metaphor

In order to understand the how the totemic forces affect individual will, it necessary to explicate the other force — the moral force — that Durkheim develops as his sociological principle. The moral force or moral authority is the “psychic energy” or “intensity” that works by conditioning the possibilities of thought. The moral force is the “shock” that works to both direct and confine cognition in order to coordinate perception and belief among members of a given collective and condition the possibility of its cohesion. Durkheim begins his explanation of moral force with the ordinary example of moral authority. “When we obey someone because of the moral authority we recognize in him, we follow his advice, not because he seems to be wise, but because a psychic energy immanent in the idea we have of this person make us bend our will and incline to
compliance. Respect is the emotion we experience when we feel this internal pressure and entirely mental pressure… This intensity is what we call moral authority” (155).

Durkheim explains that this power exerted through the moral force is commensurate with the force of the collective because of the felt, accumulated energy channeled through the ideas, objects, and acts that are consecrated by the group.

The representations that express it in each of us, then, have an intensity that pure states of individual consciousness could not attain: for they are fortified by the numerous individual representations that have shaped them… In short, when a thing is the object of prevailing opinion, each individual’s representation of it draw such power from its origins, from the conditions of its birth [collective action], that it is felt even by those who do not submit to it. It tends to suppress representations that contradict it, keeping them at a distance, and instead authorizes acts that embody it. This is done not by physical coercion or the threat of it, but by the simple radiance of mental energy. (155-156)

This the essence of Durkheim’s intervention in epistemology, which ties belief to collective activity rather than logic, rationality, representational accuracy, or any other traditionally privileged mode of knowledge production. According to Durkheim, when you perceive a god and feel belief, you actually perceive the collective will and energy that has gone into the creation and maintenance of that god by the collective. This energy of the collective, this force of collective focus and action, is what prompts the individual mind to accept it as real. This is why, for Durkheim, the representations of totem are actually more powerful than the animal itself. As objects that are handcrafted, maintained
in spaces that are also specially arranged, written into strict behavioral codes, they more obviously bear the trace of collective energy than the animal itself.

Figures of any sort representing the totem are surrounded by a respect palpably greater than that inspired by the creature whose form is represented…. The *churingas* [symbolic objects] are kept in a sort of temple, on whose threshold the sounds of profane life subside into silence. This is the domain of holy things. By contrast, the totemic animals and plants live in the profane realm and participate in daily life. And since the number and importance of the prohibitions that isolate a sacred thing and withdraw it from circulation correspond to the degree of holiness with which it is invested, we arrive at the remarkable conclusion that *the images of the totemic being are more sacred than the totemic being itself.* (103-104)

[emphasis in original]

The more an object is thoroughly imbricated in the ritual, behavioral, and material systems of the collective, the more the collective is felt through its presence. The more thoroughly imbued an object with the energy of the collective, the more its force will exert itself in intellectual life. This is why, Durkheim explains, that the totems are often humble creatures such as the ant, caterpillar, or plum tree; the totemic species themselves “do not inherently produce those great and powerful impressions that sometimes resemble religious feelings and lend a sacred character to them” (153). The animal itself does not need to inspire awe or communicate power itself; “the focus of the cult lies elsewhere,” in the force of collective energy which is “transfigured and imagined in the physical form of
the plant or animal species that serve as totems.”

When Durkheim speaks of “social forces,” then, he is referring to the felt “intellectual,” “psychic,” “mental” energy that accumulates when a collective joins in coordinated belief regarding certain ideas, objects, or actions. Durkheim’s discussion amounts to a theory of collective cognition and perception, both of which are directed and constrained through collective energy. Of course, Durkheim does not use the term “cognition;” rather, he refers varyingly to terms (in addition to the ones quoted above) such as “intellectual life,” “mental life,” and “categories of thought.” Durkheim offers commentary throughout *Elementary Form* on how, exactly, cognition is shaped by the collective. To being, it difficult for the mind to invest itself in other ideas when the power of the collective is encountered.

Because it inspires such emotion, a respected being, in fact, is always expressed in consciousness by a representation that is charged with a high dose of mental energy. Consequently, this representation is armed to stave off any other representation that contradicts it…. We cannot be entirely devoted to the ideal beings to which the cult is addressed, and at the same time entirely to the collectivity and entirely to our egos. These are two different systems of conscious states that are directed, and direct our conduct, toward two opposite poles. The more powerful tends to push the

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34 In light of this, I would suggest that Durkheim’s theory of mimesis and representation be placed in conversation with André Leroi-Gourhan’s study of prehistoric cave art in *Gesture and Speech* (1964). In summary, Leroi-Gourhan argues that Prehistoric cave art did not have its origins in representation, but in the abstraction of behavioral and linguistic interactions that are performed by a community of participants. The images are means of coordinating behaviors and interactions. These early images are abstractions of a narrative that is performed by the group; the performance, stabilized through the images, reinforce unified values and coordinated perception of the world by the group. According to Leroi-Gourhan, art becomes representational only later in history.
other out of consciousness. (236)

The constraint of the collective force acts to keep the mind within the parameters of thought established by the collective and also positively directs them by redoubling the individual’s power through participation in the collective. Durkheim explains that the action of these collective forces is concurrent with human perception. If we perceive a god, it is because the collective force is acting.

The force isolating the sacred being and holding profane beings at a distance is not really in this being [the god]; it lives in the minds of the believers. So they perceive it at the very moment it is acting on their wills, to inhibit certain movements or command others. In a word, this constraining and necessitating action, which escapes us when coming from an external object, is readily perceptible because everything is inside us. Of course, we do not always interpret it in an adequate manner, but at least we cannot fail to be conscious of it. ([Swain translation] 365)\(^3\)\(^5\) [emphasis added]

2.5. Human Cognition is Collective Cognition

Given the picture of collective cognition\(^3\)\(^6\) that Durkheim constructs, I would argue

\(^{35}\) Carol Cosman’s translation of *Elementary Forms* is an abridged version and omits important passages, such as this, that exist in the original. However, the Cosman version does make improvements in the translation itself. All quotations from *Elementary Forms* are taken from the Cosman text except when noted otherwise.

\(^{36}\) It will be clarifying to distinguish the sense of “collective cognition” as developed by Durkheim from more recent theories of “collective cognition” or “distributed cognition”, as first described by Edwin Hutchins in *Cognition in the Wild* (1995). Hutchins’ foundational theory is focused on
that Durkheim should be placed within a lineage of twentieth-century theorists who progressively develop accounts of collective, constructivist epistemologies. Barbara Herrnstein Smith has provided a history of “conceptual-discursive systems” that were formalized over the twentieth century: “Foucault’s ‘epistemes’ (and, later ‘discourses’) are comparable along many lines to Fleck’s ‘thought styles’ and Kuhn’s ‘paradigms.’ Although the emphases are different in each case, all three point to the existence of conceptual-discursive systems that both enable and constrain the processes of cognition – perception, classification, and so forth – for the members of some historically or otherwise specific collective…” (Smith 5). As Smith clarifies, these systems are not composed of social influences that muddle objective perception. “These perceptual-conceptual dispositions are not ‘biases’, a term that suggests disabling distortions of otherwise clear or direct perceptions. Rather, and precisely because of how they constrain cognition, such dispositions enable what we call facts to be known, what we call reality to be brought forth and experienced” (59) [emphasis in original].

But, one may ask, how is the mind so powerfully constrained so that the members of the collective are compelled to stay within its range? For Durkheim, the individual does so precisely because this constraint is definitional to itself — it does so in order to remain human. The “human” as a distinct group, is such because it participates in collective cognition. The human, like the god, exists because it is continually performed, because its understanding cognition as a process that extends beyond the individual mind. By focusing his study on the functioning of a navy ship, he seeks to understand how the tasks of cognition and memory are distributed among members of a society (through various strategies of specialization and memory storage) and are dependent on aspects of the environment and material apparatus and process. In contrast, Durkheim seeks to demonstrate that only reason the human mind can create coordinated meaning and perception is because human cognition functions through collective action. The reason we can create complex statements that are meaningful to each other is because our cognitive faculties (including perception) are structured to function collectively with others.
members continue to participate in shared structures of meaning. Durkheim claims that the human mind as we know it was born when it first felt the collective force acting on its own will. In other words, the human mind, in all its special and particular cognitive abilities, emerges in the first moments of experiencing the force of the collective will shaping and directing its perception of the world. According to Durkheim, this quality distinguishes humans from animals: “The fact is that man is not simply an animal with a few additional qualities: he is something altogether different” (59). To be human is to participate in collective perception and cognition; in other words, human cognition is collective cognition.37

What happens when a mind openly departs from these norms of all thought? Society no longer considers that mind human in the full sense of the word, and treats it accordingly….We have the feeling that if we abandon these constraints, our thought will cease to be human. This seems to be the origin of the very special authority inherent in reason that makes us confidently

37 The explanation for this shift in the human animal is Durkheim’s point of departure from his contemporaries such as Tarde and Gustave Le Bon (1841-1931), who will explain “social force” within human psychology. Le Bon's theory of crowd behavior, as explained in his widely-read work, The Crowd: A Study of the Popular Mind (1896), claims that when people have gathered in a collective or crowd, they take on unique psychological and neurological behaviors/states that cannot be reduced to any of its members alone. People begin to act from a more primitive part of their spinal cord when part of a collective. One consequence is that affect becomes exaggerated and contagious among the members of the group, which explains why people become highly responsive to images. However, both Durkheim and Le Bon argue that in a collective, members demonstrate complex behavior in which their mental states cannot be reproduced in isolation. Le Bon and Durkheim have very different explanations for the mechanism of how this collective behavior arises – LeBon’s is a cognitive explanation; Durkheim’s is a social epistemological explanation. Le Bon (a participant of the Palladino sessions) is most famous for his theory of crowd psychology and affect yet, it is less commonly known that Le Bon was also an amateur physicist and he wrote two scientific volumes – The Evolution of Matter (1906) and The Evolution of Forces (1907) – that were popular in France. In Evolution of Forces, Gustave Le Bon takes credit for Nietzsche’s notion of eternal return. In his theorization of force, Le Bon includes the following footnote: “The above rather reminds one of ‘Retour eternal’ of Nietzsche; it is a hypothesis, moreover, void of importance, which I formulated long before that author, as Professor Lichtenberger recalls in a book devoted to the doctrines of the philosopher.”
accept its suggestions. This is the authority of society colouring certain
to thinking that are the indispensable conditions of all common
action….It is a particular kind of moral necessity that is to intellectual life
what moral obligation is to the will. (19)

Although a relatively short passage in the text, this explanation provides a crucial link for
Durkheim’s analysis. We know ourselves as human because we participate in certain
parameters of thought that emerge and are stabilized through interaction among members
of a collective; this allows its members to share meaningful statements about the world. In
other words, to be human is to share in a common framework of meaning. Durkheim
offers further evidence of this link between cognition and the collective, as he explains that
when humans lose connection with the social, they also lose connection to meaningful
thought as we know it. “It has often been noticed that social confusions multiply mental
confusions. This is additional proof that logical discipline is one aspect of social
discipline. The first is relaxed when the second weakens” (Footnote 19).

By participating in this shared framework, humans confer the benefits of collective
life, which include the amplification of their own power, energy, and life force. Or, as
Durkheim sometimes describes it, “every religion is a kind of practice that allows man to
face the world with more confidence” (142). Much can be made of “confidence” here.
By acting in accordance with the collective, by joining in a shared framework of meaning,
the individual is, in return, strengthened by the aggregate energies that constitute it. “A
god is not only an authority to which we submit, however; it is also a force that supports
our own. The man who has obeyed his god, and therefore believes he is on his side,
approaches the world with confidence and the feeling of accumulated energy” (157). Why
do we coordinate meaning? Because it aligns us with the expanded power that comes from participating in a collective. When acting with a collective instead of in isolation, the individual experiences increased confidence, power, and energy. If we cease to invest energy in the collective, we lose the powers that make us, as humans, particularly effective in the world.

Common faith is naturally revived in the bosom of the reconstituted collectivity; it is reborn because it is rediscovered in the same conditions in which it was born…. However crude, the methods used to help the gods cannot seem futile since everything seems to be proof of their efficacy. People feel more confident because they feel stronger, and they really are stronger because the forces that were languishing have been reawakened in their minds. (256)

Durkheim does not define particular the characteristics of human cognition beyond their collective nature. Human cognition is not definitional to certain parameters of rationality, nor does its categorical organization need to adhere to a particular logic. To be human is to create collective systems of cognition that produce shared meaning among its members; as such, these epistemological systems will always bear relation to the world. This is why Durkheim carefully maintains throughout Elementary Forms that, “there are no false religions” (4). In this picture, the engine of the positive cult ensures the continual assembly of the collective, which allows for the continued generation of a shared epistemological framework. In other words, for a shared framework to continue to function, it needs to be actively used, put into practice because ultimately, that is how it is stabilized and rendered usable. Thus, humans need to perform their humanness (the dancer
has to keep dancing). The positive cult needs to ensure the propagation of the totemic energies, which are in fact, the collective energies.

I am inclined to accept Durkheim’s claim that he does not use the terms force and energy as a metaphor (at least not in their most significant sense). His epistemological system functions because it is stabilized through ongoing interaction among members of the collective; it functions only because members invest and re-invest their bodily and mental energy in collective life. “What the worshipper really gives his god is not the food he places on the altar, or the blood he spills from his veins, but his thought” (257). Just as the circulation of energy is the content of the totemic religion, the reality of the religion as a framework for collective cognition relies on the mental energy invested into it.

Collective energy (rather than representational accuracy) becomes the measure by which the religion functions to coordinate a collective. A system of cognition functions in a meaningful way not because it is representationally accurate but because it is stabilized through its continually performance/utilization among a circuit of actors. This is the development in epistemology that, I argue, allows us to align Durkheim with constructivist accounts of science; however this is also the reason why it is valuable to think through Durkheim’s energetic epistemology. Durkheim’s account is a *model of energetic epistemology*; it is focused on the creation of meaningful cognitive systems from the investment of human will, action, and energy, which in return amplify the effective powers of the individual in the world. That is why the totemic gods need their energy restored, this is how this system functions.

On the one hand, the individual takes from society the best of himself, everything that gives him a distinctive personality and a place among other
beings, his intellectual and moral culture….The characteristic attributes of human nature therefore come to us from society. But on the other hand, society exists and lives only in and through individuals…. We can therefore repeat here what was said above with respect to the divinity: society has reality only to the extent that it has a place in human consciousness, and we make this place for it. (257)

Or, as long as we channel energy into it. Of course, there are many instances in Elementary Forms when Durkheim uses force and energy as metaphors. However, these terms often function (in a way that remains true to their literal definitions) to provide a strikingly new account of meaning. The resulting energetic system, which draws new lines between epistemology and ontology, results in an account that focuses on the relationship of meaning to investment, effectivity, and power.

Durkheim states very clearly that his energetic epistemology is not metaphorical because the collective forces have real effects in the world. Just as the system functions through accumulated forces, its effects are also felt as force.

When we say that these principles are forces, we are not using the word in a metaphorical way: they behave like real forces. In a sense, they are even material forces that mechanically generate physical effects. If an individual comes in contact with them without taking the necessary precautions, he receives a shock that can be compared to an electric charge…. When they enter a body that is not suited to receive them, they automatically cause sickness and death. Outside of man they play the role of life principle; by action on them, as we shall see, they reproduction of the species is ensured.
All life depends on them. (141-142)

In fact, Durkheim claims that this experience of force came to establish one of the most fundamental characteristics of human cognition — the concept of causality. The most fundamental parameter of human thought that Durkheim covers is precisely the parameter created through this experience; it generates the basic structure of causal reasoning and provides the model on which the forces of the natural world are modeled in human perception. “The very first thing that is implied in the notion of a causal relationship is the idea of efficacy, or productive power, of active force. The concept of cause is commonly understood to mean that which is likely to produce a specific change. Cause is force before it has demonstrated power; effect is the same power actualized” (269). Thus the human capacity for causal thinking originates with the experience of these multiple notions of force. This leads Durkheim to make the bold claim that the experience of the collective forces (which is most fundamental to human experience) provides the model upon which the forces of the physical universe (i.e. the Newtonian forces) are later theorized (and not the other way around).

Durkheim entertains the commonly discussed possibilities for the origin of our idea of force — namely, that we arrived at a notion of force by experiencing the efficacy of our own will — only to disprove it. While the human will is a discrete force necessarily possessed by the individual, the spirits are “anonymous, vague and diffused powers which resemble cosmic forces in their impersonality” ([Swain translation] 364). The personal will is an internal force that “spreads out in metaphor only”; its effectivity relies on dynamics other than “an energy which communicates itself.” Social forces are, on the other hand, actually experienced as force, as “a force that dominates [the individual]”
Social forces are “entirely psychical; they are made up exclusively of objectified ideas and sentiments. But, on the other hand, they are impersonal by definition, for they are the product of a cooperation. Being the work of all, they are not the possession of anybody in particular.” Social forces “enter from without” but act “internally in the mind” ([Swain] 365). So while the human will can only be extended as an idea of force through metaphor, the collective force acts on the mind through the actual force that is experienced internally, even though originates externally with the collective.

Because social pressure exerts its influence mentally, it was bound to give many the idea that one or more powers exist outside him powers both moral and forceful, that compel his submission. Since these powers speak to him in the tone of authority and sometimes even tell him to violate his own natural inclinations, man must imagine these powers as partly external to himself. Of course, there would be no mythological interpretations if he could readily see that these influences emanate from society. But social action works circuitous and obscure ways, using psychic mechanisms that are too complex for the ordinary observer to perceive their source. (156-157)

Durkheim describes the vague awareness of an external force in the workings of one’s own cognitive processes. The presences of the social framework in the mind will be the intangible element of cognition that theorists of constructivist epistemologies will work to incorporate into their understanding of knowledge and cognition (as will be described below). For the influence of this “spectacle of society within us,” Durkheim refers alternatively to mental radiance, energy, heat, electricity, and force.
Durkheim stops short of universalizing his theory of causality precisely because he has, in the process of explaining it, described the deeply contextual way cognitive frameworks are created. Instead, he concludes the discussion with this gesture: “It is far from our desire, however, to present the preceding remarks as a complete theory of the concept of causality. The question is too complex to resolve in this way. The principle of cause was understood in different ways in different times and places; in the same society it varies with social setting, and with the realms of nature to which it is applied” (275). The footnote of this last sentence contextualizes further:

The idea of cause is not the same for a scientist and for a man lacking all scientific culture. On the one hand, many of our contemporaries understand the principle of causality differently, depending on whether they apply it to social data or to physico-chemical data. People often have a conception of causality as it operates in the social order that is highly reminiscent of the conception that was for so long the basis of magic. We may well wonder whether a physicist and a biologist imagine the causal relation in the same way. (Footnote 275)

Even the most fundamental aspect of human cognition, then, is still a product of the collective, rather than a definitional human trait (other accounts of human intelligence in Durkheim’s era usually maintained that the human could be distinguished by its ability for causal or rational thinking). Here, causal thinking is produced by the more fundamental condition of the human — collective cognition. “So everything would indicate that the first powers the human mind could imagine are those that societies established as they became organized. It is in their image that the power of the physical world were
The principle just explained [moral and physical efficacy of the rite] does not have merely ritual function but bears directly on the theory of knowledge. Indeed, it is concrete expression of the law of causality, and very likely one of its most primitive expressions. A whole conception of the causal relationship is implied in the power that is thus attributed to ‘like produces like’ [the principle of representation and the mode of relation of force]; and this conception dominates primitive thought since it serves as the basis of both cultic practices and the techniques of the magician. The origins of the precept on which mimetic rites rest can therefore clarify the origins of the principle of causality. (269)

According to Durkheim, the notion of force subsequently developed in philosophy and science, originates from the experience of the collective force. “The notion of force is therefore religious in origin. First philosophy, then the sciences borrowed from religion. Comte already understood this when he made metaphysics the heir of ‘theology’. He drew the conclusion that the idea of force was fated to disappear from sciences because, due to its mythic origins, he denied it any objective value” (152).38

As is already implied by Durkheim’s explanation of the origin of the scientific

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38 In addition to Comte, Durkheim also distinguishes his explanation of “force” from that provided by Herbert Spencer. “According to Spencer, however, there is a grain of truth in the belief in spirits: the idea ‘that power that is manifest in consciousness is another form of power that is manifest outside consciousness (‘Ecclesiastical Institutions’, VI, s. 659 in The Principles of Sociology, iii. 169) Spencer means that the notion of force in general is the feeling of the force of our own force extended to the whole universe” (Footnote 61). This is the distinction between the internal force (that is only extended by metaphor to the external world), and the collective force within us that actively shapes us (that is, as Durkheim maintains, a real force). Returning to Spencer: “Moreover, this grain of truth is also, and even more, a grain of error. For if it is true that forces of nature and those of consciousness are related, they are also profoundly distinct, and to treat them as the same is to run the danger of profound miscalculations” (Footnote 62).
Because faith originates in this way, it is, in a sense, ‘impervious to experience.’ If the intermittent failure [ex. the fertility rite did not bring an abundant population] of the Intichiuma do not shake the Australian’s confidence, this is because he clings with all the strength of his soul to these practices in which he periodically renews himself. He could not possibly deny them in principle without causing an upheaval of his entire being, which resists this. But great as this force of resistance may be, it does not radically distinguish the religious mentality from other forms of human mentality, even those usually considered its opposites [i.e. science]. In this regard, the mentality of the scientist differs only in degree. When he endows a scientific law with the authority of numerous and varied experiments, it is contrary to all method to renounce it too easily upon the discovery of a fact that seems to contradict it…. Now, the Australian proceeds no differently when he attributes the failure of an Intichiuma to some sorcery, or the abundance of a premature harvest to some mystic Intichiuma celebrated in the other world. (267)

In spite of being continually faulted for a blindness caused by a reverence for science, Durkheim provides the basic arguments about science that will be developed in more specific detail by Fleck, Kuhn, and Latour. In Durkheim’s account, humans ignore anomalies because they would cause an “upheaval” in the larger epistemological system which contains it; in other words, knowledge gains its status for how it is invested a larger
context of social relations. “So if the believer happens to be resistant to certain lessons of experience, this is because he is relying on other experiences that seem more conclusive. The scientist does no differently; he is merely more methodical” (268). This is not, of course, to argue that Durkheim conflates science and religion. What he recognizes with this observation is the role of human collectives in the production of scientific knowledge. “Some will object that science is often the combative antagonist of opinion, rectifying its errors. But science can succeed in its task only if it has sufficient authority, and it can draw on this authority on from opinion itself. All the scientific demonstrations in the world would have no influence if a people had no faith in science” (156). Durkheim’s study of religion presented an entirely new account of how meaning is created in human collectives; he linked truth to larger social and conceptual systems in the same way social-constructivist theorists of science will do later in the century.

On its own, pure speculation can generate only provisional, hypothetical views that are more or less plausible but must always be subject to question. For we do not know whether some new observation will come along to invalidate them in the future. An axiom that the mind accepts and is bent on accepting, unreservedly and unconditionally, could not come to us from this source. The necessities of action alone, and especially collective action, can and must be expressed in categorical, peremptory, and decisive formulas that admit no contradiction; for collective movements are possible only on the condition that they are concerted movements, and consequently regulated and defined. They exclude casting about in the dark, which is the source of anarchy; they tend toward organization that, once established,
imposes itself on individuals. And as activity cannot dispense with intelligence, intelligence is led among the same path that adopts without discussion the theoretical postulates that practice requires. The imperatives of thought and the imperatives of will are, in reality, two sides of the same coin. (274)

This dense passage is worth presenting in length because it encapsulates insights about the relationship between cognition and collectivity (and thus agency) that have been unraveled and debated up until the present moment. Here, Durkheim recognizes that our truth statements about the world must be produced in conversation with the needs of maintaining the collective (rather than producing anarchy). Once a collective organization is formed (which itself is the only thing that allows the production of meaning as we know it), the framework of meaning must work in support of it, or else it loses the ability to create meaning. Thought is not just shaped by the collective; there is no meaningful thought as we know it outside of the collective. Durkheim’s framework for describing this system is energy: the amount of energy (or action) that the collective has invested gives the collective its strength in organizing the world; in the process, productive energy is fed back to the individual in her ability to act within the world. This connection is fundamental for Durkheim: belief will always be entangled with the necessities of maintaining the collective: “The imperatives of thought and the imperatives of will are, in reality, two sides of the same coin.”

In Elementary Forms, we do not see a subject who is conditioned through external assemblages of power and organization; rather, Durkheim is concerned with articulating an energetic epistemology in which meaning becomes possible through collective investment.
In Durkheim’s picture, we get an engine that is made stronger as one invests in it, which results in a different set of terms for thinking about agency and knowledge.

2.6. Intellectual Convergences: Ludwik Fleck

Understanding *Elementary Forms* as one of the first formalized theories of social epistemology allows us to reconsider the lineage of Durkheim’s work over the course of the twentieth century. Specifically, Durkheim’s connection with Ludwik Fleck (1896-1961) needs to be reconsidered. Fleck, who was largely unacknowledged during the twentieth century, published *The Genesis and Development of a Scientific Fact* in 1935, which drew from his experiences as a practicing physician in Poland. Those who know Fleck also know his connection with the work of Thomas Kuhn. In the Preface of the initial publication of *The Structure of Scientific Revolutions* (1962), Thomas Kuhn names Fleck (along with Quine and the Gestalt philosophers) as a key influence for his theory of paradigms. Babette Babich makes a persuasive argument that Kuhn may have been limited by the cold war political climate in crediting Fleck more fully and for the necessity of changing Fleck’s term “thought-collective” to “paradigm.”

Fleck opens *Genesis and Development* with a simple question: How did the empirical fact of the Wasserman reaction (which was used to reliably diagnose syphilis) come to be unquestioned in the practice of science? Immediately, from the title and central question, it is clear that Fleck’s account of empirical fact is genealogical; put another way, his title may have read, how do we come to perceive what we consider to be statements of

39 See Babich, Babette E. “From Fleck’s Denkstil to Kuhn’s Paradigm"
fact? To answer this question, Fleck develops the term “thought-style” over the course of *Genesis and Development* as the fundamental element of his account of a collective, constructivist epistemology. Thought-style is the stylistic bonds among concepts that are stabilized by their active and passive associations. For instance, once we actively make conceptual connections between phenomena (i.e. medieval scientists group all venereal diseases under the concept of carnal scourge), many other statements about this connection will passively follow (some treatments make carnal scourge worse). This secondary conclusion can only be formulated after the concept of carnal scourge is established.

However, the term *style* not only speaks to the network of associations and concepts within a collective, but it also gestures to a cumulative disposition that results in a host of intellectual and physical actions. To participate in a particular thought-style may, for instance, disposes one to engage in language in a certain way, assume certain causal models, or adopt a certain approach to observation and measurement.

For Fleck, thought-style is one element in a three-part relationship that enables cognition and the production of knowledge. “Cognition must be considered as a function of three components: it is a relation between the individual subject, the certain object and the given community of thinking (*Denkkollektiv*) within which the subject acts; it [cognition] works only when a certain style of thinking (*Denkstil*), originating in the given community is used” (Fleck 154). For Fleck, untrained and initial observations are vague, undirected, and full of possibilities; observations are wandering and fragmentary, and, as such, they are ultimately blinding to form. It is only after possibilities are reduced, a *restriction* that happens through thought-style, that perception of form becomes possible. “Direct perception of form [*Gestaltsehen*] requires being experienced in the relevant field
of thought. The ability directly to perceive meaning, form, and self-contained unity is acquired only after much experience, perhaps with preliminary training. At the same time, of course, we lose the ability to see something that contradicts the form. But it is just this readiness for directed perception that is the main constituent of thought style” (Fleck 92).

In Fleck’s theory the “threefold function of cognition” includes not only the knowing subject and the object to be perceived, but the collective fund of knowledge and practice (the thought-style) that determines the condition of the other two. In his primary example of syphilis, Fleck notes that as the concept of carnal scourge changes over time, its connection with particular concerns and objects changes as well. While earlier notions of carnal scourge contained much more information about the effects of environment and weather, our current concept loses its connection to this information, which diminishes our understanding in certain ways. In this picture, thought-style is an ever-changing (even if minutely so) system that exists in the mind of every participant (yet belongs to no one individually), and shapes perception of the world. Given this theory, facts, objects, propositions, etc. are not based in correspondence to an external reality, but are produced by various configurations of an ever-changing social-cognitive system. “All empirical discovery can therefore be construed as a supplement, development, or transformation of the thought style” (Fleck, 92) [emphasis in original]. A fact is not a verified statement but a particular stabilized relationship among the three elements of cognition (subject, object, community) that allows all of its participants a coordinated perception.

For the time being we can define a scientific fact as a thought-stylized conceptual relation which can be investigated from the point of view of history and from that of psychology, both individual and collective, but
which cannot be substantively reconstructed in toto simply from these points of view. (Fleck, 83)

Each act of perception is an individual contribution to thought-style and each perception has the ability to influence the entire system in subtle or more profound ways. A fact is never a final statement of truth, but an “event” in the history of a thought-style.

In general, accounts of social epistemology have failed to make a strong connection between Durkheim and Fleck because of a critique Fleck launches against one of Durkheim’s students, Lucien Lévy-Brühl (1857-1939), most commonly known and critiqued for his book *Primitive Mentality* (1923). Since Fleck’s mentions Lévy-Brühl as Durkheim’s student, Fleck may have intended a critique of Durkheim by extension.

However, Fleck’s disagreement with Lévy-Brühl in his review of social epistemologists in *Genesis and Development*, strongly resonates with Durkheim’s own criticism of Lévy-Brühl in *Elementary Forms*. Fleck quotes Lévy-Brühl at length:

> “Once the mentality of primitive societies is opened to experience,” Lévy-Brühl continues, “it also becomes more sensitive to contradiction.” “As soon as any society’s intellectual structure and institutions develop…a feeling for, or knowledge of, what physically is possible or impossible emerges and gradually becomes established. The situation is therefore much the same with physical absurdity as it is with logic. The same causes render the prelogical mentality insensitive to both types of absurdity.”
> (Fleck 48)

The implication of Lévy-Brühl’s argument is that the thought patterns of “primitive societies” [sic] were not sensitive to the given, logical contradictions inherent in reality. In
such societies, objects that Lévy-Brühl assumed to be logically antagonistic were grouped in a classification structure governed by principles other than logic. For instance, Lévy-Brühl would likely assume that the Crestless White Cockatoo Clan, which categorizes kangaroos, summer, sun, wind, and autumn under its totem, is not operating with a rational or logical categorical system. The assumption Lévy-Brühl makes (and which both Fleck and Durkheim reject) is that there is a cosmological order that the human mind can know and express in its totality, in representationally accurate terms. Fleck responds: “We must object in principle that nobody has either a feeling for, of knowledge of, what physically is possible or impossible. What we feel to be an impossibility is actually mere incongruence with our habitual thought style. Until recently the transmutation of elements as well as may other phenomena of modern physics, let alone the wave theory of matter, were regarded as absolutely ‘impossible’” (Fleck 48). This is the essence of Fleck’s objection to Lévy-Brühl (and Durkheim by association); they are blinded by an “excessive respect, bordering on pious reverence, for scientific facts” (47) and continue to maintain the possibility of thinking in a purely objective mode (49).40

40 I would argue that one of the reasons that Durkheim’s sociology is misread is because of the term “social forces.” Starting with Durkheim, the term “social forces” in twentieth-century cultural and literary theory is a study in itself, as it has as complicated a history as the scientific term of force and for some of the same reasons. The journal Social Forces, which began publication in 1925, is just one indication of its saliency. The reading of social forces in Elementary Forms provided here, does not equate with an objectified version of the term that takes for granted the nature and stability of an objectified “social” influence. While its meaning is much more complex in Elementary Forms, this is how the term came to be used by many social theorists (including Durkheim himself, especially in his earlier work) and by literary theorists in the twentieth century. In The Taming of Chance (1990), Ian Hacking explains some of the implications of objectifying “causal forces” as within the term “social forces”: “Durheim's collective forces were...agents that necessarily produced stable phenomena. They were nevertheless described by a new kind of law of collective phenomena, a law endowed with its own 'reality.' Quetelet had made the mean of a population as 'real' as the position of an island or a star. At the time of Durkheim, the laws of deviation from the normal themselves became a part of reality...The reason why there must be cosmic forces acting upon the population and producing the tendencies to suicide is that there can be no other explanation of the statistical stabilities” (177).
However, Durkheim argues with the very same proposition made by Lévy-Brühl in *Elementary Forms*. Durkheim writes:

> It is said that the participations postulated by mythologies violate the principle of contradiction and are therefore antithetical to scientific explanations [footnoted to Lévy-Brühl]….To be sure, if primitive thought is the sort of general and systematic indifference to contradiction attributed to it [additional footnote to Lévy-Brühl], it would contrast on this point — and contrast markedly — with modern thought, which is always careful to be consistent. But we do not believe it is possible to characterize the mentality of lower societies by a kind of unilateral and exclusive penchant for refusing to make distinctions. If the primitive mingles things we keep distinct, conversely, he keeps apart things we yoke together…There is no gulf, then, between the logic of religious thought and the logic of scientific thought. Both are made up of the same essential elements, although these elements are unequally and differently developed. (Durkheim 182)

Durkheim’s critique of Lévy-Brühl supports one of the most carefully developed claims of *Elementary Forms*, namely, that totemic religious systems are *not* rooted in misconception (which is his primary disagreement with animist and naturist explanations of religion). Rather, Durkheim urges that “human institutions [religion] cannot rest on error and falsehood or it could not endure. If it were not based on the nature of things, it would have met with resistance from those very things and could not prevailed. When we approach the study of primitive religions, then, it is with the certainty that they are rooted in reality and are an expression of it.” He continues: “In reality, then, there are no false religions.”
All are true in their fashion: all respond, if in different ways, to the given conditions of human existence” (4). The distinction here is very fine but one that aligns Durkheim with Fleck more generally: both seek to articulate conceptual systems that condition the possibility for thought by providing a stable system of concepts and relations that coordinate perception and action among the members of the collective. While they acknowledge that conceptual systems can become more effective and precise in particular ways, they do not claim to comment on the fidelity of those systems to an external reality. For these reasons, both Fleck and Durkheim acknowledge that science is always subject to revision and overhaul by unforeseen developments; knowledge is provisional, contextual, and never complete.

Yet, even in the supplementary materials provided with Genesis and Development, the antagonism between Durkheim and Fleck is restated. In an uncredited analysis that follows Fleck’s study, Durkheim is positioned alongside Lévy-Brühl:

Comte, Durkheim, Lévy-Brühl, and other sociologists were wrong, Fleck believes to exempt scientific knowledge form sociology and uncritically accept accumulated progress in scientific knowledge, as if our way of thought represented an improvement upon the thought style of previous generations. He [Fleck] emphatically rejects the notion that currently recognized ‘facts’ are more true, opposes the Vienna Circle by rejecting any absolute and objective criteria of knowledge, and challenges Carnap to discover for himself the social conditioning essential for scientific knowledge. (155)

In truth, there is much that resonates between Durkheim and Fleck. Both give detailed
descriptions about how associations are made between objects and ideas through social interaction; each make strong arguments about the social nature of cognition as well as the practice of science; both explain the process by which moral authority (in the social rather than religious sense) is established and exercised; and finally, each give an account of how thought is shaped and constrained by a collective system of classification, association, practice, and habit. This, however, is not an attempt to elide the difference between these two thinkers (their subjects are, indeed, different), but to explain a different lineage of thought that has been overlooked; by placing Durkheim within this context, we have occasion to rethink his contributions in conversation with the current scholarship in social epistemology.
Works Cited


Chapter 3
The Debate of the Hydraulic Ram:
Energetic Accounts of the Action in History

3.1. Abstract

This chapter opens with a debate between Henry Adams and William James regarding the value of energetics for theorizing human agency and historical development. Although Adams is often faulted for creating deterministic and reductionist accounts of human history, I provide a close reading of Henry Adams’s theory of history as sequences of force that argues against such interpretations. For Adams, the individual actor is most effective as an agent (or force) of history during the particular and momentary congruencies achieved between the constitution of the actor and the configurations of forces that the actor continually creates and transforms by the fact of being and acting in the world. The temporary alignments of agent and world are achieved through effective education; although Adams tries to formulate a universal theory of education, he fails precisely because one is “always remaking the “mis-fit” of last generation’s clothes for the “emergency” of the ever-changing conditions of the present moment.” This chapter closes by considering Adams’s and James’s divergent views on thermodynamics and the fate of the universe.

3.2. Henry Adams, William James, and the Hydraulic Ram

To say that Henry Adams and William James shared the same historical and intellectual context is an understatement. Both men were educated at Harvard (Adams in the 1850s, James in the 1860s); they were colleagues at Harvard in the 1870s (Adams in History, James alternatively in Physiology, Anatomy, Psychology, and Philosophy); they attended meetings of “The Metaphysical Club” in Cambridge in 1872; the wrote about and debated the same scientific texts of their day; they visited and dined together with family
and mutual friends at home and in Europe; and they were close readers of each other’s work. Although their friendship began in 1870, the bulk of their known correspondence dates to the first decade of the twentieth century, when they were also writing some of their most important texts. During that time Adams completed *Mont Saint-Michel and Chartres* (1904), *The Education of Henry Adams* (1906), and *Letter to American Teachers of History* (1910), while James labored over *Pragmatism: A New Name for Some Old Ways of Thinking* (1907), *A Pluralistic Universe* (1909), *Some Problems of Philosophy* (partially completed in 1910, published posthumously in 1911), and a series of essays written from 1904-5 published as *Essays in Radical Empiricism* in 1912. Their correspondence through these productive years reveals a relationship based on deep mutual respect, evinced as much by expressed affection as the directness of their responses to each other’s ideas.

From 1907 until James’s death in 1910, their communication intensified as they debated the finer points their philosophical frameworks, and, in particular, their incompatibility. After completing *The Education*, Adams had the manuscript circulated among a number of trusted readers, and, reluctantly, to James as well. After receiving a strongly worded letter from James complaining that he had not been among the first of his friends to receive the manuscript, Adams replied: “If I did not send it to you at once, as

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41 Henry Adams’s correspondence with both Henry James and William James indicates that they read and discussed each other’s publications. The Massachusetts Historical Society also retains Henry Adams’s copy of William James’s *The Principles of Psychology*, which is annotated by Adams.

42 In December 1907, James wrote to Adams: “Don’t you think that after this dark abyss of time and separation you owe me the approximation of letting me have a copy of your autobiography? Aproximation, and reparation! for seeing a copy last summer at Loulie Warner’s house, i hastily looked in the index for the word ‘James’ — did you never perform a similar act of egoism? — and found myself accused (along with others) of having made of Cambridge a conversational desert, or words to that effect. properly only blood could wipe out such an insult, but you are an old man (70 by the living jingo, & I who have during all these years still considered you as about 40!) so that in consideration of the volume i will compound the injury.”
I did to Charles Eliot, it was because I feared your judgment more than his, but since, now, I must, let me explain why I feared you most” (Monteiro 156). Adams’s hesitation to hear the criticism of his esteemed friend was perhaps due to the ambition and personal nature of the project, but he may have also intuited the potential conflict in their philosophies. *The Education* provides a third-person narrative account of Adams’s own educational development through his roles as political advisor, professor, and highly respected American historian. His unusual autobiography also unfolds the culmination of this education — his theory of history — as directly explained in the penultimate chapters, “Dynamic Theory of History (1904),” and “Law of Acceleration (1904).” After reading the text, James reported back to Adams in a letter dated February 8, 1908 and flatly remarks on this most important aspect of the project: “I don’t follow or share you way of conceiving the historic problem, as the determination of a curve by points. I think that applies only to what is done and over, in other words it is the retrospection projected on the future” (Monteiro 158).

James found the discourse of objectified and quantified energy as history highly problematic. In *Some Problems of Philosophy*, which James was writing during the final year of his life, James may have had Adams in mind as he commented on the problem of energy for philosophy.

I omit saying anything in my text about ‘energetics.’ Popular writers often appear to think that ‘science’ has demonstrated a monistic principle called ‘energy,’ which they connect with activity on one hand and with quantity on the other. So far as I understand this difficult subject, ‘energy’ is not a principle at all, still less an active one. It is only a collective name for
certain amounts of immediate perceptual reality…It is not an ontological
theory at all, but a magnificent economic schematic device for keeping
account of the functional variations of the surface phenomena. (Some
Problems of Philosophy)

Also during this time, James read Adams’s *Letter to American Teachers of History* in
1910, an essay which moves to further formalize a method for understanding history in
energetic terms and thermodynamic principles. In his correspondence to Adams about the
Letter, James’s criticism was sharpened [James to Adams, June 17, 1910 (Nauheim,
Germany)]: “To tell you the truth it doesn’t impress me at all, save by its wit — and
erudition, and I ask you whether an old man [Adams] soon about to meet his Maker can
hope to save himself from the consequences of his life by pointing to the wit and learning
he has shown in treating a tragic subject. No sir, you can’t do it — can’t impress God in
that way” (Monteiro 161). This letter of considerable length articulates James’s
fundamental problem with “energetics” as a framework for describing human history and
meaning, which ultimately points to a tension between a pragmatic account of meaning
and a materialist account history. Adams, however, was not tempted into a discussion of
content. In his reply he states, [Adams to James June 20, 1910 (Paris, France)] “I accept
your figures and images with welcome,” and then he balks at the provocation: “Just now, I
am not asserting or rejecting anything. I am trying to find out what our friend Ostwald —
or Bergson or Dastre or Loeb (Brunhes is just dead) — thinks or teaches or intends…I
have quoted them till my pages weep with repetition, and now I sit and wait” (Monteiro
16). James, perhaps frustrated at Adams’s evasion, followed it with a postcard that offers
yet another example to bring the conflict into full relief [James to Adams, June 26, 1910
You tempt me to offer you another illustration — that of the *hydraulic ram* (thrown back to me in an exam as a “hydraulic goat” by an insufficiently intelligent student). Let this arrangement of metal, placed in the course of a brook, symbolize the machine of human life. It works, clap, clap, clap, day & night, so long as the brook runs *at all*, and no matter how full the brook (which symbolizes the descending cosmic energy) may be; and it works always to the same effect, of raising so many kilogrammeters of water. What the *value* of this work as *history* may be, depends on the uses to which the water is put in the house wh. the ram serves. (Monteiro 164)

James wrote this final note to Adams after trying to recover his health at the Nauheim baths, exactly two months before his death on August 26. In his reply to James’s letters, Adams again refuses to respond to the objection. In his comparatively short letter, Adam writes [Adams to James, June 29, 1910 (Paris, France)]: “Oh, best of Friends, I love the hydraulic goat! . . . It reminds me of the days when we were all hydraulic goats, and you were the light and joy of Beverly Farms and Harvard College. Ah, but I never let myself think of that! I am a pretty well played out hydraulic goat now, and I don’t much care how soon the brook dries up altogether” (Monteiro 164). This was possibly their final correspondence, and the disagreement was never resolved with any satisfaction.

The problem posed by the hydraulic ram, however, remains an interesting question for Adams’s energetic account of history. In this illustration, the hydraulic ram (a mechanical pump that moves water from a lower to a higher elevation using only the flow and force of the water) is intended to demonstrate a disconnect that James identifies
between two distinctly different systems — one of physical energy and the other of the significance of energy in history. Offering a solution to the perceived error in Adams’s logic, James explains that the historical value of the physical energy converted by the ram’s work is entirely determined within the context of how the water is used by the members of the household. In James’s view, Adams’s focus on “following sequences of force [or energy]” as the analytic method of understanding human historical developments is misguided. The energy itself does not determine history; rather, its use-value within human systems alone directs and determines its significance in the human world. Or, as James explains his point in the initial letter dated June 17: “Just so of human institutions — their value has in strict theory nothing whatever to do with their energy-budget — being wholly a question of the form the energy flows through” (Monteiro 162).

For James’s, Adams’s energetic history rehearsed the same problems of other varieties of materialist reductionism, namely, it reduced complex phenomena or systems of order to simple physical properties and interactions. In one reply, for instance, James attacks Adams for reducing the significance of the human intellect to the quantity of energy required to run the human brain. Like the hydraulic ram, the amount of energy needed by the brain does not equate to the significance of the work it produces [James to Adams, June 17, 1910]

To begin with, the amount of cosmic energy it costs to buy a certain distribution of fact which humanly we regard as precious, seems to me to be an altogether secondary matter as regards the question of history and progress. Certain arrangements of matter on the same energy-level are from the point of view of man’s appreciation superior, which others are inferior.
Physically a dinosaur’s brain may show as much intensity of energy-exchange as a man’s, but it can do infinitely fewer things, because as a force of detent it can only unlock the dinosaur’s muscles, while a man’s brain, by unlocking far feeble muscles, indirectly can by their means issue proclamations, write books, describe Chartres Cathedral, etc, and guide the energies of the shrinking sun into channels which never would have been entered otherwise — in short, make history. (Monteiro 162)

Several scholars — such as Katherine Hayles, Roland Martin, and William H. Jordy\(^43\) — have similarly puzzled over the way Adams factored human intelligence into a material theory of history, noting the problems of measuring the quantity of energy expended in acts of reason as an indication of their work in the physical world. The first of such commentators was likely a mathematical physicist at Yale, Henry Bumstead, who provided annotated notes on an early draft of Adams’s *Rule of Phase Applied to History* (1909); Bumstead pointed to a fundamental problem of putting physical and mental powers on the same scale. Jordy also imagines how a physicist might respond to Adams’s *Rule of Phase Applied to History* and wonders, “If such a mechanistic view of thought has any meaning at all, perhaps the physiologist may someday measure its movements; but I doubt this possibility and, anyway, mechanistically speaking, it is almost certain that men in the past have expended as much energy in their thinking as we do today” (Jordy 150). Indeed, it is not difficult to critique Adams’s energetic theory of history, particularly in his *Letter to American Teachers* and *Rule of Phase*. While Adams clearly intended to offer a material history grounded in energetics, he seems to come in and out of a serious relationship with a

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\(^43\) See: Hayles, *Chaos Bound* (p.87-89); Martin, *American Literature and the Universe of Force* (p. 141-14); and Jordy, *Henry Adams Scientific Historian* (p. 149-153)
science of energy — at times running calculations of energetic trajectories, and at other times clearly playing with the metaphors of energy — particularly in *The Education.* Katherine Hayles, like many others, ultimately concludes with a discussion of Adams’s inadequate knowledge of physics and his problematic use of its concepts. “It is possible that Adams simply did not understand the gravity of Bumstead’s objection that thought and energy cannot be equated. So customary — and necessary — was his compounding of human consciousness with the supposedly objective world of chaotic force that for him to take full account of it would have required a complete reorientation of his thought — a task that at age seventy-two, he may well have been unable as well as unwilling to undertake” (Hayles 88).

Although many of these objections to Adams’s account of history are valid given the highly ambivalent nature of the text, it remains possible to read *The Education* as incorporating the human agent in material history without resorting to a material reductionism that equates a quantity of energy with the significance of the human actor in history. Adams, in fact, incorporates the human agent in his theory of energetic history through a highly fraught interpretive choice; namely, he theorizes history in relation to how forces act as “attractions on his own mind” or what he later describes as “thought-motions.” Rather than leading to a material reductionism that would equate agency with quantities of energy, this choice allows Adams to argue that the individual is most effective as an agent of history during the momentary congruencies between the subject and her world, when the human actor can “react, not haphazard, but by choice, on the lines of force that attract their world” (264). Given that the arrangement and sequences of force evolve in history, the individual, according to Adams, will need to be continually reshaped
through education. Rather than overvaluing scientific method in this account, Adams provides an extended critique of science in his commentary and in the analytic choices he makes while developing his theory of history and education.

3.3. The Energetics of History and Education

Although Henry Adams wrote several respected volumes of American history, two novels, and numerous essays and articles, he is primarily remembered in the literary cannon for his two non-fiction masterpieces: Mont Saint-Michel and Chartres (1904) and The Education of Henry Adams (1906). In discussing these works, critics frequently describe Adams’s general picture of human history as deterministic. For instance, John Conder sees the relationship between literary form and determinism as the central question of Adams’s thought: “And little of the arbitrary would enter were the reader to see some connection between the forms of literary endeavor he followed and his changing attitudes towards determinism. It is the basic issue of his career. What remains is to link it to form” (5). These are many reasons why determinism is associated with Adams, and most of them have to do with his claims that the human subject can be brought into the purview of science. Conder explains:

Nearly every important interpreter of Adams’s thought has observed how early in his development the issue — a determinism denying free will — confronted him and how persistent was its attraction. Although not yet a determinist at twenty-five, he was so visibly impressed by the possibilities of transforming history into a science that he was prompted to write his
brother, “I believe every part of organic nature will be brought some day within this law” — a single law applying equally to man and nature. At forty-six, only half done with his *History* and still not totally committed to a determinist position, he was nonetheless confident “that in another generation psychology, physiology, and history will join in proving man to have a fixed and necessary development as that of a tree; and almost as unconscious. (Conder, 4)

Critics have associated Adams’s determinism with his claims that science will eventually fold the human into a unified theory, that science will make human development chartable, that the human is shaped by forces in the universe, that history can be made into a science, and that human fate is set on a one-way entropic unraveling toward inevitable heat-death. Furthermore, Adams focused on physics for his theoretical framework, which is often associated with a mechanistic Newtonian physics. However none of these observations alone can support the blanket claim for Adams’s determinism. Adams was, for example, most influenced by the dynamic and developmental sciences of his day (namely thermodynamics and evolution). Adams states, “the kinetic theory of gas is an assertion of ultimate chaos. In plain words, Chaos was the law of nature; Order was the dream of man” (Adams, 377). Critics’ claims about determinism, then, are often concerned with the status of free will or agency in Adams’s account of the human subject. Admittedly, the status of agency becomes more complicated when the individual is understood as a subject within and a subject of biological, social, and physical circumstances and contexts. It may be argued, then, that discussions of determinism are better explained as an anxiety about free will and self-determination when the human agent is considered a non-exceptional subject
of biological and material history.

To complicate these discussions, Adams’s collective works present us with an interpretive openness that frustrate attempts to easily label his account of history. At times, his tone suggests an attempt to describe a rigorously applied scientific method for interpreting history (as in *A Letter to American Teachers of History* and “The Rule of phase Applied to History”), while elsewhere he offers up scientific concepts only to play with their status and stretch their meaning. Such is the case in *The Education*. This way of handling scientific concepts should, in itself, instruct how we gauge Adams’s assessment of scientific knowledge. Katherine Hayles has read the trajectory of Adams’s narrative as self-consciously mapping a transition in scientific paradigms of nineteenth-century determinism to twentieth-century complexity, as told through the character of Adams.

Adams self-consciously conceived of *The Education* as marking the rupture between the ordered certainties of the Newtonian synthesis and the chaotic multiplicities that he saw as characteristic of the twentieth century. This division is inscribed into the form of *The Education*. The first half records Adams’s repeated attempts to launch himself in the world, working form a conception of the universe as unity, linearity, and fixed truths; the second half finds him searching for, and eventually articulating, a theory that can explain the world as it actually exists — an anarchistic multiverse of chaos, complexity, and relativism. From this perspective, *The Education* seem to be an exemplary account of one man’s initiation into the technological and social contexts that form the cultural background for the later emergence of the sciences of complexity. (62)
As Halyes explains, Adams recognizes chaos, complexity, and multiplicity, while also searching to find a scientific method for understanding it. Adams directly says as much in *The Education*: “Since monkeys first began to chatter in trees, neither man or beast had ever denied or doubted Multiplicity, Diversity, Complexity, Anarchy, Chaos. Always and everywhere the Complex had been true and the Contradiction had been certain” (380). Hayles focuses her reading on interpreting the centrality of “chaos” in *The Education*, a decidedly non-deterministic concept. “In *The Education*, chaos is not just connected with the self; in an important sense it is the self….Anticipating [Claude] Shannon, *The Education* recognizes the possibility that chaos may be a positive force rather than negative uncreation. But enough of the older attitudes toward disorder still cling to it so that chaos is represented within *The Education* as an intensely ambivalent, as well as highly charged, concept” (61). In Hayles’s reading, chaos results from the unruly, yet creative energies that may produce new form. For Hayles, there is a “transvaluation of chaos” (83) in *The Education*, and “chaos is conceived as capable of creation as well as destruction” (89).

The “intensely ambivalent” status of Adams’s main concept — “force” (as used interchangeably with “energy”) — is another site that maintains these tensions within it. Those who find a deterministic world in *The Education*, often center their interpretation on Adams’s use of “force.” For instance, in the opening lines of his chapter “A Dynamic Theory of History (1904)” (one of the final chapters of text that explicitly explains his theory of history), Adams writes: “Man commonly begs the question again by taking for granted that he captures forces. A dynamic theory, assigning attractive force to opposing bodies in proportion to the law of mass, takes for granted that forces of nature capture
man” (395). Even though Adam writes about the controlling nature of forces within the style of a scientific law, all of the main terms of this statement — force, attraction, mass, capture — have been carefully crafted in the course of the narrative and, even when arranged axiomatically as they are here, do not amount to a denial of human agency or free will. I argue that the human agent, rather than being at the mercy of forces in historical process, occupies a central role in their organization and application in Adams’s scientific history. In other words, rather than a picture of the human agent as subject to material forces of the world, Adams attempts to place the human agent and her intellect centrally within a material energetics of “force.”

Adam’s development of the concept of force is not easily summarized, and it is necessary to begin by examining the two projects of The Education — history and education — since they will converge through ideas of force and energy by the end of the text. The narrative is propelled forward by chronicling Adams’ life as a history of his own education. The content of his life — his privileged upbringing in Massachusetts (as the son of American diplomat Charles Francis Adams, grandson of President John Quincy Adams, and great-grandson of President John Adams), his time at Harvard, his desultory years spent in Europe, etc. — are all recounted for their effects on his educational development. Yet, the purpose of education is only obliquely described in The Education.

As educator, Jean Jacques was, in one respect, easily first; he erected a monument of warning against the Ego. Since his time, and largely thanks to

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44 William James could not help but comment on the extent to which the narrative is molded into a story of education. He parenthetically comments on this fact in one of his initial responses to The Education in a letter to Adams [William James to Henry Adams, Massachusetts, February 9, 1908]: “There is a hodgepodge of world-fact, private fact, philosophy, irony (with the word ‘education’ stirred in too much for my appreciation!” (Monteiro 157).
him, the Ego has steadily tended to efface itself, and, for purposes of model, to become a manikin on which the toilet of education is to be draped in order to show the fit or misfit of the clothes. The object of study is the garment, not the figure. The tailor adapts the manikin as well as the clothes to his patron’s wants. The tailor’s object in this volume, is to fit young men, in universities or elsewhere, to be men of the world, equipped for any emergency; and the garment offered them is meant to show the faults of the patchwork fitted on their fathers. (Adams 8)

Being “equipped for any emergency” gestures towards a much larger agential capacity in *The Education*, and the unpredictability and urgency implied by “emergency” is significant for reasons discussed below. Elsewhere, Adams describes education as “a certain form of energy” (8), as “own[ing] a mind capable of reacting to any purpose on the forces that surround him” (264), or “react[ing], not haphazard, but by choice, on the lines of force that attract their world” (264). In essence, the purpose of education is to train the mind to act effectively in the particular world in which it finds itself. In acknowledging this, Adams admits (and laments) that historical contingencies render any universal plan for educational development meaningless.

The second project of the book, finding a method for understanding history, is also developed through Adams’s biography, as told through his experiences as a writer of American history and as a Professor of History at Harvard. With history, Adams faces another crisis of method.

Historians undertake to arrange sequences, – so called stories, or histories – assuming in silence a relation of cause and effect. These assumptions,
hidden in the depths of dusty libraries, have been astounding, but commonly unconscious and childlike….He [Adams] had even published a dozen volumes of American history for no other purpose than to satisfy himself whether, by the severest process of stating, with the least possible comment such facts as seemed sure, in such order as seemed rigorously consequent, he could fix for a familiar moment a necessary sequence of human movement. The result had satisfied him as little as at Harvard College.

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The crisis of Adams’s own education and his efforts as a historian simultaneously culminate in a chapter simply entitled “Failure (1871),” which biographically recounts the years he spent as a professor at Harvard. This failure had as much to do with the complexities of understanding history as it did with the related impossibility of teaching it:

The task was doomed to failure for a reason which he could not control…. History is a tangled skein that one may take up at any point, and break when one has unraveled enough; but complexity preceded evolution…One may not begin at the beginning, and one has but the looser relative truths to follow up. Adams found himself obliged to force his material into some shape to which a method could be applied. (254).

Although Adams will come to suggest a method for understanding history by the end of The Education (which he will continually qualify, as we will see), he finds the task of teaching history at Harvard an inherently flawed enterprise. “In essence, incoherent and immoral, history had either to be taught as such — or falsified. Adams wanted to do neither” (252). Deciding “he had no fancy for telling agreeable tales” (252), Adams
eagerly moved back to Washington, having taught at Harvard for only seven years.

After driving the question of education and history towards these crises of method, Adams leaves them unresolved and omits twenty years of his own history directly following the chapter “Failure (1871).” Many critics, such as Hayles, have noted that this lacuna of two decades passes over any mention of his father’s death in 1886, his mother’s death in 1889, and his wife’s suicide in 1890, while also marking a formal shift in The Education. In the next chapter, “Twenty Years After (1892),” Adams describes his own life as if posthumously. Adam writes, “Education had ended in 1871; life was complete in 1890; the rest mattered so little!” (265). Yet, The Education will cover another fifteen years (ending with the final chapter “Nunc Age (1905”), and his own life will continue another twenty-seven years until his death in 1917. In the remaining chapters of the text, while continually claiming his distance from life, he will describe the most impassioned and ingenious moments in his own education, which ultimately culminate in his dynamic theory of history. Having permanently broken with institutions of formal education upon taking leave from Harvard, his education and his understanding of history will be launched forward again when he attends the World’s Columbian Exhibition of 1893 in Chicago and the Exhibition Universelle of 1900 in Paris.

The second half of the text, then, can be read as an explanation of this theory of force, and it will eventually come to address the problems of method for both history and education. Adams unfolds the concept of force biographically (in recounting his experiences at the exhibitions) and also explicitly in the chapters, “Dynamic Theory of History (1904),” and “Law of Acceleration (1904).” Biographically, Adams frames the exhibitions in relation to one another — the Exhibition at Chicago poses unanswerable
questions for history and education; Adams is only able to offer answers to them seven years later in Paris. In Chicago, Adams is confronted with exhibits that consolidated the radical proliferation of new mechanical forces, such as ocean steamers, railroads, dynamos, and explosives (286). Feeling that his nineteenth century education lacked the ability to deal with twentieth century forces, Adams notes that “education went mad” in 1893; “when one sought rest at Chicago, educational game started like rabbits from every building, and ran out of sight among thousands of its kind before one could mark its burrow” (285). If, for Adams, the purpose of education is to own “a mind capable of reacting to any purpose on the forces that surround him” (264), the Exhibition of 1893 rendered his nineteenth century education obsolete.

Education ran riot at Chicago….Men who knew nothing whatever — who had never run a steam-engine…never talked through a telephone, and had not the shadow of a notion what amount of force was meant by a watt or an ampère or an erg, or any other term of measurement introduced within a hundred years — had no choice but to sit down on the steps and brood as they had never brooded on the benches of Harvard College, either as student or professor. (287)

Adams, of course, is not merely speaking of a practical education, but a capacity to act effectively in a world now dominated by new powers, material arrangements, and speeds. His questions about the new forces are physical (“Did it [the dynamo] pull or did it push? Was it a screw or thrust? Did it flow or vibrate? Was it a wire or a mathematical line?” (287)); his questions are also historical (“where in the Hell are they going?” (474, n to page 317). The problems for Adams as a historian were perhaps more complicated than those
for Adams as a member of twentieth-century American society. Adams wanted not only to know how to be in the world newly remade by these forces, but he also wanted to understand how they were continuing to reshape the world as well. “Chicago asked in 1893 for the first time the question whether the American people knew where they were driving. Adams answered, for one, that he did not know, but would try to find out” (287).

At the Chicago Exhibition, the dynamo “had barely reached infancy” (287), but by the Paris Exhibition in 1900, the scale of “the great hall of dynamos” overwhelmed Adams. In contemplating the dynamos at work, Adams imagines force as both an arrangement (an organization that could mobilize and direct energy) and a quantity (the amount of physical energy harnessed in the process). The dynamo, as a force in itself, was a mechanical arrangement that could translate, channel, and direct energy in order to make it available for work. “To him, the dynamo itself was but an ingenious channel for conveying somewhere the heat latent in a few tons of poor coal hidden in a dirty engine-house carefully kept out of sight; but to Adams the dynamo became a symbol of infinity” (318). While energy as a quantity may be limited by the amount of coal, the arrangement of the machine itself, its ability to channel and direct energy, was potentially infinite. This ability of the dynamo’s mechanical arrangement becomes the organizing principle of Adams’s material history. The historian’s task was to follow the lines and sequences of force and energy, to find their most important sites of production and translation. All other methods for sequencing history – chronology, cause and effect, intellectual development, teleological progress – failed to work. Only sequences of force were revealing:

Satisfied that the sequence of men led to nothing and the sequence of their society could lead no further, while the mere sequence of time was
artificial, and the sequence of thought was chaos, he turned at last to the sequence of force; and thus it happened that, after ten years’ pursuit, he found himself lying in the Gallery of Machines in the Great Exposition of 1900, with his historical neck broken by the sudden irruption of forces totally new. (320)

Throughout the text, Adams varyingly refers to arrangements that generate and translate force as “sequences”, “tracks”, “channels”, “economies”, “machines”, or simply “forces.” During the days spent wandering the hall of dynamos, Adams explains that the historical significance of the Virgin Mary should not be understood through sentiment, emotion, or piety (i.e. representational and symbolic frameworks), but through material force (i.e. her effects and attractions on human populations and physical environments). “Symbol or energy, the Virgin had acted as the greatest force the Western world ever felt, and had drawn man’s activities to herself more strongly than any other power, natural or supernatural, had ever done; the historian’s business was to follow the track of the energy; to find where it came from and where it went to; its complex source and shifting channels; its values, equivalents, conversions” (325). As for the meaning of the symbol within Christianity, Adams never comments. Instead, he explains why the Virgin drew and channeled so much energy to her, or, in other words, how she functioned as a dynamo. The Virgin was an embodiment of power and fecundity, and her followers were drawn to her as they were drawn to power itself. (321) “The force of the Virgin was still felt at Lourdes, and seemed to be as potent as X-rays; but in America neither Venus or Virgin ever had value as a force — at most as sentiment. No American had ever truly been afraid of either” (320-321). Although not as straightforward as coal, the quantity of energy
accumulated and translated by the Virgin (when she still acted as a force and not as an icon of “reflected emotion, human expression, beauty, purity, taste, scarcely even as sympathy”) could be measured. Adams explains: “artists, constantly complained that power embodied in a railway train could never be embodied in art. All the steam in the world could not, like the Virgin, build Chartres” (324). Forces as arrangements or channels, then, were important for the historian: “economies of force, [were] sometimes more powerful than the forces they helped” (397).

By refocusing his analysis on the dynamics of force over the progression of intellectual development, Adams necessarily redefines historical progress along these lines. “Progress as the world made consisted in economies of energy rather than in its development” (397). For Adams, intellectual, cultural, and even biological developments resulted from certain arrangements and concentrations of energy, rather than the reverse. For instance, Adams’s historical analysis of the ocean liner is not based on its cultural significance but on the parameters of how it does its work:

Historical exhibits were common, but they never went far enough; none were thoroughly worked out. One of the best [at Chicago] was that of the Cunard [ocean] steamers, but still a student [Adams] hungry for results found himself obliged to waste a pencil and several sheets of paper trying to calculate exactly when, according to the given increase of power, tonnage, and speed, the growth of the ocean steamer would reach its limits. His figures brought him, he thought, to the year 1927; another generation to spare before force, space, and time should meet. (286)
Adams’s evaluation of cultural developments was no less material.

Outside of occult or fetish-power, the Roman world was incredibly poor. It knew but one productive energy resembling a modern machine — the slave. No artificial [mechanical] force of serious value was applied to production or transportation, and when society developed itself so rapidly in political and social lines, it had no other means of keeping its economy on the same level than to extend its slave-system and its fetish-system to the utmost. The result might have been stated in a mathematical formula as early as the time of Archimedes, six-hundred years before Rome fell. The economic needs of a violently centralizing society forced the empire to enlarge its slave-system until the slave-system consumed itself and the entire empire too, leaving society no resource but further enlargement of its religious system in order to compensate for the losses and horrors of the failure.

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At the Paris Exhibition, the forces of the Virgin and the dynamo were fairly simple arrangements of accumulation and translations for Adams. Also on exhibit, however, were the “supersensual” (319), “irrational” (320), “occult” (325), and “anarchical” (318) forces of quantum mechanics, radiation, and x-rays that completely overturned nineteenth century physics. “The man of science must have been asleep indeed who did not jump from his chair like a scared dog when, in 1898, Mme. Curie threw on his desk the metaphysical bomb she called radium (377). Appropriately, Adams also calls these new forces “parricidal” (318) in their relation to nineteenth century science and Newtonian physics: “Radium denied its God…denied the truth of his Science. The force was wholly new”
Forced to account for these revelations, Adams acknowledges that human world would change as it admits new orders of force, becomes multiple, and recedes from direct observation and measurement.

In these seven years man had translated himself into a new universe, which had no common scale of measurement with the old. He had entered a supersensual world, in which he could measure nothing except chance collisions of movements imperceptible to his senses, perhaps even imperceptible to his instruments, but perceptible to each other, and so to some known ray at the end of the scale. Langley seemed preparing for anything, even for an indeterminable number of universes interfused — physics stark mad in metaphysics.

These new forces posed two important questions for history: first, how would these supersensual forces be controlled and applied in the material world, and second, how would their incorporation into cosmology reconfigure it and, consequently, alter the possibilities for the human agent in history and the education she would need. In searching for answers, Adams admits “[he] knew nothing about any of them [the new forces], but as a mathematical problem of influence on human progress, though all were occult, all reacted on his mind, and he was rather inclined to think the Virgin easiest to handle” (325).

In a desperate reach for comprehension, Adams positions the human as the common denominator among these various systems; ultimately, his historical method is one that uses the particular position of the human agent as the framework for meaning.

The historian was thus reduced to his last resources. Clearly if he was bound to reduce all these forces to a common value, this common value
could have no measure but that of their attraction on his own mind. He
must treat them as they had been felt; as convertible, reversible,
interchangeable attractions on thought. He made up his mind to venture it;
he would risk translating rays into faith. (320)

This relatively short passage stands as the center of Adams’s historical method. First, it is
important to notice that it is a description of a method, not an explanation. Adams does not
describe how or why forces affect the mind (in other words, he does not provide a causal
explanation). Instead, it is a method that traces the movements and effects of forces. More
significantly, this passage does not record a moment of discovery. Adams does not claim
to have uncovered an unknown order of relation. It is, rather, an interpretive choice
fraught with uncertainty. To present this as a choice rather than a revelation, however,
does not, in Adams’s estimation, devalue its potential contribution to science; rather, it
more accurately reflects the limits of scientific analysis. For Adams, a “science” of
history, then, is not a tarnished metaphorical or analogical approximation of science, but a
science that acknowledges its limitations in the form of its methods of analysis and
interpretation.

While his own scientific method provides a tacit critique of science, Adams also
unambiguously states his criticisms of science while evaluating the leading texts of his
day. For instance, throughout The Education, Adams repeatedly refers to science and
mathematics as a “convenience” for living and understanding, rather than as a statement
about nature. In quoting Poincaré on mathematics he writes, “How should I [Poincaré]
answer the question whether Euclidian Geometry is true? It has no sense! . . . Euclidian
Geometry is, and will remain the most convenient” (380). Similarly, when Adams
appropriates the “law of squares” to track increasing complexity in this theory, he states, “one might, for convenience, use the formula of squares to serve for a law of mind. Any other formula would do as well, either of chemical explosion, or electrolysis, or vegetable growth, or of expansion and contraction in innumerable forms; but his happens to be simple and convenient” (409). Alongside mathematics, Adams dismantles another emblem of objective science:

In mechanics, whatever the mechanicians might think, both energies [the Virgin and the dynamo] acted as interchangeable forces on man, and by action on man all known force may be measured. Indeed, few men of science measured force in any other way. After once admitting that a straight line was the shortest distance between two points, no serious mathematician cared to deny anything that suited his convenience, and rejected no symbol, unproved or unprovable, that helped him to accomplish work. (324)

Concerning evolutionary theory, Adams criticizes both Darwin and Lyell (while also repeatedly calling himself a Darwinist) for lacking specific evidence and seizing on a universal theory bordering on dogma (or, as he also describes it, “enforcing a unity” which could itself become a force). (190-200) To clarify his position, he states that, “he [Adams] warmly sympathized in the object; but when he came to ask himself what he truly thought, he felt that he had no Faith; that whatever the next new hobby should be brought out, he should surely drop from Darwinism like a monkey from a perch” (196). In speaking of history, finally, he states that “the old formulas had failed…One sought no absolute truth. One sought only a spool on which to wind the thread of history without breaking it”
Adams’s historical method maintains an “intensely ambivalent” status in *The Education*, which is appropriate to his epistemological position and his critiques of scientific knowledge. For example, after stating his historical method with the rhetorical confidence of scientific assertion, he adds, “This, then, or something like this, would be a dynamic formula of history” (405). Appropriately, his analytic linchpin — “attractions on his own mind” (or what will become the factor of “thought-motion” in his later explanations) — also recognizes that knowledge functions as such because of how it configures the human/world relationship, rather than how it describes the entities that occupy it. When Adams discusses the moment in history when the force of human agency was at its peak (in other words when education enabled one to “react, not haphazard, but by choice, on the lines of force that attract their world”), he looks back nearly a thousand years, to a time when the human as an agent (“as a force”) was aligned with the world that was imagined around it; or, in other words, when human education fit most seamlessly into the accepted cosmological order.

Any schoolboy could see that man as a force must be measured by motion from a fixed point. Psychology helped here by suggesting a unit – the point of history when man held the highest idea of himself as a unit in a unified universe. Eight or ten years of study had led Adams to think he might use the century 1150-1250, expressed in Amiens Cathedral and the Works of Thomas Aquinas, as the unit from which he might measure motion down to his own time, without assuming anything as true or untrue, except relation.

The movement might be studied at once in philosophy and mechanics.

Katherine Hayles also discusses Adams’s relationship with science. See *Chaos Bound*, p. 67-72.
Setting himself to the task, he began a volume which he mentally knew as “Mont-Saint-Michel and Chartres: a Study of Thirteenth-Century Unity.”

From that point he proposed to fix a position for himself, which he could label: “The Education of Henry Adams: a Study of Twentieth-Century Multiplicity.” (363)

For Adams, medieval scholastic philosophy marked the period in history when the human actor occupied the central position within the unity he had imaged the world to be. For the medieval mind, the larger order resonated with it: “the universe that had formed him took shape in his mind as a reflection of his own unity, containing all forces except himself” (395). Or as Adams also explained it, thirteenth-century unity was possible because humanity had imagined the world to be a person:

The direction of mind, as a single force of nature, had been constant since history began. Its own unity had created a universe the essence of which was abstract Truth; the Absolute; God! To Thomas Aquinas, the universe was still a person; to Spinoza, a substance; to Kant, Truth was the essence of the ‘I’; an innate conviction; a categorical imperative; to Poincaré, it was convenience; and to Karl Pearson, a medium of exchange. (380-381)

This last description by Pearson, father of mathematical statistics and probability theory, figures the universe as “medium of exchange,” which most directly corresponds to Adams’s energetic model.

The effectivity of the human actor in history, then, is ultimately conditioned by a larger order in which she herself participates in generating. For Adams, the human agent was strongest as a force in directing history when humanity imagined the rest of nature as
ordered by the same principles of organization and relation that ordered itself; or, in other words, when the hydraulic ram would not have posed a conceptual problem. Even while standing in the hall of dynamos, Adams still recognizes such unity as the strongest of forces in human history as measured by its ability to produce and direct human will:

On one side, at the Louvre and at Chartres, as he knew by the record of work actually done and still before his eyes, was the highest energy ever known to man, the creator of four-fifths of his noblest art, exercising vastly more attraction over the human mind than all the steam-engines and dynamos ever dreamed of; and yet this energy was unknown to the American mind. An American Virgin would never dare command; an American Venus would never dare exist. (321-322)

In spite of all its technological advances, the multiplicity of forces in the twentieth century could not compete with the unity of force achieved in the thirteenth: “all the steam in the world could not, like the Virgin, build Chartres” (324).

The Education traces the evolution from the unity of forces in the thirteenth century to the multiplicity of forces of forces in the twentieth and its consequences for the project of education. While Adams does arrive at an answer to the crisis of historical method by the end of the narrative (be it highly idiosyncratic, intentionally ambivalent, and ultimately provisional), there is much less guidance for navigating the crisis of method for education. While this crisis of education was initiated by the fact “man had translated himself into a new universe” (319), the real challenge of it would be coping with the complexity of its forces: “The child born into 1900 would, then, be born into a new world which would not be a unity but a multiple” (382). Offering his own formulation of post-humanism, Adams
acknowledges the social and epistemological rupture precipitated by an irrevocable departure from the actor/world unity embodied by Aquinas. The new universe would require “a new social mind” and Adams could not say with absolute certainty that it was up for the task.

The movement from unity to multiplicity, between 1200 and 1900, was unbroken in sequence, and rapid in acceleration. Prolonged one generation longer, it would require a new social mind. As though thought were common salt in indefinite solution it must enter a new phase subject to new laws. Thus far, since five or ten thousand years, the mind had successfully reacted, and nothing yet proved that it would fail to react — but it would need to jump. (414)

The primary reason for this misfit is the increase in complexity, or in other words the proliferation in both type and quantity of force. Once again, Adams’s explanation of increasing complexity is neither a teleological account nor a statement of refinement — it is purely a measure of organized force. For Adams, complexity increases as society comes to organize an increasing amount of force, an inevitable fact of energetic sequence rendered through the natural world, of which the human mind is counted as an unexceptional participant. “A dynamic law requires that two masses — nature and man — must go on, reacting upon each other, without stop, as the sun and a comet react on each other, and that nay appearance of stoppage is illusive. The theory seems to exact excess, rather than deficiency, of action and reaction (398). This idea is further developed his chapter, “A Law of Acceleration (1904),” and it is the only assumed relation of his dynamic theory.
Whether the attractive energy has been called God or Nature, the mechanism has been always the same, and history is not obliged to decided whether the Ultimate tends to a purpose or not, or whether ultimate energy is one or many. Everyone admits that the will is a free force, habitually decided by motives. No one denies that motives exist adequate to decide the will; even though it may not always be conscious of them. Science has proved that forces, sensible and occult, physical and metaphysical, simple and complex, surround, traverse, vibrate, rotate, repel, attract without stop; that man’s senses are conscious of few, and only in partial degree; but that, from the beginning of organic existence, his consciousness has been induced, expanded, trained in the lines of his sensitiveness; and the rise of his faculties from a lower power to a higher, from a narrower to a wider field, may be due to the function of assimilating and storing outside force or forces. (405-406)

Here the mind’s increase to a “higher power” is quantitative, and it records the increased organization of force/energy that necessarily results from interaction, rather than human will. Just as energy from the sun became organized on earth before the arrival of the human agent, the human mind will continue to accumulate force and increase its complexity by the very nature of its existence. “Nature, not the mind, did the work that the sun does on the planets” (404). As a final disarticulation of the Aquinas unity, Adams notes that the human mind, as one of many organic strategies of organized energy, may not be able to “jump” adequately enough given the dynamics it must exist within. “A law of acceleration, definite and constant as any law of mechanics, cannot be supposed to relax its
energy to suit the convenience of man” (410). As complexity increases, the human agent either experiences “rapid education” or “succumbs”: “In the earlier states of progress, the forces to be assimilated were simple and easy to absorb, but as the mind of man enlarged its range, it enlarged the field of complexity, and must continue to do so, even into chaos, until the reservoirs of sensuous or supersensuous energies are exhausted, or cease to affect him, or until he succumbs to their excess” (406).

If an analogy whatever existed between the human mind, and the laws of motion, on the other, the mind had already entered a field of attraction so violent that it must immediately pass beyond, into a new equilibrium, like the Comet of Newton, or suffer dissipation altogether, like meteoroids in the earth’s atmosphere. If it behave like an explosive, it must rapidly recover equilibrium; if it behaved like a vegetable, it must reach its limits of growth; and even if it acted like the earlier creations of energy — the saurians and sharks — it must have nearly reached the limits of its expansion. If science were to go on doubling or quadrupling its complexities ever ten years, even mathematics could soon succumb. An average mind had succumbed already in 1850; it could no longer understand the problem in 1900. (412-413)

For the measurement of increasing complexity, Adams makes another convenient choice for his standard unit — coal comes to serve as the “dynamometer” or common measure in his dynamic theory of history. “Science has quite enough trouble in measuring its material motions without volunteering help to the historian, but the historian needs not much to help to measure some kinds of social movement; and especially in the nineteenth century,
society by common accord agreed in measuring its progress by the coal-output. The ratio of increase in the volume of coal-power may serve as dynamometer” (406). By this scale, the problem of education and increasing complexity could be understood through coal: “To educate — oneself to begin with — had been the effort of one’s life for sixty years; and the difficulties of education had gone on doubling with the coal-output” (414).

The particular problem of education for the new generation would be the necessity of representing the new world of increased force and complexity. While society has thus far had provided unified models of the actor and its world, the same could not be said of the twentieth century. While society was previously able to provide an education that would shape children into effective and powerful agents of history, the project was now idiosyncratic and left to the individual: “Every man with self-respect enough to become effective, if only as a machine, has had to account to himself for himself somehow, and to invent a formula of his own for his own universe, if the standard formulas failed” (393). Education becomes nothing less than the process of “inventing a formula” or building one’s own model of an increasingly complex system of forces.

As we have seen, Adams gives a complex account of forces in his theory of education and history. Rather than focusing on the energy required by the brain for intellectual work, Adams describes the actor’s capacity for historical significance as an alignment between itself as a force in a larger order of forces, in order to “turn[] and hold[] its lines of force in the direction supposed to be most effective” (70). Adams does not separate the intellect from the material world in this picture. The human is always, necessarily using and translating energy in “excess, rather than deficiency, of action and reaction” (398); the fact of the organism itself, being a highly complex order, requires the
use of energy for its maintenance. One possible response to the problem of the hydraulic ram, then, would be to understand the ram as already embedded within and inseparable from the human order that created it. The ram is, most fundamentally, a mechanical arrangement created by humans that manipulates energetic flows for the maintenance of the more complex arrangement of the household above it. The fact of the ram’s existence, that energy was directed and concentrated in this particular formation, is significant for human history.

For Adams, the individual is a most effective agent of history during the particular and momentary congruencies (or fit) achieved between the subject and the world it is continually creating and transforming by the fact of its being. The tailor is always remaking the “mis-fit” of last generation’s clothes for the “emergency” of the ever-changing conditions of the present moment. “The tailor adapts the manikin as well as the clothes” (Adams 8). Education is the process by which such a fit between the individual and its historical moment can be achieved. Education is what allows one to “react, not haphazard, but by choice, on the lines of force that attract their world” (264); “react with vigor and economy” (264); “float with the stream” (336); “turn[] and hold[] its lines of force in the direction supposed to be most effective” (70). Education is “a certain form of energy” (8) and “a matter of life and death” (93). Effectivity in history is not the ability to apply energy (that is already happening); it is, rather, the alignment of the energetic flows that characterize the subject and its particular world. This is why Adams began his study of education with Aquinas and the thirteenth century, when the human agent was at its most powerful and most seamlessly aligned with its own cosmology; it is also why the human mind would need to jump in the twentieth. With the proliferation of new forces in
the twentieth century, Adams saw an increase of coercion to follow an increase in complexity. “No [educational] scheme could be suggested to the new American…but the next great influx of new forces seemed near at hand, and its style of education promised to be violently coercive” (414). Ultimately, this reading of Adams’s theory of history sounds less like a material reductionism and more in line with a Jamesian point of view.

3.4. Thermodynamics and History

Although Adams may approach a Jamesian account of agency in historical development, Adams and James clearly diverged in their longer view of history. Even though Adams discusses the increasing complexity of forces, his view of the future was dark as he anticipated the inevitable entropic decline of cosmological order. In James’s initial response to The Education, he writes [James to Adams, June 17, 1910]:

Tho’ the ultimate state of the universe may be its vital and psychical extinction, there is nothing in physics to interfere with the hypothesis that the penultimate state might be the millennium – in other words a state in which a minimum of difference of energy-level might have its exchanges so skillfully canalizes that a maximum of happy and virtuous consciousness would be the only result. In short the last expiring pulsation of the universe’s life might me “I am so happy & perfect that I can stand it no longer.” You don’t believe this, and I don’t say I do. But I can find nothing in “Energetik” to conflict with its possibility. You seem to me not to discriminate, but to treat quantity and distribution of energy as if they
formed on question. (Monteiro 162).

Ultimately, however, James’s view of thermodynamics also remains ambiguous. In *The Ethics of Energy: William James’s Moral Philosophy in Focus*, Sergio Franzese claims that James’s use of “energy” ultimately breaks down and becomes a metaphor precisely at the moment it is called to maintain the exceptionality of the human intellect, or “the dynamogenic power of ideas:” Franzese explains:

This additional energy can be called ‘spiritual energy’, thus denoting the activity of the spiritual dimension of the individual, or in other words, the dynamogenic power of ideas, which creates the special condition we could call the ‘human anomaly,’ in virtue of which the entropic process, at least virtually, can be reversed. By virtue of their spiritual dimension, human beings have the ability to draw energy from their own ideas, as it were, and, in doing so, to introduce a source of new energy into the physical world, or at least to manage more proficiently the energy they have. Thus, when we strip human ‘energy’ of any mythical connotations, what it comes down to, for James, is that human destiny is in human hands, and dependent upon human power and ability to use and organize their activity for the construction and preservation of the human world, in defiance of the Second Law of Thermodynamics. Here the meaning and the task of an ethics of energy reveal themselves: to inquiry in the conditions in which human energy is produced and can be organized on behalf of human civilization. (177-178)
The “human anomaly” in the system, for James, is the ability of the human intellect to add more energy to the world than it uses (or, as Bergson would perhaps comment, “to add much from little,” “to surpass itself”). For James, the human intellect maintain exceptionality in the material world and (as his example of the hydraulic ram is intended to demonstrate) these two systems of order cannot be fully integrated. While Adams has attempted to bridge these orders, he moves in an out of metaphor and analogy at whim and ultimately relies on the highly subjective move of making the “attractions on thought” or “thought motion” his central concept. Even though Adams’s language is axiomatic, this interpretive leap allows Adams to give a non-reductionist material account of the human actor in history through the language of energetics. The question of whether Adams uses energy as a metaphor or not, then, is perhaps not the most revealing question given how Adams understood the epistemological limits of science. It is perhaps more interesting that Adams attempted to account for the human force in history as part of the material world, capricious as he may be in the process.

In spite of the many ways Adams re-imagines the discourse of science, he made the choice to present his work, at times, within this framework. Indeed, the uncertain status of the text itself (Is it science? Is it literature? Is it sociology?), and the status of its central term, energy (Is it literal? Is it a model? Is it a metaphor?) leaves one without a clear framework for assessing it. In his Letter to American Teachers, Adams makes a direct case for considering social energy as a real material energy imbedded in nature, rather than an exception to it. For Adams, “the direction of mind, [is] a single force of nature” (380). His argument sounds strikingly similar to Durkheim’s case for the existence and materiality of social forces:
Since the Church had lost its authority, the historian’s field had shrunk into narrow limits of rigorously human action; but, strictly within those limits, he was clear that the energy with which history had to deal could not be reduced directly to a mechanical or physico-chemical process. He was therefore obliged either to deny that social energy was an energy at all; or to assert that it was an energy independent of physical laws. Yet how could he deny that social energy was a true form of energy when he had no reason for existence, as professor, except to describe and discuss its acts? He could neither doubt nor dispute its existence without putting an end to his own and therefore he was of necessity a Vitalist, or adherent of the doctrine that Vital Energy was independent of mechanical law. Vitalists are of many kinds. Students who are curious on the subject can consult the “Vitalismus als Geschichte und als Lehre”; by Dr. Hans Driesch (Leipzig), but they will understand it little better afterwards than before. For human history the essential was to convince itself that social energy, though a true energy, was governed by laws of its own. (11-12)

The question if Adams’s concepts of energy and force are literal or metaphoric is impossible to answer given the ambiguity worked into his account. Adams has created something wholly idiosyncratic, intentionally using the discourses of science, literature, and philosophy at whims that he does not fully explain. Attempting to read it, then, strictly within one of these frameworks will ultimately be unsatisfying. Perhaps this is why he wrote his scientific theory of history in the genre of an autobiography and not in a journal of history. Similarly, this may explain his decision to write a “letter” (which he notes as a
deliberate choice) to American teachers, rather than a treatise. The genres Adams chose for his ideas may be read as another commentary on both the status of the claims he makes and as a silent critique of science.
Works Cited


4.1. Abstract

In this final chapter, I read Jack London’s *The Sea-Wolf* (1904) and *Martin Eden* (1909) as fictive worlds that elaborate a scientific concept of *rhythm*. As much as naturalist literature helped inaugurate a post-humanistic discourse as it contended with evolutionary theory, it also registered a new way of thinking about cosmological order by imagining a thoroughly rhythmic universe. First described by Herbert Spencer in his chapter “Rhythm of Motion” of *First Principles* (1864), rhythm was a primary mover, the means by which fundamental physical forces produced matter and its various configurations in the universe. Since matter was, in Spencer’s account, essentially rhythmic and susceptible to rhythmic interactions, it can be understood as a precursor to the energetic materialism discussed in Chapter 1. According to Spencer, the rhythm of fundamental forces produces and moves all things, from cosmic events to the human nervous system; thus, rhythm is also the interface by which interaction between them occurs. Environments, now understood to be vitally active, were no longer static stages for human bodies; correspondingly, bodies, like other physical systems, were no longer strictly partitioned from them. In the process of imagining life in rhythmic terms, a much different picture of the cosmos emerges, and it is one in which the embeddedness of form and action within deeply connected systems of order and organization is brought into relief. In the case of London, rhythm is at once the theory of relation and the aesthetic scheme by which a particular cosmological picture is elaborated in lived experience. Perhaps more interesting than the problematic confrontations with determinism (as literary naturalism is often read), then, is the way London engages with this particular epistemological shift in the plot lines and formal aesthetics of his narratives. Specifically, he elaborates contextual detail and dwells on the potential rhythmic effectivities of specific environments and their influence on human bodies.
4.2. Evolution, Physics, and the Force Universe

Many readers of Jack London’s novels cannot avoid questioning the dynamic forces that animate his fictional worlds. His protagonists are tested and shaped by a confrontation with internal and external forces, be they elemental, instinctual, psychological, or social. Scholars of literary naturalism have long debated the status of human agency in the face of these compelling forces and the degree to which individuals are bound to a determined existence because of them. While disagreements about determinism have produced differing accounts of naturalist literature, critics have consistently agreed that this problematic emerged from a larger intellectual confrontation with the theories of natural selection and evolution as developed by Herbert Spencer and Charles Darwin. This claim has been restated from the earliest accounts of the movement until the most recent. For instance, Malcolm Cowley opens his influential “Naturalism in American Literature” with the following: “Like European naturalism it was inspired by Darwin’s theory of evolution and kept repeating the doctrine that men [sic], being part of the animal kingdom, were subject to natural laws” (300). Recent accounts also begin in the same place. Eric Carl Link explains that, “Specifically, the American literary naturalists are those authors who engage, at the thematic level, post-Darwinian reconsiderations of the relationship between humans and nature” (72). This seems particularly true for thinking about the work of Jack London, who is considered (along with Frank Norris and Theodore Dreiser) at the very center of the naturalist movement for precisely this reason. As Lawrence I. Berkove claims: “Among the many intellectual influences on Jack London, none is so central and profound as that of Darwin…. Scholars agree unanimously that Darwin was a major influence on London, most particularly as
regards the idea of evolution” (243).

These discussions have participated in the radical rethinking of the human that evolutionary theory demands, which has altered ideas about the division between the human and animal realms; the human as a self-determined, self-same entity through history; and the privileged existence of the human outside both the laws and vicissitudes of the natural world. Appropriately, many scholars have read literary naturalism as a statement about the determined nature of human subjectivity and its uprooted place in the previously described hierarchical order of nature; commonly discussed narrative themes include the role of embodied instinct, the potential for atavistic states and behaviors, and the inescapable influence of class, temperament, and biological inheritance. While critics have worked to complicate and correct a simplified notion of determinism in literary naturalism, a compelling account of environmental influence outside the language of determinism remains to be fully developed.

Discussions of literary naturalism have less commonly focused on how

Since my argument is not centered on a philosophical discussion of determinism, I do not provide a comprehensive overview of the literature concerning determinism in literary naturalism here. For a precise analysis of the philosophical debates regarding free will going back to John Stuart Mill and the problematic interpretations of determinism offered by many literary critics, see Ian F. Roberts, “Determinism, Free Will, and Moral Responsibility in American Literary Naturalism” (2011). Roberts provides an accurate definition of philosophical determinism, which makes it distinguishable from the anxiety registered in naturalist texts regarding the possibility of choice when human agents are more thoroughly understood as subjects of social and biological history. Roberts confronts the work of Donald Pizer on the topic, as Pizer has complicated notions of determinism in naturalist literature by providing readings of literary texts which demonstrate the creation of individual meaning in the face of external forces, while also pointing to philosophical inconsistencies that should be dismissed in literary texts. See Pizer, *The Theory and the Practice of American Literary Naturalism: Selected Essays and Reviews* (1993). For a different approach to the question of determinism in naturalism, see Lee Clark Mitchell’s *Determined Fictions: American Literary Naturalism* (1989). Mitchell asks questions about agency through its development in literary style and narrative structure. Rather than ask how naturalists texts contend with philosophical questions, Mitchell asks, “How can an action be shown to be impersonally caused rather than motivated?” and “When does fiction dissociate an agent’s will from a world of events?” (Mitchell x)
evolutionary theory dramatically altered the representation of environments or settings, which, consequently became animated with forces both physical and social. As much as naturalist literature helped inaugurate a post-humanistic discourse, it also registered a new way of thinking about cosmological order, ecological systems, and environments both found and human-engineered. Environments, now understood to be vitally active, were no longer static stages for human bodies but the very condition of their emergence; correspondingly, bodies, like other physical systems, were no longer strictly partitioned from them. How, then, was this invisible interface between the body and environment to be theorized? An answer came from Herbert Spencer’s theory of rhythm, which was elaborately developed in a chapter entitled “Rhythm of Motion,” of First Principles (1864). (259-281) For Spencer, rhythm was the fundamental organizing principle of the cosmos that gives form to the natural environment as well as organic life; as such, his theory of rhythm resulted from developments in physics as much as biology. Although arising from relatively simple physical properties, Spencer claims that all physical structures and organic bodies usher forth from a dynamic, rhythmic state produced by the interaction of force. In Spencer’s view, rhythm simultaneously moves all things, from cosmic events to the human nervous system; thus, rhythm is also the interface by which interaction between them occurs. Although obviously flawed, Spencer’s theory of rhythm engendered an understanding of causal influence that the evolutionary picture demanded; it correspondingly provided the framework through which vitalized images of environmental contexts were imagined. Rather than offering a simplified picture of causality among distinct entities, the dynamic nature of rhythm afforded a complex picture of influence and interaction that emphasized thoroughly embedded and compounded systems of relation
that unfold in a forward direction of time. This picture of dynamic interaction provided a strong casual principle without being deterministic (in the simplified sense of the term). Bodies and environments were deeply entangled on a structural level through rhythmic cycles of feedback and energetic exchange resulting in their co-creation and determination. A theoretically elaborated concept of rhythm is arguably one of Spencer’s most important legacies because it encouraged new ways of thinking about dynamic interaction that were widely influential in Europe and America, and it inaugurated a “floating field” of rhythm whose relevance lasted well into the twentieth century (this will be discussed below).

In the case of Jack London, Spencer arguably surpasses Darwin in terms of influence; Spencer is one of the few authors for whom there is satisfactory evidence London had read carefully. In the novels The Sea-Wolf (1904) and Martin Eden (1909), rhythm is at once the theory of relation and the aesthetic scheme by which a particular cosmological picture is elaborated through lived experience. It is not surprising, then, to find Spencer’s First Principles directly discussed by the characters of Martin Eden and Humphrey Van Weyden during their respective journeys. In each novel, these protagonists must navigate a harsh transition between life on land and life at sea, and rhythm is the interface between the bodies of the characters and the new environments in which they must learn to exist. The reorganization of the protagonists’ bodily nervous systems (to use London’s language) occurs in response to radically new environments that are dynamically alive with social rhythms (such as those defined by work, manners, and music) and

47 See Golston: “One finds issues of rhythm informing, to varying degrees, a significant number of discourses at different moments during the first half of the century: this paper represents an initial attempt to collate, chart, and analyze such moments. As far as statistics go, the issue is nearly omnipresent: the question is, to what extent was rhythm a floating field, so to speak, mutually informing a variety of disciplines?” (“Im Anfang War Der Rhythmus” note 2).

48 See Ronald E. Martin 186-89.
physical rhythms (such as those set by sea waves or diurnal cycles). The resulting
transfiguration of the protagonist defines the structure of the plots. In *The Sea-Wolf*, the
genteel scholar Humphrey Van Weyden must adjust to the rhythms of the “miniature
floating world” of Wolf Larsen’s ship, the *Ghost*, on its long seal hunting expedition from
San Francisco to the coast of Japan (29). In a corresponding move, the eponymous Martin
Eden must recalibrate his body and mind from the pronounced rhythms of a life at sea to a
life defined by its stability and refinement on land. The sea is significant in this context, as
it allows for an elaboration of rhythm as a synthetic principle; the sea illustrates
environments whirling with multifarious effectivities that can be aesthetically and
conceptually processed through rhythm. Through the concept of rhythm, then, London
renders fictive worlds that both register and further mobilize this particular epistemological
shift in which bodies and environments are better described by the nature of their
movements and actions than an accounting of their static features.

4.2. The Science of Rhythm

In *American Literature and the Universe of Force* (1981), Ronald Martin argues
that the work of many writers at the turn of the twentieth century (including Jack London,
Theodore Dreiser, and Frank Norris) is underwritten by the “idea that reality was in
essence a system of forces” (xi). Martin parses, with impressive clarity, the complex and

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49 Martin’s study is not framed as a discussion of naturalism (even though his choices are clearly centered there); instead, he theorizes a general “naivety” consistent among early American writers in understanding the relationship between ideas and external reality. “The motif of naive realism — treating one’s mental constructs as if they were unquestionably representations of objective reality — [Herbert] Spencer added a tendency toward what we can call naive absolutism — treating one’s general vision as if it were eternally and comprehensively true” (Martin 1981, 34).
expansive body of knowledge that contributed to the widely accepted notion he calls “the force-universe,” a historically specific way of imagining cosmological structure and causal relation (xvii). According to Martin, “The universe was thoroughly and intricately modeled as a system of forces by the scientists in the 1840s in what they then conceived of as the Law of the Conservation of Force,” which had a profound effect on the physical sciences into the following century (6). The notion of “moving force” from physical mechanics was expanded to describe the physically effective component of diverse phenomena (such as light, steam, magnetism); at times, it came to serve as the concept of causation more generally, and it overlapped with the concept of energy, which eventually replaced many of its uses (7-8, 39).

For Martin, the theorist primarily responsible for developing and disseminating a vision of the force universe was the widely read Herbert Spencer. In Spencer’s cosmology, the theory of “force conservation” and biological evolution were in conversation with one another through a larger principle of “evolutionary force.”

The two ideas he was most specifically attracted to were the theory of force conservation and the developmental hypothesis, the broadly based forerunners of the nineteenth century’s two great scientific generalizations,

This naivety finds its narrative counterpart in naive omniscience. “Norris’s unreflective, derivative, and basically absolutistic approach to ideas and form led him to naive omniscience. His narrators, like those of most literary realists, know everything and have access everywhere, although they tend to focus intently on a single character or group of characters. Their knowledge, although not often generalized or didactic, is final, absolute, whether it be knowledge that a square head is a sign of degeneracy, that a strong woman needs mastering by a strong man, or that the laws of the universe ultimately work for the good” (148).

50 It is significant for this study that the terms “force” and “energy” are often used interchangeably in the scientific texts of this period, as in “the conservation of forces” and “the conservation of energy.” For Spencer, rhythm is also brought into conversation with these terms since rhythm results from the interaction of force.
the laws of energy conservation and evolution. Out of these two grand conceptions Spencer built an even grander one, a universe visualized as gradually but with mechanical inevitability realizing and perfecting itself, a universe of evolutionary force. (33)

Spencer’s “Synthetic Philosophy” was “one of the last and most impressive attempts in Western philosophy to describe the nature of the universe in absolute and all-inclusive terms” (32). While Martin provides a detailed account of this framework (32-58), his study does not include a discussion of rhythm, which, I would argue, is perhaps the most important explanatory principle to emerge from the force universe in Spencer’s hands. For Spencer, rhythm was the deep mechanism that enables the emergence of matter and life from force. Consequently, the entire natural world — organic and inorganic alike — was alive with rhythms and oscillations that determined their nature and provided a means of intercourse and feedback among them.

In the chapter entitled “Rhythm of Motion,” of First Principles, Spencer argues that all motion is inherently rhythmical. For him, rhythm is the primary organizing principle of the cosmos and a universal fact of nature: “Rhythm results wherever there is a conflict of forces not in equilibrium. If the antagonist forces at any point are balanced, there is rest; and in the absence of motion there can of course be no rhythm” (263). Here Spencer explains that motion cannot result from either the absence of force or its uninterrupted infinite extension through space (the two possibilities for force to reach equilibrium). Rather, motion results when forces are interacting in any combination and intensity; because of their uneven nature, rhythm is produced. He observes, for instance, that rhythms of interacting forces can be detected when a fixed object is struck, a moving
object hits a barrier, or two moving objects collide. Such interactions result in rapid oscillations (261). Thus, motion, as a phenomenon, is inherently rhythmical and all matter and form emerges from this more fundamental condition. In so far as rhythm is the primary organizer of the cosmos via motion, it extends to include “action in general”: “The universality of this principle suggests a question like that raised in foregoing cases. Rhythm being manifested in all forms of movement, we have reason to suspect that is it is determined by some primordial condition to action in general” (279). Thus, rhythm was a primary mover, the means by which fundamental physical forces produced matter and its various configurations in the universe. Since matter was, in Spencer’s account, essentially rhythmic and susceptible to rhythmic interactions (as we will see throughout the analysis below), it can be understood as a precursor to the energetic materialism discussed in Chapter 1.

In “Rhythm of Motion,” Spencer effectively re-describes the cosmos in terms of rhythm, and his examples are so numerous and far-reaching, they effect a new way of seeing the physical world. Spencer begins by examining the elements of nature, including, the fundamental wave formation of light, heat, wind, electricity, and water, noting the undulations and rhythmic movement inherent in the forces themselves and the patterns they cause in the bodies they encounter, such as planets, rivers, rocks, and boats. His observations range from the celestial to the terrestrial. For instance, rhythmic motion can be observed in the cosmos: “That spiral arrangement so general among the more diffused nebulae…shows us the progressive establishment of revolution, and therefore of rhythm, in those remote spaces which the nebulae occupy” (264). Rhythm is also demonstrated in the motion of earthly elements:
Note again the effect of the antagonism between the current and its channel. In shallow places, where the action of the bottom on the water flowing over it is visible, we see a ripple produced — a series of undulations. And if we study the action and re-action going on between the moving fluid [of a stream] and its banks, we still find the principle illustrated, through in a different way. For in ever rivulet, as in the mapped-out course of every great river, the bends of the stream from side to side throughout its tortuous course constitute a lateral undulation – an undulation so inevitable that even an artificially straightened channel is eventually changed into a serpentine one. (260)

This holds, of course, on land as well (“However smooth the rails, and however perfectly built the carriages, a railway-train inevitably gets into oscillations, both lateral and vertical.”) and in the ether (“Every fresh discovery confirms the hypothesis that light consists of undulations. The rays of heat, too, are now found to have a like fundamental nature; their undulations differing from those of light only in their comparative lengths.

Nor do the movements of electricity fail to furnish us with an illustration, though one of a different order.”) (261). Spencer continues at length to examine many other examples of rhythm, which are often triply and quadruply compounded in nature and sometimes occurring in wavelengths so great or tiny that we fail to recognize them as such. For instance: “In the quantity of light and heat which any portion of the Earth receives from the sun, there goes on a quadruple rhythm [in addition to the micro rhythms of the heat and light itself]: that of day and night; that of summer and winter; that due to the changing position of the axis at perihelion and aphelion, taking 21,000 years to complete; and that
involved by the variation of the orbit’s excentricity [sic], gone through in millions of years” (266).

After establishing this principle in the physical world, Spencer moves (without much explanation) from the inorganic to the organic: “Perhaps nowhere are the illustrations of rhythm so numerous and so manifest as among the phenomena of life” (270). Again, examples abound: the undulatory motions of esophagus and intestines, the pulse of heart muscles, and the contraction and expansion of the lungs are cited among the primary rhythms of the human body, while “secondary ones of longer duration” include the cycles of hunger and fatigue, the periodic occurrence of vigor, and even the “intermittent character” of symptoms in chronic illness (270-271). Spencer’s conceptualization of the body through rhythmic impulses is a significant development, and the concept of rhythm is analogously and metaphorically extended to explain cognitive function. Spencer claims that what is generally perceived as a continuous mental state or sensation is actually “an extremely rapid departure from, and return to, that particular mental state which we regard as persistent” (274). “It is not manifest that the changes of consciousness are in any sense rhythmical. Yet here, too, analysis proves both that the mental state existing at any moment is not uniform, but is decomposable into rapid oscillations” (273). As in other examples he gives, Spencer explains how the essence of cognitive function (the “establishment of relations”) is reflected in its rhythmic unfolding (the rapid oscillation among states): “From the admitted fact that thinking consists in the establishment of relations, it is a necessary corollary that the maintenance of consciousness in any one state to the entire exclusion of other states, would be a cessation of thought, that is, consciousness” (273). This rhythm of consciousness is also reflected in the pattern of
energy expenditure in the nervous system, according to Spencer. As “sensations and emotion expend themselves in producing muscular contractions,” they follow the same rhythmic oscillation pattern of mental states (274). “A continuous discharge along the nerve leading to a muscle, does not contract it: a broken discharge is required — a rapid succession of shocks. Hence muscular contraction pre-supposes that rhythmic state of consciousness which direct observation discloses” (274).

Conceptualizing the body and mind through rhythm has important consequences for biology, psychology, labor science, and aesthetic theory in early twentieth century America and Europe. Spencer stands, I would argue, as the predecessor of the forgotten science of rhythm that Michael Golston maps in *Rhythm and Race in Modernist Poetry and Science* (2008). Golston, who identifies a scientific discourse of rhythm in early twentieth century thought, does not reach back to Spencer; Martin, who expertly describes Spencer’s force universe, does not discuss his theory of rhythm. Thus, the connection between the force universe and the biological science of rhythm has yet to be fully elaborated. Drawing these two studies into relation highlights how Spencer, although discredited for his discussion of evolutionary theory, articulated widely influential theories of dynamic influence and development by imagining a rhythmic universe. The

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51 Additionally, Robert Brain has contributed important work linking the science of bodily rhythm and modernism. See Brain: “Genealogy of ‘ZANG TUMB TUMB’: Experimental Phonetics, Vers Libre, and Modernist Sound Art” (2011); “How Edvard Munch and August Strindberg Contracted Protoplasmania: Memory, Synesthesia and the Vibratory Organism in Fin de Siècle Aesthetics” (2010); and “The Pulse of Modernism: Experimental Physiology and Aesthetic Avant-Gardes circa 1900.” (2008). Although not framed as a study of rhythm, Anson Rabinbach’s (1990) *The Human Motor: Energy, Fatigue, and the Origins of Modernity*, also makes a significant contribution in tracing the history of rhythm science in the late nineteenth and early twentieth centuries. Rabinbach focuses on how the science of rhythm related to the study of human labor, efficiency, and fatigue. For instance, Rabinbach reviews French and German studies concerned with the way body rhythms affect labor. (172-78) One such study, *Arbeit und Rhuthmus*, Karl Bücher (1899) states that rhythm “arises from the organic essence of mankind. All natural activities of the human body appear to be dominated by the regulation of thrifty energy use” (qtd. in Rabinbach 1990, 175).
consequences for literary scholarship are also significant. Golston’s study establishes a profound connection between the science of rhythm and the work of the modernist poets, through their deployment of formal poetic meter and scientific ideas about blood, race, and evolution. However, tracing the history of rhythm science to Spencer allows us to understand its influence on earlier writers and the naturalists who conceptually elaborated the rhythmic universe through new ways of describing environments and interaction.

Golston begins his study in the late nineteenth century, when the science of rhythm was developed through experimental (rather than speculative) means, in fields as wide ranging as psychology, linguistics, gymnastics, and literature. (2-3) In making a case for a field of “Rhythmics,” Golston cites, among many other sources, the “Bibliography of Rhythm” in *The American Journal of Psychology* in 1913; supplementary bibliographies appeared in the journal into the 1920s (3). Collectively, they list hundreds of studies on rhythm and disclaim comprehensiveness due to the sheer volume of publications on the topic. A review of these bibliographies will turn up titles such as: “Music, rhythm, and muscle,” in *Nature* (Allbutt 1894); “Emotional Values in Rhythmic Forms,” in *Method* (Dixon 1905); “The Relation of Auditory Rhythm to Nervous Discharge,” in *Psychological Review* (Macdougall 1902); “Pulse and Rhythm,” in *Popular Science Monthly* (Hallock 1903). Indeed, it is not necessary for Golston to include a discussion of Spencer for the purposes of his study, as Spencer’s “Rhythm of Motion” is thoroughly recapitulated in Thaddeaus Bolton’s “Rhythm” (1894), which appeared in the *American Journal of Psychology*. Bolton’s essay along with the bibliographies published in the same journal re-establish a robust experimental discourse from which Golston works. Golston traces early twentieth century studies of rhythm, which became much more specific than
Spencer’s account, and they more thoroughly incorporated in the discourse of race: “By the late 1930s, then, experimental work on rhythm had coalesced into a series of theoretical equations comprising a budding scientific field that linked the human pulse, genetic difference, racial metabolisms, the unconscious, machine-age work, and the geophysical environment: human bodies and minds, it appeared, were genetically precoded to respond to certain rhythms that manifested themselves in cultural productions as distinct as national fingerprints” (47).

Spencer was certainly criticized for his problematic logic, but the extent of his influence is difficult to overstate, particularly if we look at the legacy of rhythm. While the concepts of force and rhythm were applied as universal principles and suffered from the strain of this use (or, put another way, “a slackness in terminological rigor and a fatal susceptibility to metaphor” (Golston 7), they nevertheless shaped the cosmological picture and provided a bridge between biology and physics that did much conceptual work in the period. Spencer often uses the “length of waves” or “periodicity” to bring diverse phenomena within his framework. For instance if short oscillations characterize the rhythms of mental attention, “a much more conspicuous rhythm, having longer waves, is seen during the outflow of emotion into dancing, poetry, and music” (Spencer 274); yet longer waves can been observed in societies collectively:

Nor are there wanting evidences of mental undulations greater in length than any of these – undulations which take weeks, or months, or years, to complete themselves. We continually hear of moods which recur at intervals. Very many persons have their epochs of vivacity and depression. There are periods of industry following periods following periods of
idleness….War, exhaustion, recoil – peace, prosperity, and renewed aggression: — see here the alternation more or less discernible in the military activities of both savage and civilized nations. And irregular as is this rhythm, it is not more so than the different sizes of the societies, and the extremely involved causes of variation in their strengths, would lead us to anticipate. Passing from external to internal changes, we meet with this backward and forward movement under many forms. (275-76)

Spencer even explained biological evolution through the rhythms of the single organism and the aggregate species. (271-273) “Life as it exists in all the members of such species, is an extremely complex kind of movement, more or less distinct from the kinds of movement which constitute life in other species. In each individual of the species, this extremely complex kind of movement begins, rises to its climax, declines, and ceases in death. And every successive generation thus exhibits a wave of that peculiar activity characterizing the species as a whole” (271). As this account (and particularly life as a “kind of movement”) reminds us, Spencer held that all phenomena are explained by rhythm and motion resulting from the interaction of evolving forces. For this reason, species are distinguished by their “extremely complex kind of movement” and their “peculiar activity” rather than their features.

Of particular interest for the present study is precisely the way rhythm provided a new understanding of the communication between bodies and environments that the evolutionary picture requires. As the “Rhythmicists” (to use Golston’s term) demonstrated through their experimental questions, rhythm came to stand as a point of contact and influence among different kinds of entities.
Rhythm acts as the medium through which communication may be established between such traditionally distinct categories as mind and body, or subject and state, and in fact the effects of physiological, musical, and other exterior rhythms on consciousness are central concerns of experiment and theory in early studies of rhythm. Rhythm is ubiquitous as the unheard pulse or unconscious tempo of a body, or (and) it can act as an agent of incubation (colonization) upon or within that body. (Golston “Im Anfang War Der Rhythmus”)

Golston uses this insight to understand the Modernist poets, but it also applies to Spencer’s vision of the rhythmic universe. The concept of rhythmic interface helps us to understand why naturalist authors were changing the tenor of their descriptions about the natural world to include a new openness between individuals and environments; it also allows us to appreciate the specific way in which they were doing it. Namely, rhythm demonstrated in physical terms that organic bodies were systems in continuous exchange with the surrounding physical and ecological systems through cycles of feedback, energetic exchange, and co-creation/determination. Rhythm, specifically defined by how it marks time, brings the forward direction of developmental time into an account of cosmological evolution. In Spencer’s explanation, various rhythms unfold in time and affect one another’s trajectory through dynamic interaction. In this way, rhythmic behavior and interaction was used to describe the system of a cell, organ, circulatory system, body, household, neighborhood, city, or solar system.

As these embedded systems demonstrate, rhythm was also the framework Spencer used to momentarily isolate and study systems within systems while keeping the
connection to a larger ecology in mind. For example, he could focus on the rhythm of nervous impulse leading to the heart muscle but then flatten it to consider the action of a higher order system, such as the circulatory system within the body. This ecological perspective generated a more porous image of the entities that were transversely connected to an array of networked systems, and it prompted one to question the solidity of assumed partitions (such as the skin of the body) among them. Or, put another way, the ability to trace the transformation of rhythm or energy as it moves through matter enabled the reconception of strictly partitioned entities as nested systems. In the process of imagining life in these terms, a much different picture of the cosmos emerges, and it is one in which the embeddedness of form and action within deeply connected systems of order and organization is brought into relief. Perhaps more interesting than the problematic confrontations with determinism in naturalist fiction, then, is the way naturalism presumed more effective settings, registered a new importance of contextual detail, and dwelled on the potential effectivities of specific environments, be they domestic, urban, pastoral, or cramped within a sailing vessel that was a world of rhythms, sensations, and manners onto itself.

4.3. Rhythm in London’s Bodies and Worlds

In London’s The Sea-Wolf (1904) and Martin Eden (1909), the protagonists of each story must abruptly transition between a violent, tumultuous life at sea and a refined, stable existence of upper class life on land. Metaphors of rhythm and motion are salient throughout each novel, and they stand as the primary means of describing the actual
moment of transition, the first encounter with the new environment. Rhythm is the framework through which each protagonist experiences a new setting (its physical and social features alike) and registers these changes in mind and body. The extent of Spencer’s influence is also apparent in the philosophical dilemma of each novel, as the questions of art (in Martin Eden) and life (in The Sea-Wolf) are conceived through representations of rhythm and motion.

The opening of Martin Eden depicts the painfully awkward scene in which Martin, a young, unrefined sailor, attempts to spend an evening in the fine home of the wealthy Mr. Morse. After Martin comes to the aid of Arthur Morse (Mr. Morse’s son) in a brawl on a ferryboat, Arthur invites Martin to dine at his home with his mother and siblings. Never in his life had Martin encountered a setting like the Morse home or the people who inhabited it. During this sudden transition, rhythms related to the body — speech, breath, gait, heat beat, etc. — are used to distinguish stark differences of habit, emotion, and sensibility between Martin and the Morse family. From the first moment Martin enters the home, his body, which is accustomed to the rhythms of a life at sea, is hopelessly at odds with its environment.

He walked at the other’s heels with a swing to his shoulders, and his legs spread unwittingly, as if the level floors were tilting up and sinking down to the heave and lunge of the sea. The wide rooms seemed too narrow for his rolling gait, and to himself he was in terror lest his broad shoulders should collide with the doorways or sweep the bric-a-brac from the low mantel….He watched the easy walk of the other in front of him [Arthur Morse], and for the first time realized that his walk was different from that
of other men. He experienced a momentary pang of shame that he should walk so uncouthly. (31)

Martin’s internalized sea rhythms expose him as a “wild man” as he tries to navigate the home. “The process of getting into the dining room was a nightmare to him. Between halts and stumbles, jerks and lurches, locomotion had at times seemed impossible” (45). Similarly, the rhythm of his language was also thrown off by the new cadence in which the dinner conversation unfolded. “His speech was like his walk to the table, filled with jerks and halts as he groped in his polyglot vocabulary for words, debating over words he knew were fit but which he feared he could not pronounce, rejecting other words he knew would not be understood or would be raw and harsh” (49).

During this initial scene, Martin meets Ruth Morse, Arthur’s sister, who will remain Martin’s romantic interest for the length of the novel. The strangeness of this meeting registers on the bodies and minds of both characters. For instance, Martin’s whole body “thrills to” the new experience of formal interpellation.

Under that muscled body of his he was a mass of quivering sensibilities. At the slightest impact of the outside world upon his consciousness, his thoughts, sympathies, and emotions leapt and played like a lambent flame. He was extraordinarily receptive and responsive, while his imagination, pitched high, was ever at work establishing relations of likeness and difference. “Mr. Eden,” was what he had thrilled to — he who had been called “Eden” or “Martin Eden,” or just “Martin,” all his life.

And, “Mister!” (34-5)

Ruth is similarly affected as she tries to make sense of her conflicted response to Martin,
“this traveler from another world” (40). Ruth is undeniably drawn to Martin by his obvious strength and virility, yet she is simultaneously repelled by his coarseness. In the space of listening to Martin’s stories which “brought the pulsing sea before them” (52), this push and pull of attraction eventually unhinges Ruth and moves her mind to the rhythm of sea waves that she encounters through Martin: “His roughness frightened her; each roughness of speech was an insult to her ear, each rough phase of his life an insult to her soul. And ever and again would come the draw of him, till she thought he must be evil to have such power over her. All that was most firmly established in her mind was rocking” (53).

Perhaps the most elaborate development of the rhythmic interface takes place after dinner, when Ruth plays the piano for Martin. In a complicated exchange, musical rhythms (which turn out to be class specific) become the means by which the young couple communicates: “Later, at the piano, she played for him, and at him, aggressively, with the vague intent of emphasizing the impassableness of the gulf that separated them” (54). Although he tries, Martin “did not understand the music she played. It was different from the dance-hall piano-banging and blatant brass bands he had heard” (54). Martin’s inability to catch hold of the rhythm of the measures is the obstacle to his comprehension. “The lilting measures of pronounced and simple rhythm” never lasted long enough for Martin. “Just as he caught the swing of them and started, his imagination attuned to flight, always they vanished away in a chaotic scramble of sounds that was meaningless to him, and that dropped his imagination, an inert weight, back to earth” (54). Ruth’s unwillingness to play sustained rhythmic sequences, those that were familiar to Martin, suggested an intentional insult to him. “Once, it entered his mind that there was a
deliberate rebuff in all this. He caught her spirit of antagonism and strove to divine the message that her hands pronounced on the keys” (54-5). Martin then dismisses this thought, and he submits to the new music Ruth plays; it takes him on a flight of fancy through a variety of imagined landscapes. Ruth’s music plays Martin like an instrument and, in the process, it transforms him:

He was a harp; all life that he had known and that was his consciousness was the strings; and the flood of music was a wind that poured against those strings and set them vibrating with memories and dreams. He did not merely feel. Sensation invested itself in form and color and radiance, and what his imagination dared, it objectified in some sublimated and magic way. Past, present, and future mingled; and he went on oscillating across the broad, warm world. (55-6)

In this scene, rhythm is not only as a marker of class, but something that communicates directly to the body. “He was remarkably susceptible to music. It was like strong drink, firing him to audacities of feeling, — a drug that laid hold of his imagination and went cloud-soaring through the sky” (54). The rhythms of the piano music ultimately transform Martin from a “wild man” to someone approaching Ruth’s class. “It [Martin’s] was a transfigured face, with great shining eyes that gazed beyond the veil of sound and saw behind it the leap and pulse of life and the gigantic phantoms of the spirit. She was startled. The raw, stumbling lout was gone” (56).

In addition to providing the conceptual framework, rhythm permeates London’s descriptive language throughout the novel. For example, Martin was “quivering and palpitant with emotion” after his fist visit to the Morse home (59). Martin is caused to
“vibrate to sensations that were wholesome” when encountering beauty (69). Martin’s health “seemed to rush out of him and at her in waves of force” (93). After kissing Ruth, “only colors and lights and glows pulsed” in his brain (226). London’s vocabulary for relating rhythmic responsiveness is prodigious. We are presented with a world of vibrations, waves, pulses, ripples, oscillations, swings, undulations, and flutterings. Since Martin’s body is understood as “a mass of quivering sensibilities” that dance like flickering fire (34), it is only appropriate that London should turn to rhythm when relating psychological, emotional, and physical states and responses.

The narrative of *Martin Eden* is largely occupied with Martin’s arduous effort to educate himself in order to become a professional writer and gain acceptance by Ruth’s family. In all of his study, nothing affects him as greatly as Spencer’s *First Principles*, which sends him into a pronounced state of wonderment as he begins to see the world through Spencer’s vision. “So the great discovery began” (147). Martin spends days and sleepless nights pouring over *First Principles*, until he is “drunken with comprehension” about the world around him (149). “And here was the man Spencer, organizing all knowledge for him, reducing everything to unity, elaborating ultimate realities, and presenting to his startled gaze a universe so concrete of realization that it was like the model of a ship such as sailors make and put into glass bottles” (149). Martin begins to see everything differently, “gazing upon the world he had just discovered” (149).

At the table he failed to hear the conversation about petty and ignoble things, his eager mind seeking out and following cause and effect in everything before him. In the meat on the platter he saw the shining sun and traced its energy back through all its transformations to its source a
hundred million miles away, or traced its energy ahead to the moving muscles in his arms that enabled him to cut the meat, and to the brain wherewith he willed the muscles to move to cut the meat, until, with inward gaze, he saw the same sun shining in his brain.52 (149)

Here, the sun shining in Martin’s brain is a unique image in 1909 for how completely it embodies an ecological perspective to ease the boundaries among these entities and present world of embedded systems traceable and made comprehensible through transformations of energy. The sun is not simply a removed agent at the beginning of a causal chain; the sun is in Martin’s brain. Martin’s new perspective — one that sees the fundamental rhythms and relationships of feedback and energetic exchange among all things — becomes Martin’s expectation for artistic production. After reading First Principles, Martin looks in the mirror and admonishes himself. “‘And you wanted to write!….You wanted to create beauty, but how could you when you knew nothing about the nature of beauty? You wanted to write about life when you knew nothing of the essential characteristics of life…. But cheer up, Martin, my boy. You’ll write yet’” (151). This artistic standard is finally executed in the work of Martin’s friend Brissenden towards the end of the novel, not long before Martin’s suicide. Martin’s writing career ends with the reading of Brissenden’s “Ephemera.” This work is the culmination of poetic form precisely because its rhythms reflect those of the cosmos. After reading the poem, Martin swoons: “The poem swung in majestic rhythm to the cool tumult of interstellar conflict, to the onset of starry hosts, to the impact of cold suns and the flaming up of nebulae in the darkened void; and through it all, unceasing and faint, like a silver shuttle, ran the frail, 

52 For a discussion of this passage in the context of London’s engagement with Spencer, Nietzsche, and individualism, see Roland E. Martin 206-210.
piping voice of man, a querulous chirp amid the screaming of planets and the crash of systems” (364). The poem embodies truth by capturing in its form the rhythms of the cosmos, which have been “stamped” into the work: “I shall never write again…. This is something more than genius. It is truth gone mad…. Science cannot give you the lie. It is the truth of the sneer, stamped out from the black iron of the Cosmos and interwoven with mighty rhythms of sound into a fabric of splendor and beauty. And now I won’t say another word. I am overwhelmed, crushed” (365). With the reading of this poem near the end of his long journey, Martin finally grasps the aesthetic principle that London has been employing since the opening scene of his novel.

In *The Sea-Wolf*, Humphrey Van Weyden undergoes a bodily transformation opposite to that experienced by Martin Eden; Humphrey is a gentleman author of San Francisco who must adapt to a rough life at sea during a long voyage aboard the *Ghost*. Like Martin, Humphrey also experiences a transition in class as he is forced into servitude as a lowly cabin boy by the ship’s captain, Wolf Larsen. Wolf shares a similar physique to Martin Eden when he first visits the Morse home. Humphrey likewise wonders at the sight of Wolf’s strength, “a strength savage, ferocious, alive in itself, the essence of life in that it is the potency of motion, the elemental stuff itself out of which many forms of life have been molded” (16). Just as *Martin Eden* is largely taken up with the experience of Martin’s transformation, so too is the action of *The Sea-Wolf* moved forward by Humphrey’s metamorphosis. The remaking of Humphrey is the charge called by Wolf during Humphrey’s first days onboard the *Ghost*. When Wolf asks Humphrey what he does for a living, Humphrey stammers, “I – I am a gentleman” (22). When Wolf asks, “Who feeds you?” Humphrey replies, “I have an income.” (22). Wolf then decides that
Humphrey will stay aboard the *Ghost*, replace his cabin boy, and work so that he earns his own food and no longer walks “on dead men’s legs” (his father’s estate) (22). Wolf disregards Humphrey’s protests and tells him, “It will be the making of you. You might learn in time to stand on your own legs and perhaps toddle along a bit” (23).

Humphrey’s experiences on the *Ghost* are significant because of how they affect the slow reorganization of Humphrey’s nervous constitution, and Humphrey often comments on these changes to his own mind and body. When he first encounters life aboard the ship, Humphrey is easily overwhelmed by what he sees. After witnessing Wolf Larsen violently beat another man, Humphrey claims to feel the beating himself: “I instance this to show the sensitiveness of my nervous organization at the time and how unused I was to spectacles of brutality” (26). As he slowly adapts, Humphrey begins to experience pain in a similar way to the sailors onboard. After a rough night at sea, Humphrey suffers a brutal knee injury, yet he is expected to work the next day. “On the land I would have been lying on the broad of my back, with a surgeon attending on me, and with strict instructions to do nothing but rest” (35). Even so, Humphrey makes it through his labor and notes the general callousness to pain displayed by those onboard the ship: “And this [callousness] was due, I believe, first to habit, and second to the fact that they were less sensitively organized. I really believe that a finely organized, high-strung man would suffer twice and thrice as much as they from a like injury” (35-6).

In the same way Martin Eden’s first exposure to the atmosphere of a refined home is experienced through rhythm, Humphrey’s first experience of the *Ghost* is the feeling of the rolling waves as he lies in bed and slowly regains consciousness after being pulled from the sea, nearly dead.
I seemed swinging in a mighty rhythm through orbit vastness. Sparkling points of light spluttered and shot past me. They were stars, I knew, and flaring comets that peopled my flight among the suns. As I reached the limit of my swing and prepared to rush back on the counter swing, a great gong struck and thundered. For an immeasurable period, lapped in the rippling of placid centuries, I enjoyed and pondered my tremendous flight. But a change came over the face of the dream, for a dream I told myself it must be. My rhythm grew shorter and shorter. I was jerked from swing to counter swing with irritating haste. I could scarcely catch my breath, so fiercely was I impelled through the heavens. The gong thundered more frequently and more furiously. I grew to await it with a nameless dread….I gasped, caught my breath painfully, and opened my eyes. Two men were kneeling beside me, working over me. My mighty rhythm was the lift and forward plunge of a ship on the sea. (10)

By the end of the novel, Humphrey’s nerves are so well adjusted to life on the *Ghost*, that they are disquieted by the experience of sleeping in a shelter on land. When Humphrey and his companion Maud Brewster (another castaway who ends up on Wolf’s ship), escape the *Ghost* in a small boat, they land on an uninhabited island. They build a hut and eventually Humphrey is able to attach a sealskin roof. After his first night sleeping in the completed shelter, Humphrey observes:

I awoke, oppressed by a mysterious sensation. There seemed something missing in my environment. But the mystery and oppressiveness vanished after the first few seconds of waking, when I identified the missing
something as the wind. I had fallen asleep in that state of nerve tension with which one meets the continuous shock of sound or movement, and I had awakened, still tense, bracing myself to meet the pressure of something which no longer bore upon me. (270)

In each scene Humphrey wakes fitfully to become aware of external conditions that no longer correspond to his body’s constitution. During his first night on the Ghost, as he takes pendulum swings through “rippling” centuries, the sensation of movement eventually wakes him. While sleeping for the first night back in a shelter, the absence of external pressure on his recalibrated body registers as its own sensation and “oppresses” him.

_The Sea-Wolf_ is shaped by its description of the natural world through rhythm and motion, and this includes the terms of the philosophical debate between Humphrey and Wolf regarding the purpose of life that spans the length of the novel. Just as Humphrey describes Wolf Larsen’s strength as having the “potency of motion,” Wolf describes life as “a ferment,” or, to use Spencer’s phrase, “a kind of movement” that is made possible by the circulation energy. After Humphrey expresses his belief in an immortal soul, he ventures to ask Wolf Larsen about his understanding of life. “I believe that life is a mess,” he answered promptly. ‘It is like a yeast, a ferment, a thing that moves and may move for a minute, an hour, a year, or a hundred years, but that in the end will cease to move. The big eat the little that they may continue to move, the strong eat the weak that they may retain their strength. The lucky eat the most and move the longest, that is all’” (46).53 A few scenes later, Wolf describes the exchange of movement and energy that comes with cycles of life and death: “And I shall know that I must die, at sea most likely, cease

53 Roland E. Martin also discusses this passage in an extended analysis of individualism and materialism as expressed through the character of Wolf Larsen and his discussion of Spencer’s work. (200-204)
crawling of myself to be all acrawl with the corruption of the sea; to be fed upon, to be carrion, to yield up all the strength and movement of my muscles that it may become strength and movement in fin and scale and the guts of fishes. Bah! And bah! again” (58). Wolf does indeed die at sea and “the curse of it” was the way it happened – an unidentified brain disease slowly paralyzes him so that he is fully conscious but no longer capable of moving (311). So as Humphrey has learned to eat and move under his own steam, Wolf is stripped away of his strength and movement until, one night, his life “flickered out” during a storm (329).

Here, through the term “movement,” we see the full epistemological significance of the cosmos redescribed through ideas of force, energy, and rhythm. Not only is causality and relationality completely remade within this framework, distinctions of a different order are evident here. To state (as Wolf does) that life is “movement,” or to claim (as Spencer does) that species can be distinguished by their “extremely complex kind of movement” or “wave[s] of that peculiar activity,” indicates a reality in which life and the vast range of specific forms it takes are best understood through their styles of movement and action rather than a collection of definitional traits. Instead of an epistemological framework based on static traits of identity, we see an epistemological framework based on action and process.

4.4. Conclusion

London’s novels participate in the larger intellectual revision of classical humanist distinctions about nature and the human that the developmental hypothesis and
evolutionary theory precipitated. The consequences for the self-same, self-determined individual agent were two-fold: putting the individual in the context of deep lineages of morphological history emphasized issues of genetic inheritance, instinctual legacy, and determined possibilities; however, this same evolutionary picture simultaneously meant the human was open to various forces and undetermined potentialities. Perhaps the most difficult part of this picture is theorizing the new causal relationships that the evolutionary picture necessitated. How were bodies and environments connected in this picture? How did they interact through relationships of mutual creation and exchange? Flawed as it was, Spencer’s theory of rhythm enabled a vision of causal influence that fit with evolutionary theory and shifted the epistemological framework to one based in developmental time. In the nineteenth century, rhythm put organic and inorganic systems in communication with one another through the circulation of energy and feedback of interacting forces, which emphasized deep connection and openness among nested systems. As such, Spencer’s theory of rhythm prefigured an energetic materialism argued for in Chapter 1. This relationship among entities is at once causal but not “determined” (in the simplified notion of the term). Lines of influence were still coherent yet so dynamic and deeply embedded in highly specific contexts and arrangements that the results of these interactions could not easily be parsed. These conceptual developments registered not only in the experimental studies designed by the Rhythmicists and Modernist poets, as Michael Golston has so clearly demonstrated, it also registered in the descriptive language, settings, and plot structures of the naturalist writers. In the case of Jack London’s worlds, one observes a corresponding importance felt in the details of particular environments and the specific way they are imagined. Just as bodies were open to the influence of various rhythms,
environments were correspondingly alive with them. In such a picture, the “problematic determinism” of naturalism is better understood as a commentary on the powerful shaping effects of particular environments that had become rhythmic agents, rather than static backdrops. And, in the end, it must be remembered: as much as London comments on the powerfully shaping forces of environment and heredity, his plots often chart the long (and painful) possibility of escaping these very same conditions.
Works Cited


APPENDIX 1: PHOTOGRAPHS OF THE PALLADINO SESSIONS


Figure 1

Figure 2
APPENDIX 2: A SAMPLE OF ÉTIENNE MAREY’S ILLUSTRATIONS, PHOTOGRAPHS, AND GRAPHIC INSCRIPTIONS

Source: Archives Collège de France, Paris

Figure 8

Figure 9
APPENDIX 3: SCIENTIFIC DEVICES FOR ANIMATING VIBRATORY MOTION

Source: Musée des Arts et Métiers, Paris, France

Figure 13

Figure 13.1