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Materialism and the Critique of Energy

Brent Ryan Bellamy and Jeff Diamanti

The critique of energy sits between two fields that condition the present — environmental catastrophe and capitalist crisis. Marx wrote that the past “weighs like a nightmare” on the living.¹ With global warming and the interminable crisis of capital, it is not just the past but the future, too, which strikes fear into the human mind. During the ongoing industrialization of the planet under capitalism, fossil fuels have been the dominant source of energy to power economic expansion and political domination.² The very fabric of today’s climate crisis is knit from the exhaust of intensive and extensive waves of capital accumulation. Typically framed as a consequence of bad consumer habits, the environmental problem of energy is and always has been deeply bound to the material origins of the commodity form — what it takes to make a thing and what it takes to move it. Today, the lion’s share of emissions come from transportation and production sectors of the industrial economy. By almost every projection, the simple reproduction of existing systems of production and distribution, to say nothing of their growth, will doom the planet to a host of ecocidal developments — from rising sea levels and ocean acidification to desertification in some places and more intensely concentrated rainfall in others. Against the weaving of such catastrophic tapestries, pundits of the coming energy transition spread solace with the techno-future vision of a world that could be different than the one currently soaked in hydrocarbons. Yet these proponents of technologically smoothed energy transition miss the forest for the trees: the question is not simply one of engineering, but

instead how to overcome the deep roots of capitalism's ever-growing energy dependence.

Whether for the requirement of aggregate economic growth or the expansion of new horizons of value, capitalism has been historically and logically bound to ever-increasing quantities of energy. The core contradiction of today's economic system is and always has been tied to its facility with energy. A critical standpoint on the conditions of political, economic, and ecological possibility requires a new account of energy's historical function, which is to say, a new account of energy's relationship to the production, distribution, and accumulation of value. *Materialism and the Critique of Energy* develops this standpoint, first, by revisiting the entangled conceptual and material history of capital and energy at the foundations of materialism and, second, by clarifying the stakes of a critique of energy for contemporary critical theory and politics.³ Its core claim is that while the condition of climate change today has occasioned a groundswell of interest in energy regimes and environmental systems, only the materialist critique of energy found at the heart of Marxism can explain why capitalism is an energy system and hence offer a clearer sense of a way out of its fossil-fueled inertia.⁴ As a collection of research on the lineaments of energy in materialist thought, this book distills a form of energy critique both sensitive and hostile to the many forms of inequality, injustice, and exhaustion that populate the contemporary political landscape.

Materialism has a long history. Though materialism's roots as a philosophical project stretch further back than the nineteenth century, we are concerned with its turn toward the material structures that began shaping social life in a quickly industrializing Europe. Current understandings of both energy and materialism were forged in the furnace of coal-powered innovation. The coeval emergence of industrial capitalism and self-consciously materialist thought is not mere coincidence; nor can their historical emergence be explained as simple causal determination. Rather, we argue, their emergence must be understood dialectically, beginning with a critical recognition:

the materialist tradition that emerges out of this moment is already terminologically and epistemologically connected to the industrial flares of a fossil-fueled world. From Ludwig Feuerbach, Marx, and Friedrich Nietzsche to twentieth-century critical theory, Marxist-feminism, and the multiple post-humanisms and new materialisms emerging today, streams of different materialisms flow: each is historically shaped by the industrialization and globalization of fossil fuels.⁵ This is particularly urgent given that this materialist tradition, after Marx, remains the basis for the most viable critique of the political-economic system, capitalism, whose rolling crises appear increasingly indistinguishable from the looming problems of energy and climate.

Materialism has developed two modes of tracking energy that demystify the force unleashed by fossil fuels: on the one hand, through the critique of political economy; and on the other, through a theory of materiality contoured by the access to deep history and cosmic space made available first by coal and eventually by oil and natural gas. There is a historical dimension to these trajectories. The methodological and theoretical development of Marxism, the tradition most strongly associated with the first of these two modes, begins in the 1840s within the contemporaneous surfacing of the theory of energy across Britain, Prussia, and France. What this means for materialism as it evolves from Feuerbach's treatment of Christian reason to Marx's critique of capital is that energy is dialectically bound to economic history — not a concept or variable independent of it, but a structuring force without which capital could not operate. Following this originary recognition, energy slipped away from materialist understanding until Walter Benjamin intervened to articulate a materialist revision of cosmic time. His dialectical apprehension would identify the *stylistic force* of energy over and above its positivistic or physicalist concept. Energy, through Benjamin's gaze, becomes a materialist concept once more. The following three sections examine these developments in turn.

Marxism and the Origins of Energy Critique

Marxism could be said to have two births. In the first, the fires of the Industrial Revolution breathe forth a concatenation of social conflict from which the labor movement and international communist movement emerge. But a different kind of Marxism is also nascent in the mature phases of the second scientific revolution. In the late-eighteenth century, from the principles of motion, Newtonian mechanics, and models designed to exhibit scientific discoveries came political economy, industry, and the tools of the industrialist's trade. Sadi Carnot (1796–1832) famously drew up a theory of the caloric from simple observations of the steam engine, and Hermann von Helmholtz (1821–1894) refined his ideas about the conservation of energy in observations of muscle metabolism.⁶ The work of the body and the work of the machine, once ignited by the roaring furnace of fossil fuels, allowed for the redefinition of the conceptual constellations of science. In the collision of the industrial and scientific revolutions a new set of variables emerged: energy and work; wealth and value; labor and capital.

At the dawn of the nineteenth century, developments in production and economy — mixed with increasingly sophisticated accounts of what in the eighteenth century was still called *vis viva* or living force — occasioned the simultaneous discovery of energy. By mid-century, Lord Kelvin (1824–1907), Julius von Mayer (1814–1878), Rudolf Clausius (1822–1888), and Hermann von Helmholtz arrived at more or less the same law of the conservation of energy. Thermodynamics emerged from this cauldron of scientific and industrial exchange as a key field of knowledge. Its theories stated that the total energy of an isolated system is constant and that energy can be transformed from one form to another but can be neither created nor destroyed.

The theory of energy as it unfolded in this crucial decade did not descend from the heavens, but bubbled up from the hidden abode of industrial production. This is the remarkable insight offered by the twentieth-century historian of science, Thomas Kuhn, whose analysis

of the “simultaneous discovery” of energy conservation frames the paradigm through which energy would emerge — as much the effect of economic history as it is an outcome of scientific discovery. He opens his 1956 essay with a query: “Why, in the years 1830-1850, did so many of the experiments and concepts required for a full statement of energy conservation lie so close to the surface of scientific consciousness?”⁷ Kuhn approaches an answer to his question in the form of a threefold hypothesis. First, the scientific and industrial instruments of the 1830s made available multiple instances of the conversion process from water, wind, wood, and coal into motion or thrust.⁸ Second, the dominant investment driving scientific discovery was the economic “concern with engines.” And third, the “philosophy of nature” running through Gottfried Wilhelm Leibniz, Immanuel Kant, Friedrich Wilhelm Joseph Schelling, Johann Gottlieb Fichte, and their shared *Naturphilosophie* made German thinkers, but British and French scientists as well, “deeply predisposed to see a single indestructible force at the root of all natural phenomena.”⁹ When Kuhn makes reference to something like “scientific consciousness,” he means it as both a cause and an effect of — at least in the case of the doctrine of energy — an emergent mode of understanding the economic, technical, and philosophical coherence of force. Put differently, the “scientific consciousness” responsible for the doctrine of energy helps generate, and in Kuhn’s account is symptomatic of, the emergence of a new mode of production: industrial capitalism.¹⁰

The emergence of the doctrine of energy and Marx’s materialism in the mid-nineteenth century is not sheer happenstance. Rather, their emergence is mutually implicated in industrial phenomena. The decisive shift from the problem of alienation in Marx’s early writings to the more technical language of labor power of *Capital* signals a growing awareness of the historical and social specificity of energy flows bound to the worker’s exploitation. Terminologically, labor power is identical to Helmholtz’s word for the work of energy (*Arbeitskraft*), which, as Anson Rabinbach reminds us, had been rapidly popularized across public science circles since late 1840s in

Western Europe.¹¹ As a technical term for the value form of human work in the factory too, labor power simultaneously names the objective consistency between the worker's caloric output, the coal power expressed in machinery, and the abstraction of both forms of *Arbeitskraft* by the value form of capital at a more general level. *Arbeitskraft* is the concept Helmholtz had been using in the 1840s to distinguish energetics from *vis viva* or living force still resonant with the scientific epistemology of the previous century. Between the 1840s and the 1850s, Marx had changed his thinking on the core concepts that would animate his critique by the time of *Capital* in 1867. Rabinbach argues that by positing *Arbeitskraft* Marx finally had access to the concept necessary to conceive of capitalism as a totality. This means that Marx's more developed critique of political economy, sensitive as it is to the energetic content and calibration of *Arbeitskraft*, already contains a critique of energy.

By naming the commodification of human work *labor power*, Marx alerted his readership to the twofold abstraction taking place in the production process: human exertion becomes a flow of energy in the concrete, while at the same time being modulated by the value form of capital in the abstract.¹² The calorie burners of a human body offer a relatively inefficient source of physical energy compared to even the heat and light released from burning a piece of coal. Yet no lump of coal ever got up and threw itself into the furnace of the steam engine. Capital thrusts human and fossil energy together to extract surplus value from the former but at a greater and greater magnitude due to the energetic efficiency of the latter. Once the conditions for industrial capital are in place, neither coal power nor labor power can produce surplus value independent of the other, because each form of energy congeals unevenly into, and is in turn socially regulated by, what Marx calls the "organic composition of capital."¹³

Marxism offers a developed concept of energy by taking note of just how entangled the capitalist compulsion to increase productivity and the generalization of coal power were. If capitalists could keep the factories open around the clock, then they might also seek to

implement the ever-profitable “curtailment of the necessary labour-time” by implementing labor saving techniques and machines.¹⁴ Later, Marx adds that “[t]he same causes which develop the expansive power of capital, develop also the labour power at its disposal. The relative mass of the industrial reserve army thus increases with the potential energy of wealth.”¹⁵ In this sense, Marx’s notion of labor power and its social regulation are inextricably connected, via the dialectic of forces and social relations of production, to the energetic capacity of a given place and time.

Marx’s concept of labor as it evolves over the course of his writing registers, among other things, the radically disruptive and uneven process of fossil energy’s integration into the social relations of production. Both a familiar and a novel relation to energy is at work across industrial capital at this time — from muscle-bound forms of human and animal labor to productivity-lending machines in the factories. The energy innovations of water- and steam-powered production reduce the amount of labor time required to produce a given commodity by a worker of average skill and productivity. The influx of water- and coal-powered machines into the site of production shift the balance not only in labor’s intensity, but also in its worth. The environment through which labor was organized and sustained was submitted to constant revision as capitalists dug deeper into the dirt to build waterways for mills and unearth new sources of coal. In essence, the new regime of energy generates a radical transformation in the character of the labor-capital relation. Counter to orthodox histories of the industrial revolution that posit coal power as a cheaper and thus natural replacement to wind, water, and wood, Andreas Malm offers a unique account of this historical transformation into a fossil-fueled industrial economy. Malm outlines the ways in which coal-powered steam engines offered a solution to a labor problem plaguing British capitalists: namely, how to bring the site of production into the urban spaces where the newly dispossessed were gathering.¹⁶ Coal power, according to Malm, did not rise because of its relative cheapness, but because of the ease of transporting coal as compared to transporting

water power, which had to remain proximate to the waterways. At its origin then, fossil capital increased the productivity of a newly minted proletariat in the same moment that it generated their class relation to the new mode of production. Put concisely, the proletariat became materially bound to the industrialization of fossil fuels; one becomes unthinkable without the other.

Why Energy Needs Dialectics and Why Materialism Needs Energy

Marx reconciles the critique of political economy with the otherwise positivistic concept of energy dominating scientific inquiry, yet he does so with a dialectical twist — showing energy and labor as immanent to one another — that turns energy into a moving target. Marx’s treatment of energy occurs shortly after Feuerbach inspired a new direction in materialism. Energy became a core component of historical materialism when Marx connected the surge of physical force in the production process to a twofold abstraction of human labor — on the one hand by coal-powered industrialization and on the other by the value form of capital. Yet the concept of energy developed along alternative genealogies in nineteenth- and twentieth-century materialism, becoming an index of how materialist thinkers imagine their relationship to the physical and the metaphysical. Briefly tracking one such genealogy, we offer an account of how the historical particularities of energy’s systematic usage inform its concept and figure. These particularities include the social, economic, ecological, and political environments in which energy is put to work.

In the history of materialism in the twentieth century there are a number of vital encounters with energy, staged at different levels of abstraction. Consider for instance the figure of the eternal return so important to Nietzsche and troublesome to Benjamin: “What, if some day or night a demon were to steal after you into your loneliest loneliness and say to you... ‘The eternal hourglass of existence is turned over again and again, and you with it, speck of dust!’”¹⁷ Here, Nietzsche personifies the eternal return popularized

by thermodynamic theory. The idea being that a cosmic logic is independent of the ephemeral and self-involved history of human reason. In the person of the demon, the eternal return marks the irony of human finitude and the metaphysical tradition on which Nietzsche leans to make a point about cosmic infinitude. Turn to the famous section 1067 of Nietzsche's notebooks, *The Will to Power*, and both the paradigm and promise for thinking this eternal return become more explicit: "And do you know what 'the world' is to me? Shall I show it to you in my mirror? This world: a monster of energy, without beginning, without end; a firm, iron magnitude of force that does not grow bigger or smaller, that does not expend itself but only transforms itself."¹⁸ Nietzsche turns the law of the conservation of energy into a metaphysical conceit, a new concept of history divorced from the moral, ethical, and philosophical constructs he found so intolerable. Rather than as a flow made historically contingent, energy, for Nietzsche, is encountered as the world as such.

When Nietzsche drew the thought experiment of the eternal return out of the law of the conservation of energy, he may or may not have had Frederick Lange's monumental book *History of Materialism* (1866) in mind, but to Benjamin the connection to Lange verified a certain theoretical underdevelopment. Benjamin sees in Nietzsche's words the traces of a mode of thinking that is taken with its own image. By the early twentieth century, energy had begun to emit a philosophical tendency contemporaneous with its industrialization and figured as *ungraspable* and *inexhaustible* growth.¹⁹ Both Nietzsche and Lange had certainly encountered the materialism of Louis Auguste Blanqui (1805–1881), even if their references to the commundard were infrequent. Blanqui's appearance in the first volume of Lange's *History of Materialism* closes a poetic sequence opened by Lucretius in *De rerum natura*. Lange drew conclusions about the fate of materialism from Blanqui's cosmic concept of the eternal return:

It is interesting that recently a Frenchman (A. Blanqui...) has carried out again, quite seriously, the idea that everything possible is

somewhere and at some time realized in the universe; and, in fact, has often been realized, and that too as an inevitable consequence, on the one hand, of the absolute infinity of the universe, but on the other of the finite and everywhere constant number of the elements whose possible combinations must also be finite.²⁰

When Lange tied the (in)finity of being to the fundamentals of materialism, he did so with what was only a faint expectation of its thermodynamic implications. Yet, Lange's reading of Blanqui supplies the metaphysical coordinates that appear in Nietzsche's eternal return. Moreover, this reading also defined the material elements in a way that would prove necessary for Benjamin's materialist conception of the cosmic.

As Benjamin conducted his research on Baudelaire, he uncovered a connection between Blanqui's cosmic criticism and Nietzsche's eternal return, and he did so, as we know, in the midst of the early rumblings of German fascism. Benjamin's insight into the sociopolitical appearances of energy's force comes first in the form of a preemptive critique of the fascistic cult of technology:

It is the dangerous error of modern men to regard [ecstatic contact with the cosmos] as unimportant and avoidable, and to consign it to the individual as the poetic rapture of starry nights. It is not; its hour strikes again and again, and then neither nations nor generations can escape it, as was made terribly clear by the last war, which was an attempt at new and unprecedented commingling with the cosmic powers. Human multitudes, gases, electrical forces were hurled into the open country, high-frequency currents coursed through the landscape, new constellations rose in the sky, aerial space and ocean depths thundered with propellers, and everywhere sacrificial shafts were dug in Mother Earth.²¹

The great surge in forces available to twentieth-century military and industry forces and industry processes struck Benjamin as modern

man's contact point with the flux of the cosmos — a new “*physis*” consisting of rhythms, temporalities, and spaces previously reserved for the gods. In Benjamin's critique, the internalization of that force did not express an inversion whereby technology dominated man, as the techno-utopian mastery of nature had in World War I.²² The surge in energy expressed in the war was conditioned by capital. To imagine otherwise was either to be entranced by the mystique of the cosmos or by the mystification of industrial capital. In Benjamin's treatment, the way all three thinkers — Blanqui, Lange, and Nietzsche — were absorbed in the concept of eternal return was a feature of thinking about the world *industrially*. Benjamin, in other words, interpreted the conceptual apparatus of the eternal return as reified thinking — a failure to historicize that thus mistakes a perfectly consonant image of the present for being itself: a thought that bubbles up out of production so pure and unadulterated a product of its circumstances that its provenance (and thus historicity) becomes unrecognizable. It was as if they were looking at an autostereogram of factory smoke and seeing the birth of being.

If for Nietzsche “the world” is “a monster of energy, without beginning, without end” whose only will is “the will to power,” then “the world,” for Benjamin, is still tied to what he called, following Baudelaire, *the phantasmagoria of industry* — a world too tied up with industry to recognize the historical specificity of thought.²³ This realization defines the allure with which Benjamin archived Blanqui's anticipation of Nietzsche's eternal return and, in good Benjaminian fashion, tied it to the historical condition that binds both together. Cut from the same cloth, Benjamin says, the “cosmic speculation” that both men engage in signals a new stage of materialism — a critical state fully responsive to the energetic content of history.²⁴

Alas, both Blanqui and Nietzsche are, in Benjamin's words, from a “century... incapable of responding to the new technological possibilities with a new social order,” which is to say a standpoint out of phase with the technological rush that rapidly overtakes political thought.²⁵ By the time Benjamin took his own life at Portbou, it looked

like that incapacity had extended to the twentieth century as well.

Benjamin was overcome on more than one occasion by matter, but this is not the same as saying that Benjamin was a new materialist, much less a new (or old) matter-ist. For in his account the problem with the eternal return of energy is that it provoked an unmediated image of industrial progress, rather than a dialectical one. Here we see the aesthetic force of capital's facility with industrialized energy fully formed: the fossilized mode of production projects an image of itself as a world. In order to move from the phantasmagoric to the dialectical, we will always need one eye on value and one eye on the cultural modulation of nature, lest we turn to either a vitalist new materialism allergic to historical determinability or a thermodynamic desocialization of value immune to the political.

The theoretical appearance of the eternal return as cosmic speculation is qualified by the rupture of fossil fuels, even if Benjamin does not yet fully grasp the systemic capacity that capital has drawn from them. It is clear enough to Benjamin that the war machine facilitated by capital drew unconscionable power from the earth's depths, and that this power was dislocating, violent, and significant at a cosmic level.²⁶ Neither Nietzsche nor Blanqui were *wrong* in their phantasmagoric image; rather, it is in their interpretation of the outcome that both skip over the historical conditions from which a reified concept of energy is made possible. Occasioned by the new concept of energy supplied by the industrial image of thermodynamics, these cosmic speculations verify the stylistic appearance of energy beyond any immediate experience of it and the incomplete project of critically grasping how it contours historical experience. That is, even if Benjamin is alert to the way in which fossilized energy itself leads to a materialist notion of cosmic time (or a geological time-scale, as we will later term it), his temptation by the cosmic is proximate to the deep time drawn up by fossil capital. This cosmological element in Benjamin's thinking is sometimes seen as the aberration in his claim to materialism, a similar kind of idealism to that which he takes issue with in the "eternal return" as it appears in Nietzsche. Benjamin's

“cosmic time” itself functions as another example of a kind of energy unconscious (like Nietzsche’s and Blanqui’s failure to historicize the concept on Benjamin’s account): Benjamin, in other words, does not fully grasp how the burning of crystallized cosmic-time in the form of coal undergirds industrialization; yet, as with Nietzsche before him, he somehow apprehends the consequences of energy’s historically specific stylistic expression, without yet knowing precisely how energy figures in the project of critical materialism.

The burning of the fossilized carbon locked away in long-dead plant and animal matter generates a decidedly new, indeed unprecedented, historical situation. Yet this assertion does little to discredit Blanqui, Lange, Nietzsche, or Benjamin; instead, it simply situates the eternal return on a geologic time-scale. Ashes to ashes, dust to dust, yet energy passes on for all of time. The problem, for us, is that we live in a fragile habitat, and that fragility is relative to a human standpoint already conjoined to radical social inequality. As Malm writes in *Fossil Capital*, “the causal power of the past inexorably rises” once capital becomes fossil fueled.²⁷ One cannot separate the cosmic order made available as *image* to Blanqui and Nietzsche, and in Benjamin’s critique of them, from the economic order of the industrialized energy system. Fossil capital’s burning away of condensed energy from past eras, previously sequestered in the Earth, catches up with the present in the form of billowing emissions that wrap the planet in a warming blanket. The industrialization of energy also produces a vantage from which to assess the ontological status of energy and its residues.

Energy’s economic elasticity and social plasticity in the form of fossil fuels, especially once oil becomes the dominant source of global energy in the 1950s is one kind of theoretical problem; its consistency — its unique immunity to creation and destruction — is yet another. Historical materialism was built for addressing this kind of challenge. Whence, then, a critical theory of energy? Where is energy in the critique of capital: an input on the side of labor; a force of production on the side of capital; or, is it somewhere else? Like most good questions, this one also has two sides. On one hand, if what interests

us is the political economy of energy, we can turn to Marx's own embedded critique of energy. Historical materialism is born in the same breath as the doctrine of energy conservation, not as a version of it, but as a rejection of its uncanny claim on value, history, and labor. For a political economic framing of energy and capital, one might search out the technical location and impact of energy in general on the composition and scientific critique of capital. One might look, for instance, to the human and animal calories per kilojoules of fuel extracted, to the length of the workday, to the organic composition of capital, and to the level of capital's reliance on energy from fossil fuels to maintain intensive gains year after year. On the other hand, if what interests us is a critical theory of energy, we can follow the conviction that Marxism works best when it conducts immanent critique rather than an intransitive orthodoxy, and ask: how are the core concepts that Marxism takes as its own transformed by the late twentieth- and early twenty-first-century experiences of energy substitution at the site of production and mounting impact of climate change everywhere else? This approach relies less on process and outcome. Turning to an ontology of energy, it points to a different order of question, and it has as much to do with the influence of Lucretius on Marx's materialism as it does with Blanqui's impact on the landscape of critical thinking in the twentieth and twenty-first centuries.

Materialism and the Critique of Energy

Patricia Yaeger has asked how humanists and social scientists might reconceive cultural history in light of the energy regimes that underwrite it. This same question might be asked of the history of theory: what is critical theory in the age of wood, wind, coal, and oil? Answering the question means clarifying the social structure of energy regimes offered across various traditions. Teresa Brennan, for instance, brings the work of Marx much closer to the economic and environmental impasse named by late fossil capital in her book, *Exhausted Modernity* (2000). Labor, Brennan insists, is an all too human category for Marxism's critique of the labor theory of value.

She argues that it moves too far in the direction of objectified nature to allow us to return to an ecological standpoint. To think the critique of the Gotha Programme while reading *Capital* provides one solution: against the orthodox position that only labor provides value — and the cult of the (masculine) body that flows from this position — the rejoinder that nature provides it too must be read back into the critique of the mode of production that depends upon labor power as well as labor's minimization. For Brennan, arriving at this point entails adding the “law of substitution” to the Marxist critique of capital.

The “law of substitution” follows from a critique of political economy without a subject, where labor power is an *embodied* force, but one that is nevertheless consistent with the other forms of energy: mechanical, chemical, electrical, atomic. Thinking about energy and labor in these terms achieves a kind of total mapping of what might be called the labor-energy relation. Brennan writes, “time is out of joint.... We smell this around us and know it in our bodies. We console ourselves with the myths of hybrids... while living the divide between a speedy fantasy that overlays us and a natural time that knows it is running out.”²⁸ The rising organic composition of capital squeezes tiny quotients of labor from ever more immiserated and precarious bodies. The concrete and electrical world of fixed capital weighs heavy on the critical and ecological will of the *polis*. At the same time, for Brennan, labor becomes at once calories, carbohydrates, lipids, protein, and depletion as well as consciousness, language, and international and gendered division. Brennan figures labor as at once matter *and* materiality — its relation to the environments in which it finds itself embedded is exogenously and endogenously regulated by flows of energy. As such, value begins to disappear as it bleeds in the background of the various flows of the “law of substitution.”

In this way, Brennan's work risks folding labor power back into the world of nature. It stops short by tying capital's use of energy to socially necessary labor time, threatened ever increasingly by the “violent conversions” of capital's energetic disposition. As Elmar

Altwater reminds us, nature is “not *value*-productive, because it produces no commodities to be sold on the market.... [I]t is labor which turns nature into commodities.”²⁹ Moreover Anna Tsing argues that nature is instrumentalized all the time as use value necessary for exchange value — as resource and as standing reserve — though, at any one time, the vast majority of it never enters this relationship quantitatively.³⁰ Instead, the standing reserve of nature gets reconfigured as either carbon sink or fuel in the age of fossil capital. Yet just as true for materialism and the critique of energy is the corollary claim implied by Brennan: namely, that labor power is itself a social relation produced out of capital’s economization of energy’s physical force, a relation that is suffused as much with electrical currents and data flows as it is with blackened carbon-full skies and bleached oceans. The question for today’s materialism would thus seem to pivot back and forth between the question of where value comes from, and how to locate energy in the production and destruction of economic, social, and natural environments.

However detached, Marxism’s theoretical inversion of energy into the dynamic of capital’s reinvention of labor is not purely conceptual, and coming to terms with the entanglements of capital and energy regimes from the vantage of Marxism necessarily engages in a dialectic of historicity — a coming to terms with the present as a historical moment, rather than as an empty totality, a plurality of pluralities, or an eternal return. It is to historicize, as Benjamin did for Blanqui, the temptation to think the eternal return of energy — the seduction of metaphysical immunity from economic and ecological catastrophe. If Marxism is to stay true to one of its guiding insights — that “[humans] make their own history, but they do not make it as they please” — it must renew its habit of attending to the pivot located in the critique of energy.³¹

The central insight that historical materialism brings to a theorization of energy is that the relation we have to fossil fuels, and indeed to all forms of generating, capturing, and storing or distributing energy, is *form determined by value*. Edison’s major innovation was

not the filament that would illuminate a glass bulb, but the grid that would distribute electricity from the point of its generation to the point of its consumption. He created the mechanism whereby energy could be brought to market. In this way, market relations, and the capital-labor relation underlying them, came to effectively mediate not only the price and draw of energy, but also which energy source would dominate economic capacity, turnover time, and the technical composition of consumption.³² While renewable technologies are gradually displacing fossil fuels from electricity generation — though the jury is out on whether renewables could ever make up for future demand in a growth curve — the grid itself as social *form* is wired for the accumulation of *value* (i.e. the former is determined by the latter). The grid's relation to the energy market, for instance, conceals the origin and source of the electricity, allowing for mixed modes of generation.³³

Etienne Balibar claims that “Marx’s materialism has nothing to do with a reference to *matter*.”³⁴ Following this line, one might say that *Marx’s materialism has nothing to do with a reference to energy either*, not because the concept and history of energy is not important to Marxism, but because it is essential to separate the sense of energy as eternal return from a dialectical sense of energy as social relation. In Malm’s words:

No piece of coal or drop of oil has yet turned itself into fuel, and no humans have yet engaged in systematic large-scale extraction of either to satisfy subsistence needs: fossil fuels necessitate waged or forced labor — the power of some to direct the labor of others — as conditions of their very existence.³⁵

You cannot *see* energy in the way that you can see a barrel of oil, because energy in the concrete is still abstract, and an energy system fueled by fossil fuels is more abstract still, even though it is determinate of virtually all economic and political capacities today.³⁶ Energy has come to determine the future of capital development in a

profound way. This is not to say that, therefore, energy is capital and capital is energy: ubiquitous and allusive, forever leaving its mark but hiding under the cloak of appearances.³⁷ Instead they bear a family resemblance, and not accidentally since capitalism's global spread since the industrial turn — its very systematicity — has been an effect of its facility with fossil fuels. Energy thus does not merely name the capacity for doing work, as in physics, with a focus on potential, kinetic, thermal, electrical, chemical, nuclear, or other forms of energy, but instead makes vivid the ways any future beyond capital must reconceive both the capacity for work and the flows of value. The critique of energy is the critique of our structural dependence on an environmental relation inherited from the industrial revolution; it is a critique of the facile faith in a technological fix to climate change; it is a critique of the many barbarisms that flow from the contradictions of late fossil capital; and it is a critique of a fossil-fueled hostility to the very notion of social revolution — and hence of the very notion of structural dependence too.³⁸

A Note on this Book's Structure

Today a number of critical positions on the importance of energy in social, environmental, and economic history are helping to address what was until very recently a blindspot in social science and humanities critique. This includes the historical work done by Timothy Mitchell, the economic critique developed by John Bellamy Foster and the *Monthly Review Press*, and the social-scientific inquiry into energy systems offered by John Urry. Many of the authors whose work is included here emerge from or have been in conversation with the Petrocultures Research Group in Alberta where, in the words of the co-authors of *After Oil*, a new approach to energy is today occasioned by the impasse of energy: "Oil is so deeply and extensively embedded in our social, economic, and political structures and practices that imagining or enacting an alternative feels impossible, blocked at every turn by conditions and forces beyond our understanding or control."³⁹ Hence many of our contributors look to unexpected traditions and

thinkers in order to kick-start a more cohesive critique of energy.

The collection opens with “Theories”: the pieces that comprise this grouping grapple with the categories provided by Marx’s critique of political economy and look for ways that energy might be properly integrated into such categories. Allan Stoekl begins this section by tracing the development of energy critique from a Marxist perspective, specifically addressing the quantification of labor and of energy that takes place in a capitalist system of accounting. He begins with a crystallized overview of Marx’s critique of the theory of value as it arrives in classical political economy and moves to consider how the expanded use of fossil fuels confirms Marx’s insight. Where Stoekl discusses oil and coal, Peter Hitchcock analyzes water as a vital resource in the reproduction of social relations characteristic of primitive accumulation, tied as it is to dispossession, energy generation, and the slow violence of capitalism’s crude realities. Moving into the territory of control, he asks what relation obtains between hydropower as electricity and hydropower as governing force.

The Anthropocene externalizes alienated labor. This is the argument that Daniel Cunha develops in his essay, which posits the Anthropocene as an unfulfilled promise of humanity’s collective stewardship over the Earth and the well-being of all. The new geologic era represents the impacts wrought by capitalist social relations under the direction of less than 25 percent of the planet’s population. Cunha asks: what theoretical tools do we have in Marxism to critique the Anthropocene without fueling the conceptual fetishizations so dominant in environmental discourse? Likewise, Katherine Lawless considers the material and cultural memory of the nuclear era in relation to contemporary discourse on climate and energy. Radionuclides are said to be the key indicator that the Holocene has ended, and that the Anthropocene has begun. Taking up the nuclear as power generator and as radiation’s trace, Lawless suggests that as fields of inquiry energy humanities and memory studies have much to gain from a critical crossing of wires. She

develops work on the concept of an energy unconscious — the idea that energy systems *implicitly* structure habits of thought — through its hinge in trauma and latch with nuclear power. Then, moving from residues to the point of no return, George Caffentzis reconsiders the “limits to growth” thesis through an analysis of Saral Sarkar’s *Eco-Socialism or Eco-Capitalism?* (1999) and *The Crises of Capitalism* (2012). Caffentzis finds much to be admired in Sarkar’s analysis, even as he engages its problematic relationship to history and class struggle. In the final paper of this section, Elmar Flatschart binds a form of value-critique to the conceptualization and politicization of energy relations. Building from his work with the German journal *EXIT! Krise und Kritik der Warengesellschaft*, Flatschart masterfully weaves what he calls “societal-nature relations” with a Marxist-feminist and an energy-critique analysis. Flatschart demonstrates that to take energy as a materialist category, theorists must problematize the “patriarchal, androcentric, and sexist model of the Othering of feminized (first) nature,” which dominates so much critical work on climate and energy.

The contributions in the “Histories” section of the book track problematics crucial to entwining the twin foci of the collection: the impact of fossil fuels on materialism and materialism’s critical apparatus for conceiving of energy and a collective politics responsive to its capacities and contradictions. Andreas Malm, whose *Fossil Capital* has been so central to the left critique of fossil fuels in recent years, develops here a theory of “Long Waves” of capitalist development. Deploying the work of Ernest Mandel, Malm periodizes waves of capitalist development around technological advances and energy advances, developing a periodization proper to fossil capital. The framework he provides here interfaces with world-systems theory and cultural analysis, offering a much-needed framework for historicizing energy. The book’s focus returns to nuclear power with Adam Broinowski’s history of nuclear development in the world system. Broinowski’s analysis ranges to Russia, the United Kingdom, India, and Japan. In “Keeping the Lights On,” David Thomas narrows

the historical frame and geographic scope to the United Kingdom during the 1970s to furnish a sense of the impact of what he dubs “the rise of electroculture.” In Thomas’s essay, it’s not the oil that’s at stake; it’s the machines, and forms of dispossession, that oil can power. Tracing a history of class struggle and state violence, Thomas deepens a critical frame indispensable to conceiving of labor politics and energy politics as mutually expressive, even as they appear to drift apart in today’s climate discourse.

The problem of oil for collective and revolutionary politics has been nearly eclipsed in the postwar period by the “peak oil” thesis. Gerry Canavan asks what are we to make of so-called “peak oil” arguments in light of alternative extraction techniques and natural gases. Canavan engages the question of what to do when the crisis becomes not too little oil, but too much. Going back even further, Daniel Worden traces the cult of personality associated with corporate entities to the life and attitudes of John D. Rockefeller. Rockefeller’s Standard Oil laid the groundwork for how corporate oil would dominate transportation and communications industries. Worden unpacks the social and cultural genres of big oil through Ida Tarbell’s *The History of the Standard Oil Company* (1902), showing that energy critique has wide resonance across histories and genres. The final piece in this section is Jasper Bernes’s “The Belly of the Revolution,” which traces the long history of agricultural development from before the birth of capital to the present. Bernes makes a political argument as well as a historical one: food will be a (if not *the*) primary concern for a revolutionary movement to come.

The contributors to the section of the volume entitled “Cultures” move the scope of analysis from that of theory and history into cultural form: that of books, art exhibits, and the lived relations of energy capital. Sheena Wilson engages with the utopian dimensions and crucial absences of Jonathan Porritt’s *The World We Made* (2013) — a book as emblematic as it is absurd in its projection a greenwashed capitalist future. Wilson insists that critical thinkers of energy need to also be critical thinkers of gender, race, and indigeneity, the cultural

histories of which are entangled to the asymmetries of fossil fuels and fossil capital at every stage. Greenwashing the technological base of the world after oil does more work to mask social inequalities than it does to urge us toward a renewable future. Moving deeper into the novel form, Amy Riddle demonstrates what a Marxist-oriented literary analysis and energy critique have to offer one another. Reading Helon Habila's novel *Oil on Water* (2010) and Abdelrahman Munif's novel *Cities of Salt* (1984), Riddle contrasts Habila's use of oil as content with the way oil works behind the scene in Munif's novel. She asks, "Why the abundance of physical descriptions of oil in the more contemporary novel?"

Turning to the realm of contemporary artistic production, Amanda Boetzkes circles the figurative use of energies in both political struggle and the work of machines. Taking up work from the 2015 Venice Biennale and Fredric Jameson's *Representing Capital*, Boetzkes argues for a reading of this art through Benjamin's use of the archaeomodern tool — in which political energies can be gauged in their representation as petrified objects. The final piece in this section had to come at the end — it would be too devastating to come at the beginning. Alberto Toscano develops a cultural theory of what he calls "universal exhaustion." Engaging Rabinbach's *The Human Motor*, Engels's *Dialectics of Nature*, and finally Sartre's *Critique of Dialectical Reason*, Toscano posits a powerful rebuttal to Jason Moore's concept of "double internality" that hinges on the dialectics and tragedy of depletion, exhaustion, and the limits to both nature and capital.

The essays in the final section of *Materialism and the Critique of Energy* ("Politics") take up the question of "what is to be done?" The thickness of our atmospheric haze and the social consequences of near-negative rates of profit, when stitched together, occasion new forms of struggle. "Politics" features infrastructural assessments, a call for direct action, and self-reflexive writing. Matthew T. Huber argues for a revision of Marx's "Development of Productive Forces." Huber tracks his argument through David Shwartzman's call for "Solar Communism." While careful not to pose a definitive answer,

Huber situates his analysis as a weighing of the options with the claim that “[h]istorical materialism is nothing else if not a commitment to understanding the political possibilities that exist given certain material conditions.” Jonathan Parsons’s contribution, “Anarchism and Unconventional Oil,” could not agree more with Huber’s insistence on gauging material conditions, yet Parson’s political conclusions insist on the importance of direct action in the struggle against hydraulic fracturing, bitumen mining, and other intensive processes of alternative extraction. Finally, taking on questions of biocapacity and surplus labour, Tomislav Medak interrogates the role of technology in energy transition. At its conclusion, Medak’s piece outlines a model for degrowth premised on the process, focus, and governance of technological development.

The two pieces that end this section push against the conventions of an academic collection, though their form as personal essays ought to be recognizable and refreshing. Warren Cariou offers a story about Indigenous labor in tar sands and the complicated overdetermination of work, life, land, and struggle that emerges from the tar sands of Northern Alberta and Saskatchewan. Dominique Perron’s piece offers another twist to the story of oil workers in Northern Canada. Her essay reflects on the migration of laborers from the far reaches of the country and discusses the effects of working in bituminous sands. Perron offers a Marxian-inflected Bourdieusian reflection on the workers and a coda on the May 2016 wildfires that ravaged Northern Alberta.

This book presents no single answer to the twin fields of social anguish that characterize the present: environmental catastrophe and capitalist crisis. Yet, it recognizes that these fields cannot be eliminated, reconciled, or transformed without thinking them together. The collected essays of *Materialism and the Critique of Energy* present starting points for carrying out the work of making energy into a conceptual category for the critique of capital and for figuring the dynamics of historical change crucial to understanding the role of energy in human development. Today, as the annual consumption

of fossil fuels lurches upward, emerging economies industrialize and postindustrial economies automate. The vague promise of a clean transition to a renewable economy rings out as capital's own false consciousness of its material structure. With a projected increase of 45 percent global energy consumption by mid-century in order to maintain current growth rates, we are no doubt on the brink of a major transition.⁴⁰ Without a materialist critique of energy, the transition will almost certainly exacerbate, rather than alleviate, environmental and economic anguish.

Notes

The authors are enormously grateful for sustained, challenging, and exacting feedback from Justin Sully, Imre Szeman, Nicholas Brown, and Marija Cetinić on this essay.

1. Karl Marx, *The Eighteenth Brumaire of Louis Bonaparte*, Marx/Engels Internet Archive, 1995, 1999 (1852), <https://www.marxists.org/archive/marx/works/1852/18th-brumaire/>
2. Energy names both the strength and vitality required for sustained physical or mental activity and the power derived from the utilization of physical or chemical resources. It is also true that fossil fuels have been the dominant source to power revolutions, the overthrow of colonial rule, and many of the imaginings of alternative social orders, which is not to mention the USSR, PRC, Yugoslavia, or other communist nations (each of which relied heavily on fossil fuels).
3. This collection responds to a set of challenges and questions posed by the emergent field of study called the energy humanities. For an introduction to the field, see Imre Szeman and Dominic Boyer's "Introduction: On the Energy Humanities in *Energy Humanities: An Anthology* (Baltimore: Johns Hopkins University Press, 2017); Bellamy and Diamanti's special issue of *Reviews in Cultural Theory* titled *Energy Humanities* (2016); the short

- treatise *After Oil* (2016; available in full at afteroil.ca); and the website of the Petrocultures Research Cluster (www.petrocultures.com).
4. See Brent Ryan Bellamy, "The Inertia of Energy: Pipelines and Temporal Politics," *Time, Globalization, and Human Experience*, eds. Paul Huebener, Susie O'Brien, Tony Porter, Liam Stockdale, and Rachel Zhou (New York: Routledge, 2016) 145–159.
 5. For an account of how Marxism anticipates, and is in the unique position to critique, the proliferation of materialisms today see Kimberly DeFazio, "The Spectral Ontology and Miraculous Materialism," *Red Critique* 15 (Spring 2014) <http://redcritique.org/WinterSpring2014/spectralontologyandmiraculousmaterialism.htm>
 6. Howard Caygill, "Life and Energy," *Theory, Culture & Society* 24.6 (2007) 21; Russell Kahl, Introduction to *Selected Writings of Hermann von Helmholtz* (Middletown, Connecticut: Wesleyan UP, 1971) xvi.
 7. Thomas Kuhn, "Energy Conservation as an Example of Simultaneous Discovery," *The Essential Tension: Selected Studies in Scientific Tradition and Change* (Chicago: U of Chicago P, 1977 [1956]) 72. Kuhn observes that without naming energy as such, William Grove (1811–1896) and Michael Faraday (1791–1867) in England, as well as C.F. Mohr (1806–1879?) and Justus von Liebig (1803–1873) in Germany, simultaneously observed both the convertibility of force across electrical, thermal, and kinetic forms, and more importantly that this force could neither be created nor destroyed.
 8. Here we are referring to scientific instruments such as James Prescott Joule's (1818–1889) apparatus for measuring the mechanical equivalent of heat and industrial mechanisms for converting energy such as the wind mill, water wheel, and steam engine.
 9. Kuhn, "Energy Conservation" 73, 96.
 10. By the mid-nineteenth century, the manufactory system had taken hold of Britain. Though the timing of this development is a hotly contested historical debate, the long transition from feudalism was now nearing its completion. T.H. Aston and C.H.E. Philpin, eds, *The Brenner Debate: Agrarian Class Structure and Economic Development in Pre-Industrial Europe* (Cambridge: Cambridge UP, 1987) and Ellen Meiksins Wood, *The Origins*

of *Capitalism: A Long View* (London: Verso, 2002).

11. Anson Rabinbach, *The Human Motor: Energy, Fatigue, and the Origins of Modernity* (Los Angeles: U of California P, 1990) 55.
12. For a compelling political argument modeled on the poetics of entropy see Karyn Ball, "Losing Steam After Marx and Freud: On Entropy as the Horizon of the Community to Come," *Angelaki: Journal of the Theoretical Humanities* 20.3 (September 2015) 55–78.
13. Though Marx rarely speaks of "energy," he does when discussing the industrial reserve army in Chapter 25 of *Capital*: "It is capitalist accumulation itself that constantly produces, and produces indeed in direct relations with its own energy and extent, a relatively redundant working population..." Karl Marx, *Capital: A Critique of Political Economy Volume I*, trans. Ben Fowkes (London: Penguin Books, 1976 [1867]) 782, 798.
14. Marx, *Capital Vol. I* 432.
15. *Capital Vol. I* 798.
16. Andreas Malm, "The Origins of Fossil Capital," *Historical Materialism* 21.1 (2013) 32.
17. Friedrich Nietzsche, "§341: The Heaviest Weight," *The Gay Science*, trans. Josefine Nauckhoff (Cambridge: Cambridge UP, 2008) 194–195.
18. Friedrich Nietzsche, *The Will to Power* (New York: Random House Books, 1967) 549–550.
19. We're grateful for Tyrus Miller's treatment of the concept of the eternal return and Benjamin's fascination with it in "Eternity No More: Walter Benjamin on the Eternal Return," *Given World and Time*, ed. Tyrus Miller (Budapest: CEU Press, 2008).
20. Frederick Lange, *History of Materialism Volume 1* (London: Trübner & Co., Ludgate Hall 1877) 151. The Blanqui Lange writes of is indeed the Blanqui after whom Blanquisme, a particular revolutionary attitude, gets its name. As Friedrich Engels wrote in *Der Volksstaat*: "Blanqui is essentially a political revolutionist. He is a socialist only through sentiment, through his sympathy with the sufferings of the people, but he has neither a socialist theory nor any definite practical suggestions for social remedies. In his political activity he was mainly a 'man of

- action,' believing that a small and well organized minority, who would attempt a political stroke of force at the opportune moment, could carry the mass of the people with them by a few successes at the start and thus make a victorious revolution." Friedrich Engels, "The Program of the Blanquist Fugitives from the Paris Commune," Marxists.org, trans. Ernest Untermann 1908, <https://www.marxists.org/archive/marx/works/1874/06/26.htm>
21. Walter Benjamin, "To the Planetarium," *The Work of Art in the Age of Its Technological Reproducibility, and Other Writings on Media*, eds. Michael W. Jennings, Brigid Doherty, and Thomas Y. Levin (Harvard: Harvard UP, 2008) 58.
 22. Benjamin, "To the Planetarium" 59.
 23. Nietzsche, *Will to Power* 550.
 24. Walter Benjamin, *The Arcades Project* (Cambridge, Mass.: Harvard UP, 1999) 15.
 25. Benjamin, *The Arcades Project* 26.
 26. Tyrus Miller contends that Benjamin understands eternal return socially and meta-historically as a critique of progress. Benjamin finds a fellow traveler in Blanqui on this investment. "Blanqui conjoins a temporality of crisis with a temporality of repetition," Benjamin claims, but he goes one step further and gives the shared time of crisis and repetition historical weight by situating what Miller calls the "privileged crisis point" in history—the very moment when this "cosmic order" becomes intelligible to Blanqui ("Eternity No More" 288).
 27. Andreas Malm, *Fossil Capital: The Rise of Steam Power and the Roots of Global Warming* (New York: Verso, 2015) 9.
 28. Teresa Brennan, "Why the Time is Out of Joint: Marx's Political Economy Without the Subject," *South Atlantic Quarterly* 97.2 (1998) 278.
 29. Elmar Altvater, "The Social and Natural Environment of Fossil Capitalism," *Socialist Register* 43 (2007) 41.
 30. Anna Tsing, "Sorting out Commodities: How Capitalist Value is Made through Gifts," *Journal of Ethnographic Theory* 3.1 (2013) 21.
 31. "...they do not make it under self-selected circumstances, but under circumstances existing already, given and transmitted from the past."

Marx, *The Eighteenth Brumaire*.

32. For a discussion of grids, futurity, ruin, and politics see Karen Pinkus, "Intermittent Grids," *South Atlantic Quarterly* 116.2 (April 2017) 327–343.
33. These components shift, behaving differently in varied historical contexts as well. The energy of the center is not the energy of the periphery. Moreover, the varied historical contents also have to be taken into account in different national contexts.
34. Quoted in Alberto Toscano, "Materialism without Matter: Abstraction, Absence and Social Form," *Textual Practice* 28.7 (2014) 1222.
35. Malm, *Fossil Capital* 19.
36. In tracking the lineaments of capital as a real abstraction, Benjamin Noys suggests there is "no image of capital, capital itself is a kind of pure relationality, a pure abstract relation of value, labour and accumulation, which can only be 'seen' in negative." Benjamin Noys, *The Persistence of the Negative* (Edinburgh: Edinburgh UP, 2008) units/cppe/seminar-pdfs/2005/toscano.pdf.
37. See also, "[m]oney is both abstract and real; it is a real abstraction that, even if it does not really exist, produces effects in reality." Oxana Timofeeva, "Ultra-Black: Towards a Materialist Theory of Oil," *e-flux* 84 (September 2017) <http://www.e-flux.com/journal/84/149335/ultra-black-towards-a-materialist-theory-of-oil/>
38. Timothy Morton, like other object-oriented-ontology enthusiasts, takes global warming as the final nail in the coffin for anything resembling revolutionary will: "We were perhaps expecting an eschatological solution from the sky, or a revolution in consciousness — or, indeed, a people's army seizing control of the state. What we got instead came too soon for us to anticipate it. Hyperobjects have dispensed with two hundred years of careful correlationist calibration. The panic and denial and right-wing absurdity about global warming are understandable. Hyperobjects pose numerous threats to individualism, nationalism, anti-intellectualism, racism, speciesism, anthropocentrism, you name it. Possibly even capitalism itself." Timothy Morton, *Hyperobjects: Philosophy and Ecology after the End of the World* (Minneapolis: U of Minnesota Press, 2013) 76.

39. Imre Szeman, et al., *After Oil* (Morgantown, WV: West Virginia UP, 2016) 16.
40. International Energy Agency, *World Energy Outlook* (Paris: OECD, 2008)