Materialism and the Critique of Energy

Edited by
Brent Ryan Bellamy and Jeff Diamanti

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Brent Ryan Bellamy and Jeff Diamanti

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To Imre Szeman, for everything and more.

For all those broken and exhausted by the impasse and for what yet may come.

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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 energic 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 energic 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 energic 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 communard 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)finitude 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 energic 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 energic disposition. As Elmar

Altvater 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 R*eviews 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)

Marxism, Materialism, and the Critique of Energy

Allan Stoekl

Marxism and the Question of Value

In all the discussions of economic crisis in recent years, there hovers an uncanny specter: that of the problem of energy. It's relatively easy to link rapacious capitalist exploitation of the earth to the contemporary ecological crisis; it's much harder to see beyond capitalism to another economic regime, one that would address not just economic and social injustice, but ecological exploitation and destruction as well.[1] Of course intuitively these injustices go together, but how precisely can one imagine a society respectful of both labor *and* the environment arising out of the collapse or destruction of capitalism in its current, not so novel form? Is the Marxist critique of an economic regime intimately linked to a fundamental critique of an energetic regime? How? Or is the Marxist critique *opposed* to an energetic one? And, finally — a question I will develop in the final section of this essay — is there a way of conceiving the "commodity" (the product, one can argue, of both human labor and energetic inputs) that leads to a revision of the notion of value as elaborated in the Marxist *and* energetic traditions?

The path of ecological economics and energetics is attempting, of course, a linkage that seeks broadly to reintroduce environmental and energetic concepts back into accounts of growth. I would argue, however, that there is an important contradiction between a Marxist critique of capitalism and the critique of capitalism carried out by ecological economists and energeticists. In the first case, from the

classic Marxist perspective, the final crisis of capitalism will be an essentially *economic* one: the falling rate of profit will render the larger capitalist economy unworkable and ripe for proletarian revolution. In the second model, capitalism's vulnerability is due above all to the fallibility of the growth model itself — the principle that the world's economy can indefinitely "grow" its money supply and its profits on the basis of a fundamentally finite world of energy resources and materials. The first model — Marx's — focuses on labor, falling profit, and the fallacy of the infinite expansion of capitalism through profit; the second — that of, among others, Frederick Soddy, M. King Hubbert, and Richard Heinberg, which I'll call here the energetic argument — highlights the material basis for the unworkability of capitalism: the finitude of the earth and its resources.[2] These are, one can argue, two very different propositions. Nevertheless, I will argue that, in the end, each theory provides something the other lacks and that, moreover, there is even a certain kind of complementary relation between them. And I will also argue, finally, that the Marxist and energeticist models are not only connected, but that future models of value must go beyond their seemingly inevitable dyad.

Let's look at Marx's model first.

Marx is forced to separate out the material basis of the "commodity" (the thing produced through human intervention) in a thoroughgoing way. This is a somewhat contentious point, and has been debated practically since *Capital* was first published. Certainly recent commentators, such as John Bellamy Foster, have underlined the fact that Marx stressed the double genesis of the commodity: "labor is the father of material wealth, the earth is its mother."[3] But one sees very little of mom in Marx's analysis in *Capital I*. The economic analysis is all important; the ecological — and Marx certainly never used the word — not at all.[4] In N. Scott Arnold's (rather problematic) summary, three basic theses characterize Marx's analysis of the value of the commodity:

> (1) The Law of Value (LV): Commodities that exchange in the market have equal value.
> (2) The Identity Thesis: The value of a commodity is identical to the quantity of socially necessary labor required to produce it.
> (3) The Theory of Surplus Value (TSV): The profit that accrues to the capitalist is the difference between the value of the labor power he employs and the value embodied in the product he sells.[5]

The second, "Identity Thesis" is, I think, the basis for the others, and for Marx's entire argument in *Capital*. The value of an object consists, quite simply, in the amount of work, done by a person, or persons, that went into it. And when a commodity is exchanged, there is, absent the ephemeral fluctuations in the market, an equivalence based on the inherent labor contained in the object.

But if value is identified with labor, then the question of what is and what is not labor looks like an important one for Marxists to ask. Arnold's second and third theses in fact conflate "socially necessary labor" (thesis 2) and "labor power" (thesis 3). But are "socially necessary labor" and "labor power" the same thing? Arnold seems to assume that they are, but the argument can be made that they are in fact quite different.

First, one should note that Marx indeed does distinguish between "labor" and "labor power." Marxist critic Duncan Foley notes that labor can produce products, which are "bought and sold as commodities." But, again quoting Foley, "it is impossible to give an exact sense to the idea of buying and selling labor itself, productive activity."[6] Why? Foley does not dwell on the point. Perhaps the problem is that labor itself is not a quantifiable element but an activity that cannot simply be reduced to a presence in a thing. What the laborer sells is not labor, but his labor power, which is, again according to Foley, not the product of labor but *the promise* "to expend labor in the interest and under the direction of the purchaser, in exchange for a sum of money, the wage."[7] It's almost as if labor in and of itself both founds and escapes the economic relation; it is a differential, a social relation

that makes possible an equivalency (the value of two commodities, compared) while itself remaining intangible. It is, on the other hand, labor power that can be quantified, but not in and of itself. Labor is doubled, and has to be, in other words, in labor power, and through this doubling labor is identifiable with any physical object whose value can be measured and compared — a physical object, in other words, a commodity, which can just sit there and have a comparable and convertible value.

It's through the quantification and abstraction of labor power that the capitalist makes his money: in surplus value there is a temporal differential between, as Marx writes, "that part of the working day necessary to reproduce the value of the laboring power, and the *surplus-time* or *surplus-labor* performed for the capitalist."[8] Labor power is something that is sold, and that goes to reproduce itself (by allowing the worker to live). Labor under capitalism reproduces itself through labor power, in other words. Labor can be abstracted, quantified, promised, represented, and misrepresented only in and through labor power, which is strictly speaking not labor. Labor power's performative is labor's misrepresentation. When it is represented or projected forward as a speech act — the constative and performative aspects of the speech act, in other words — labor is inevitably misrepresented: it is held to have a certain value, which is not, cannot be, its true value (under capitalism, at any rate). The value of labor power is inevitably double for this reason, and a double falsification: it is the power to reproduce a certain amount of labor (the worker receives money to eat, clothe, and house himself and his family) and an extra quantity of obfuscated labor — misrepresented labor — that is stolen from the laborer. The quantification of labor power under capitalism allows this to happen.

Representation, quantification, and abstraction are thus obfuscation; labor is wrapped up in the promise to expend (labor power), met by the (deceptive) promise to pay (in full, anyway). Labor itself floats at the margin, beyond representation, beyond category, beyond quantification, absolute, only what it is not: if labor

is somehow alive, intimately connected with the person, and with the necessary social activity of the laborer, it is known only through the exchange value of commodities, objects, which are themselves inert, passively sitting there, waiting to be compared. Dead, really, just quantified stuff. Labor can only be known, under capitalism, through this misrepresentation.

It is capitalism that has transformed the activity of labor to a quantified, abstract thing, a thing that allows the capitalist to unjustly take his share. My labor is inalienable; my labor power can be stolen. But how are the two conjoined?

I think there is a passage in *Capital* that gives us an idea of what Marx was getting at with labor (as opposed to labor power), although the passage in itself doesn't help us think about how to quantify it. Marx writes:

> [T]he commodity-form, and the value-relation of the products of labor within which it appears, have absolutely no connection with the physical nature of the commodity and the material [*dinglich*] relations arising out of this. *It is nothing but the definite social relation between men themselves which assumes here, for them, the fantastic form of a relation between things.* In order, therefore, to find an analogy we must take flight into the misty realm of religion. There, the products of the human brain appear as autonomous figures endowed with a life of their own, which enter into relations both with each other and with the human race. So it is in the world of commodities with the products of men's hands. I call this the fetishism which attaches itself to the products of labor as soon as they are produced as commodities.[9]

Note that Marx is concerned here above all in identifying labor as the source of value in commodities, with distinguishing labor as a "social relation" from the sheer thing status of the exchangeable commodity. Marx seems to be thinking of social relations as a kind of deep sociability, which one could argue is profoundly resistant to quantification. A commodity, in other words, is not a thing that

somehow has an independent life separate from human social relations. It is not a fetish, in the religious sense, an idol that exists above and beyond human society, blissfully alone in its realm of the absolute. Rather, it is defined as the concretization (the "crystallization") of relations between people. Labor is a social relation, it is *the* social relation: it is the one that really counts, the one that is embodied in the commodities upon whose use value we depend to live, and thus to continue in our social relations.

The fetishized commodity — that which exists as does a god, more alive than the laborers who produced it — is also the quantified commodity: it becomes autonomous when there is a definitive number attached to it (exchange value) that lets it exist independently of producers and their labor. From this perspective, while labor is the "definite social relation" par excellence, labor power is the ultimate fetish, the sheer quantification that opens the possibility, so to speak, of all other fetishes, all traded commodities that seem to have lives of their own.

The paradox of this is that Marx's materialism, which grounds value in labor, is nevertheless at a loss to account for any value, since labor itself — as opposed to labor power — is precisely not quantifiable. Labor power is a travesty of labor, just as the fetishized commodity is a travesty of labor. Labor is fundamentally resistant to quantification and hence representation. I would even go so far as to argue that Marx, the famous materialist, has largely disavowed the materiality of the commodity. The true commodity cannot incarnate labor power, for which a laborer is paid, but rather the labor that somehow eludes representation and quantification themselves, a kind of absolute labor. For this reason we still don't understand how labor entails value, or how that labor is conjoined — through the misrepresentation of labor power — to a calculable economic relation. Is quantifiable labor power just primordial capitalist ideology, which will fall away after the final Revolution? Or might there be something more to it, beyond ideology? How then can Marxist economic analyses of surplus value (and the concomitant final crisis of capitalism) be

carried out with scientific certainty?

Perhaps labor is only part of the story. The non-quantifiable social relation alone cannot explain how products are produced through a process that involves quantification: of labor inputs, of value that inevitably entails comparison of values. But if labor cannot be "fetishized" in quantifiable production and products, it nevertheless enters into relation with a quantification process. It does so, I would argue, through a kind of holy or unholy alliance with fossil fuels. Labor as the "social relation between men themselves" cannot accomplish anything without the add-on of energy derived from fuel.

Value, one could argue, is clearly dependent not just on human labor power, no matter how it is defined, but on the inputs of energy derived from sources external to the human body or human consciousness. Raising beams in construction, heating ore to make steel, transporting goods in trucks or trains: all require massive inputs of energy deriving, for the most part, from the combustion of fossil fuels. Marx, in passages other than the one I cited above, most certainly notes the importance of "two elements, the material provided by nature, and labour."[10] Stuff, provided by nature, is always part of any commodity. We always need stuff, and it comes, ultimately, from the earth. Yet energy in the form of both bodily and machinic fuel is not the same as mere stuff, as "material provided by nature."

Fossil fuels not only provide materials to make other things out of — plastics from petroleum and natural gas, for example — they also provide the energy inputs without which humans could not produce "commodities" on the scale required by modern industrial society. The energy derived from fossil fuels, in other words, contributes to the value of finished products. But from the standpoint of Marxism, what does it mean to *contribute* to the value of the finished products, if the orthodox claim is that labor is the sole source value? This energy, one could say, is a supplement to human labor, but it is nevertheless distinct from that labor. It is inanimate, and in its lifelessness it recalls the nightmare of commodity fetishism: the "*the fantastic form of a relation between things*."[11] Without externally derived energy, labor

(however one defines it) could accomplish only a tiny portion of what it does in the current fossil-fueled economic and industrial regime — or even in a non-capitalist one.

Yet Marx does not seem to recognize the importance of this difference between the materials used to make things and the materials that make labor possible. He notes it only to then ignore it. Consider the following quotation from *Capital I*:

> Raw material may either form the principal substance of a product, or it may enter into its formation only as an accessory. An accessory may be consumed by the instruments of labor, such as coal by a steam-engine, oil by a wheel, hay by draft-horses, or it may be added to the raw material in order to produce some physical modification of it, as chlorine is added to unbleached linen, coal to iron, dye to wool, or again it may help to accomplish the work itself, as in the case of the materials used for heating and lighting workshops.[12]

Note here the fact that Marx does not distinguish between what today we would call adjuncts (chlorine to linen) and uses of materials such as coal and oil that provide inputs to "accomplish the work itself." The addition to or modification of a material, in Marx's view, is no different from the energetic input of coal or oil which fuels an engine or heats a workshop. And yet the nature of these "accessories" is clearly quite different. Adding coal to a steam engine — or hay to a horse — makes the work it does possible; adding chlorine to linen, or oil to a wheel (to grease the wheel, I take it) merely facilitates a process that is powered in some way not disclosed.[13] Marx here, without making it explicit, provides a distinction between "work" and "labor": "accomplishing the work itself" presumably indicates the entire work process, incorporating both human labor and the supplemental energy of coal or oil (or hay). Marx, however, does not elaborate on this distinction, perhaps for fear of clouding the primacy of labor — the purely human and social component — in the constitution of value.

This ignoring of the component provided by energy sources (coal,

oil, hay) is perfectly consonant with what I earlier indicated as the nature of Marxian labor, found in the awareness of the labor process itself, as concretized in the commodity. If labor is essentially the social relation and our knowledge of it, while performing it, the component of "work" added to the production process by burning oil or coal will be largely irrelevant, or at least fundamentally external to what really matters in the creation of value. Labor is the living social relation; work, derived from fuel, is the offshoot of the calculable energy inputs derived from stuff (oil, coal, natural gas, whatever).

Once used, the energy derived from fossil fuels— the contribution of the energetic "accessory" to "work" — can never be returned. It does not fit into an economic model of restitution that is fundamental to Marxism: the worker regains control of his labor. A gallon of oil burned to power an engine in a communist regime would be no more and no less used — but not exploited, one can't exploit a thing — than under the worst capitalist regime. The thingness of oil bears no relation to the profound humanity of labor. Oil's energy is not somehow crystallized in the commodity, as labor is held to be. I will go further: if labor is profoundly resistant to quantification and even representation, then, on the other hand, energy resources *are* profoundly quantifiable. In fact, that is all they are: matter quantified, matter not somehow indicating a social relation, but matter (fuel) destroying itself, in order to make possible a kind of supplement to labor, namely, work: a certain number of watts, horsepower, or BTUs produced. Energy resources, after the admixture of labor, nevertheless are a gifted resource of the earth, they help laborers labor, but they are fundamentally alien to labor; they are the finite ("non-sustainable") adjunct that comes from the earth, that is taken from it. No human has labored to put them there.

Can one argue that considerations of energy expenditure must play no role whatsoever in considerations of the stagnation or ultimate crisis of the capitalist system? Should we assume that energy use is neutral and that there are no economic consequences to various fossil-fuel regimes? That the oil used to power an engine is no different from

the grease used to lubricate a wheel?

If we turn this line of questioning around, we can see another possibility: that human labor is only part of the story and that considerations of energy must play a fundamental role in any model of the stagnation, and hence ultimate fall, of the capitalist system. But the question remains, how?

We might even argue that the rather bizarre connection between labor and labor power — between that which fundamentally resists quantification and abstraction and that which is the very ground of that abstraction — is made possible by another and more fundamental connection: between labor as source of value and energy expenditure as source of value. If labor is, finally, "living" and thus social — not an inanimate and overweening fetish — then fuel for its part is dead — the residue of life on earth from millions of years ago. Labor only becomes effective when it is conjoined with inanimate energy. Labor in its social essence (if we can speak of such a thing) might remain fundamentally non-quantifiable, with "no connection with the physical nature of the commodity," and yet once labor in capitalism (and one assumes under some future communism) is intensified by energetic inputs from fuels it is somehow conjoined with "relations between things." Thus the true source of value may be found not in a Marxian unquantifiable labor, which in a mystical fashion conjoins with quantifiable energy inputs to create value, but rather in the energetic inputs themselves. In this case economic crisis finds its origin not in a "falling rate of profit" (ultimately based on inadequate restitution of profits to a hazily conceived labor), but instead in a crisis of growth tied to the ever-greater expense of energy derived from fossil fuels.

But basic questions remain: how is the monstrous hybrid of non-quantifiable labor and the quantification of energy inputs possible? What is their point of conjunction? And what then is the role, and fate, of labor? And beyond that, of sociality itself?

Energetics and the Matter of Critique

Another tradition exists, which posits another source of value, another scenario of economic stagnation and collapse, and another solution to the fundamental problem of social inequality. As in the Marxist model, this one stresses the idea that modern capitalism is doomed and that a more just regime will arise through the correction of the fundamental problem(s) that plagues modernity. And here, too, as in the Marxist theory of value, some reckoning is missing in the old order: a necessary reckoning that will account for the missing (or, in the Marxist case, stolen) component of value creation.

If the Marxist model posits surplus as the invisible element that makes the system function — the share created through the worker's labor that disappears into the capitalist's pocket — in this one that element is energy provided by external (so-called natural) sources. To be sure, oil is pumped (sometimes fracked), refined, and transported — all elements of its value that "crystallize" human labor inputs. But oil's value ultimately rests on the energy it releases that has not been added (and cannot be) through human effort. The crucial element here is Energy Return on Energy Investment (EROEI). Oil is of no value if its use value is only the embodiment of the energy (human and otherwise) invested in its production. The whole point is to get a kind of surplus value, not from the laborers themselves, but from nature. Of course Marx, as we have seen, anticipates the addition of a certain value to any commodity that would come as a "gift" from nature. But here the gift is what makes the entire operation of advanced capitalism function — it's a lot more than just the gift of passive materials like wood or iron ore, which are things given form through human intervention. Here the contribution of nature's "gift" is *active*. And indeed we can hardly call it a "gift," since there is nothing voluntary about nature giving it up.

An energetic theory of value makes possible an economic critique of the capitalist economy as it is currently constituted. This theory is associated with thinkers such as Frederick Soddy in the 1920s, and,

in the 1930s, an American economic and political group that styled itself "Technocracy Inc."[14] One of the key thinkers of Technocracy was M. King Hubbert, whose later work in the 1940s and 1950s came to greatly influence "peak oil" debates in the early 2000s. A contemporary follower of Hubbert, Richard Heinberg, presents the problem straightforwardly: the American economy is a growth economy: if it does not grow, it stagnates, and stagnation is inseparable from economic crisis. Prosperity is growth. But how is growth under capitalism possible?[15] Heinberg writes:

> Currently all nations have a type of financial system in which virtually all money is created through the making of loans. Thus, nearly all of the money in existence represents debt.... [M]oney is not a physical substance kept in a vault, but a fictitious entity created out of nothing by bankers in order to facilitate the keeping of accounts.[16]

Here again, as in Marx, we have the concept of a value that is a fiction: in the case of Marx, we saw that the wages paid to workers were a fiction, in the sense that they represented only a portion of the true value of the work "crystallized" in the commodity. In this analysis as well money is a fiction, because it is arbitrarily created to obfuscate — once again — the true source of value. Heinberg goes on:

> All of this being so, a problem arises: From where does the money come with which to pay back the interest on loans? Ultimately, that money has to come from new loans, taken out by others somewhere else within the financial network of the economy. If new loans are not being made, then somewhere in the network people will be finding it impossible to pay the interest on their existing loans, and bankruptcies will follow. Thus the necessity for growth in the money supply is a structural feature of the financial system.[17]

Nevertheless, one could object that the economy has continued to expand, and spectacularly so, for a hundred years — with, of

course, the occasional downturn. How was this almost continuous expansion — this growth — then possible? The answer is simple: from a continuous growth in energy supplies. Again, Heinberg:

> Until now, this loose linkage between a financial system predicated upon the perpetual growth of the money supply and an economy growing year by year because of an increasing availability of energy and other resources has worked reasonably well.... Productivity — the output produced per worker-hour — has grown dramatically, not because workers have worked harder but because workers have been controlling ever more energy in order to accomplish their tasks.
>
> ...With less physical economic activity occurring [due to the decrease in the availability of energy], businesses would be motivated to take out fewer loans. This might predictably trigger a financial crisis.[18]

The basic energeticist theory, then, from Soddy, the Technocrats, to Hubbert and Heinberg and many others, is consistent: increases in productivity derive ultimately from the energy provided by fossil fuel inputs. In fact all of the growth in the system (of "total economic activity, population, and money supply") derives from ever-increasing supplies of energy resources: coal, natural gas, and, above all, oil. A decline in the availability of these resources will mean a decline in the performance — and most certainly the growth rates — of the economy. Beyond stagnation, bad enough already, one can foresee social crisis of the worst sort.

"Cornucopians"[19] on the other hand, argue against the energeticists that "the stone age didn't end for want of stones," and that the oil age won't end for want of oil: in other words, shrinking supplies of fossil fuels will be replaced by technological wizardry and the development of other energy resources.[20] This argument is distantly related to that of Marx: energy supplies are fully dependent on human labor — in human technological advances — not just in the production and refining of supplies (crude oil to refined oil and gasoline, for example),

but in the very development of previously unknown or unknowable supplies. From this perspective the possible growth of energy supplies is limitless and is fully dependent on human labor.[21]

If, however, we continue to posit with Heinberg the eventual limits to growth — the earth is, after all, finite in its energy resources — we still have a problem. Labor is a secondary component in this model of value: it comes down, finally, to the control of energy supplies. Labor in this sense is pretty much just the expenditure of energy: it's the calories put out by the worker in the production of commodities, or, much more likely, in the work done to control the energy derived from external sources. There are "ecological" or "carbon footprint" models that purport to demonstrate the exact amount of carbon-based energy that must be expended to make a given product.[22] They at least offer the promise of the calculation of energy inputs in all products and activities. On the simplest level we can say that as energy costs rise — the price of oil and natural gas, for example — there will be less money to spend on other goods and services produced in the economy. Of course more money can always be issued (printed), but then the result will just be greater inflation. This is indeed what happened during the energy crisis of the 1970s. Or, since profits can no longer be derived from the continuous increase in the production of actual goods and services, profits will be derived, more and more, from speculative instruments (derivatives, sub-prime mortgages, pyramid schemes, and so on). And this is what happened in the late 2000s. In either case severe economic contraction results: the recessions in both the 1970s and late 2000s. Even if calculating the exact numbers behind the carbon footprint is extremely difficult, one could say that the effects of the shrinking supply of energy inputs would manifest itself in a precisely calculable way.

How to address the economic crisis resulting from ever more expensive energy? The simplest method would be, instead of issuing ever more money, and debt, the restraining of debt production by tying the economy directly to available oil resources. This is another way of saying that the amount of money in circulation must reflect the

currently available energy resources. As less energy resources become available, the economy too will have to contract (but in a controlled, well managed way!).[23] In the words of Colin Campbell, oil geologist and "peak oil" exponent:

> To achieve [price stabilization], producing countries would not produce oil in excess of their present national depletion rate: i.e., roughly speaking, the oil burnt, expended or exported must equal the oil produced or imported. Furthermore, it would be required that importing nations stabilize their imports at existing levels. This would have the effect of keeping world prices in reasonable relationship to actual production costs and let Third World countries afford their oil imports.[24]

Note that the price of oil here is tied not only to production but to consumption: "the oil burnt, expended or exported must equal the oil produced or imported." With consumption tracking production (which will be in decline), runaway inflation will be prevented: in other words, excess demand over supply will be eliminated, and economic collapse averted. But how will consumption be limited? How will restraints or constraints be imposed? Improvements in efficiency can go only so far.

Under an energetics model, where the labor value will be monitored and surplus value tracked (and presumably returned to the workers from whom it was stolen), oil production will be monitored carefully, and the economy constrained from outrunning available energy resources. In both cases — tying money to available resources or a resource-minded command economy — the fictions of economic skullduggery will be stripped from the system. The only problem is one that is found in most versions of communism as well (at least those versions that shy away from some form of anarchism): some specialized body or authority will be necessary to administer this economic and social transformation. But here there is a major difference: in the case of regimes inspired by Marxist analysis the

vast majority — the working class — will presumably be better off. The transformation of the economic system will result in a freeing of energies and minds and a more egalitarian distribution of wealth. In the case of the post–fossil fuel regime, however, fewer resources will be available, given that the true source of value is to be found in an ever-shrinking quantity of available fossil fuels. Life for many, in the first world at least, will become more constrained, not less. And, despite Campbell's best intentions (that is, provisions for stabilizing the import cost of oil for Third World economies noted above), one can hardly imagine that things will improve in the Third World, either. Perhaps more important, the result of this "Powerdown" (as Richard Heinberg calls it), is not *in principle* one of egalitarianism, freedom, and so on.[25] While Marx's model has at its core the promise of a future egalitarianism — the equalization of compensation, depending on one's needs — Campbell's is finally a technocratic one, with distribution to be decided by self-selected experts. It certainly could be more democratic or egalitarian than the current regime, but it could also continue to reinforce an unequal distribution of resources. What will count above all will be the stabilization of the currency, and the rate of depletion of natural resources, along with the end of the fiction of infinite growth and hence the forestalling of revolution, none of which necessarily implies the elimination of social injustice.

What's missing in the energeticist model is clearly a strong sense of social justice. While lip service might be paid to a more egalitarian social structure, the energy-based theory of economy ultimately relies on sheer quantification: EROEI, social systems designed to be adequate to the quantities of fossil-fuel derived energy available. One has the sense that this model recognizes what Marx's misses — the deep connection between quantification and value — but that it lacks precisely what Marx's provides: a strong theory of labor, and hence value, as social relation. If unquantifiable labor promised an ethical grounding for value without a way of precisely determining how stolen labor inputs were to be restituted, quantified energy inputs

provide a technical measure without ethical coherence. How value is to be grounded in both labor and abstract energy remains the crucial question. What is the articulation point, their point of connection? How can a future economy be imagined that would respect both the fundamental social bond and the energetic inputs necessary for the establishment and elaboration of that bond?

Marxism, Energy: Rethinking Economy

In both cases, value is embodied, contained, crystallized, in *things*. Stuff. And in both cases the truth of things reveals the way forward for economic stability, and, hopefully, justice. But what is the truth of things? The Marxist model contrasts the "fetishism" of the bad commodity under capitalism with the "social relation" of the good commodity under communism. The Soddy/energetics model contrasts the obfuscated value of fuel under the old growth regime (though the word "capitalism" is generally avoided) with the new, fully accounted-for value of fuel in the new; fuel is now fully human, not just combustible matter from the ground, but an inherent, comprehensible part of the new society that we will build.

In Marxism, the new, transparent commodity in which value is "crystallized" is, in principle, fully social, and not in any sense autonomous from human wants, needs, and labor. But, one has to point out, the commodity is still a thing. It is still something that always threatens to escape our complete and conscious control. We act on it, but it acts on us, in ways that are not always foreseeable. Some commodities are (or can be) sexual fetishes: they trouble us, and we can become their slaves. Some are great new "disruptive" inventions: they both make our lives easier and dislocate them. The commodity's needs sometimes seem to be greater than our own (this is certainly the case with the automobile). To say that one fully socializes an object by simply comprehending the labor it "crystallizes" seems, well, premature. The object is never just "us." It comprehends us as much as we comprehend it. It grasps our lives and turns them around, for better and for worse. The dream of labor and its products as sheer

social relation is always haunted by the autonomy of the object. The thing escapes our grasp, does what it was not supposed to do, and in its materiality resists one social relation while triggering another. It thwarts or arouses our desire; it quantifies itself, resisting the simple sociability of an evanescent but concrete "labor." Labor, finally, is inseparable from its crystallization, which defies us in abstraction: our world is composed, whether we like it or not, of substitutable objects, things we value (and depend upon) inordinately and which always confuse us with sexy, quantifiable significance. How big is it? How many can I have? What do others think of it? Can I make them want what I have? Conversely, has any Marxist ever been able to suggest what a non-fetish object would be? What would it look like? How would it be used? How would it embody the extirpation of all those nefarious human religious drives (not to mention the desiring ones)?

And oil is always oil, and coal coal, and gas gas — they are never simply tamed, their origin as value is never simply known, their unintended effects (climate change, fracking devastation) never simply under our control. We can never fully master through quantification or abstraction the inputs and outputs of fossil fuel. Even a single quart of gasoline burned results in the release of a small amount of carbon dioxide, a tiny movement in the direction of harmful climate change. Fossil fuels are always the energy slaves that resist us, that revolt against us, even when we think we have fully mastered them. Their objecthood defies our purposes: they interpellate, call to us to spend, to involve ourselves in modes of often socially destructive consumption and often asocial fantasies. They defy us by challenging us to calculate an incalculable (because of its scale) ecological footprint.

We can always coordinate models of social crisis and attempt to see how our mastery will ameliorate our lives and the lives of those living in the future. But just as one theory narrowly misses what the other theory accounts for, one has the sense that they function together in a strange chiasmus, the Marxist model both proffering a purely

social labor that nevertheless inevitably betrays itself in measurable objects, and the energetics model proffering sheer calculability with objects that relentlessly attempt to impose themselves as social beings, indeed as *the* dominant social beings, and *the* dominant purveyors of sociality, of the planet. Perhaps it is less a question of trying to imagine the strange and monstrous conjunction of sheer sociality on the one hand and sheer abstraction on the other, and instead realizing that the opposition itself is dependent on a certain model of selfhood that characterizes our modernity: a self that is absolute, absolutely self-conscious, absolutely social, but that knows itself and exercises its mastery (both individually and as an overweening social presence) through proxy objects that have meaning only when they're counted, compared, ogled, and assigned value.

One can in fact make the argument that both the Marxist and the energetic models are creatures of capitalism. This might seem obvious in the case of energetics, but Marxism itself is haunted by the specter of a fetishism that it correctly associates with capitalism but that comes to mark its own approach.[26] For Marxism too is concerned with a return of value to a true (originary) possessor (this time around the proletariat, labor, and so on), the appropriation of "natural" products and their utilization (which necessarily depends on quantification), and the exploitation of literally non-sustainable resources that are conceived as the sole property not of an individual but of a now liberated humanity. Perhaps the dyad labor-fuel is itself at fault in the sense that it either blankets the earth with a transcendent and ineffable humanity, or reduces it to a "mother" that does nothing more that give birth to great quantities of pumped and dumped stuff. Perhaps an economic model can be conceived that neither celebrates labor as the ultimate origin and valuation of things, nor one that celebrates energy as something that we can only measure in the act of using it while using it up.

Such a model, one could argue, relies more on voluntarism, gift giving, and the like. J.K. Gibson-Graham, for example, has attempted to work out the parameters of a "community economy" in the wake

of economic disinvestment: despairing, laid-off workers were encouraged to see their involvement in the economy not as one of passive dependence ("I need a job…") but rather one of active giving ("what can I contribute to the community?"). The economy, in other words, was recast as a movement much larger, and more profound, than that of the capitalist engine of investment, profit, and banking, with "jobs" — and workers — fully dependent on those things. The central question is no longer what can be taken from the earth (and what value to give it and the work it does), but rather how less stuff can be "used" and more can be freely distributed (the circulation of things given, loved, and repurposed). This is an economy, one could argue, more profound than one in which labor, resources, and prices are allocated from above. Perhaps most importantly, labor itself, resistant to quantification and hence comprehension, is replaced by other economic modes that are inherently outside the orbit of abstraction: sharing. The result was the development of a number of community organizations that helped foster a "non-market" economy where we find, for example:

> The woman who tithes (meaning giving away fully one-tenth of her income) but not to the church — to friends and neighbors who need it; The depressed single mother who volunteers twenty-four-hour counseling and support services to drug addicts; The retired insurance adjustor who does dowsing as a gift, a way of opening people to their powers of intuition and connecting them to the environment (he is also a spiritual counselor and gives away counseling and writings on grieving); The woman who raises "found" children (in other words, not her own), usually high-school aged boys.[27]

This is an economy where labor and energy as measurable terms are eclipsed by an involvement that gives rather than labors and that certainly uses energy, but not an energy dependent on fuels for which land is destroyed through pollution and wars are fought to assure supplies. And perhaps not even energy tied to the specter

of the depletion of fossil fuels. Renewable energy, tied to the small-scale economics of the sharing (and shrinking) economy, might even sound the death-knell of the capitalist economy so dependent on processing the stuff of personal possessions and the fuel that makes them possible.[28]

Energy, perhaps, can even be reconceived as *vibrancy*, as Jane Bennett calls it, which entails not so much the measure of the profit-loss (in all senses) profile of fuels and the carbon footprint of inanimate but fetishized toys as the active engagement of stuff as it works, as an agent, in and for a society that respects both people, animals, plants, and things (the "living" and the "inanimate"). Bennett, rethinking Lucretius's model of materialism in *De rerum natura*, writes:

> A primordial swerve [as in Lucretius] says that the world is not determined, that an element of chanciness resides at the heart of things, but it also affirms that so-called inanimate things have a life, that deep within is an inexplicable vitality or energy, a moment of independence from and resistance to us and other bodies: a kind of thing-power.[29]

In a world where things can labor and create, where energy is an "inexplicable vitality" that defies counting or exhaustion, where people can give and share, perhaps the economic crises analyzed in the Marxist and energetic traditions will have to be reconceptualized as opportunities, in which the social relation and the physical relation are seen not from the perspective of lack — never enough energy and possessions, always too much unremunerated labor — but of fullness, of excess.

With all that said, the questions of labor and energy remain. Both will continue to be quantified — they will have to be quantified — but perhaps from now on more in the context of gift-giving or sharing rather than exclusively in the mode of jealous accounting. After the fictions of value in capitalism (fictions that occlude the "true" value of labor and energy inputs), we might posit other, larger, fictions —

or at least colorful narratives. These might entail the decline of the exclusive and overweening self and the rise of resistant and active objects in variable and joyous communities. Such fictions could serve not as representations, but as markers for the futures of a society that has learned to question the omnipotence of the labor-energy dyad.

Notes

1. See Adrian Parr, *The Wrath of Capital: Neoliberalism and Climate Change Politics* (New York: Columbia UP, 2013).
2. Here I am using the term "energetics" to indicate an economic and social structure based in a very specific type of energy use, in this case (modern industrial capitalism) mainly involving the burning of fossil fuels (coal, natural gas, oil). This follows from the official definition of energetics: "Energetics (also called energy economics) is the study of energy under transformation." (https://en.wikipedia.org/wiki/Energetics)
3. Karl Marx, *Capital: A Critique of Political Economy Volume I*, trans. Ben Fowkes (London: Penguin Books, 1976 [1867]) 134.
4. Here I differ with John Bellamy Foster, the thrust of whose work is to maintain that for Marx the physical and natural inputs are as crucial to value as are those of human labor (see, for example, John Bellamy Foster, *The Ecological Revolution: Making Peace with the Planet* [New York: Monthly Review Press, 2009]). While I certainly agree with Foster that Marx acknowledges the inputs of "nature" and the dependence of humans on the "gifts" of nature, at the same time I recognize that Marx's analysis is concerned solely with determining how labor inputs determine value.
5. N. Scott Arnold, *Marx's Radical Critique of Capitalist Society: A Reconstruction and Critical Evaluation* (New York, Oxford: Oxford UP, 1990) 70.

6. Duncan Foley, "Labour Power," in Tom Bottomore, ed., *A Dictionary of Marxist Thought* (Cambridge: Harvard UP, 1983) 265–267; 265.
7. Foley, "Labour Power" 265.
8. Karl Marx, "Value, Price and Profit," in John F. Sitton, ed., *Marx Today: Selected Works and Recent Debates* (New York: Palgrave Macmillan, 2010) 99–122.
9. Marx, *Capital Volume I* 165.
10. *Capital Vol. I* 133.
11. *Capital Vol. I* 165.
12. *Capital Vol. I* 288.
13. Note here that a horse does the work, for which a human would take credit. How to separate a horse's "work" from a human's "labor"? Is a horse capable of providing "labor"? Why not? Is a horse exploited when it provides it, even though it doesn't consciously sell it? Or is a horse no different from a machine? Does its consciousness (or lack thereof) preclude its participation in the human paradigm of labor, value, and ultimately, liberation? What if a horse has a consciousness? Does it not count because it is not a human consciousness, an awareness of the sociability of the horse in human society? Could on the other hand a horse have a consciousness in general, or an awareness of its own sociality, in relation to human society? Or horse society? What is the difference between the exploitation of a horse laborer and the exploitation of a human laborer? Or, following Descartes, would Marx argue that a horse is only a sentient machine? One has the sense that if one could somehow answer these questions one would have a much better understanding of what "labor" is. But horses are hardly the only "animals" that work, either for humans or for themselves… Could there be a larger ecological theory of labor?
14. At least in the English speaking world, the link between economic value and energy was put forth most forcefully by Frederick Soddy (in, for example, *The Role of Money: What It Should Be, Contrasted with What It Has Become* [New York: Harcourt Brace, 1935]); in the German speaking world the chemist Wilhelm Ostwald had propounded it already in the late nineteenth century (see Wilhelm Ostwald, *Energetische Grundlagen*

der Kulturwissenschaft (Leipzig: W. Klinkhardt, 1909).

15. The Technocrats, in their era (the 1930s), were sometimes taken as a right-wing or even pseudo-fascist group (see Howard Scott, *Introduction to Technocracy* [New York: John Day, 1933]). The recent reappropriation of Hubbert and his "peak" theory — by Richard Heinberg and others — glosses over the intellectual history, and politics, behind the theory and practice of "Technocracy Inc." It is also true, though, that Stalinist communism, like fascism and Nazism, and even Roosevelt's New Deal, were seen by many in the 1930s and 1940s to be variants of Technocracy; the social movements were therefore conflated. A prime example of this position is James Burnham's laudatory *The Managerial Revolution: What Is Happening in the World.* (Westport, CT: Greenwood P, 1972 [1941]); George Orwell's dystopian view of the future (in *Nineteen Eight-Four*) stands as perhaps more of a rehash and virulent critique of Burnham's conflation of Technocracy and power across the political spectrum (Orwell was quite familiar with Burnham's book) than it does as a simple criticism of Stalinist communism (the usual reading of *Nineteen Eighty-Four*).
16. Richard Heinberg, *The Party's Over: Oil, War and the Fate of Industrial Societies* (Gabriola Island, BC: New Society Publishers, 2003) 170.
17. Heinberg, *The Party's Over* 170.
18. *The Party's Over* 171.
19. See Peter Huber and Mark P. Mills, *The Bottomless Well: The Twilight of Fuel, the Virtue of Waste, and Why We Will Never Run Out of Energy* (New York: Basic Books, 2006). "Cornucopians" are generally politically conservative commentators who see energy resources, and indeed all usable resources, not as finite, but as potentially infinite. One can forget the "limits" to growth; the earth is, on the contrary, a cornucopia producing endless quantities of goodies, given the infinite brilliance of human technical innovation. A notable cornucopian, besides Huber and Mills, is John Tierney of the *New York Times*. See, for example, the Simmons-Tierney bet: https://en.wikipedia.org/wiki/Simmons–Tierney_bet
20. On the ultimate value of this analogy, see "The 'Stone Age' Analogy Is The Dumbest Analogy Overused By Smart Energy People," in the

blog of D. Ray Long: http://raylong.co/blog/2013/10/17/the-stone-age-analogy-is-the-dumbest-analogy-overused-by-smart-energy-people. The "smartness" of the "energy people" who use this analogy is, however, not entirely evident.

21. A view contradicted by many recent works, especially ones that focus on the inevitability — and menace — of global climate change. See for example, Naomi Oreskes and Erik M. Conway, *The Collapse of Western Civilization: A View from the Future* (New York: Columbia UP, 2014). Works of this genre are slowly trending in the direction of a deep pessimism.
22. See Mathis Wackernagel and William E. Rees, *Our Ecological Footprint: Reducing Human Impact on the Earth* (Gabriola Island, BC: New Society Publishers, 1998).
23. One can argue that the cost of energy will rise not just because of "peak" production, but because of the ever-greater externalized costs of continued fossil fuel energy use — global climate change and so on. These costs will inevitably be reflected in the increase of the overall costs of doing business — and hence the crisis of the "growth" model would remain the same.
24. See Colin Campbell, "The Rimini Protocol, 2003" at http://en.wikipedia.org/wiki/Rimini_protocol
25. See Richard Heinberg, P*ower Down: Options and Actions for a Post-Carbon World* (Gabriola Island, BC: New Society Publishers, 2004).
26. The Technocrats in the 1930s argued that the government, and the economy, should be run with the same efficiency and competence as the telephone company (in those days a nationwide monopoly). See Scott, *Introduction to Technocracy.*
27. See J.K. Gibson-Graham, *A Postcapitalist Politics* (Minneapolis: U of Minnesota P, 2006) 151.
28. See, for example, Jeremy Rifkin, *The Zero Marginal Cost Society. The Internet of Things, The Collaborative Commons, and the Eclipse of Capitalism* (New York: Palgrave Macmillan, 2014), where the connection is made between the rise of the sharing economy (Uber, Airbnb, and so on) and the decline of traditional capitalism, based as it is upon high "marginal cost" (the costs of production and transfer), the personal possession

of objects, and the heavy use of fuels to subsidize their cost. In Rifkin's future people will share and give, much less stuff will be made (think of all the cars that will not be needed when self-drive Uber cars become ubiquitous), and what's left of capitalism (if anything) will be decoupled from the production of commodities and the necessities of growth. The economic model that started with the enclosure, in England, of previously collectively held lands — the appropriation by the few of previously shared resources — will be reversed, with a corresponding rise in communitarianism respectful of those shared resources.

29. Jane Bennett, *Vibrant Matter: A Political Ecology of Things* (Durham and London: Duke UP, 2010) 18.

"Water, water, every where, Nor any drop to drink": Accumulation and the Power over Hydro

Peter Hitchcock

I begin by adapting Adam Smith's thoughts on what will be discussed as the social division of a primary resource: "the accumulation of water must, in the nature of things, be previous to the division of labor."[1] This formulation would seem less controversial than the idea of original accumulation that Marx criticizes in Smith and other purveyors of classical political economy. For the human, water is always and everywhere a basic component of life, a natural need of being, and its social division decides how living proceeds — that is, life as species being. Yet accumulation, of course, has specific meanings within the history of capitalism, and the provision of water cleaves to every variation in its formations. As a primary resource, water's role in the political economy of neoliberalism has become an intense arena of contestation; nature, as an accumulation strategy, is now pivotal to the endgames of accumulation per se. Globalization has greatly intensified state and non-state activity over water and the number of institutions, sub-disciplines, and water authorities has increased exponentially. For instance, in 2015 the World Water Forum, the flagship product of The World Water Council (that describes itself as an "international multi-stakeholder platform") held its seventh tri-annual conference in South Korea with attendees from over 150 countries and hundreds of panels on everything from water security to climate change and of course, the business of water.[2] The governance and management of water is paramount among these discussions, whose subtext is necessarily political and economic (which is why the

forum is often the occasion for protest). While oil maintains a central (if arguably diminishing) role in the geopolitics of capital circulation, water's place is clearly pivotal to a neoliberal logic of power. Indeed, when we think of hydropower, for instance, we should maintain its meaning as both the ability to produce power from water and as a distinctive logic of power over water. Here I will focus largely on the latter as a means to understand more fully the dialectical impasse in the former. The greater the power over water, the greater the power from water undermines equitable modes of socialization. Indeed, for all of the abundance of water (71 percent of the Earth's surface) the problem of its accumulation under capitalism is also, whatever else it is, a question about the sustainability of/by accumulation itself. Indeed, in the following I am interested in addressing the aura of such representation and its constitutive limits, at the edge, as it were, of water rationality.

Water may not be possessed in the conventional sense but we always have it. Thinking about water in terms of dispossession then is an accumulation struggle over having rather than possession itself. Wherever water accumulates, we can *have* it without owning it, or we can collect (accumulate) it without taxation (a human has to reservoir water at some scale) unless some entity (state, corporation, private individual, etc.) claims ownership. The struggle over water is about different modes of accumulation — as Marx tells us, capitalism has no monopoly over accumulation. To have water is a necessity that preexists any and all regimes of its possession. The comparative scarcity and abundance of water remains crucial not just because it is overdetermined by forms of economic desire, but because water itself seems to slip free of the capitalist paradigms of commodification that are brought to it. If water is both free and finite, hydropower and hydration, atmospheric and remote, then the regime of accumulation built on water's multiplicity pivots on a doubled and self-eliminating logic of accumulation. Perhaps in the limit case of an "uncooperative commodity" we may witness the ways in which the commodity's function for capitalism can be overreached.

For the most part, I will address the problem of original accumulation in understanding the meaning of water for Marxist critiques of neoliberalism.[3] Clearly the struggle over water is most pressing in the Global South and more so under actually existing conditions of "adjustment" and modernization. The question at issue is not about policy necessarily, but instead about how the narrative of the provision and privatization of water asks important questions within a Marxist critique of globalization. In the last part of the essay I will examine the edge of such materialism by articulating the place of both water wars and hydropower in counter-hegemonic practices. As Arundhati Roy puts it in her discussion of activism around the Maheshwar Dam, "We were not just fighting against a dam. We were fighting for a philosophy. For a world view."[4] There is no magical key to the *Weltanschauung* of water, but the fighting over it is also and always already an engagement with the primary terms of political economy.

Original Accumulation

For Marxism, critiquing neoliberalism has renewed attention to the concept of primitive accumulation, although, as I will detail, its elaboration is no less a reinvention than the continuing dynamic of capitalism. Before considering work like Karen Bakker's on water privatization (which highlights the difference between having and owning water), and Adrienne Roberts's on the primitive accumulation of water (which differentiates this process in the Global South), it is important to address the valences of primitive accumulation as a theoretical lever.

To begin, one notes that Marx refers to the concept in *Capital Vol. I* as "so-called primitive accumulation" ("die s.g. [sogenannt] ursprüngliche Accumulation").[5] Two points are immediately germane. First, Marx's critique of Adam Smith on accumulation starts with his challenge to Smith's aforementioned assumption that "the accumulation of stock must, in the nature of things, be previous to the division of labor." This claim is, says Marx, mythical in its pretensions since accumulation of capital is coterminous and

continuous with the division of labor. Second, Marx reads "previous" as *ursprüngliche*, original, initial, or unspoiled, rather than as earlier or prior. This has the advantage of avoiding simple stagism (there are other possible meanings in *Ursprung*, not least as water source), but it has tangled translation ever since. Thus, faced with the prospect of "so-called original accumulation," Marx's English translators decide to gloss the term with a little mythology of their own and call it "primitive accumulation" (some French editions of *Le Capital* acknowledge Smith's term "previous" only to privilege the English translation as "primitive" — since the French edition is perhaps the most corrected by Marx himself, it is noticeable that in its current "definitive" version "ursprüngliche" becomes "initiale" — not quite "previous" [although the word "anterieure" is also added] but certainly not "primitive").[6] Just as the English version of *Capital* has resisted including key revisions of the definitive text in French (subsequently restored to the German), so few have tended to confront the terminological knot created by Marx in his enthusiastic debunking of the Smithian idyll. The use of "so-called" is meant to draw attention to the category error of Smith's political economy, but it has also mystified Marx's reading (his "so-called" rendering of "previous"), and this has tended to conspire in the isolation of original accumulation as a finished historical occurrence. Thus, when Marx notes, "[p]rimitive accumulation plays approximately the same role in political economy as original sin [*Suddenfall* — the Fall] does in theology," the observation cancels through his own assessment, for the attribution of "primitive" in the analysis of accumulation has become nigh talismanic, an original sin of almost incontrovertible proportions.[7] What was once a means to displace Smith from within a tradition of political economy might now be said to displace Marx from within his own, to the extent that "primitive" obfuscates the actual logic of accumulation in play. This displacement, as we will see later, is also operative in materialist discourses on water.

In his detailed exegesis of "primitive accumulation" Michael Perelman has approached such waywardness in terminology as

a means to readdress the concept's relevance for the present.[8] He correctly notes how Marx's understanding of primitive accumulation both shows the inadequacy of confining its operations to the past while yet preserving the advantage of this distance at other moments in his writing. Primitive accumulation is based on a violent separation in which workers become "free" (free from their ties to the land and especially from "any means of production of their own"). Historically, this state of freedom for workers has been won by forcible eviction, land enclosures, the diminution of the commons, and, as Marx underlines, more or less straightforward brutality: "the history of their expropriation is written in the annals of mankind in letters of blood and fire."[9] Primitive accumulation prepares the ground for capitalism proper by violently codifying worker dependency on the selling of their labor. As this commodification of labor goes, so goes all commodification under the sign of capital. The difficulty has been thinking this accumulation strategy as a contemporary component of capitalist dynamism, what Massimo De Angelis has referred to as "the continuous character of capital's 'enclosures,'" particularly in finding new markets, in displacing the contradictions of over-accumulation, and in confronting the continuing irksome relationship of labor to its operations.[10] Original or "primitive" accumulation can function at the edge of capital's reach, like the tips of a claw attempting to grip. Since not every space of socialization is capitalist, this mode of accumulation is both a historical process and an active one in the present, for the work of division never ends if such difference can be measured in capital accumulation itself. It is also important to emphasize that the "originality" of such accumulation also lies in its work at the heart of "so-called" mature capital markets — this is where core features of neoliberalism like asset-stripping and privatization are relevant, and the continuing legal struggles over, for instance, intellectual property become new frontiers of accumulation.

From the beginning of *The Invention of Capitalism*, Perelman makes clear what is at stake in "original" accumulation:

> The brutal acts associated with the process of stripping the majority of the people of the means of producing for themselves might seem far removed from the laissez-faire reputation of classical political economy. In reality, the dispossession of the majority of small-scale producers and the construction of laissez-faire are closely connected.[11]

Non-market measures (enclosures, violence, and so on) might be required to further this process in the countryside. Perelman continues:

> Formally, this dispossession was perfectly legal. After all, the peasants did not have property rights in the narrow sense. They only had traditional rights.... Simple dispossession from the commons was a necessary, but not always sufficient condition to harness rural people to the labor market.[12]

In addition to separating people from a sustainable relationship to the land, original accumulation developed a legal structure to enforce such separation: "A host of oftentimes brutal laws designed to undermine whatever resistance people maintained against the demands of wage labor accompanied the dispossession of the peasants' rights, even before capitalism had become a significant economic force."[13] Thus, in Perelman's analysis of the process Marx elaborates, so-called "original" accumulation was none other than violent expropriation, or what David Harvey has termed "accumulation by dispossession." Again, it is important to emphasize that original or "primitive" accumulation is not fixed in the past but understood as an active component of capitalist activity. Perelman does point out, however, that Marx sometimes presents original accumulation as a "presupposition" for developed capitalism (he quotes Lucio Colletti on *Grundrisse* in this regard), so, depending on who you read, such expropriation might be distanced from the present.[14] Nevertheless, to consider the chapter on primitive accumulation alongside the previous one on "The General Theory of Capitalist Accumulation" lends credence to the idea that

Capital represents a dynamic collocation of components that are never simply mutually exclusive. The becoming of capitalism is more about the intensities of historical emphasis, contingent accumulation, than it is the culmination of one aspect to the expiration of others. Whether growing or shrinking, capitalism moves in its febrile totality.

Understood from this vantage, the central elements of original accumulation can be seen all over the map of contemporary capitalism. Perelman, for instance, remarks on the destruction of small-scale farming in the United States in the twentieth century which indeed bears the hallmarks of primary dispossession. The largest migration in human history, the movement of some three hundred million peasants from the countryside to the city in China in the last thirty-five years, features substantial evidence of theft and expropriation of land for primary subsistence and subsequent levels of proletarianization that easily surpass the breadth and intensity of such transformation in early modern Europe. Even within the city, the curbing of self-provision continues apace (Perelman uses the example of high-density living reducing the space for washing and drying clothes, which makes the population dependent on private laundry facilities). As work like Silvia Federici's clearly shows, the social divisions of labor in the production and reproduction of life use unpaid labor to enforce the wage as a basic condition of socialization in general. Indeed, it is less that original accumulation precedes capitalism proper but that it mediates its continuing possibility.

Federici's book, *Caliban and the Witch* (2004), focuses primarily on the transition from feudalism to capitalism and explores the tension within accumulation as primitive, original, and prior.[15] Her critique of capitalist accumulation as always already based on women's production and reproduction of labor power extends along modernity's reach. As she discovers in her research in Nigeria in the 1980s, adjusting decolonization to fit neoliberalism pivots around attacks on social reproduction, whether in the attempt to force new enclosures of agricultural land, or via direct attacks on procreation rates as a means to discipline labor and labor power. As in another

key Federici work, *Revolution at Point Zero*, women's struggles over land are not an adjunct to regimes of accumulation but are written into discourses of subjugation and profound resistance to the same.[16] The question of hydropower at this level is crucially linked to women's struggle over the commons and a power over resources that stands against, for instance, the management of state assets promoted by the World Bank, or the ease through which privatization becomes privation. The reclamation of lands and water from avatars of neoliberal original accumulation is ongoing and particularly energetic in the Global South where what Federici calls the "commercialization of nature" is most acute.[17] The power over clean water is at the heart of social reproduction and explains why feminist praxis within accumulation is crucial to the future of the commons and the fate of the capitalist mode of production itself. But is neoliberalism actually an intensification of such original dispossession and how might this process be more conceptually elaborated? Four years after Perelman's intervention on accumulation by what he calls "primary dispossession," David Harvey published his now definitive essay on this very question.[18] After a detailed exegesis of how capitalist crises emerge and move in the contemporary world system, Harvey suggests such spatio-temporal fixes cannot be adequately understood according to the norms of classical political economy, nor by the super-separation of primitive accumulation from capitalism proper. Now, it is true Harvey has to underplay the contiguous framework Perelman outlines, but his intervention is to make of original or "primitive" dispossession a conceptual clue to the workings of neoliberal capitalism as a whole. For instance, if financialization manipulates money supply and the pricing of asset classes, it is a process that complements a similarly feverish desire to control basic elements of social sustenance, or what Marx calls species being. Harvey's critique of this dynamic combines a trenchant reading of *Capital* around Marx's interrogation of "so-called" primitive accumulation with an assessment of how this ostensibly distant process drives a new imperialism in the present. It is important to note Harvey's analysis is

not formulaic but attempts to address aforementioned symptomatic solutions to long-standing limits to capital accumulation like over-production, a falling rate of profit, and various spatio-temporal fixes that constellate the appearance of capitalism in a specific form. Pondering the "projection of power over space," Harvey argues through specific examples that "free trade does not mean fair trade."[19] How does primitive accumulation fit within this picture?

The attempted maintenance of U.S. power beyond the nostrums of the "Washington Consensus" reveals a highly complex and networked structure of financial and governmental interests across the globe, in which the U.S., through the World Bank and IMF, but also through coordinated activities of the U.S. Treasury and Federal Reserve, is able to create new levels of crisis management in the reassignment of accumulation. Such accumulation by "other means" is what Harvey terms "accumulation by dispossession," a powerful heuristic that shows the ways in which Marx's conceptualization can be rethought and reframed in the present. In part, Harvey's attention to the "predation, fraud, and thievery" of the credit and finance industries indeed highlights an intensification of such activities, particularly after the economic crisis of the early 1970s (which precisely called for "accumulation by other means").[20] All kinds of stock promotions, speculative bubbles, mergers and acquisitions (with attendant asset stripping) illuminate the period and reveal processes of financialization that appear relatively autonomous in their prescriptions and effects. New mechanisms of dispossession include WTO-inspired patenting and an expanded monetizing of intellectual property rights, biopiracy, the privatization of public assets like state universities, and the reappropriation of hard-won public goods like health care, pensions, and welfare. The level of rapacity in these areas is extraordinary and together they constitute defining elements of what neoliberalism has come to mean. Again, Harvey's point is about recognizing the amplification of such processes, rather than seeing them as an absolute break with accumulation practices of the past. But he also usefully links such active accumulation to periodic imperialist

adventures when the normal business cycles of production and reproduction seem unlikely to offer quick or sufficient return. This is both about a scramble for resources according to the price volatility of core commodities and a realignment of inter-state relations through structural adjustment often limned to the dictates of hedge fund or other speculation associated with the power brokers of finance.

There is little argument about the broad picture of the new financial architecture that Harvey paints and, since the critique is prefaced by long-standing connections outlined by Luxemburg and Arendt, the place of "accumulation by dispossession" in a genealogy of radical theorization seems both warranted and secure.[21] In the voluminous literature that has followed Harvey's essay, however, the specificities of accumulation by water have raised important caveats about its sweep. For instance, Adrienne Roberts notes that the commodification and "market governance" of water complicates the picture of neoliberalism and "new imperialism" Harvey is at pains to identify.[22] Like Federici, Roberts focuses on relations of social reproduction, which offer a particular valence on accumulation strategies of the Global South. What Roberts details is a "growing disjuncture between the scales and geographies of production and social reproduction" as a complementary critique to, for instance, Neil Smith's stress on the implications of the social reproduction of nature itself.[23] This, I believe, holds crucial lessons for how we understand the role of water as a distributed good and its meaning as a source of power. The "neoliberalization of socio-nature" is not just a matter of crass monetization but of a transformed logic in what we claim as sustenance.

Sustainability

How does water signify this changed relation while yet demonstrating that it is, as Karen Bakker avers, an "uncooperative commodity"?[24] Within colonialism, the provisioning and distribution of water clearly favored the colonizers and their surrogates not just for personal use but for irrigation that boosted cash crops and agricultural exports.

Part of the process of decolonization emphasized a redistribution of water resources as a sign that newly-independent states were sustainable at local and national scales. Yet increasingly, development under neoliberalism has meant the bracketing of more equitable sustainability, as even basic resources are factored into asset portfolios and debt servicing. Thus, on one hand, the development of a sustainable hydro-infrastructure links water security to state stability; on the other hand, the growth of water as an industry also means social discontent is weighed against the privatization of the social itself. Whereas water crises might have once signaled difficulties in sourcing supply, they now mean the extent to which accumulation races ahead of sustainability as such. "Market environmentalism" has never been so stark as it is in the business of water in which basic metrics of affordability and access have been overwritten in order to maximize prices and margins. In this sense, the power over hydro has become a primary arena of social contestation (not just over resources, but how the social itself is constellated). How does water change the understanding of original accumulation outlined by Marx and deepened in the work of Perelman and Harvey?

If Marx emphasizes the ways in which primitive or original accumulation presages qualitative transformations of the social that we now associate with capitalist dynamism *tout court*, is the privatization and monetization of water simply an expression of this process in the present, or does the "primitive accumulation of water" as Roberts terms it, challenge the socioeconomic logic in play? Much of the debate shows that privatization increases water rates, eliminates utility subsidies for the poor, and raises cut-off rates for the most disadvantaged. Roberts augments this view by including water's relationship to social reproduction, all of those elements of daily life that provide the constitutive conditions for capital accumulation in the wage (a focus that has the advantage of understanding the gendered division of such processes). As part of the retreat from Keynesianism, the idea of the social provisioning of water has been recast as one about access to capital. Water may be a

fictitious commodity, as Polanyi describes it, but its effects are all too tangible at differing scales, particularly the local.[25] Roberts notes, for instance, a disjunction between the transnational dimensions of contemporary water authorities and the understanding of local needs. When "full cost recovery" produces mass disconnections from a stable water supply, populations can be driven to water sources of dubious quality, with all of their attendant health risks. (Cholera outbreaks in South Africa, for example, have been linked to this crass rationalization of nature.) Overall, the power over hydro has shifted the economics of the social provision of water from the state and local authorities to the needs of families and associated communities who are then compelled to recalibrate the terms of social reproduction to maintain as best as possible water security's role in everyday life. As Arundhati Roy has argued to great effect, this displacement of responsibility over social provision has dramatically changed what counts as "the cost of living."[26]

If original accumulation institutes the power relations for class hierarchy, the rethinking of primitive accumulation under neoliberalism has also produced vital critiques about how modes of dispossession exacerbate inequalities of race and gender. Indeed, the importance of the struggle for water foregrounds the antinomies of combined and uneven development in its social divisions; water, in this sense, is thus not an adjunct to globalization as a world system but is instead a central heuristic in understanding the latter's maturity, limits, and contradictions. The reapportioning of responsibility in contrast to the affirmation and protection of rights is a key feature of the colonization of a social logic by an economic one and emphasizes the metonymic reach of neoliberal priorities. The reduction of socialization itself to the abstractions between price and value is not necessarily new (as the long history of original accumulation affirms), yet water power has distinct demands and reveals what is at stake in, for instance, the new social movements and in modes of resistance that seek to undo the meaning of globalization in its local instantiations. While the fight against the deleterious effects of water power

("hydropower as also the power over water") provides a strong sense of empowerment, the nature of the latter is itself uneven and often hinges on perceived national prerogatives and the self-image of the state. Neoliberalism, however, also promotes forms of empowerment, specifically those that encourage a stakeholder mentality with market characteristics, that is, that paying for water at higher rates is really only a sign of greater participation and that markets secure such social responsibility. It is true that the relative scarcity of clean, potable water necessitates "responsible" distribution, but here the question of "responsible" consumption is preempted by price points irrespective of demonstrable need. Water therefore becomes a structural antinomy in contemporary accumulation as such.

The place of water in globalization signifies a distinct "liquidity crisis" in capitalism: what is original to species being is no longer originary within a system of dispossession as exchange. This presents significant difficulties for both mavens of monetization and for those who reject and resist attempts to recolonize the commons. Ostensibly, for capitalism, water offers all kinds of niche market and branding opportunities: why drink from a fountain when you can both carry water with you and mark it as a lifestyle with singular prestige? Using the paradox "natural means commodity," premiums can be gleaned from "original sources" — *Ursprung* indeed — and branded differences (because water is transparent, its appearance as a commodity for marketing often comes down to names and the shapes or quality of the container). At this level, however, water margins are thin because every player in the business knows that creating scarcity in a consumer market is never an easy gambit, and especially so when an item is otherwise considered "naturally" abundant. If the market for branded water is commodification at its loudest, the appropriation of water within processes of social reproduction is neoliberalism's signal power, a seemingly quiet dispossession (because rational or rationalized) that has yet produced the greatest resistance. Water's logical resistance to commodification is tempered by the economic and political power available from its energic capacities.

Because accumulation as privatization has been prominently vexed over the provision of water, it has offered a significant window onto the processes of contemporary capitalism and the forms of opposition that interrupt them. Karen Bakker's extensive research on water privatization cautions against reproducing a public/private binary in this regard because both necessitate rethinking when it comes to the meaning of water and power in socialization.[27] In part, Bakker recognizes the significant emergence of the environmental commons, whose advocates see the limits of market and state rationalization as an impetus to seek viable community alternatives. The energy of water on this level is its power as a discourse of the commons which creatively negotiates water's various roles as an agricultural necessity, energy potential, and basic resource for life. According to Bakker, the commons is not just a broad-based bottom up approach to the redistribution of social goods but also has an institutional imprimatur that renders the concept quite similar if not identical to governmental structures it might otherwise be read to subtend. Seen in this light, Bakker offers a different reading of the water wars of Cochabamba, Bolivia — a celebrated struggle against water privatization (initiated by IMF structural adjustment contingencies in 1998) that sought community-based distribution.

As is well known, when large corporate conglomerates like Bechtel and United Water enter local markets, prices often rise sharply, and water metering becomes the standard model of distribution. Without recounting the complex turn of events surrounding the struggle over water control in Cochabamba, there is little dispute that the principle of water privatization was dealt a significant rebuke by a broad popular movement.[28] The problem has been converting strong local support for communal ownership of water resources into a viable public-to-public model across Bolivian society, one that would require a transformation of the public utility as an institute of government. Just as the scale of water supply necessitates different strategies regarding its use, so the antinomies of accumulation interlace strategies of resistance and change. Communities of self-

help preexist the nostrums of neoliberal monetization, but one mode of social provision does not simply cancel out the other: they exist in different logics of need. Bakker suggests that both the public/private and local/transnational oppositions need to be mediated or mutually implied rather than idealistically overreached. This is not a defense of privatization but an acknowledgment that elements of its efficiency (in contrast to more embedded forms of governmentality) might be learned rather than ignored or discounted in advance. More than this, however, Bakker argues that water is not in fact a "global commons" or even a scarce resource (scarcity is "produced") but a basic management problem.[29] It is true that appropriately scaled management models can improve the sourcing and distribution of water, but this seems to obviate the actually existing conditions of accumulation that inform the power structures such management embodies. This conditionality in and over water is most explicit when the power over hydro is in the service of hydropower.

Hydropower

While the history of hydropower is long, its specific role in the production of electricity is coterminous with industrial development and expansion. The same question of scales of accumulation applies in order to understand the conflicting needs of specific communities in relation to others and, just as the difference between water sourcing and place of consumption creates inequalities of access, so the infrastructural control over an electrical grid greatly affects how and where hydropower ends up being used. Whether a location can be optimized for the production of hydropower depends on a complicated web of factors, but here let's think of them in specific relation to the logic of original accumulation. It is quite possible to elaborate hydropower economics without reference to capitalism or indeed specific strategies of accumulation, but this can be understood not as an evasion of political economy but as a confirmation of its saturation.[30] Mega-dam projects in particular announce a kind of inexorable inertia in their financing, labor-intensive production,

architectural monumentalism, and social impacts — all without seeming to question the primary principles in their manifestation. But surely, water power is a renewable resource? It is cleaner to produce than anything fossil fuels can manage and is much safer than any nuclear option. Like the sun and the wind, water at this level is vital to any future premised on environmental sustainability.

The complexity of large scale hydropower projects requires formidable capital inputs, contracts, feasibility studies, legal reviews, environmental analysis, infrastructural build out, management and maintenance networks, and expansion potential. In short, if the source of water for the project involves local communities these are often disproportionately arrayed before the massive interests that mega-dams and generators represent. Whereas a water war may develop because of a necessary intimacy in exploitation — for example, Bechtel, in order to assure sufficient margins, must act locally — the struggles against any deleterious effects of a mega-dam are violently abstract. Both the privatization of water and the business of hydropower have their advantages: the former can improve supply volumes and potability for instance, while the latter can provide electricity in the absence of viable alternatives. Yet large-scale dam projects in particular offer the developmental logic of water management as a structural contradiction of capitalist history as a whole. Thus, while it shares with water sourcing and distribution a marked tendency to original dispossession — the displacement of 1.3 million people for the Three Gorges project and at least 200,000 people for the Sardar Sarovar Dam are strong indicators in this regard — the grand scale of modernization seems to trump a corresponding passion for justice, equity, and responsibility.

In her trenchant critique of the Sardar Sarovar project, Arundhati Roy asks the big questions: "Who owns this land? Who owns its rivers? Its forests? Its fish?"[31] This not only invokes the fate of the Adivasi, "original" inhabitants who have faced the brunt of displacement and dispossession, but the future of social organization itself when theft is legalized for "the greater common good" (which is also the title of

Roy's essay). Defenders of such modernization say "not to worry" because the age of the mega-dam is drawing to a close and that the shift to small, minimal-impact energy producing dams is a kinder, gentler, and environmentally friendly neoliberal protocol for the new millennium. Perhaps.

The problem is that the combined and uneven development of the world system calibrates the commons according to distributable harm (and not just benefit). The principled sourcing and allocation of water provides a litmus test of how the power over social being is not just imagined but instantiated. Even if the crude rationalizations for capitalism are to be expected, the structural logic of water exploitation is complex and contradictory precisely because of water's imbrication in "the cost of living." The plethora of institutions of water management is in part a multi-pronged approach to "manage" original accumulation as capital's constitutive desire. Since for humans water is not primarily a discretionary purchase, its role as a commodity is inexorably unstable as a market metric. Monopolistic pricing and the creation of scarcity might seem opportune, yet locally such accumulation by dispossession has engendered intense protest and struggle, as if what is primary in resources is coterminous with what is paramount for social division. At this level at least, we must say that hydropower means both a laudable element of a future defined by renewable resources and a primary arena of power over water that decides what is "original" in accumulation. Who wins this power decides the power of accumulation itself.

Notes

1. Of course, Smith ponders the accumulation of stock, not water, but his notion began all sorts of disputation about the "origins" of capitalism. Here I am concerned to explore resources held in common, rather than in common stock. See, Adam Smith, *An Inquiry into the Nature and Causes of the Wealth of Nations*, Vol. 2, eds. R.H. Campbell and A.S. Skinner (New York: Oxford UP, 1976) 277.
2. See *Water for Our Future: Seventh World Water Forum, April 12–17th, Republic of Korea*. The program can be accessed at http://eng.worldwaterforum7.org/introduce/program/program.asp.
3. See, for instance, David Harvey, *A Brief History of Neoliberalism* (Oxford: Oxford UP, 2005). The brevity of this tome should not detract from the critical global issues it addresses and the polemic it advances.
4. Arundhati Roy, *The Algebra of Infinite Justice* (New York: Penguin, 2001) 180. A notion of infinite justice for infinite water is a complicated algebra, not least because solidarity is mediated by competing equations about climate, the commons, and geopolitics.
5. Karl Marx, *Capital: A Critique of Political Economy Vol. I*, trans. Ben Fowkes (London: Penguin Books, 1976 [1867]) 873. Chapter Twenty-Six is devoted to this subject.
6. The point here is not to settle debate by deferring to the French edition over the English or German, despite Marx's editorial interest in the French text. It is less a problem of mistranslation or editorial authority and more a distinct conceptual difficulty that, for instance, reaches into what we mean by the time of capital and the fraught connection of labor and production.
7. Marx, *Capital Vol. I* 873.
8. Michael Perelman, *The Invention of Capitalism: Classical Political Economy and the Secret History of Primitive Accumulation* (Durham, NC: Duke UP, 2000). See also, Michael Perelman, "A Short History of Primitive Accumulation," *Counter Punch,* April 16, 2013, http://www.counterpunch.org/2013/04/16/a-short-history-of-primitive-accumulation.
9. *Capital* 875.

10. See, for instance, Massimo De Angelis, *The Beginning of History: Value Struggles and Global Capital* (London: Pluto Press, 2007). Among other crucial points in De Angelis's rearticulation of autonomist thought, he finds forms of enclosure all over the contemporary maps of capitalism and a burgeoning and creative resistance to its manifestations. From this perspective, "primitive accumulation" is not part of some Marxian "pre-history" but is a lived distillation of capitalist processes. One doesn't begin history after the revolution but within the material struggles against capitalism, vibrant alternatives already posed inside and outside its reach.
11. Perelman, *Invention* 2.
12. *Invention* 13–14.
13. *Invention* 14.
14. See Lucio Colletti, *Marxism and Hegel*, trans. Lawrence Garner (London: Verso, 1979) 130. When Marx talks in terms of serfs with "the presuppositions of their becoming which are suspended in their being" he suggests that peasants are locked into pastness as process, which grates with the interpretations of Perelman, Federici, and Harvey, who find the logic of capital active in its present. See, Karl Marx, *Grundrisse*, trans. Martin Nicolaus (London: Penguin, 1973) 459–460.
15. See Silvia Federici, *Caliban and the Witch: Women, the Body, and Primitive Accumulation* (New York: Autonomedia, 2004). Federici's work here reaches back to earlier research, particularly feminist interventions on social reproduction that appeared in the 1970s (the Wages for Housework movement, for instance). The project reframes the history of capitalism, especially the transitional phase in early modernity. While Federici uses the word "primitive" this is as much about the ironies and contradictions of "witch hunts" as it is a nod to notions of a less-developed capitalism.
16. See Silvia Federici, *Revolution at Point Zero* (Oakland: PM P, 2012). The title is an allusion to another pivotal feminist text, the novel translated as *Woman at Point Zero* by Nawal el Saadawi.
17. Federici, *Revolution* 143.
18. David Harvey, "The "New' Imperialism: Accumulation by Dispossession," *Socialist Register* 40 (2004) 63–87. Although Harvey builds on the work of

Perelman and Federici, he is much more concerned to figure "primitive accumulation" within contemporary articulations of imperialism so that the concept becomes a touchstone in understanding political economy and geopolitics after the end of the Cold War.

19. David Harvey, "The 'New' Imperialism" 71.
20. "The 'New' Imperialism" 74.
21. The relevant texts are Hannah Arendt, *Imperialism: Part Two of the Origins of Totalitarianism* (New York: Harcourt Brace, 1968) and Rosa Luxemburg, *The Accumulation of Capital*, trans. Agnes Schwarzchild (New York: Routledge, 2003).
22. See Adrienne Roberts, "Privatizing Social Reproduction: The Primitive Accumulation of Water in an Era of Neoliberalism," *Antipode* 40:4 (2008) 535–560. Roberts's article provides an excellent bridge between the theoretical discussions of primitive accumulation and the political questions hydropower, the power over hydro, compels.
23. Neil Smith, "Nature as Accumulation Strategy," *Socialist Register 2007: Coming to Terms with Nature*, eds. Leo Panitch and Colin Leys (London: Merlin Press, 2007) 16–36.
24. See, Karen Bakker, *An Uncooperative Commodity: Privatizing Water in England and Wales* (Oxford: Oxford UP, 2004).
25. The concept of fictitious commodities comes from Karl Polanyi, *The Great Transformation: The Political and Economic Origins of Our Time* (New York: Farrar & Reinhart, 1944). The idea here, of course, is that water is a social necessity and therefore does not "cooperate" with the prescriptions of the commodity form.
26. See Arundhati Roy, *The Cost of Living* (New York: Modern Library, 1999). In this book Roy analyzes power as production and domain through India's development of dams and nuclear reactors. "The Greater Common Good" in particular, is a searing critique of the Sardar Sarovar Dam project and a template for resistance, fighting the power of hydro as an accumulation strategy.
27. In addition to *An Uncooperative Commodity*, see, for instance, Karen Bakker, "Archipelagos and Networks: Urbanization and Water Privatization in the South," *Geographical Journal* 169:4 (2003) 328–341;

"A Political Ecology of Water Privatization," *Studies in Political Economy* 70 (2003) 35–58; "The 'Commons' versus the 'Commodity': 'Alter'-Globalization, Anti-Privatization and the Human Right to Water in the Global South," *Antipode* 39:3 (2007) 430–455; and "The Ambiguity of Community: Debating Alternatives to Water Supply Privatization," *Water Alternatives* 1:2 (2008) 236–252.

28. The Cochabamba water war has been extensively debated. A good introduction is Oscar Olivera, *¡Cochabamba!: Water War in Bolivia* (New York: South End Press, 2004). The story of how transnational conglomerates like Bechtel and United Utilities extend the reach of World Bank structural adjustment in the Global South is central to an understanding of primitive accumulation in neoliberalism. Here water becomes a frontline over conditions of socialization and sustainability. For more on the continuing struggles over water in Bolivia see Emily Achtenberg, "From Water Wars to Water Scarcity: Bolivia's Cautionary Tale," *ReVista: Harvard Review of Latin America* 7:2 (2013) 39–41. The entire issue is dedicated to the problem of water in South America.
29. Bakker, *Uncooperative Commodity* 216.
30. See Finn R. Førsund, *Hydropower Economics* (New York: Springer, 2015). It is both distressing and hardly surprising that "management science" can so insistently disconnect its calculations from what Roy calls "the cost of living." Power politics begins in the space of this disconnection.
31. See Roy, *The Cost of Living* 45.

The Anthropocene as Fetishism

Daniel Cunha

> A society that is always sicker, but always stronger, has everywhere concretely re-created the world as the environment and decor of its illness, a *sick planet*.[1]

The "Anthropocene" has become a fashionable concept in the natural and social sciences.It is defined as the "human-dominated geologic epoch" because in this epoch of natural history it is humanity that is in control of the biogeochemical cycles of the planet.[2] The result is catastrophic: the disruption of the carbon cycle, for example, leads to a global warming that approaches tipping points that might be irreversible.[3] The exponential growth of our freedom and power, that is, of our ability to transform nature, is now translated into a limitation to our freedom, including the destabilization of the very framework of life. It reaches its highest degree with the problem of global warming.[4] In this context, it becomes clear that the Anthropocene is a contradictory concept. If the "human-dominated geologic epoch" is leading to a situation in which the existence of humans might be at stake, there is something very problematic with this sort of domination of Nature that should be investigated. Its very basic premise, that it is *human*-dominated, should be challenged — after all there should be something *in*human or objectified in a sort of domination whose outcome might be human extinction.

What is claimed here is that, exactly as for freedom under capitalism, the Anthropocene is an unfulfilled promise. Freedom in capitalism is constrained by fetishism and class relations — capitalist

dynamics are law bound and beyond the control of individuals; the workers are "free" in the sense that they are not "owned" as slaves, but also in the sense that they are "free" from the means of production, they are deprived of their conditions of existence; the capitalists are "free" insofar as they follow the objectified rules of capital accumulation, otherwise they go bankrupt. Likewise, the social metabolism with Nature is constrained and objectified: I claim that the Anthropocene is the fetishized form of interchange between Man and Nature historically specific to capitalism, the same way that the "invisible hand" is the fetishized form of "freedom" of interchange between men.

Since primitive accumulation, capital has caused a metabolic rift between Man and Nature. It was empirically observable at least since the impoverishment of soils caused by the separation of city and countryside in nineteenth century Great Britain.[5] In the twenty-first century, though, this rift has become globalized — critical disruptions of the carbon cycle (global warming), the nitrogen cycle, and the rate of biodiversity loss — in a way that implies that humanity is already outside of a "safe operating space" of global environmental conditions.[6] The Anthropocene, appears, then, as the globalized disruption of the natural cycles of the Earth, not as a planned, calculated, and controlled disruption, but, crucially, as an unintended side effect of social metabolism with Nature that seems to be progressively *out* of control.

Perhaps the most striking example is the massive burning of fossil fuels at the root of climate change. The motivation for it was for industrial capital to access plentiful cheap labor in cities with the use of a mobile energy source (coal) during the Industrial Revolution. This was impossible with the use of hydraulic energy, which limited industrial activity to the vicinity of waterfalls, often located in depopulated rural areas, and increasingly so as industrial production grew and the exploitation of new waterfalls was needed.[7] This transition from hydraulic to fossil energy, therefore, was determined by the valorization of value; there was no intention

to manipulate the carbon cycle or to cause global warming, nor, indeed, were such eventualities recognized as possibilities prior to the mid-twentieth century. The result, though, is that, in the twenty-first century, atmospheric carbon dioxide concentration is already beyond the safe boundary of 350 parts per million (ppm) for long-term human development. As for the nitrogen cycle, it was disrupted by the industrialization of agriculture and fertilizer production, including the fixation of atmospheric nitrogen with the Haber-Bosch process. Again, there was no intention or plan to control the nitrogen cycle, to cause eutrophication of lakes, or to induce the collapse of ecosystems. Nevertheless, the boundary of sixty-two million tons of nitrogen removed from the atmosphere per year has already been surpassed, with 150 million tons in 2014.[8] A similar story can be told about the rate of biodiversity loss, and the phosphorous cycle and ocean acidification are following the same pattern. The "human-dominated" geologic epoch, in this regard, seems much more a product of chance and *unconsciousness* than of a proper control of the global material cycles, in spite of Paul Crutzen's reference to V.I. Vernadsky's and Teilhard de Chardin's "increasing consciousness and thought" and "world of thought" (noösphere).[9] "They do not know it, but they do it" — this is what Marx said about the fetishized social activity mediated by commodities, and this is the key to a critical understanding of the Anthropocene.[10]

In fact, Crutzen locates the beginning of the Anthropocene in the design of the steam engine during the Industrial Revolution.[11] Instead of seeing it as an unmediated effect of technology, however, the determinants of the "human-dominated" geologic epoch should be conceptually investigated in the capitalist form of social relations. With his analysis of fetishism, Marx showed that capitalism is a social formation in which there is a prevalence of "material relations between persons and social relations between things," in which "the circulation of money as capital is an end in itself."[12] Capital is the inversion where exchange value directs use, abstract labor directs concrete labor: "a social formation in which the process of production

has mastery over man, instead of the opposite," and its circulation as money and commodities for the sake of accumulation constitutes the "automatic subject," "self-valorizing value."[13] Locating the Anthropocene in capitalism, therefore, implies an investigation into the relation between the Anthropocene and alienation, or, as further developed by the late Marx, *fetishism*.[14]

According to Marx, the labor-mediated form of social relations of capitalism acquires a life of its own, independent of the individuals that participate in its constitution, developing into a sort of objective system over and against individuals, and increasingly determines the goals and means of human activity. Alienated labor constitutes a social structure of abstract domination that alienates social ties, in which "starting out as the condottiere of use value, exchange value ended up waging a war that was entirely its own."[15] This structure, though, does not appear to be socially constituted, but natural.[16] Value, whose phenomenal form of appearance is money, becomes in itself a form of social organization, a perverted community. This is the opposite of what could be called "social control."[17] A system that becomes quasi-automatic, beyond the conscious control of those involved, and is driven by the compulsion of limitless accumulation as an end in itself, necessarily has as a consequence the disruption of the material cycles of the Earth. Calling this *Anthropocene*, though, is clearly imprecise, on one hand, because it is the outcome of a historically specific form of metabolism with Nature, and not of a generic ontological being (*antropo*), and, on the other hand, because capitalism constitutes a "domination without subject," that is, in which the subject is not Man (not even a ruling class), but capital.[18]

It is important to note that fetishism is not a mere illusion that should be deciphered, so that the "real" class and environmental exploitation can be grasped. As Marx himself points out, "to the producers… the social relations between their private labors appear as what *they are*, i.e., as material relations between persons and social relations between things"; "commodity fetishism… is not located in our minds, in the way we (mis)perceive reality, but in our social

reality itself."[19] That is why not even all scientific evidence of the ecological disruption, always collected *post festum*, is able to stop the destructive dynamic of capital, showing to a caricatural degree the uselessness of knowledge without use.[20] The fact that now "they know very well what they are doing, yet they are doing it" does not refute, but rather *confirms* that the form of social relations is beyond social control, and merely changing the name of the *Anthropocene* (to *Capitolocene* or whatever) would not solve the underlying social and material contradictions.[21] Value-directed social production, that is, production determined by the minimization of socially necessary labor time instead of by the conscious satisfaction of social needs and desires, results in an objectified mode of material production and social life that can be described by "objective" laws. Time, space, and technology are objectified by the law of value. Of course the agents of the "valorization of value" are human beings, but they perform their social activity as "character [masks]," "personifications of economic relations": the capitalist is personified capital and the worker is personified labor.[22] The fetishistic, self-referential valorization of value through the exploitation of labor (M-C-M') with its characteristics of limitless expansion and abstraction of material content implies the ecologically disruptive character of capitalism, wherein "the development of productive forces is simultaneously the development of destructive forces."[23] Self-expanding value creates an "industrial snowball system" that is not consciously controlled, but "a force independent of any human volition."[24] In this context, it is not a surprise that the disruption of global ecological cycles is presented as the *Anthropocene*, that is, as a a *natural process*. That Man is presented as a blind *geologic force*, such as volcanic eruptions or variations in solar radiation, is an expression of the naturalized or *fetishized* form of social relations that is prevalent in capitalism.

In this sense, the technical structures with which Man carries out its metabolism with Nature is logically marked by fetishism. As Marx notes, "technology reveals the active relation of man to nature, the direct process of the production of his life, and thereby

it also lays bare the process of the production of the social relations of his life, and of the mental conceptions that flow from those relations."[25] In capitalism, production processes are not designed according to the desires and needs of the producers, ecological or social considerations but according to the law of value. Taking as an example the world energy systems, it has been demonstrated that there is no technical constraint to a complete solar transition in two or three decades if we consider the use-value of fossil and renewable energies (their energy return and material requirements), that is, it is technically feasible to use fossil energy to build a solar infrastructure to provide world energy in a quantity and quality sufficient for human development.[26] This transition, which from the point of view of use value or material wealth is desirable, necessary, and urgent, is not being carried out, though, because fossil energy is still more prone to capital accumulation, to the valorization of value: capital went to China to exploit cheap labor and cheap coal, causing a strong spike in carbon emissions on the eve of a climate emergency, in a clear display of fetishistic irrationality.[27] More generally, the American ecologist Barry Commoner has shown that in the twentieth century many synthetic products (such as plastics and fertilizers) were developed that took the place of natural and biodegradable products. However, the new products were no more effective than the old ones; the transition was only carried out because it was more lucrative to produce them, although they were much more polluting and environmentally harmful — these new technologies were, in fact, the main factor for the increase of pollution in the United States, more than the increase in population or consumption.[28]

Of course the law of value does not determine only the final products, but also the production processes, which must be constantly intensified both in terms of rhythms and material efficiency, if not in terms of the extension of the working day. Already, in his day, Marx highlighted the "fanaticism that the capitalist shows for economizing on means of production" as they seek the "refuse of production" for reuse and recycling.[29] However, under the capitalist form of

social production, productivity gains result in a smaller amount of value created per material unit, so that it fosters enlarged material consumption.[30] This general tendency is empirically observable in the so-called Jevons Paradox, in which efficiency gains eventually result in a rebound effect, increased material production.[31] This paradoxical effect was first shown by William Stanley Jevons, who presented data that demonstrate that efficiency gains in coal consumption to fuel steam engines during the Industrial Revolution resulted in increased aggregate coal consumption.[32] What in a conscious social production would be ecologically beneficial (increased efficiency in resource use), in capitalism increases relative surplus value, and therefore reinforces the destructive limitless accumulation of capital and a technological system that is inappropriate in the first place. It is astonishing that many environmentalists still preach efficiency as an ecological fix, without noticing that the capitalist social form of wealth (value) turns productivity into a destructive force.

Even the way capitalism deals with the problem of pollution is configured by alienation: everything can be discussed *but* the mode of production based on commodification and maximization of profits. Since production is carried out in competing isolated private production units, socio-technical control is limited to external control, through state regulations that enforce end-of-pipe technologies and market mechanisms. The Kyoto Protocol is the best example of the contradictions of market–based approaches to environmental issues. It represents the commodification of the carbon cycle, establishing the equivalence principle, the very form of commodity fetishism, in a sort of stock exchange of carbon. Therefore, it implies a whole process of abstraction of ecological, social, and material qualities to make possible the equivalence of carbon emissions, offsets, and carbon sinks located in very different ecological and social contexts. The abstraction process includes the equalization of emission reductions in different social and ecological contexts, of emissions reductions carried out with different technologies, of carbon of fossil origin and biotic origin, the equalization of different molecules through

the concept of "carbon equivalent" and a definition of "forest" that does not include any requirement of biodiversity.[33]

However, as with any commodity in capitalism, use value — carbon emissions reductions in this case — is governed by exchange value. The fetishistic inversion of use value and exchange value that characterizes capitalism implies that the effective goal of the whole process of emissions trading comes to be money, not emissions reduction. Empirical examples abound. The trading scheme set out by the Kyoto Protocols does not present any incentive for long-term technology transition but only for short-term financial earnings. In practice, offsets allow polluters to postpone a technological transition, while the corresponding Clean Development Mechanism (CDM) project probably generates a rebound effect that will foster fossil fuel deployment in developing countries.[34] Easy technological reductions, such as burning methane in landfills, allow the continuation of carbon emissions by big corporations. Some industries earned more profits mitigating emissions of HFC-23 than with the commodities they produced, while generating huge amounts of offsets that again allow polluters to keep up with their emissions.[35] And the comparison of projects with baseline "would be" scenarios even tragically allows the direct increase of emissions, for example, by financing coal mines that mitigate methane emissions. And more examples could be cited. The fact that global warming is determined by cumulative emissions in any meaningful human time-scale reveals the perverse effects of this exchange value–driven scheme: delays in emissions reductions today constrain the possibilities of the future.[36] Again a simple Marxian critique reveals how exchange value comes to dominate use value, as the allocation of carbon emissions is determined not by socio-ecological criteria, but according to the valorization requirements or by "the optimized allocation of resources." Thus, when the global carbon market hit the record market value of $176 billion in 2011, the World Bank said that "a considerable portion of the trades is primarily motivated by hedging, portfolio adjustments, profit taking, and arbitrage," typical jargon of financial speculators.[37] Kyoto, with

its quantitative approach, does not address, but rather hampers the *qualitative* transition that is necessary to avoid a catastrophic climate change, that is, the solar transition. Even though substantial amounts of capital are mobilized with the trading schemes, global carbon emissions continue to increase.

Under current conditions, it is increasingly likely that the application of an end-of-pipe technology might be necessary. With the rise of the welfare state and ecological regulation, a myriad of such technologies were used to mitigate industrial emissions to water, air, and soil — air filters, wastewater treatment plants, and so on. The problem is that these technologies can only be applied in particular corporate units if it is feasible in the context of value-driven production, that is, only if it does not jeopardize the profitability of corporations. It happens, though, that carbon capture and storage (CCS) is still too expensive to be used in production units or transport systems. Therefore, what comes to the fore is *geoengineering*, the ultimate end-of-pipe technology applied on a planetary scale to mitigate the effects of carbon emissions: the direct manipulation of world climate itself with processes such as the emission of aerosols to the stratosphere to reflect solar radiation or the fertilization of oceans with iron to induce the growth of carbon-sequestering algae.[38] The origins of these processes can be traced back to the Vietnam War and Stalinist projects, one of its first proponents being Edward Teller, the father of the atomic bomb.[39] There are huge risks involved in this approach, as the climate system and its subsystems are not fully understood and are subject to non-linearities, tipping points, sudden transitions, and chaos. Moreover, climate system inertia means that such geoengineering techniques would have to be applied at the time-scale of a millennium or longer, effectively implicating dozens of future generations.[40] In case of technological failure of the application of geoengineering, the outcome could be catastrophic, with a sudden climate change.[41]

Considering the relatively low cost of geoengineering, though, it is likely that capitalism assumes the risk of business as usual in order

to preserve its fetishistic quest for profits, keeping geoengineering as a sort of silver bullet of global warming.[42] Of course there is the frightening possibility of combining geoengineering and trading schemes, so that geoengineering projects could generate carbon credits in a competitive market. That was the idea of Planktos Inc. in a controversial experiment of ocean fertilization, that alludes to a dystopian future in which world climate is manipulated according to the interests of corporate profits.[43] It is clear that capitalist control of pollution, either through market mechanisms or state regulations, resembles the Hegelian Minerva's Owl: it only (re)acts *after* the alienated process of production and the general process of social alienation. However, if the core of destructiveness is the fetishistic process itself that is reproduced by trading schemes, and end-of-pipe technologies are subject to failure and complex dynamics that are not rationally accessible to the time scales of human institutions (at least in their current forms), both market and state mechanisms might fail in avoiding a catastrophic climate change.

Future projections of global warming by neoclassical economists reveal the alienated core of the Anthropocene in its very essence. In integrated climate-economic models such as the ones developed by William Nordhaus and Nicholas Stern, the interest rate ultimately determines what is acceptable in terms of atmospheric concentration of greenhouse gases and its related impacts (coastal inundations, biodiversity loss, agricultural disruption, epidemic outbreaks, and so on), as "cost-benefit analyses" discount future impacts and compound present earnings.[44] But as shown by Marx, the interest is the part of the profit that the industrial capitalist pays to the financial capitalist that lent him money-capital in the first place, after the successful valorization process.[45] Interest-bearing capital is value that possesses the use value of creating surplus value or profit. Therefore, "in interest-bearing capital the capital relationship reaches its most superficial and fetishized form," "money that produces money," "self-valorizing value."[46] Interest-bearing capital is the perfect fetishistic representation of capital, as the automatic geometric progression of

surplus value production, a "pure automaton."[47] Correspondingly, the determination of future social metabolism with Nature by the interest rate is the ultimate expression of the fetishistic character of this historical form of social metabolism with Nature, that is, of the fetishistic core of the so-called Anthropocene, no matter the magnitude of the interest rate. In capitalism the interest rate *is* determinant of investments and allocation of resources, and overcoming this is not a matter of moral restraint or of a lower interest rate (as in Stern) but of overcoming the capitalist mode of production itself.[48]

Future scenarios determined by the interest rate ultimately negate history, since only in capitalism is the interest rate socially determining, as it is capital in its purest form. While in capitalism interest-bearing capital becomes totally adapted to the conditions of capitalist production, and fosters it with the development of the credit system, in precapitalist social formations, "usury impoverishes the mode of production, cripples the productive forces."[49] This is so because in capitalism credit is given in the expectation that it will function as capital, that the borrowed capital will be used to valorize value, to appropriate unpaid "free" labor, while in the Middle Ages the usurer exploited petty producers and peasants working for themselves.[50] The determination of future social metabolic relation with Nature by the interest rate is thus an extrapolation of the capitalist mode of production and all of its categories (value, surplus value, abstract labor, and so on) into the future, the fetishization of history. Nowhere is this fetishization of history better crystallized than in the term *Anthropo*cene, which depends upon a ahistorical concept of Man.

The sort of cost-benefit analysis that Nordhaus and Stern carry out tends to negate not only history, but matter itself, as the trade-off of the degradation of material resources with abstract capitalist growth implies the absolute exchangeability between different material resources, and hence between abstract wealth (capital) and material wealth. For example, the most basic natural synthetic process necessary for life as we know on Earth, photosynthesis, is

not technologically substitutable, that is, no amount of exchange value could replace it.[51] Synthesizing the complex interactions and material and energy fluxes that constitute ecosystems of different characteristics, scales and path-dependent natural histories is not at all a trivial task on its own terms; doing so under the condition of capitalist social relations, where material interactions and specificity are exactly what exchange value abstracts from, appears doomed to failure. What the analysis found in Nordhaus and Stern takes for granted is the commodity form itself, with its common substance (value) that allows the exchange between different material resources in definite amounts, detached from their material and ecological contexts. But it is this very detachment or abstraction that leads to destructiveness: "The dream implied by the capital form is one of utter boundlessness, a fantasy of freedom as the complete liberation from matter, from nature. This 'dream of capital' is becoming the nightmare of that from which it strives to free itself — the planet and its inhabitants."[52]

Last but not least, capital is also trying to increase its profits exploiting the very anxiety caused by the prospect of the ecological catastrophe, as an extension of the production of subjectivity by the culture industry.[53] For example, Starbucks cafés offer their customers a coffee that is a bit more expensive but claim that part of the money goes to the forest of Congo, poor children in Guatemala, and so on. In this way, political consciousness is depoliticized in what is called the "Starbucks effect."[54] It can also be seen in commercial advertisements. In one such advertisement, after scenes depicting some kind of undefined natural catastrophe intercalated with scenes of a carpenter building an undefined wooden structure and women in what seems to be a fashion show, the real context is revealed: the models are going to a sort of Noah's Arc built by the carpenter, so that they can survive the ecological catastrophe. The purpose of the advertisement is finally disclosed: to sell deodorant — "the final fragrance." The slogan — "Happy end of the world!" — explicitly exploits the ecological collapse to sell commodities.[55] Opposition and political will themselves are

being seduced to fit into the commodity form, even pervading climate science itself. Climate scientists appear increasingly aware of this pervasive pressure of economic fetishism over science when they state: "liberate the science from the economics, finance, and astrology, stand by the conclusions however uncomfortable," or "geoengineering is like a heroin addict finding a new way of cheating his children out of money."[56] Decarbonization is always challenged to be "economically feasible." What is necessary, though, is that a more radical critique come to the fore in the public debate, an explicitly anticapitalist stance that refuses the requirements of capital accumulation in the definition of socio-environmental policies — not the least because it seems it is already impossible to reconcile the limitation of global warming to two degrees Celsius and simultaneously keep "economic growth."[57]

It must be highlighted that the fetishization here described and its ecological destructiveness are a historical development, specific to capitalism, and that is why it can be overcome: there is nothing necessarily destructive about the social metabolism with nature. Commodity fetishism and labor as the social-mediating category (abstract labor) are historically specific to capitalism, and began with primitive accumulation.[58] As the globalized disruption of Nature, the Anthropocene is the externalization of alienated labor, its logical material conclusion.[59] Overcoming it requires the reappropriation of what has been constituted in alienated form, that is, the decommodification of human social activity or the overcoming of capitalism.[60] Technology so reconfigured and socialized would no longer be determined by profitability, but would be the technical translation of new values, and would tend to become art.[61] Instead of being determined by the unidimensional valorization of value, social production would be the outcome of a multiplicity of commonly discussed criteria, ranging between aesthetic, ecological, ethical, and social considerations and beyond. In other words, material wealth should be freed from the value form. Technologies such as solar energy, microelectronics, and agroecology, for example, could be used to shape a world of abundant material wealth and a conscious social

metabolism with Nature — a world with abundant clean renewable energy, abundant free social time due to the highly automated productive forces, and abundant food ecologically produced, under social control.[62]

Then and only then could humanity be in conscious control of planetary material cycles and could use this control for human ends (even if deciding to keep them in their "natural" state). In fact, this proposition means taking the promise of the Anthropocene very seriously, that is, humanity *should* take conscious control of planetary material cycles, extend the terrain of the political hitherto left to the blind mechanics of nature and, in capitalism, to commodity fetishism.[63] And this not only because the productive forces developed by capitalism allow it — although up to now we do it without conscious social control — but also because it might be necessary. Civilization is adapted to the Holocenic conditions that prevailed in the last ten thousand years, and we should be prepared to act to preserve these conditions that allow human development or mitigate sudden changes, because they could be challenged not only by human (fetishized) activity, but also by natural causes, something that has already occurred many times in natural history (such as in the case of glacial-interglacial cycles triggered by perturbations in Earth's orbit, or the catastrophic extinction of dinosaurs due to a meteor impact).[64] The (fetishized) "invisible hand" and the (fetishized) "Anthropocene" are two faces of the same coin, of the same unconscious socialization, and should both be overcome with the communalization of social activity, that is, the real control of planetary material cycles depends on conscious social control of world production.

It should be emphasized that what is here criticized as "fetishism" does not merely describe the imprecise naming of the Anthropocene, but the form of material interchange itself. And yet what emerges here is a truly utopian perspective, the promise of the realization of the Anthropocene, not as an anthropological constant or a "natural" force, but as a fully historical species-being that consciously controls and gives form to the material conditions of the planet. If, as the

young Marx puts it, alienated labor alienates humanity's *species*-being, the liberatory reorganization of social-material interchange would unleash the species potential that is embedded, though socially negated, in the *Anthropo*cene.[65] Freed from value form and the instrumental reason that reduces nature to a "substrate of domination," geoengineering and advanced technology in general could be used not only to solve the climate problem, but also, as Theodor Adorno wrote, to "help nature to open its eyes," to help it "on the poor earth to become what perhaps it would like to be."[66] Advanced forces of production imply that Fourier's poetic utopian vision recalled by Walter Benjamin could be materialized:

> [C]ooperative labor would increase efficiency to such an extent that four moons would illuminate the sky at night, the polar ice caps would recede, seawater would no longer taste salty, and beasts of prey would do man's bidding. All this illustrates a kind of labor which, far from exploiting nature, would help her give birth to the creations that lie dormant in her womb.[67]

Even the elimination of brutality in nature (predation) and the abolition of slaughterhouses through the production of synthetic meat seem today within theoretical reach with developments in "genetic reprogramming" and stem-cell technology. All this goes beyond the wildest Marcusean utopian dreams.[68] Of course, this requires a social struggle that subverts the production determined by the valorization of value and frees, first of all, human potential. On the other hand, with business as usual, we are likely to see our material future on Earth being determined by the interest rate, emergency geoengineering, and chance.

Notes

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Mapping the Atomic Unconscious: Postcolonial Capital in Nuclear Glow

Katherine Lawless

During his visit to Hiroshima on May 27, 2016, the first ever to be made by a sitting U.S. president, Barack Obama claimed that "the memory of the morning of August 6, 1945, must never fade."[1] Not only did he seek to preserve the memory of the dropping of the first atomic bomb beyond the last voices of the *hibakusha*, he framed this call for preservation in moral terms: "The scientific revolution that led to the splitting of an atom requires a moral revolution as well." If his explicit claim is that the role of science in human atrocity can be mitigated by a renewed moral framework, the implicit message is that the practice of commemoration provides a symbolic ground for this renewed morality. Accordingly, the president's discourse of moral revolution not only affirms the largely apolitical, ahistorical nature of global memory culture, which tends to translate historical forms of exploitation into universal narratives of suffering, but it also obscures the slow violence of nuclear energy regimes by reducing nuclearity to the moment of explosion. In seeking to preserve the memory of atrocity, the moral revolutionary, however unwittingly, preserves the colonial logic of nuclear energy regimes by transforming the material exploitations of energy production into the universal grammar of commemoration.

Against the idealism of the moral revolutionary, I want to recuperate the material dimensions of cultural memory and suggest that it might serve a different purpose in the context of postcolonial capital: to elucidate the materiality of an energy unconscious

embedded in memory media.[2] Postcolonial capitalism here signifies the ways in which immaterial forms of accumulation and material forms of labour intersect in the colonial landscapes of global memory culture. My utilization of the term is meant to reflect the complex ways in which enclosures of knowledge and labor reinforce one another while contributing to new forms of accumulation through the aestheticization of colonial capital's material remains.[3] In my elaboration of the atomic unconscious of postcolonial capital, I adapt Michael Niblett's question regarding the mapping of energy regimes in relation to cultural media. Suggesting that patterns of capital accumulation might be embedded in cultural forms, Niblett asks: "What happens if we map the flow of energy regime transitions in relation to cultural manifestations?"[4] In other words, what can specific cultural media (Niblett uses the example of Gothic narratives) tell us about the flow of energy during the transition between regimes (for example, from coal to oil)? Following Niblett's lead regarding this link between material inputs and symbolic forms, I ask: What happens if we map the emergence of global memory cultures alongside the transition to nuclear energy? And, consequently, how does memory media register not only cultural anxieties about repeating the past but also the "energy invisibilities" that accompany the emergence of nuclearity as a "green alternative" to fossil fuels?[5]

I begin by tracing the entwined histories of memory studies and energy humanities and identify the vital role discourses of rupture have played in both the preservation of memory and conceptions of nuclearity. I follow this brief historicization by tracking the ways in which the energy unconscious works across different cultural mediums tasked with doing memory work, beginning with the example of the modern museum. Drawing on the concept of resource aesthetics, I argue that the atomic unconscious, closely associated with the history of photography, registers a new regime of dispossession in the uneven landscapes of postcolonial capitalism in which commemoration becomes not only an aesthetic practice but also a cultural resource. Finally, I assert that the materialities at work

in nuclear photography — including its status as a physical object that circulates within and through various cultural institutions; its manifestation as the effect of light on a chemically specific surface; and its subjection to environmental impacts that result in fading, tearing, annotating, archiving, destruction — register contradictions between the brute materiality of nuclear inputs and cultural representations of nuclearity in the form of an atomic unconscious whose relationship to memory differs significantly from the carbon unconscious. I conclude by claiming that memory can serve as a critical methodology for the energy humanities.

Discourses of Rupture

As emergent disciplines of the atomic age, memory studies and energy humanities share a common genealogy: both arise from a series of ruptures — technological, historical, moral — accompanying the postwar condition. While the origin of global memory culture is varied, and contested, American historian Jay Winter argues that it proliferated after World War II due to shifting social and economic conditions that increased both leisure time and disposable income.[6] Despite this socioeconomic basis, memory studies often uses the atrocities of the Holocaust as a touchstone, a tendency that has been harshly criticized by Kerwin Lee Klein, who sees the memorial turn in historical discourse as a form of cultural re-enchantment deriving from the intersection of the therapeutic and the avant-garde.[7] As a result of this re-enchantment, memory is falsely lauded as a site of emancipation. Memory scholar Andreas Huyssen proffers a similar critique. In addition to the criticism of Holocaust as touchstone, he claims that the conception of "history as trauma" that permeates memory studies does very little to elucidate the political and material dimensions of cultural memory.[8] The effect is to reduce memory to yet another version of identity politics.[9] Indeed, affirming memory as the organizing principle of twentieth-century historical study *par excellence*, Winter asserts that "the hyphen of identity is strengthened by commemoration."[10] However, the main difference between

memory and other expressions of identity is that memory movements pose a temporal disruption rather than a simple re-signification. This concept of temporal rupture is central to literary theories of trauma and memory, which locate emancipatory potential in repressed counter-narratives that speak back to and against dominant historical narratives.[11] Here, traumatic memory signifies a disruption of the proper ordering of experience. Representations of historical trauma stand in for an original encounter, analogically signifying the return of the repressed, where repressed memory disrupts official historical narrative.[12] Postcolonial scholars, however, have criticized this version of trauma theory for its colonial constitution: "following feminist psychologist Laura Brown, they argue that the 'event' or 'accident'-based model of trauma associated with [Cathy] Caruth assumes the circumstances of white, Western privilege and distracts from 'insidious' forms of trauma that involve everyday, repeated forms of traumatizing violence, such as sexism, racism and colonialism."[13] Put differently, Western trauma theory fails to address the slow violence of colonial logics, which include forms of sexual and racial exploitation.[14]

In nuclear discourse, the emancipatory potential of rupture is tied to postwar instantiations of the twin movements of human rights and decolonization. This relationship is best represented in the work of Gabrielle Hecht, who states: "In the beginning, there was The Bomb. It ended The War. Splitting the atom ruptured human history."[15] Connecting scientific discovery and morality (albeit very differently than Obama), she explains that the historical rupture taking place around the time of detonation was not only scientific but moral as well; alongside the power of nuclear technology, the Universal Declaration of Human Rights, in line with movements of decolonization, promised to emancipate those populations exploited under colonial rule.[16] Mediated by discourses of historical rupture, however, decolonization did not lead to emancipation; rather, colonial power was simply reoriented along the lines of the nuclear (colonizer) and the non-nuclear (colonized).[17] In a separate article, Hecht departs

from the usual polarizing categories of nuclear scholarship to examine the ways in which the intertwining "rupture-talks" of nuclearity and decolonization play out in the lives of uranium miners in colonial Africa.[18] By making the miners and not technoscientific innovation the focus, she exposes the "power effects" of nuclear ontologies. By mapping the reorientation of French colonial power onto the revolutionary imaginary of nuclear technology, she argues that discourses of rupture had material effects: "Nuclear and postcolonial rupture-talk combined in shaping sociotechnical practices, but what mattered most to [the uranium miners] was how these practices conjugated colonial power relations into real and imagined futures."[19] What becomes evident in Hecht's work on nuclear ontologies is the ways in which the discourses of moral and historical rupture that underwrite contemporary forms of commemoration eclipse the slow violence structuring the everyday labor of the uranium miner.

Elsewhere I have argued that memory is implicated in the forms of exploitation that accompany the new global enclosures; and that the dispossession of knowledge reinforces material dispossessions. Sites of memory, in other words, are also sites of enclosure, operating according to a logic that conceals cycles of accumulation and dispossession through the preservation of the material remains of previous stages of accumulation. In this way, enclosures of knowledge fortify the outward thrust of capitalist expansion. This relationship is exemplified in popular interpretations of the Harper government's actions toward knowledge-producing institutions, such as the closure of seven of nine Fisheries and Oceans Libraries whose destruction has been referred to in popular media as both "libracide" and a "knowledge massacre." These practices emerge alongside a cultural paradigm I have named the preservationist aesthetic, which frames the new global enclosures in moral terms as sites of historical and cultural preservation and emphasizes memory's property form in the post-crisis cultures of late capitalism. It also places the drive for preservation in the form of collective memory at the heart of *both* new forms of enclosure *and* new practices of

resistance. Mediated by this ideology, social, political, and economic exploitation are reframed as aesthetic problems in terms of loss, erasure, and ruin. Hence, alongside the proliferation of memory culture we see the corresponding proliferation of aesthetic trends such as ruin porn. In general, the preservationist aesthetic has a dual function: on one hand, it recovers and preserves those aspects of common history under the name of heritage that are threatened with erasure by the innovations of capitalist production, including nuclear technology; on the other hand, it produces new spheres of enclosure by colonizing those spheres previously excluded from the production process, transforming them into aesthetic experiences. In short, the preservationist aesthetic is an ideological mechanism for translating material exploitations into symbolic terms (that is, forms of extraction into forms of cultural representation). As a result, we are faced with a paradox: in defending against the threat of erasure, of "obsolescence and disappearance" that characterizes late capitalism, preservationist aesthetics contribute to the creation of new spheres of colonization and enclosure.[20] In this way, the forms of representation specific to this aesthetic regime facilitate neocolonial sensibilities by mediating capital's social and material resources.Thus, despite the mandate to educate, the function of memory museums and similar memory media is to conciliate and disarm while at the same time commodifying and incorporating the social and material remains of previous stages of accumulation.[21]

Memory media, however, are not only sites of primitive accumulation but also resource aesthetics across which different materialities are at work. Outlined by Brent Ryan Bellamy, Michael O'Driscoll, and Mark Simpson in the introduction to a special issue of *Postmodern Culture*, the concept of resource aesthetics provides a framework for linking modes of exploitation (like uranium extraction) with modes of representation (Hecht's concept of rupture-talk, for example).[22] Beginning with the "amnesiac history" of Fort McMurray as a storage site for radioactive waste, Bellamy et al. define the resource aesthetic as a site of contradiction between the figural and

the material that requires a dialectical understanding of the relation between "the aesthetics of resources" and "the aesthetic as resource." Elaborating this constitution, Imre Szeman identifies the dual aspect of resources, their simultaneous materiality and unrepresentability, stating: "Resources are material in ways that, in part, evade aesthetics, evade representation. There's a double movement in thinking about aesthetics and resources that I want to keep alive: one in which we recognize their sheer necessity and blunt reality, and another in which we try to bring them into representation."[23] In these terms, the "blunt reality" of uranium extraction doesn't show up in popular discourses of nuclearity, which feature The Bomb or forgotten heroes like the nuclear operator. Hecht, among others, has even suggested that knowledge of the relationship between uranium extraction and nuclearity has, in fact, been withheld from uranium miners.[24] Resource aesthetics facilitate this dispossession of knowledge in support of accumulation practices like uranium extraction.

The Slow Violence of Nuclear Memory

Mediating contradictions between cultural narratives of atrocity (or accident-based trauma) and the slow violence of exploitation, memory media are therefore part of an apparatus of erasure that participates in material forms of dispossession. The modern museum is a prime example. While museums have long played an important role in the production of cultural value, contemporary museums take an active role in this process in the context of late capitalism, as Rosalind Krauss has shown.[25] According to Wolfgang Ernst, museums are "memory-producing machines" that, unlike their historical predecessor, are "transformers" rather than mere "receptacles."[26] No longer mere spaces for the sedimentation of historical memory, they are vehicles through which collective memory as a cultural resource is both produced and transmitted.[27] As cultural transformers, they are exemplars of a new mode of enclosure that converts the material remains of previous stages of accumulation into aesthetic objects under the auspices of cultural preservation. Take the United States

Holocaust Memorial Museum, for example. As the inaugural memory museum, it not only helps to elucidate the conversion of mundane everyday objects into shrines of dispossession, it also serves as a microcosm of the new experience-based economy in which memory becomes a cultural resource. According to Alison Landsberg, one of the most striking exhibits in this museum, which spans three floors and incorporates both historical artifacts and personal possessions, is the room on the second floor filled with "survivor shoes."[28] Drawing on Fredric Jameson's comparative analysis of Van Gogh's peasant shoes and Warhol's *Diamond Dust Shoes*, where the latter "embod[ies] the logic of the commodity" and the former retains a sense of "lived individuality," each shoe "bears a trace of the absent body" and in doing so recreates a "whole missing object world."[29] These "survivor objects," in which religious and commodity fetishes seem to merge, resist the alienating logic of the commodity while contributing to a fantasy of immediacy in which the mediating object is rendered invisible.

Despite the resistance to erasure that underwrites memory's preservation, the preservationist aesthetic nevertheless participates in the slow violence of nuclearity by reinforcing a series of elisions, beginning with the elision of Hiroshima as the origin of global memory culture.[30] Further elisions include: Hiroshima's overshadowing of the long-term nuclear testing on the Marshall Islands, which saw sixty-seven tests over a period of twelve years (and whose explosive power and radioactive fallout far surpassed that of Hiroshima); the banalization of petro-crises, such as oil spills, against the atrocities of nuclear meltdown; an emphasis on atrocities (spills and meltdowns) that fail to acknowledge the everyday forms of exploitation that support these wide-scale atrocities. In the nuclear museum, these elisions take the shape of nuclear exceptionalism, which Hecht defines as "a technopolitical claim — emerging immediately after the end of World War II — that there was something radically unique about nuclear things. From 1945 onward, both cold warriors and their activist opponents cultivated this nuclear exceptionalism. Atomic

weapons were portrayed as fundamentally different from any other human creation."[31] In "Nuclear Ontologies," Hecht elucidates the stakes of such exceptionalism in the following way: "Asserting the ontological distinctiveness of 'the nuclear' carrie[s] political, cultural, and economic stakes amplified by morality-talk, which tend[s] to boil down to a simple duality: nuclear technology represent[s] either salvation or depravity."[32] The response to the radical uniqueness of the destructive capacity of atomic weapons is, of course, the radical uniqueness of the potential salvation offered by forms of nuclear energy. However, the other side of this exceptionalism, as she points out, is the rendering banal of nuclear power, where nuclear power is represented "not as a life-saving technology for the human race, but as simply another way to boil water. Radiation [is] just another industrial risk. Such representations seek to banalize nuclear things."[33] Along with the sensational discourses of nuclear atrocity, the banalization of nuclear power serves to elide the slow violence of such energy regimes, in addition to the reality that other similar energy regimes (such as coal and oil) perform similar routine elisions through the polarization of the mundane and the spectacular.[34] Put differently, in the production of nuclear memory, the slow violence of global energy regimes (which includes both climate change and the new global enclosures) is eclipsed by the spectacle of nuclear atrocity and re-presented as the preservation of nuclear memory.

The preservation of nuclear memory then is not a question of morality but a problem of representation. Linking the erasure of memory to processes of slow violence, Rob Nixon writes: "In the long arc between the emergence of slow violence and its delayed effects, both the causes and the memory of catastrophe readily fade from view as the causalities incurred typically pass untallied and unremembered."[35] Slow violence — "a violence that occurs gradually and out of sight" as opposed to a violence that is "immediate in time" and "explosive and spectacular in space… erupting into instant sensational visibility" — is also, then, a form of forgetting.[36] For Nixon, the question becomes one of how to represent this slow

violence of the everyday that is effaced by the spectacular violence of atrocity. Accordingly, he asks: "In an age when the media venerate the spectacular, when public policy is shaped primarily around perceived immediate need, a central question is strategic and representational: how can we convert into image and narrative the disasters that are slow moving and long in the making, disasters that are anonymous and that star nobody, disasters that are attritional and of indifferent interest to the sensation-driven technologies of our image-world?"[37] In other words, how can we represent the everyday forms of violence that fail to register as violence without reducing them to spectacle? In the context of nuclear memory, the question becomes: how can we represent the everyday violence of nuclearity characterized by uranium extraction and related forms of exploitation without reducing them to the spectacular violence of Hiroshima?

The answer lies (at least in part) in Patricia Yaeger's concept of the energy unconscious, to which the concept of narrative erasure is central. Drawing on Jameson's notion of the political unconscious, Yaeger defines the energy unconscious as not only a "cultural code or reality effect" but also a "field of force" whose causality lies elsewhere and shows up as an "energy invisibilit[y]" that constitutes a "particular kind of erasure."[38] Building on Yaeger's definition, Brent Ryan Bellamy describes it as a "structuring presence" that lies "outside the narrative" of energy; in Vivasvan Soni's words, an "unsignifying opacity," which Szeman describes further as an "incapacity to name the social, political and cultural significance of energy."[39] As sites of accumulation, memory media are also registers of the energy unconscious, which take different forms in different media tasked with the work of remembering. Literary critic Stephanie LeMenager, for example, describes the energy unconscious of oil literature as a form of "embodied memory and habitus for modern humans, insofar as everyday events such as driving or feeling the summer heat of asphalt on the soles of one's feet are incorporating practices, in Paul Connerton's term for the repeated performances that become encoded in the body."[40] Following Marshall McLuhan's

description of "infrastructure as media," she argues further that infrastructure as embodied memory is also "a meeting point of ecology and history."[41] Bob Johnson makes a similar claim regarding petroculture's embodied memory in his work on the role of fossil fuels in the production of American culture, arguing that forms of cultural production featuring carbon derivatives not only structure both an experience and understanding of the world, but also the ways in which the suppression of carbon dependency drives its reappearance as embodied memory.[42] In LeMenager's and Johnson's treatments, embodied memory signifies the return of a repressed energy infrastructure.

A Methodology of Exposure

The materialities at work in nuclear photography which register contradictions between the brute inputs of nuclear fallout and cultural representations of nuclearity — highlighted, for example, by the "atomic shadows" left by exposure to nuclear fallout — constitute an energy unconscious that looks quite different from that of carbon. The atomic unconscious that emerges in nuclear photography is less structural and more iconic, less embodied and more diffuse, relating to questions of visibility, invisibility, and exposure rather than habitus or embodiment.[43] Barbara Marcon, for example, talks about "atomic shadows" as a form of testimony; Ned O'Gorman and Kevin Hamilton refer to Atomic Age aesthetics as a "performance of collective memory" in which the forgotten origins of nuclear hegemony are buried within a cultural icon; and Lippit refers to the x-ray as "a kind of living remnant, a phantom subject" that "retains the dimension and shape of its object while rendering its inside."[44] What each of these characterizations has in common is the "problem of exposure," which elin o'Hara slavik argues is central to both photography and the history of the atomic age.[45] Nicole Shukin affirms this historical interdependency, stating that "in both their means and their ends photography and nuclear science share a history as well as material resources and techniques, particularly 'exposure' of bodies to light,

either in the form of visible or invisible rays."[46] Accordingly, as Thomas Pringle suggests, this allows photography to serve as a material index or "early variety of Geiger counter" that "repurpose[es] aesthetics into a functional diagnostic tool for *the general barometry of light*."[47] slavik, and other theorist-practitioners of nuclear photography, utilize this methodology of exposure to "make visible the unseen, to reveal what is denied and hidden."[48]

What, exactly, does this methodology, which is so intimately connected to discourses of rupture, promise to reveal? In trauma theory, it promises, of course, to reveal repressed memories, which contribute to the broader cultural movement toward the re-valuing of forgotten histories. In the context of nuclearity, however, it promises to reveal the persistent materiality of nuclear exposure. Following the dialectic of the resource aesthetic, it takes two related forms: one material, the other figural. In the former constitution, the methodology of exposure reveals the material exposure of the photograph to the invisible rays of nuclear energy. In the latter, it emerges in conjunction with discourses of testimony and witnessing that render nuclear photographs, in Yaelle S. Amir's words, "material witness[es] to the effects of nuclear energy."[49] In her curatorial statement, Amir describes the material persistence of nuclear traces in the following way: "The exhibition *Reactive Matters* explores the ways in which nuclear energy permeates our surroundings — its presence lingers in the soil we tread, the water we consume, and the roads we often travel." While this statement sounds similar to LeMenager's description of oil infrastructure as embodied memory, there is a clear distinction between the constitution of the carbon unconscious and that of the atomic. Instead of registering as a performance encoded in the body, atomic infrastructure registers as alienated memory through which the remains of nuclear disaster are animated as material witnesses. Fetishized, these material witnesses perform a double elision: first, they stand in as substitutes for the living witness, the *hibakusha*; second, as substitutes for the social relations of spectacular violence, they elide the social relations of

slow violence underwrite the spectacle of atrocity.

This brief account of the relationship between nuclear memory and postcolonial capital demonstrates that memory is not just an object of analysis; it is also a methodology of exposure that promises to reveal the materiality of the energy unconscious at work within and across memory media. In elaborating its usefulness as a critical methodology for the energy humanities, I have demonstrated at least three things: (1) by placing the entwined histories of memory and energy alongside one another, with particular attention to the nuclear, I have demonstrated how each corresponds to colonial discourses of rupture; (2) by framing memory media (such as nuclear photography) as resource aesthetics, I have posited memory as both an aesthetic practice and a cultural resource that is embedded within cycles of accumulation, as well as a form of materiality and a mode of figuration where the former is eclipsed by the latter; and, finally, (3) by positing memory as a site of dispossession, I have suggested that the analysis of various memory media might help to track different expressions of the energy unconscious, which registers, in the case of the atomic unconscious, not only the energy invisibilities that accompany the transition to nuclearity but also the forgotten materiality of nuclear memory itself. Without such a materialist perspective, we are left with the false radiance of a moral revolution whose advocates sit on the winning side of nuclear history and whose discourses serve the interests of postcolonial capital.

Notes

1. The full transcript of Obama's tribute speech was reprinted by *The New York Times* the day of the commemoration. "Text of President Obama's Speech in Hiroshima, Japan," *The New York Times*, March 28, 2016, http://www.nytimes.com/2016/05/28/world/asia/text-of-president-obamas-speech-in-hiroshima-japan.html
2. Patricia Yaeger, "Editor's Column: Literature in the Ages of Wood, Tallow, Coal, Whale Oil, Gasoline, Atomic Power, and Other Energy Sources," *PMLA* 126.2 (2011) 305–326.
3. For a broader discussion of postcolonial capitalism and its relation to labor and knowledge, see Sandro Mezzadra's "How Many Histories of Labour? Towards a Theory of Postcolonial Capitalism," *Transversal: Unsettling Knowledges*, European Institute for Progressive Cultural Policies, 2012, http://eipcp.net/transversal/0112/mezzadra/en.
4. Michael Niblett, *Fueling Culture: 101 Words for Energy and Environment* (New York, NY: Fordham UP, 2017) 138.
5. The concept of "energy invisibilities" belongs to Patricia Yaeger. I am using it in relation to the atomic unconscious to suggest that the atomic unconscious is comprised of energy invisibilities that accompany the transition to nuclearity.
6. Jay Winter, "The Memory Boom in Contemporary Historical Studies," *Raritan* 21.1 (2001) 52–66.
7. Kerwin Lee Klein, "On the Emergence of *Memory* in Historical Discourse," *Representations* 69 (2000) 136.
8. Andreas Huyssen, *Present Pasts: Urban Palimpsests and the Politics of Memory* (Stanford UP, 2003) 9. Memory scholars such as Shoshana Felman discuss the relationship between Freud's work on trauma and the idea of "history as trauma" discussed by Huyssen. In her remarks on Cathy Caruth's analysis, Felman suggests that Freud was responsible for the transformation of all history into trauma: "In an exemplary analysis of Freud's as yet uncharted legacy of trauma in his last work *Moses and Monotheism*, Caruth remarkably, paradigmatically, shows how the book itself — Freud's testament on *history as trauma* — is the site of

an inscription of a historical trauma: that of Freud's dramatic departure from Vienna, then invaded and annexed by Hitler's Germany." Shoshana Felman and Dori Laub, *Testimony: Crisis of Witnessing in Literature, Psychoanalysis, and History* (New York, NY: Routledge, 1992) 174. Indeed, though Caruth doesn't pen this phrase exactly (history as trauma), in her reading of Freud she asks: "What does it mean, precisely, for history to be the history of a trauma?" (15). Her answer to this question is: "For history to be a history of trauma means that it is referential precisely to the extent that it is not fully perceived as it occurs; or to put it somewhat differently, that a history can be grasped only in the very inaccessibility of its occurrence" (18). She concludes with the claim that "history, like trauma, is never simply one's own, that history is precisely the way we are implicated in each other's traumas" (24). History, in Caruth's analysis undergoes an essential transformation; the history of trauma in particular is transformed into history as trauma in general. Cathy Caruth, *Unclaimed Experience: Trauma, Narrative and History* (Baltimore: John's Hopkins P, 1996).

9. Both Winter and Huyssen have argued this perspective. Winter, in particular, claims that "[t]he creation and dissemination of narratives about the past arise out of and express identity politics" (Winter, "The Memory Boom" 54).
10. Jay Winter, *Remembering War: The Great War Between Memory and History in the Twentieth Century* (Yale UP, 2006) 36.
11. In *Unclaimed Experience*, Cathy Caruth emphasizes the logic of rupture not only in her references to trauma's belated representation but also to its appearance as a "break in the mind's experience of time" (61). Transferring the language of psychic experience (in which the symptom is inscribed on the body as text) to narrative representation, Caruth argues that the trauma text is "the story of a wound that cries out, that addresses us in the attempt to tell us of a reality or truth that is not otherwise available," a wound that "is experienced too soon, too unexpectedly, to be fully known" (4).
12. The problem with such a model is not only that it relies on the analogical importation of an individual model of psychic trauma into the order

of cultural representation, but also that it is based on a fundamental assumption that history proceeds chronologically. Walter Benjamin and Guy Debord, as well as a number of contemporary theorists of primitive accumulation, including Tony C. Brown and Massimiliano Tomba, are critical of this abstract, linear historical time for its complicity with not only the accumulation of capital but, in Debord's words, "the victory of the bourgeoisie." Guy Debord, *Society of the Spectacle*, trans. Ken Knabb (New York: Zone Books, 2006) 51. See also Water Benjamin, "The Work of Art in the Age of Mechanical Reproduction," *Illuminations*, ed. Hannah Arendt, trans. Harry Zohn (New York: Schocken Books, 1968) 217–252; Tony C. Brown's "The Time of Globalization: Rethinking Primitive Accumulation," *Rethinking Marxism* 21.4 (2009) 571–584; and Massimiliano Tomba, "Historical Temporalities of Capitalism: An Anti-Historicist Perspective," *Historical Materialism* 17 (2009) 44–65.

13. Michael Rothberg, *Multidirectional Memory: Remembering the Holocaust in the Age of Decolonization* (Stanford UP, 2009) 89.
14. This postcolonial critique of trauma theory is echoed by Slavoj Žižek's materialist critique of trauma. Following Catherine Malabou in her elaboration of a "material unconscious," Žižek argues that the Freudian model of trauma is Western-centric and cannot account for experiences of trauma that do not take the form of a sudden, unexpected event (such as chronic civil war). Departing from Malabou, however, he maintains that even her critique focuses to specifically on content rather than form. Traumatic shock, he suggests, should not be understood as a repetition of substance, but of the very act of erasure. Such a position is useful in articulating the atomic unconscious. In this model, the methodology of exposure would reveal not the erased content, but this very act of erasure. Slavoj Žižek, "Descartes and the Post-Traumatic Subject," *Filozofski vesting* 29.2 (2008) 9–29.
15. Gabrielle Hecht, "Nuclear 2," *Fueling Culture: 101 Words for Energy and Environment*, eds. Imre Szeman, Jennifer Wenzel, and Patricia Yaeger (New York: Fordham UP, 2017) 246.
16. Gabrielle Hecht, "Nuclear Ontologies." *Constellations* 13:3 (2006) 322.
17. Hecht, "Nuclear Ontologies" 323.

18. Gabrielle Hecht, "Rupture-Talk in the Nuclear Age: Conjugating Colonial Power in Africa," *Social Studies of Science* 32.5–6 (2002) 691–727
19. Hecht, "Rupture-Talk" 720.
20. Andreas Huyssen, "Present Pasts: Media, Politics, Amnesia," *Public Culture* 12.1 (2000) 33.
21. The modern prison system is one such example of the incorporation of the remains of previous stages of accumulation. With the abolition of slavery, which Marx argues is one of the five forms of extra-economic violence (alongside conquest, robbery, murder, and land enclosure) through which the processes of primitive accumulation take place, former slaves that could not be incorporated into the wage-labor system compose a large percentage of the prison population. See Karl Marx, *Capital Vol. I*, trans. Ben Fowkes (New York: Penguin, 1990 [1867]), and Angela Davis's Are Prisons Obsolete? (New York: Seven Stories P, 2003). We see a variation of this situation in the closure of former political prisons, such as Robben Island, that have been transformed into museums — the former inmates are often reincorporated as tour guides.
22. Brent Ryan Bellamy, Michael O'Driscoll, and Mark Simpson, "Introduction: Toward a Theory of Resource Aesthetics," *Postmodern Culture* 26:2 (2016).
23. Imre Szeman, "When Energy is the Focus: Methodology, Politics, and Pedagogy — A Conversation with Brent Ryan Bellamy, Stephanie LeMenager, and Imre Szeman," *Postmodern Culture* 26.2 (2016).
24. In the Canadian context, Peter C. Van Wyck claims that the Sahtu Dene of Great Bear Lake, who mined uranium used in the development of the bombs detonated in Japan, suffered a similar eclipse of knowledge. Tracing the trade routes of fissionable uranium in Britain, Canada, and the United States, he states: "Until the bombs were dropped on Hiroshima and Nagasaki in August 1945, virtually all of this was carried out in secret. Workers at the mine site were apparently unaware of the purpose of the ore, or at least this is the claim one finds most frequently." "The Highway of the Atom: Recollections Along a Route," *Topia 7* (2002) 100n2.
25. Rosalind Krauss, "The Cultural Logic of the Late Capitalist Museum,"

October 54 (1990) 11.

26. Wolfgang Ernst, cited by Susan A. Crane, ed. *Museums and Memory* (Stanford UP, 2000) 27.
27. Walter Benjamin and Rosalind Krauss both anticipated this emerging role of the museum as processor by situating it in the context of the capitalist mode of production, elucidating transitions in the functions of the art object under its industrial mode and the exhibition within its later logic respectively. In "The Work of Art in the Age of Mechanical Reproduction," Benjamin illustrates the ways in which technologies of mass reproduction transformed the work of art from religious to commodity fetish (replacing the divine with the social relations of production), which results in the tipping of the scales in favor of exhibition rather than cult value. And, in "The Cultural Logic of the Late Capitalist Museum," Rosalind Krauss elucidates a similar transformation of the exhibition itself during capital's later stages. Accordingly, Krauss demonstrates the ways in which the synchronic or encyclopedic museum, under the influence of minimalism, "would forego history in the name of a kind of intensity of experience" (9). In short, it would become "a space from which the collection has withdrawn" (4). This new cult of experience represents the generalization of exhibition value, or the exhibitionist properties of the modern museum extended to their logical conclusion. Thus, while the space of exhibition was from the outset a space for working through social and political tensions (a role already evident in the seventeenth-century French salon), its institutionalization within the context of contemporary capital points to the specific role it would come to play in the processing of social and political life, particularly in terms of aesthetic experience.
28. Alison Landsberg, "America, the Holocaust, and the Mass Culture of Memory: Toward a Radical Politics of Empahty," *New German Critique* 71 (1997) 79.
29. Landsberg, "America, the Holocaust, and the Mass Culture of Memory" 79–80.
30. In his historical revision, Ran Zwigenberg places Hiroshima at the center of global memory culture. Arguing that the role of the Holocaust

was, from the outset, intertwined with Hiroshima, he demonstrates how Hiroshima not only served as a reference point for the factors leading to the Holocaust but also provided the moniker "holocaust" which originally signified "nuclear anxieties"; *Hiroshima: The Origins of Global Memory Culture* (Cambridge: Cambridge UP, 2014) 12–13.

31. Maximillian Mayer, "Nuclear Ontologies, Technopolitics in Postcolonial Spaces, and the Cold War as Transnational History: An interview with Gabrielle Hecht," *The Global Politics of Science and Technology — Vol. 1: Concepts from International Relations and Other Disciplines* (Berlin: Springer, 2014) 277.
32. Mayer, "Nuclear Ontologies" 321.
33. "Nuclear Ontologies" 278.
34. Ned O'Gorman and Kevin Hamilton, "The Diffusion of an Atomic Icon: Nuclear Hegemony and Cultural Memory Loss," *Rhetoric, Remembrance, and Visual Form* (New York: Taylor and Francis, 2012).
35. O'Gorman and Hamilton, "The Diffusion of an Atomic Icon" 8–9.
36. Rob Nixon, *Slow Violence and the Environmentalism of the Poor* (Cambridge: Harvard UP, 2011) 2.
37. Nixon, *Slow Violence* 3.
38. Yaeger 309.
39. Brent Ryan Bellamy, "Into Eternity: On Our Waste Containments and Energy Futures," *Paradoxa* 26 (2014) 145–158; Vivasvan Soni, "Energy," *Fueling Culture: 101 Words for Energy and Environment* 133; Imre Szeman, "On Oil and Philosohy," *Contours Journal* (2015), 36–40n.
40. Stephanie LeMenager, *Living Oil* (Oxford UP, 2013) 104.
41. LeMenager, *Living Oil* 27, 193.
42. Bob Johnson, *Carbon Nation* (Lawrence: UP of Kansas, 2014).
43. Despite my claims, the clear alignment of literature with the carbon unconscious and photography with the atomic unconscious is necessarily overdetermined. Their polarization is not so clear. Demonstrating the role of photography in the production of a carbon unconscious, LeMenager suggests that Dick Smith's images of dead shore birds after oil spills recall "photography as itself memory practice — a means of taking something into the self, repurposing it for the self, giving it a story

and place" (38). Foregrounding the role of literature in the production of an atomic unconscious, science fiction writers such as H.G. Wells, who included descriptions of nuclear explosions, were read by Leo Szilard long before he began working with Oppenheimer and anticipated the invention of the atomic bomb. Nevertheless, in our present moment the embodied memory of the carbon unconscious is more deeply aligned with a literary consciousness and the atomic with the photographic. For further discussion on the development of a photographic consciousness, see my article "Memory, Trauma, and the Matter of Historical Violence: The Controversial Case of Four Photographs from Auschwitz," *American Imago* 71.4 (2014) 391–415.

44. Barbara Macron, "Hiroshima and Nagasaki in the Eye of the Camera: Images and Memory," *Third Text* 25.6 (2011) 792–793; "The Diffusion of an Atomic Icon" 189–190; Akira Mizuta Lippit, "Phenomenologies of the Surface," *Qui Parle* 9:2 (1996) 39.
45. elin o'Hara slavick, "Hiroshima: A Visual Record," *The Asia-Pacific Journal* 7:30 (2009) http://apjjf.org/-elin-o'Hara-slavick/3196/article.html
46. Nicole Shukin, "The Biocapital of Living — and Art of Dying — After Fukushima," *Postmodern Culture* 26.2 (2016).
47. Thomas Pringle, "Photographed by the Earth: War and Media in Light of Nuclear Events," *Necsus: European Journal of Media Studies* (2014) http://www.necsus-ejms.org/photographed-earth-war-media-light-nuclear-events/.
48. slavick, "Hiroshima" 310.
49. Yaelle S. Amir, "Curatorial Statement," *Reactive Matters* (Newspace Center for Photography, Portland, OR, 2016).

Work or Energy or Work/Energy? On the Limits to Capitalist Accumulation

George Caffentzis

Introduction: The Limits to Growth Paradigm

Will capitalism end in the coming decades? What are the material conditions for its end? What, if anything, can slow the juggernaut of capitalist accumulation and then stop it? These questions have perturbed historical materialists since Marx and Engels wrote the *Communist Manifesto*. Since the crisis that began in earnest in 2008, they have left the strictly Marxist parochial political environs, becoming the veritable "talk of the town."

Historically there have been two kinds of answers to these questions. One approach takes the internal contradictions of capitalism — especially the tendency of the falling rate of profit brought about by the increasing organic composition of capital — to be the key to an answer. The other approach takes the intensity of class struggle as its starting point. It is a class struggle generated by the combination of the inequality of social wealth and a proletariat increasingly sophisticated and trained in cooperation and militancy by the development of large-scale industry. Historical materialism has tacked from one side to the other, sometimes attempting to bring them together. Michael Hardt and Antonio Negri, for instance, use a combination of both explanations. In their account, "immaterial workers" bring "cognitive capitalism" to its conclusion, which is a historically specific development from the picture of industrial capitalism and its "material workers" (to coin a phrase).[1] Of course,

"the end of capitalism" does not necessarily equate with the coming of a revolution that will bring about a new, morally, and ecologically superior form of production that is not based on capitalist accumulation. After all, the end of capitalism could just as easily lead to "the common ruin of the contending classes" as Marx and Engels noted long ago.[2]

Since the 1960s, literature has developed arguing that capitalism will end neither because of its internal contradictions nor because of working-class revolt. Rather, some argue that its end will have a natural twist. According to this view, Mother Nature has been stingy with capitalists. She did not leave them enough easily accessible fossil fuels in the cupboard of the planet's crust. Some predict that the rising cost of production will constrict output to a crawl when the discovered stocks of fossil fuels have peaked.Other theorists make "parallel" claims (on the basis of a somewhat different and more elaborate model) which anticipate not just a peaking of fossil fuel production but a total depletion of available fossil fuels.[3] The corollary of these views is that the physical or monetary exhaustion of these resources will destroy accumulated wealth and the capitalist mode of production with it. These allied socio-geological claims are often popularly called the peak oil hypothesis and the Limits to Growth hypothesis respectively. They are very attractive to many anti-capitalists because they seem to provide an objective limit to capitalism's expansion. God might not be on the anti-capitalists' side, from this perspective, but Mother Nature is!

In this essay I analyze these hypotheses and find them problematic based upon an "energy fetishism" that attributes value creation to processes outside the ambit of human work. In a previous essay, I offer a critique of the peak oil theory supporters.[4] So, in this one I will concentrate on the Limits to Growth argument. There have been many presentations of the limit to growth hypothesis. In particular, I take Saral Sarkar as the primary spokesperson of this position. I do this because Sarkar has presented a straight-forward Limits to Growth argument based on the role of increasing entropy in

limiting not only capitalism but any industrial society. He is to my mind the most logically precise proponent of the Limits to Growth view. Thus my argument begins with an exposition of Sarkar's core argument in *Eco-Socialism or Eco-Capitalism?* (1999) and *The Crises of Capitalism* (2012) — two clear sighted books that reject the apocalyptic hyperbole of many in the peak oil and "Limits to Growth" camps.[5] Then, I turn to a critique of Sarkar's account of energy, labor, and the ends of capitalism.[6] His is a wise voice addressing the anti-capitalist movement. Let us listen.

Peak Oil and Limits to Growth

In his latest work especially, Sarkar concludes that we are in the midst of a crisis of capitalism, instead of another crisis in capitalism. For Sarkar, this crisis is wholly other than the one plaguing the financial system:

> A defective mechanism can be both patched up and repaired (which process has already been started), but an ineluctably eroding foundation cannot. As long as the foundation can remain strong, the system can remain alive. The foundation of today's capitalism is its material resource base. And this base is eroding fast and irreparably.[7]

Put simply, in Sarkar's analysis the base and superstructure of modern capitalism is not the economic and the cultural, but is rather the material world itself and the economic system that depends upon it. Sarkar argues that the fundamental source of labor productivity in all ages (from the Stone Age to the Bronze Age to the Industrial Revolution) is energy. At first it was derived from human bodily and animal power, then from wind and water, then from the burning of wood, then coal, and then oil and gas combustion. He concludes his chronology with what he calls our contemporary Industrial Civilization: "its enormous labor productivity, and its prosperity are mainly based on fossil energy sources."[8] But though they have supported this superstructure, fossilized energy resources "are a once

only gift of nature. They are exhaustible. Their stock is continually diminishing."[9] This key insight of the Limits to Growth Hypothesis has brought about a paradigm-shift in anti-capitalists' understanding of capitalism.

In Sarkar's eyes, this paradigm shift condemns all social theories that ignore it to irrelevance. For example, he criticizes Marx's labor theory of value (LTV) for taking human labor as the sole determinant of the value of a commodity. He retorts that there are two value producing areas that Marxists have ignored to their peril. First, natural conditions like the weather affect the socially necessary abstract labor time required to produce a commodity. Second, the scientific and technological knowledge produced by people who do not labor is crucial to the production of a commodity.[10] In fact, he seems to find human labor a negligible part of the value created in capitalism. Consequently, he arrives at the political conclusion that the refusal of labor does not disrupt the value accumulating process.

Worth noting up front, however, is that his understanding of surplus value differs from a Marxist take on the subject. In Sarkar's account, surplus value has three sources: (1) easily exploitable natural resources; (2) the ability of nature to absorb human-made pollution ("sinks"); and (3) scientific and technological developments that increase labor productivity and increase the quantity of new useful products.[11] There is no mention of the labor process at all in Sarkar's analysis of the sources of the surplus.

For Sarkar, since capitalism depends on an eco-surplus for its profits and accumulation, its three sources already name the Limits to Growth: (1) the exhaustion of natural sources of energy, especially oil and gas; (2) rising toxicity in the form of poor soil, smog, and so on when natural "sinks" begin to fail; and, finally on the question of energy, (3) we have reached an entropic limit and no scientific or technological breakthroughs can overcome the loss of the fossil-energy resource base. The optimism attached to renewables is therefore preempted in this model. He argues that there is much flawed optimism about renewable technology from those who cannot

distinguish between technical feasibility and economic viability.[12] All three limits lead to capitalism's destruction, in Sarkar's theory, and they are already far advanced. However, in Sarkar's schema there is a process that seems to be irrelevant to the end of capitalism, the labor process, for there is again no mention of the labor process or, more precisely, the refusal to labor, in Sarkar's account of the reduction of surplus.

The first two blockages to surplus are obvious enough and have been documented extensively, but the third depends upon a more elaborate argument since it seems to be violating Karl Popper's maxim: "if there is such a thing as growing human knowledge, then we cannot anticipate today what we shall know only tomorrow."[13] (Though Popper was, of course, an archenemy of historical materialism, his maxim does have a point. We should never be afraid of learning from our enemies what could be used for our struggle!) In particular, how can we know today that there will never be a scientific breakthrough that devised an inexpensive and environmentally safe process to create useful energy on a large scale using a relatively cheap common substance like tap water?[14]

Sarkar's violation of Popper's maxim is based on Nicholas Georgescu-Roegan's efforts to apply the Second Law of Thermodynamics to the whole economic process. Georgescu-Roegan argues: (1) both energy and matter come in two states: available and unavailable; (2) in an isolated (closed) system, available energy and matter gets continuously and irreversibly transformed into unavailable energy and matter; (3) the only source of energy on the planet that is not facing continual degradation is sunlight, but the problem with using sunlight directly as a source of energy is that, in Sarkar's words, "it reaches us in a very high entropy state… its energy density is very low. It is therefore not readily available for most purposes of industrial production, which require high temperatures or electric power," and, therefore, (4) the probability that an economically viable substitute for fossil fuels will be found is negligible.[15] A corollary to this conclusion is that since capitalism depends upon the energy created by the combustion of

carbon fuels and the stock of these fuels is rapidly diminishing, industrial capitalism will come to an end (though what will follow is an open question). In other words, Sarkar assures us that there will be no "energy transition" in the twenty-first century of the sort that went from water, wind, and animal power to carbon-based, fossil-fuel power in the late eighteenth and early nineteenth centuries.

Sarkar presents a wonderfully clear critique of Marxist theories of capitalist crisis as well as a well-argued explanation of why this crisis is a crisis of capitalism. In fact, his critique of Marxism, especially of the LTV, is essential to his explanation. I am, however, at odds with both his critique as well as his explanation. In my view as a historical materialist, Sarkar's Limits to Growth misses a crucial element in any account of the end of capitalism, since his dismissal of the importance of labor for the reproduction and accumulation of capital misses, too, the importance of its refusal for the dis-accumulation and eventual abolition of capital. I appreciate the frustration evoked in anti-capitalist writing when assessing the record of working class struggle with its divisions, retreats and frequent racist, sexist and anti-ecological accommodations with capital. But working-class struggle against exploitation, not the diminishing stocks of oil and gas, is the only definitive logical limit to capitalist accumulation, "subjective" though it may be, as I argue below.[16] First, however, I will deal with Sarkar's rejection of labor as the primary source of value.

A Critique of Sarkar's Argument against Marx

Sarkar's critique of Marx's LTV has two elements: (1) natural conditions like rainfall, climate, and weather can have a visible and profound effect on the value of an agricultural commodity — for example, "[t]he value (i.e. exchange value) of wheat is, in this case, partly determined by nature"; (2) scientific and technological knowledge congealed in machines increases the labor productivity and hence affects the value of commodities that are in the production process; but scientific and technical knowledge is not produced through labor: "[i]t is not correct to subsume the activities of scientists, inventors and developers under

the general category of labor."[17] Let me take each in turn.

First, I should point out that Marx recognizes the importance of nature in in the production of commodities from the first chapter of *Capital I*:

> When man engages in production, he can only proceed as nature does herself, i.e., he can only change the form of the materials. Furthermore, even in this work of modification he is constantly helped by natural forces. Labour is therefore not the only source of material wealth, i.e., of the use-values it produces... As William Petty says, labour is the father of material wealth, the earth is its mother.[18]

But material wealth is not value. Value is not a material thing, nor even a relation among material things. Rather, it is a social form that can be represented — unlike something like natural wealth, which is more like an environmental condition of possibility rather than an exchangeable quantity — and needs a socially determined equivalent of time to circulate as value. Thus, though more rainfall might affect the amount of socially necessary labor time for the production of a pound of wheat, the rainfall does not create the value of that pound of wheat. In other words, capitalism in its appearance as a commodity-exchanging society is extremely "humanistic" in the sense that its major concern is to expand its control of human life as much as possible in order to channel that life into exploitable labor. Capitalism requires a value-creation process that must be reproducible and whose results can be accumulated. The idea that you could accumulate the natural wealth of rainfall, and that you could in turn toss the accumulated wealth of rainfall into a market where it could magically yield more of itself without further accumulated rainfall, makes no sense. And the reason it makes no sense is because the version of value we are speaking about with natural wealth is use value, and not exchange value, since it is useful for the human labor that is employed by capital, but could never itself circulate as exchange value, let alone beget more of itself in the style of M-C-M'. One must be careful, in other words,

not to commit a "naturalistic fallacy" in considering value to be on par with the natural, for though a use value (a food that tastes sweet) might be analyzed chemically, value cannot be analyzed chemically. I fear, however, that Sarkar does commit that fallacy. For it is not that nature isn't useful, in Marx's estimation; it is just that it doesn't create values. Capital literally has a "lust for labor" (which can also be called a "lust for value").[19] We can see that lust animated recently in the mobilization of nearly a billion Chinese and Indian workers to become part of the global working class in a period where many were arguing we were on the verge of a "post-industrial era," when workers are supposed to be superfluous for capitalism!

Sarkar's second objection to Marx's LTV is that scientists and technological inventors are "not workers in the Marxian sense," but they are crucial to the increase of labor productivity. Marx definitely was aware of the importance of science and technology for the increasing productivity of labor, and he definitely appreciated the difference in the productivity of an hour of labor in a modern shoe factory versus the productivity of an hour of labor in an early modern shoe workshop.[20] Be that as it may, scientists and technological innovators hired by corporations today are skilled workers who apply their knowledge and capacities to satisfy the requirements of the company (for example, Claude Shannon, the innovator of Information Theory, worked for Bell Labs, and his theoretical labors were part of his job).

We now have a large category of workers who are involved in "knowledge production and communication" from schoolteachers to computer programmers to movie actors to shoe designers. They might be "immaterial workers," in the terminology of theorists of "cognitive capitalism," but they operate as workers in the past did. They must negotiate labor contracts, meet deadlines, and confront real bosses and are under the same pressure to increase productivity as industrial workers in manufacturing economies. Almost any contemporary production process is a complex one, with many different concrete forms of labor of a variety of skill levels, but every level requires

human intellectual and disciplinary capacities in abundance and the result of the work of the shoe designer is factored into the social necessary labor time required to produce the shoe. Sarkar seems to think that a decisive argument for his view is that the work of immaterial workers gets paid even "for their fruitless activities" and their payment "comes from the results of the labor of the rest of the work of the corporation."[21] But this situation is not unique for so-called "immaterial workers." (For a critique of this term see my book, *In Letters of Blood and Fire*.[22]) After all, even on an assembly line a worker is paid when the quality control check at the end of the line rejects a certain percentage of the products s/he worked on. Who pays for the "fruitless activity"? In most cases the payment comes from the results of the labor of the rest of the work of the corporation. This is especially true in product liability law where the corporation is responsible for damages caused by defective products it sells, not the workers who produced them.

The fundamental point I want to make here is that the LTV has political importance, but also explains logical inconsistencies in the physiocratic and classical value theories Sarkar inadvertently reproduces for the contemporary era. If labor was not central in the creation of the surplus value, then capital would be anxious to shrink both the quantity and quality of the class of workers, but that is not happening in the twenty-first century. On the contrary, billions are being added to the working class and on all levels of skills (from agricultural workers to nuclear scientists). The capitalists seem even more concerned about locating reserves of "low entropic" workers (to mix categories!) than in finding oil and gas deposits. For example, between 1990 and 2014 the labor force participation in BRICS countries — Brazil, Russia, India, China, and South Africa — increased from 1115 million to 1510 million, roughly a 35 percent increase.[23] Moreover, the powers of science and technological innovators have been largely incorporated into the capitalist assembly line.

Critique of the Notion of the Natural Limits of Capitalism

The power of Sarkar's Limits to Growth deduction of the end of capitalism is that it claims to find natural limits to capitalism in the material resource base of industrial capitalism. According to Sarkar, as the stock of easily available petroleum and natural gas becomes exhausted, the whole superstructure of production, circulation, and consumption called capitalism is mortally threatened, since collective capitalists do not have any alternative but to burn its material base up in smoke. This process will lead to a continuous contraction of capitalism until it faces its doom. Indeed, Sarkar argues that the present crisis is an anticipation of the final shrinkage of the resource base.[24]

Though elegant, I find Sarkar's explanation of the crisis problematic for a number of reasons. First, his theoretical dismissal (and consequent empirical neglect) of what is central to capitalism and its opponents: labor and its refusal. Sarkar is not alone with this attitude to labor, of course. Most Limits to Growth proponents shift the political focus from class relations to the limits of nature. Thus, in a period of intense workers' resistance to capitalism in France, the United States as well as in the colonized world in the early 1970s, there was an increased study of the Limits to Growth and the threats to affluence arising literally from nature. The mathematical models of Jay Forrester and the Club of Rome had the resource-hungry economy machine driving straight into the brick wall of Not Enough (exactly the opposite of the Zapatistas' "Ya Basta!") that had nothing to do with class struggle.[25] According to them, there was simply not enough oil, not enough natural gas, not enough uranium, not enough coal, and even not enough air to keep up the pace of post-WWII capitalist growth, so they suggested a steady-state form of capitalism. Sarkar, of course, has no interest in reforming capitalism, steady-state or not (as was the political intent of the members of the Club of Rome) since he concludes that an eco-socialist government would be a way to at least ameliorate the harsh conditions that will follow the collapse of

capitalism due to the exhaustion of the energy resources that is now becoming evident. All of this sounds more or less palatable from the standpoint of environmental politics, except for a key feature of the entire economic structure Sarkar is interested in theorizing the ends to: the social and energic content of surplus value upon which growth is categorically, logically, and historically built upon.

My first retort is that capitalism in its history has had a number of energetic resource bases and, in fact, it began in the sixteenth and seventeenth centuries with a "solar" base (wind, water, wood, animal, and human power). The conquest of the Americas, the formation of the global market, the creation of the banking system, the expansion of the slave trade, and the enclosures of the European commons were all realized without heat engines and their material fuel basis (coal, oil, and gas). This original period of accumulation was followed by a capitalism with other energy resource bases. Roughly we call them by their substance names: from coal to petroleum and natural gas to, in some places like France, nuclear power. Two things should be pointed out about these bases: (1) much more than energy was required for production, for it required quite different kinds of proletarians to become creators of surplus value; and (2) the basic components of capitalism were not changed in going from one energy base to another. I will elaborate on both points.

A. Proletarians and Energy: Work/Energy

A proletarian on a ship driven by oarsmen, by sails, by coal, by oil, or by a nuclear reactor is not the same proletarian as the one rowing, rigging, firing, stoking, or monitoring. A different set of rules apply to exploit their labor and a different logic of refusal applies to different forms of motive power. So, for example, an enslaved proletarian is hardly a crewman that would be appropriate to a nuclear submarine or to a space colony (for the latter, see "Mormons in Space," an essay coauthored by Silvia Federici and myself).[26] Similarly, an assembly line staffed by artisans would be problematic as well. This connection between workers and the technological means of production

was understood by the political economists of the eighteenth and nineteenth century like Adam Smith and John Stuart Mill whose critique of slavery was based on its inefficiency, for no reasonable capitalist would want to have slaves tending machines that cost many times the slaves' value. In other words, slave production could only be compatible with the lowest technological level because the slave could be expected to "labor as little as possible" and be "inefficient and unproductive" respectively.[27] So whenever there is a change in the energy resource base of capitalism, there is a necessary change in the social character of the proletariat that will make the new base productive of surplus-value. What is crucial for capitalism, then, is neither work nor energy alone, but work/energy, that is, the ratio between the amount of work that creates surplus-value and the quantity of enegy produced by the resource base.[28]

The chain of causation also goes the other way. For changes in the work/energy ratio are caused by proletarian action. As Timothy Mitchell has powerfully argued and documented, the reason why there was a shift from coal to oil was not due to the superiority of the latter substance for industrial production, but it was because miners and their strikes began to pose a serious challenge not only to their immediate bosses, but to the entire capitalist system by creating a new level of class power:

> Workers were gradually connected together not so much by the weak ties of a class culture, collective ideology or political organisation, but by the increasing and highly concentrated quantities of carbon energy they mined, loaded, carried, stoked and put to work.... More than a mere social movement, this socio-technical agency was put to work for a series of democratic claims whose gradual implementation radically reduced the precariousness of life in industrial societies.[29]

The move to oil was an attempt by capital to find an energy resource base that was able to undermine this power of the working class in the coal circuit. Many features of oil provided much more control over

the energy resource base:

> The ability to weaken the labour force by dividing it into separate racial groups, with managers, skilled workers and unskilled workers housed and treated separately, reflected the different distribution of oil production across the world compared to coal, and its development after rather than before the rise of moden industry.[30]

This analysis is an example of why it is important to understand the class dynamics that motivate many of the energy resource base transitions, for they are not determined by questions of scarcity and energy density, as the Limits to Growth theorists would have us believe today.

B. Capital's Historical Consistency

Throughout these many work/energy transitions since the sixteenth century, capitalist accumulation continued unabated. This demonstrates that the basic categories needed to constitute a capitalist society are not determined by the energy resource bases of the day. Profit, wage, rent, interest, value, surplus value, constant capital, and so on do not require a particular technology with an accompanying energy resource base. This is not to say that "anything goes," or that, for example, capitalism can point-for-point "return to a solar past," since capitalism at its dawn confronted a world population the fraction of the present size and a circulation process operating at a fraction of the present speed. But these differences do not affect the fact that capitalism is a very old social system that has been able to launch and survive many energy resource transitions due, in part, to the inability of its oppositions to generate the social power necessary to overthrow it. Though the energy resource bases can change, what is crucial is that there will always be workers who have no direct access to the means of subsistence and production whose work can be exploited and turned into the many forms of revenue: profit, interest, and rent. As long as these workers are willing to accept a much lower energy

density in the means of production (that is, a return to an archaic technological level), then it is possible for capitalism to continue the accumulation process, for what is accumulated is not energy, but work. Will they? This is not clear, but there are indications of the terrain of struggle to come is the refusal of "extractivism" — the doctrine that roots economies on the extraction and export of natural resources — especially by Indigenous people in Latin America.[31]

To go further into my critique of Sarkar's view of the determining character of the energy resource base, it is worthwhile asking the naïve question: for what purpose is this energy resource base being used? In most cases energy's major purpose is to power machines (from trucks and tractors to electric power plants). So this brings us to the machine and to another naïve question: for what purpose is the machine to be used in capitalist society? Machines are certainly not introduced in order to reduce the pain and danger of the labor process. On the contrary, they are introduced to increase the profitability of the capitalists who own them via the productivity of the workers they exploit. More to the point, machines are themselves not simply accumulated energy from fossil fuels, but are rather the products of past labor — dead labor, in the historical materialist idiom — full of an accreted form of human labor waiting to be employed by new living labor. Machines, Marx reminds us, don't wake up and decide to go to work of their own accord. The key issue for the individual capitalist is that s/he purchases a machine to use in the production of a commodity in order to keep up with the competition. But that does not answer the question; it simply defers it to the initial adopters of the machine in question who did not have competitive pressures to motivate the change. The key view that opens up the possibility of an answer is that machines are instruments in class struggle, since the boss can threaten to replace workers who are successful in increasing wages, reducing the workday and making claims on the productive apparatus. Of course, the substitution is also mathematical. For the cost of the machine (with its energy costs and its depreciation) must be less than the "savings" in the wages and other costs connected with

workers' struggles (e.g., sabotage).

There are additional attributes of machines that are useful in the class struggle, as Renfrew Christie pointed out many years ago:

> Dead labor in the shape of machinery has another advantage over living labor. It does not talk back. It does not go on strike. It does not steal. It does not resist the designs of capitalists.... Capitalists, therefore, use the disciplines and skills of machines as substitutes for the withdrawable skills and calculated indisciplines of their class enemies, the workers.[32]

This connection between work and energy was well known to Marx and it helped structure *Capital Vol I*. For it is no accident that Part 4, "The Production of Relative Surplus-Value," which is comprised largely of a discussion of the role of machines in capitalism is followed by Chapter 11 on the successful struggle to reduce the working day. For the more effective the class struggle is at the point of production, the greater is the tendency of capital to increase mechanization and hence there is an increased need for power generated by energy resources. And here we can see that this energy resource base is crucial in replacing labor power (if it is full of struggle) and intensifying its exploitation.

Let us examine the relation between energy needs and class struggle in a schematic way by assuming that the sum value of the totality of commodities (T) is constituted by constant capital (C), value of labor power (V) and the surplus-value (S) (T=C+V+S) and the rate of profit of the whole system is S/V+C. A successful class struggle is one that increases the value of labor power and reduces the rate of profit. How can the capitalists react to increase the rate of profit? One answer is: to increase C in order to reduce the required number of workers and their wages (the wage bill, as it was known in nineteenth-century political economy) V, and also increasing S. In general, therefore a response to increased and successful class struggle is via an increase in mechanization and hence power requirements. Indeed, one might

say that in a capitalist society increased class struggle would tend to accelerate the use of energy resource base. Consequently, as long as the struggle is kept under control, the drive to increase the pace of mechanization is reduced and hence the need for more energy is reduced. This is the capitalists' version of conservation! But the struggle that escapes control (increasing V and decreasing S) and successfully resists the substitution by machines (keeps C level) is the workers' ecological path away from capitalism. No wonder why there has been "a struggle between worker and machine"! As the Luddites taught Marx, "The instrument of labor strikes down the workers."[33] This struggle not only puts a brake on the accumulation process but, in the tradition of historical materialism, is the only formal path to anti-capitalist transition.

What does this excursus into capitalist mathematics mean for the Limits to Growth? It demonstrates that class struggle has a profound effect on the use of energy in capitalism. It is only the "subjective" aspect of the work process that is a limit to capitalism, not the "natural" aspect (which at first glance to the Limits to Growth supporters appears to be the decisive factor). The problem with this subjectivity is that it does not have clear limits! How much working class "patience" can capitalists count on? This is a quantity (like future knowledge) that cannot be known in the same way that the amount of petroleum in a given volume of subsoil. Thus, a drama is proposed by this way of formulating the question of the end of capitalism. For it is perfectly possible for the wage and working conditions of workers to shrink to unprecedented levels without bringing about a revolutionary response. Indeed, we are seeing such a development in Greece right now where more than a century of struggles to guarantee a less precarious life to the working class has evaporated without a fundamental break with the system (yet). Consequently, the Limits to Growth response to the end of capitalism seems to avoid dealing with the decisive question: when (if ever) will class struggle reach a point of refusal in the face of deteriorating natural conditions?

One way to answer this question is to examine it historically. In this

article I will examine only one case — that of Nazi Germany — but it embodied an extreme case of ecological breakdown. It faced a classic "energy crisis," its cities became ecological hells, and it had revived the slave mode of production. The German working class in 1945 was definitely a prime candidate of one that had been pushed to the limits.

Case Study of the Limit to the Limits to Growth: Nazi Germany

> Berlin... has great hopes for these secret weapons as well as the productive capacity of Dora. Upper Nazi circles think the rockets can and should lead to a redressing of the military situation. In a sense, then, the slaves of Dora have become the potential saviors of Hitler's Third Reich! — Yves Beon, a slave on Planet Dora[34]

In order to best understand my critique of Sarkar's explanation and my insistence on the subjective limit of capitalism it is worthwhile to look at the experience of Nazi-ruled Germany during World War II as an "extreme case" that proves the norm. When we examine this experience we see that the so-called natural, ecological, and resource limits that the Nazi regime faced were not final determinants of its end. Rather we see the subjective limits presented by workers are the primary ones.

For example, ecological limits are not given. The question, "how much ecological degradation would the working class of the planet accept before revolting against the agent of this degradation?" cannot be answered with any definitive certainty. Using the standard parameters like air quality, German cities like Dresden in World War II experienced a level of ecological degradation at an unprecedented pace under the British and U.S. bombing campaigns; however this degradation did not lead to the mass exodus of the German citizenry from the Nazi regime. Let us remember that the level and pace of the ecological degradation in Dresden during World War II was much more severe than the climate changes that are being predicted by the

projectors of climate change for Dresden in the near future. After all, the firebombing of Dresden (and the major cities of Japan) increased the average temperatures in the city into a realm far beyond the heat projections for cities of the north of the Tropic of Cancer.

The record of the population of Nazi Germany under bombardment puts the issue of limits into focus. The assumption of the Allied military planners was that the massive bombing campaign would lead to an equally massive defection from the regime. However, both the British and the U.S. Bombing Surveys noted that though the campaign clearly had an effect on morale, it did not lead to the insurrectionary consequences they wanted to instigate with the firebombing of Dresden and other cities to "dehouse and demoralize"! It shows us that there is no inevitability that can be deduced from ecological conditions, especially extreme and rapid changes. After all, as mentioned above, modern war is an ecological catastrophe. On the one side, in the midst of llied bombing, German industrial production (defined both in terms of military hardware and the profits of companies like Daimler-Benz) increased. On the other hand, Germany faced a dramatically reduced material base, especially with the defeat at Stalingrad (which was the main obstacle to the Nazi march on the Baku oil fields). In effect, Nazi Germany was suffering a classical "energy crisis."

Paradoxically, the Nazis made up for this lack of a material energy base in two ways. One by looking to the past and the other by looking to the future:

> As for the past, the Nazis introduced slave labor instead of bringing German women into the factories. For as Bernard Bellon notes, "keeping women in the home was also intended to prevent the kind of social unrest which led to the revolution of November 9, 1918, and the 'stab in the back' of conservative and Nazi legends."[35]

The Nazis also experimented with violating the advice of Adam Smith and John Stuart Mill in their desire to test the extreme limits

of capitalism when the Nazi regime put slave workers to the job of assembling high-tech V-2 rockets between 1943 and early 1945 in mine tunnels near Nordhausen. For though the ceiling of the cavern where the rockets were produced was lined with the hanging bodies of recalitrant slaves, still, as Smith and Mill predicted, the missiles were sabotaged, many of them landing harmlessly in fields and seas miles away from their targets. Approximately 6,000 people were killed by the V-2s, while more than 12,000 slave laborers died in the production of 3,000 V-2 missles. Thus the V-2 was one of the first weapons in history where more people were killed in its production than by its use. Thousands of these slaves died of exhaustion and disease, but 350 were hung (including 200 who were explicitly executed for acts of sabotage). As Michael Neufeld writes in his Introduction to Yves Beon's *Planet Dora*:

> Sabotage naturally remained a centeral concern, the usual punishment was a gruesomely slow hanging on the roll call square.... [S]abotage... had some indeterminate but significant effect on missile quality.[36]

This situation confronted the Nazis with the problematic produced by mixing a slave mode of production with a high organic composition industry. In the interest of keeping production going:

> [T]he preservation of the prisoner workforce became a higher priority, as many now possessed semiskilled training in various assembly line jobs. The Mittelwerk company made limited efforts to improve clothing and good rations, and [chief engineer] Rudolph was involved in the creation of a premium wage system that allowed some prisoners to earn prison scrip that could be used to buy a few extras at a canteen.[37]

The correlations between organic composition of a branch of industry and the composition of the working class involved in that industry, however, is not fixed.

As for the future, the Nazis deployed an extensive use of coal

liquification that would turn coal (mined in a more traditional manner by the use of slave labor) into liquid fuel for internal combustion engines. This is a technology that is still being explored in our day. And many like Sarkar would point to its thermodynamic inefficiency, since it takes an enormous amount of energy to transform hydrocarbons in solid form into carbohydrates in liquid form. But for the Nazi regime, it was efficient on another dimension, the polemodynamic (literally, "the war force") dimension. For in the "blitz" strategy, speed was essential, with tanks and fighter-bombers being its prime movers (and both demanded liquid fuel).

In both these cases, the limits of the process of accumulation the Nazi regime instituted (which included the revival of slave labor in Europe and the deployment of the most advanced technological means to produce fuel for its war machines) were not determined by the natural environment, but rather by subjective limits (to use a short-hand term). Of course, the Nazi regime did not last for its much-trumpeted millennium-long existence; it only existed for twelve years. But did it inevitably have to fail? That is not clear to me now, and it was certainly not clear to most people then. There were limits to both the "patience" of the German citizenry and the divisions of the slaves among them, but what they were is a mystery since, though courageous, the number and effectiveness of collective slave and citizen revolts in Germany against the regime were not sufficient to overturn it. That required the combined military forces of the United States, the Soviet Union, and the United Kingdom to literally occupy the country (unlike the denouement of World War I).

Defenders of the limit to growth hypothesis like Sarkar might object that the Nazi regime was not a "normal" capitalist regime and the war made extreme its already deviant non-capitalist tendencies. But the Nazis were intent to preserve and expand the reach of the fundamental structures of modern capitalism around the world, just as long as it was German capital that took the best plums. For example, Daimler-Benz built a good portion of the V-2 rocket for the German military for a profit. Moreover, if a large military industry disqualified

a country from joining the ranks of capitalist states, then the United States would be the first to be ousted. The whole point of this short reminiscence of Nazi Germany, however, is to show that energy and ecological crises of the most devastating sort alone will not directly lead to the abandoning of a socioeconomic system like capitalism unless there is an alternative available and a political force united enough and massive enough to achieve it.

Conclusion: Refusing the Bargain of Green Capital

In conclusion, I find Saral Sarkar's defense of the Limits to Growth paradigm explanation a major challenge to Marxist conceptions of the limit to capitalism, but ultimately it is problematic. Let us review a number of reasons for such a conclusion.

First, the only limit of capitalism arises from a subjective form of energy — work — that intrinsically is open to refusal and, via its negative capacity, creates value.[38] It is value that capitalists accumulate; not material use values.

Second, there have been many changes in the energy bases of the capitalist mode of production without a change to the fundamental, categorical structure of capitalism. There is no reason to see the present energy and ecological state as more threatening to the continuation of capitalism than previous transitions, for there is still an enormous pool of labor power available for exploitation, certainly more than in all the history of capitalism.

Third, capitalists are willing to unleash enormous destruction to preserve their system of accumulation and class power as has been demonstrated time and again in the last century. But they speak in shrouded words. Think of the messages sent in the language of the nuclear bombs exploded in Hiroshima and Nagasaki and the hundreds of "tests" of nuclear bombs, both atmospheric and subterranean, that were meant to remind the world population of capital's power.

The capitalist class appears to hold the world hostage. Unclear, however, is whether the average rate of profit will be increased by investing in reversing climate change and preventing the complete

depletion of carbon-based natural resources or by sustaining energy intensive growth that has defined capitalism since the industrial revolution. In "climate summits" the Green faction of capital, at least, looks to the world working class and asks of it whether a deal is possible: "Are you willing to buy our 'stranded asset,' oil in the soil, to the tune of tens of trillions of dollars and so face a long period of a sort of indentured servitude-with-increased work and decreased wages? In other words, do you agree to satisfy our need for surplus value in exchange for us doing what is necessary to 'save the planet'?" A revolutionary retort to this "deal" will not be provided by those who depend upon nature's limits, but by those who organize to refuse capital's blackmail.

Notes

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6. Saral Sarkar, *The Crises of Capitalism: A Different study of Political Economy* (Berkeley, CA: Counterpoint, 2012), and Saral Sarkar, *Eco-Socialism or Eco-Capitalism?: A Critical Analysis of Humanity's Fundamental Choices* (London: Zed Books, 1999).
7. Sarkar, *The Crises of Capitalism* 352.
8. *The Crises of Capitalism* 278.

9. *The Crises of Capitalism* 278.
10. *The Crises of Capitalism* 280.
11. *The Crises of Capitalism* 282.
12. *The Crises of Capitalism* 284.
13. Karl Popper, "Preface," *The Poverty of Historicism* (London: Routledge and Kagan Paul, 1957).
14. Frankly, we cannot know for sure at this time where the science of the future will lead any more than we can know the status of an afterlife. But giving Sarkar the benefit of the doubt, we can reckon by the reliability and durability of a limit law like the Second Law of Thermodynamics — a "law" that puts clear limits on the efficiency of heat engines and "decrees" that perpetuum mobiles are impossible — that the suspension of Popper's maxim is justified in this case. Indeed, a half-century before the first formulation of the Second Law the French Academy decided (anachronistically) to violate Popper's maxim when it refused to consider any correspondence with people claiming to have invented perpetuum mobiles in 1775!
15. *The Crises of Capitalism* 289.
16. "Subjective" in this context is not an antonym of "objective," but it is its dialectical complement. Here I follow a Hegelian usage: "...the term subjectivity is not to be confined merely to the bad and finite kind of it which is contrasted with the thing (fact). In its truth subjectivity is immanent in the fact, and as a subjectivity thus infinite is the very truth of the fact." William Wallace, *The Logic of Hegel* (Oxford: Oxford UP, 1892) 270
17. *The Crises of Capitalism* 278, 280.
18. Karl Marx, *Capital Vol. I,* trans. Ben Fowkes (London: Penguin Books, 1976 [1867]) 134.
19. Silvia Federici, *Caliban and the Witch: Women, the Body and Primitive Accumulation* (New York: Autonomedia, 2004).
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21. *The Crises of Capitalism* 280.
22. George Caffentzis, "A Critique of Cognitive Capitalism," in *Letters of Blood and Fire: Work, Machines, and the Crisis of Capitalism* (Oakland, CA: PM P/

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32. Renfrew Christie, "Why Does Capital Need Energy?" in *Oil and Class Struggle*, eds. Petter Nore and Terisa Turner (London: Zed Books, 1980) 14.
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34. Yves Beon, *Planet Dora: A Memoir of the Holocaust and the Birth of the Space Age* (Boulder, CO: Westview P, 1997) 25.
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1903-1945. (New York: Columbia UP, 1990).

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37. Neufeld, "Introduction" xvii.
38. *Letters of Blood and Fire* 161–163.

Crisis, Energy, and the Value Form of Gender: Towards a Gender-Sensitive Materialist Understanding of Society-Nature Relations

Elmar Flatschart

What is the relevance of a gendered perspective on crisis developments located at the intersection of nature and society? How does energy matter for such a perspective? Critics and theorists typically approach society-nature relations from a strictly economic perspective. This approach tends to situate the subjectivity that appropriates nature as masculine. Uncovering the gendered character of nature relations involves a critique of this form of reductionism and the development of a perspective that incorporates gender as a value relation. From the standpoint of gender, we will be better suited to explain the core mechanisms of society-nature relations, and to reconstruct the conceptual and material conditions of today's overlapping crises of labor, capital, and energy. The type of matrix my claim is meant to test will revise the core conceptual commitments that drive theories of economic and environmental crisis. By understanding gender as a value relation to nature, rather than an attitude towards or essence extracted from nature, I show that critiques of so-called anthropocentric (or anthropocenic) history appear to be only partially capable of overcoming the primary social contradictions that lead to our current impasse. Moreover, they seem much less capable of mediating the energy content of capital, let alone the value form of gender.

Conceptually, I build on a materialist framework that retains arguments about the real character of nature relations, but

significantly expand its scope by turning to approaches developed in Marxist feminism and the Frankfurt School tradition. I thereby introduce scholarship from the German debate that has hitherto not been (sufficiently) received in the Anglophone debate. In the first part, I take the categorical critique of mainstream economic theory as my point of departure. I propose to expand the scope of economic contradictions towards an integral and ultimately more substantial perspective that historicizes the economy. This approach unveils a distinctive conceptualization of the relations to nature that take the form of "second nature," which both obscures nature and produces it anew in a doubly social manner. Consequently, these relations of second nature can only be grasped in terms of a "negative ontology," a condition that has to be critiqued for its dominating character. Such a venture is closely linked to Marxian critique of political economy. New readings of Marx's economy-critical work, as they have flourished in the German debate since the 1970s, contributed significantly to an understanding of *abstract domination* that is buttressed by the economic forms we find in value-form analysis. Combining these readings with a perspective on nature relations paves the way for an understanding of crisis beyond the economical and unveils how the latter is itself the outcome of what I call the *fetishized materiality* of modernity.

The crisis inside the fetishized materiality of modern relations to nature is the main topic of the second part of this essay, starting with the contradiction of use and exchange value. Here we shall see that the modulation of use and exchange value constitutes the foundational mechanism behind the relations of natural and social matter, and I shall show how its dialectical logic can itself be in a state of crisis. Against "externalist" ecological and eco-Marxist takes on this issue, which restrict crisis to pure material determinations, I advance a categorical critique following the theorem of *societal nature relations* (GNV), which differentiates between "first nature" (passively constituted, apparently "pre-given") and "second nature."[1] I will furthermore show that capitalist nature relations are facilitated

by a specific *energic system* that combines the abstract human energy represented in abstract labor and fossil energy in a fetishized *energic fix*. I expand the argument and show how crisis is internal to the social forms of value, money, and capital and their mediation by the predominant energic system. We cannot discern a distinct causal basis for either economic or ecological crisis phenomena as it is the dialectic of both sides that matters ultimately for the processing decay we call crisis, and this dialectic requires a take on energy relations. I eventually draw on the work of the German Marxist Robert Kurz and conclude that an understanding of crisis that scrutinizes the development of the energic fix that characterizes capitalism is essential for critical theory.

In the third part, I introduce the gender-critical approach of this paper. This section departs from the above-developed perspective of a Marxist take on GNV. I argue that the radical categorical critique of GNV ultimately remains economicist and androcentric. The apparently neutral and closed logic of production requires a mode of reproduction that is not wholly immanent as it builds on a (first) nature that is never represented as such, but only as "the Other." A dialectical approach thus has to theoretically account for the (historical) grounds of this process of abjection or Othering. The key to this is the uncovering of a male bias in the economic that can be structurally related to the character of its materiality: modern GNV boasts a binary gendered hierarchy in fetishized second nature in which male aspects are attributed to the social and cultural side and female aspects are Othered as pertaining to nature.

I propose a twofold itinerary to address energy as key materialist category: the patriarchal, androcentric, and sexist model of the Othering of feminized (first) nature should be problematized by means of a deconstructive critique. However, we must not remain there; the deconstructive take on the Other has to be adjoined with a reconstructive mode of critique. I then connect what I call the energic fix to a "male" rationale of production and this gendered energic system relates to a feminized reproductive side, which is linked to first

nature. The dialectic at work is chiefly hierarchical, gendered, and depends on the differentiation between a "closed" synchronic matrix of second-order forms, which are chiefly found in the economic and diachronic ruptures of this matrix. This dialectic is aligned with the production and reproduction of the GNV and expresses the energic mediation and its fix. The work of Roswitha Scholz provides a strong foundation for my endeavors to approach energy and gender. Her theorem of value-dissociation develops a promising version of an integral gendered dialectical approach and can fruitfully be expanded so as to tackle problems of crisis, energy, and the value form of gender.

GNV — A Critical Materialist Perspective

The financial and consequently world economic crisis that started in 2007 has profoundly reshaped the social sciences. Not only are studies on the origins and pathways of crisis phenomena becoming more and more prominent, but we are also witnessing a more general change of perspective. This change is reflected in concrete research agendas, for example, the renewed interest in questions of material reproduction as in the debate on care economy[2] and in abstract trends, like the rise of a *new materialism* that is currently shaking epistemological debates in fields that were formerly dominated by poststructuralist thought.[3]

All this new social scientific thought has however had surprisingly little effect on orthodox economic theory, just as crisis itself does not seem to have spurred significant controversy in what pass as theories *of* crisis. After all, economics seems to remain a self-referential science that is not capable of two operations crucial for every science related to humanity — reflecting on itself and relating to its social subject matter. As it has been argued by critical scholars, economics does in fact not deal with "real economy" as it is produced and reproduced by human beings, but resorts to mathematical sophistries coupled with a formalist dogmatism when it comes to questions of historical foundations of its models.[4]

What it most clearly lacks is a deliberate take on both aspects that define the economy and matter most in times of crises — the social and

the substantial dimension of the reproduction of the human species. I would argue that the *methodological individualism* of orthodox economics remains pivotal to its critical incapacity. If we want to counter these "fairy tales of the market" in order to ask the question that really matters — what is done by whom in which way? — we must look for a completely different framework, a new approach that understands the material and social content of what economists take as self-explanatory categories.[5]

Such a venture includes a *deconstructive* and a *reconstructive* take on the subject matter. As Marx argued, the materialist mode of inquiry should both encompass a critical reference to customary notions of (political) economy, thus yielding a categorical critique and providing a better, critical understanding of the actual social reality or, as Marx put it, "produce at once an exposé and, by the same token, a critique of the system."[6] Reading Marx's *Critique of Political Economy* in this vein — and not just as another theory of economics — leads in a new direction of categorical critique. At its heart is the dialectical relationship of the subject of change and the subjective factor in relation to its objective foundations and its objective factor. As such, this perspective finds but its origins in Marx's own work and has since been elaborated in new directions.

One of the most important elaborations, which also informed a wide range of philosophical and scientific studies, is the Frankfurt School tradition of Critical Theory. But it is not its most renowned protagonists like Theodor W. Adorno, Max Horkheimer, or Herbert Marcuse that have contributed most to the questions at hand; it is the late Alfred Schmidt — assistant of Adorno and professor of philosophy in Frankfurt — who offers a critical starting point. In his foundational work *The Concept of Nature in Marx*, Schmidt develops an understanding of the modern metabolism of society and nature that led to the theory of GNV.[7] GNV has been discussed mostly with respect to socio-ecological questions, but its perspective is more general in outlook and in actual fact should be understood as the most basic answer to the abovementioned twofold reformulation of the

economic question.[8] GNV critiques the economy by embedding it in a broader understanding of how society and nature are interrelating and is thereby showing the historically specific character of modern economic categories.

In Schmidt's account, the interrelation of society and nature in modern capitalism establishes a peculiar materiality, which he terms *pseudophysis*:[9]

> The "materialist" character of Marxist theory does not amount to a confession of the incurable primacy of the economy, that anti-human abstraction achieved by the real situation. It is rather an attempt to direct men's attention towards the ghostly internal logic of their own conditions, towards this pseudophysis that makes them commodities and at the same time provides the ideology according to which they are already in control of their own destinies.[10]

At the heart of this notion, we find a deconstructive approach to economy as a category — its separation into an abstracted sphere with its own "laws" that are beyond human intervention is turned into an appearance. Following Hegel's terminology, but putting it in a critical materialist framework, Schmidt argues that "first nature" and the genuinely capitalist *second nature* fall apart.[11] They separate in an oppressing way, conflating social and natural history without people's knowledge and control thus establishing a *false identity* of nature and society.[12] The highly distanced "natural laws" of economics are thus understood as pertaining to a "natural history" that is to be overcome in order to establish a free society.[13] The ideological realm of "necessities" that is so dominant in economic thinking and the economy itself thus can be subverted if we look at the origins of a society that produced these necessities in the first place. They then appear as *doubly historical* categories — once as a principal historical constitution and once as a specific ramification of modern society's second nature. This does however not mean that one should be so naïve as to believe that a genealogical deconstruction by means of ideology

critique would make the second nature of capitalist GNV obsolete. To the contrary, they are shaped in the form of a very durable, fetishized materiality — a pseudophysis apparent in the commodity form, which inseparably welds exchange and use value in an objectivity that (in this historic formation) is as real to people as the external natural world around us is.

The demi-reality of capitalist nature relations thus has to be grasped by means of a *negative ontology*, in which the negative has a dual meaning: meta-theoretically it stands for the fact that reality is not sufficiently graspable in a formal (positive) methodology; and normatively it indicates the fact that humans cannot directly access their own social structures.[14] It is the *mode of meditation* (*Vermittlung*) that matters, and hence — in the last instance — society's role in shaping itself and nature.

The critique of this mode of mediation goes in line with Marx's critique of (economic) fetishism, which he developed in *Capital*. It is already in the first section of volume one that he uncovers the fetishism of commodities as he reveals their "mystical character," which encompasses the twisted form of men's relation to nature via labor. In *abstract labor*, social interaction with nature appears not as such, but only via exchange of commodities in the economic sphere (the market).[15] In turn, value — a genuinely social quality — appears to stem from this economic domain, hence seems to be already "inside" the commodities — natural and naturalized things — in the first place. In fact, commodities do have their own "quasi-social" life — second nature — while relations between men are naturalized. On the genuinely human, social side, (abstract) labor is exemplary for the way activities are conducted in capitalism — their actual and purported determination go astray, forming a dialectical contradiction processing through time and space and alienating people.

Understood this way, a critique of energy as a social relation to nature begins to take shape. Although Marx hardly ever mentions energy in *Capital*, this does not mean that it is not there. The concept of abstract labor has two sides, one related to nature as an externality,

the other internal to the (social) second nature of capital. Abstract labor produces both a use value and an exchange value. In fact both are conjoined in reality and only theoretical analysis can distinguish between the concrete aspects of labor and labor's value abstraction. The mediation that links the internality of social forms to the externality of substance, second nature to first nature, is neither the specific value-abstraction nor the fact that something useful or physical is produced; it is the energic dimension of *abstract labor as a totality category*: the concept of abstract labor in Marx does not ultimately make sense in the singular, but only as a universal category that relates to total capital as the "automatic subject" that propels GNV. Capitalism collectivizes labor although it privatizes the labor relation. The character of labor as a social form is different from the other peculiar social forms (such as value, money, capital) that build upon it because it is all about the exhaustion of *human energy*, yet not in any concrete, but in an abstract way. The abstract "expenditure of human brains, nerves, and muscles" establishes the fetishized metabolic fusion represented by second nature.[16] Abstract labor as a totality-category is necessary to understand how societal synthesis (and consequently nature relations) is established.

Expanding on Marx, I suggest that much closer attention should be paid to the character of *abstract human energy*. The form of the labor abstraction is one determined by capital, namely, the tautological self-perpetuation of surplus value production. M-C-M' — money that accumulates — is nothing but the peculiar fusion of qualitative and quantitative aspects. Capital is an entity and, at the same time, only a quantity of something else (money); it is a relation and *the* relation of relations. As such, Capital is akin to energy. Energy is the name that we give to the capacity to perform work, but it is also intimately tied to (physical) entities facilitating this capacity. Energy has relational and thing-like qualities and thus matters for the way we approach nature qualitatively and quantitatively. The connection between social and natural determinations of energy matters for every society-nature relation: *energy* is not only natural; it is *a social relation,* as the

emerging energy humanities tell us.[17] The capitalist form of GNV is however unique as it produces a quasi-natural *fetishized energic fix* that deprives human energy of its social character once it is homogenized under the imperatives of value and ultimately capital. This energic fix constitutes the materiality of GNV as it mediates the relation of substance and form in terms of capital's teleology, the qualitative-quantitative self-propulsion of the fetishized system we live in.

It is more than a historical coincidence that the energic fix we find in capital manifests in the *fossil energy system* that drove capitalism from the beginning — the very character of the value form of energy requires a spatiotemporal determination that has hitherto only been provided by fossil energy sources. Only fossil energy is able to compress time and space in a way compatible with the (technologically advanced) exertion of abstract human energy via abstract labor and it is amongst the few forms of energy that is perfectly suited to "outsource" ecological costs, so as to increase the immediate performance in value-production. Modern GNV cannot be imagined without fossil energy; but the latter can only be meaningfully understood if it is also seen as a social relation, that is, one that has its roots in abstract labor as abstract exhaustion of energy. Abstract labor and fossil energy conjoin in the broader society-nature relations and it seems nearly impossible to disentangle them, but this does not mean that the relation is static or ahistorical. It can change from the inside.

GNV and crisis

In light of the above developed, crisis manifests not only in the "economic" or "financial" sphere, but must be rooted in a *crisis of societal materiality* as such. In order to get there, I want to pinpoint the oppressive character of the economic forms that are manifest in their second nature character. For this purpose, it is necessary to acknowledge that fetishized relations (as evidenced in economic categories) are not forming mutually homologous relations, but always imply an unequal, hierarchical split. Society — the sphere of second nature — is the dominant engine of social mediation, premised

under capital on a universal mode of domination of nature and natural substantiality. The capitalist value abstraction as "automatic subject" approaches and (co-)constitutes first nature as the Other. Eventually, capitalism is all about the production of surplus value, hence also "surplus materiality" in terms of an extended perpetuation of (qualitative and quantitative aspects of) the energic fix. Christoph Görg, a scholar who heavily draws on Schmidt and the Frankfurt School tradition, formulates the problem as follows:

> In Capitalism, mankind has not yet reached its potential to design and control its societal and natural relations, it exists in detached [*verselbstständigt*] relations, which confront mankind as "*second nature*." The specific purpose of these detached capitalist production is however not the production of use values, but the production of surplus value. The specific determination of aims ultimately defines the process of appropriation of its inherent "natural substance" [*Naturstoff*]: the *relations of production dominate the nature relations*.[18]

Relations of production dominate nature relations — this means that economic categories as well as real economic development are not only indifferent towards natural necessities, but indeed form a closed system, a *synchronic matrix* that reverberates in the perfect mathematical models of neoclassical economics but also materially manifests itself in the real world. As a universal model, it knows neither error nor crisis. If we understand how this demi-reality of a synchronic, error-free universality is only real as it stems from the fetishized realm of second nature, it becomes evident that this apparent universality is always a ruptured one, as there exist various issues that are Othered and exempted — first and foremost nature and substantiality proper.

This "Othered" first nature could be interpreted in line of a simple "nature-kicks-back argument," an ecological critique of capitalism and natural limits. In fact, there always is some truth to this kind of *externalist critique*, as it has for example been formulated by German

eco-Marxists like Elmar Altvater.[19] But as we have seen, substantiality is — pivotally evidenced by the economical category use value — never accessible as such in modernity, since it is intrinsically related to the exchange-value form, which is dominating it. This *tension between use and exchange value*, which expresses and instantaneously obscures itself in the "actually existing" incarnation of value, money, must be seen as the deep core of all economic crises.[20] Both the exchange of goods on the market (in Marx's terms "circulation") and their production thus aim at the ever-increasing generation of value, hence money that moves perpetually in the form of capital. As such, the system is autopoietic and knows no external restraints or ends. Nonetheless, behind this seemingly synchronic, closed system of capital circuits, we find a hidden subtext that is only accessible if we understand that the economic sphere is truly an outcome of the materiality of nature-relations — one that abstracts from the real relationality and conjures it away in fetishized second nature, thereby ignoring the substantiality of the use-value side.

To carry the categorical critique of economy to its end then means that we have to understand that economic crises have their origin in the *historical development* of the contradiction of use and exchange value, which never expresses itself as such, but only via the "synchronic" realm of value and the ultimately prevailing form of money. The synchronicity of value is concealing the diachronic character of first-nature determinations, which are mediated by the capitalist "energic fix." Even the apparently most contingent crisis-borne events — financial meltdowns and more general ruptures in what Marx called "fictitious capital" — do relate to the specific materiality that capital produces in relation to nature.[21] As such, crisis is a feature of the synchronic core of capitalism. The most basic crisis phenomenon — the chance that a produced use value does not manage to "attach" itself to an exchange value on the market, hence a commodity remaining unsold — has been prevalent throughout capitalism's history. But this basic understanding of crisis is not all. As capitalism is a historically developing system, the contradiction and its

material basis do not remain the same. Even though the phenomenal appearance seems to be unchanged, its dialectical core can change as relations of production and productive forces alter the nature relations and their energic mediation. Behind the "usual" cyclical bursts of overproduction-driven crises and their connection to the generation of unbacked fictitious capital, there is a more substantial reason for crisis. This cause can be located in the contradictory relation of *substance and form* that only manifests itself in a *crisis of money*, a development that has been grasped by the German theorist Robert Kurz as the continuous growth of "money without value."[22]

It is not possible to develop the whole depth of Kurz's argument in just a few words, but I shall try to delineate aspects that are of interest for a critical take on GNV. It is perhaps best to start with the theme of substantiality or materiality. Following a materialist framework, authors like Robert Kurz have argued — in line with the above-developed Frankfurt School lineage — that the "real-abstract" source of capital — *money* — increasingly loses its basis in value-substance. Value-substance, the form-determined exhaustion of human labor, requires a foundation in nature via the energic mediation. If the "mass" of use value doesn't correspond with the mass of exchange value, the contradictory energic mediation between substance and form, nature and society becomes more and more strained.[23] Due to fetishism, this contradiction does not become manifest immediately or as such, but only via a representation that is mainly visible inside the really existing (second-nature) form, money. A development in the substantial and social domains obfuscates its specific relation: the increasing productivity — as evident in scientific and technic potentialities — yields a vast stock of produced raw materials that doesn't correspond with the human energy exhaustion in the specific capitalist (second-nature) form, that is, abstract labor and the value produced by it.[24] With respect to a value perspective — and this is the (only) one that ultimately receives social validity — Kurz argues the finitude of this contradictory development has to be acknowledged:

> This contradictory development is only graspable from the perspective of value, which is situated solely on the level of societal totality and can only be ascertained by critical theory. This perspective, which is not accessible to agents in their everyday practice, constitutes the objective and elementary self-contradiction of the "automatic subject," which must by necessity of its blind dynamic historically culminate. This means that surplus value cannot grow "infinitely" on the level of societal totality (and the category is only valid on this level), while only problems of the "realisation" of value come to matter; to the contrary, the long-term historic result of the capitalist dynamic is the erosion of value as such and thus a drying up of surplus value production in absolute quantity.[25]

Now if the basis of value production in the exhaustion of abstract human energy "melts away," this leads to a friction in the money form on a societal level — the actually existing mass of value does not correspond with the mass of value substance. This misrepresentation of forms leads inter alia to the meltdowns at the stock exchange, where money as fictitious capital "devaluates." The problem cannot be solved by devaluations, as its core mechanisms are not to be found in the strictly economic sphere but relate to GNV. Hence, the societal-substantial potentials and their capitalist formal confines are not corresponding anymore, while the energic fix in mediation of substance and forms disintegrates too. This incoherence "inside" the dialectical energic mediation is hard to grasp as such, but it can be approached via its substantial and social consequences. Detrimental effects of the fossil determination of the energy fix are very obvious — climate change, for one, but also price volatility across energy, capital, and commodity markets. Yet it is the form that matters. Crisis-induced social phenomena are more multifarious as they are mediated by the complex social forms and their proper logic. Many social crisis phenomena can be understood as indicators of the *social energic limits* to further development if the above thesis of the fetishized energic fix is accepted. The value form is losing its energic momentum and

thereby obstructs even the limited potentials that are offered by the capitalist GNV. If abstract labor as substance of value is the necessary (but not sufficient) basis of social synthesis, its energic crisis must be accompanied by crisis phenomena outside of the economy. There is no immanent solution to this "entropy of crisis"; a change in social relations as such is necessary if anti-crisis measures are to be more than ephemeral containment measures.

It should be evident by now that this change cannot only be economic in the strict sense; it has to be wider in scope. I will now suggest that an understanding of the gendered character of GNV, and by extension the diremption of energy as force of production from gender as force of social reproduction is necessary in order to see that the crisis affects society as a whole and not just the economic sphere.

The Gendered Subtext of GNV

In order to approach the deeply gendered subtext of GNV, we must return to the above-developed characteristics of its materialist theorization. In my critique of economical categories, I problematized the synchronic character of the approach inasmuch as it produced the impression of a closed system. As I have shown, materialist critique proves that the *synchrony in theory* represents a misled picture of the historical development of nature relations. So far, its critique is a purely negative one and therefore thoroughly focused on the encountered economic categories. While this theoretical procedure is not wrong, as it uncovers the force of fetishism surrounding its subject matter, it can merely indicate that the universalist framework is insufficient for a comprehensive understanding of reality. It can however not be shown *why* this is the case. In its theoretical *modus operandi*, much of materialist theory by necessity clings to a categorical understanding that even in its critique reproduces the implicit functionality of thought systems which represent a societal reality that actually yields this functionality as a contradiction in the first place. This does not mean that such critique is mistaken in itself — to some degree, a materialist approach cannot but relate to a reality

that manifestly produces these kinds of universalist frameworks. There are however two problems, if materialist critique remains *purely negative* in this sense.

(1) Critique's immanence vs. its normativity
If critique were purely negative, hence solely (immanently) referring to the subject matter's functionality, it would not be able to defend its own normative impetus (as critique). One could for example argue that fetishism is good because it takes responsibility away from people and establishes a functioning system.

(2) Critique's particularity vs. universality
If the mechanism of Othering of all aspects outside the universal functional (economic) system is thus only implicitly uncovered (as a product of the immanent critique) and not explicitly framed as such, the historical critique of the oppressive character remains opaque. If all kinds of things remain exempt from the theoretical core and if there is no way to give meaning to the "logic" of exemption, then its simple recognition does not tell us very much.

Both problems are obviously interrelated — the normative momentum is deduced from the (critical) understanding of the specific oppressive character of the relations that are critiqued. Materialist critique however asks for the (dialectical) "logic" that determines the connection of both sides. A powerful thesis to understand the specific oppressive character of modern GNV is to see them as expressions of a *patriarchal rationale*. Understanding the dialectics of critique through a gender-critical framework not only means that gender is considered as just another "issue." It helps us to denominate the apparently contingent *diachronic breaches* in the synchronic field of social relations — the Other, that which remains exempt from the "closed" system we find in economic forms, is then not only just another issue. By unraveling its gendered determination, the Other's implicit character as just a "subtext" can be turned into an explicit

problem.

A good starting point for such a venture is the debate around female reproductive activities. This debate was pursued mainly among Marxist feminists beginning in the late 1960s and focused on the question if and to what degree "domestic labor," as it was called, made its way into the value form male counterparts were struggling over in the factory. It uncovered how the particular female character of reproductive activities was crucial for defining those activities as it explained their categorical and real subordination.

> When women remain outside social production, that is, outside the socially organized productive cycle, they are also outside social productivity. The role of women… has always been seen as that of a psychologically subordinated person who, except where she is marginally employed outside the home, is outside production; she is essentially a supplier of a series of use-values in the home.[26]

Female contributions to economic activities — or, taking it one step further, their critical contextualization in terms of GNV — has seldom been held in high esteem both in the public debate and its critical Marxists counterparts. Mariarosa Dalla Costa, Selma James, Silvia Federici, and others consequently argued for a more gender-sensitive approach that tried to give the family as a mainly feminized domain of reproduction a larger role in materialist critique. Others have argued against this and held that it is exactly the patriarchal nature of capitalism that yields the stark separation, hence the unproductivity of female domestic work.[27] Here is not the place to follow all the intricacies of this controversy, but what remains important is the use-value orientation that Dalla Costa mentioned: namely, that women are thought to be "closer to nature" not only qua childbearing and the purportedly natural role in family that goes with that, but also through the gendered concept of use-value orientation in economics in general.[28] The character of so-called feminine attributes like sensuality, unintermediateness, genuineness, and immediate utility

are specifically ascribed to use-value dimensions. They are sometimes ideologically praised as "non-identical" and "essential" residuum of emancipation.[29] But these are different ascriptions then those we usually find in capitalism, where (any) use value is just the bearer of exchange value. It is only in the last-instance that use value as immediate consumption is ultimately falling out of the capitalist realm — but even here it is associated with female activities in the family.[30] This is also where immediacy and apparently direct contact to the natural are situated most strikingly — the private domain of the family operates as the Othered opposite to all public enterprise and the role of women as "natural inhabitants" of this domain is clearly assigned.[31]

The argument is not that this kind of *use-value orientation* in the private domain is completely outside of GNV. To the contrary, capitalist relations co-produce this patriarchal domain. As pertaining to the logic of modern fetishist forms, the naturalization relevant in the private, "female" domain and hence the attributes assigned to women qua allegedly "natural" and "biological" necessities are historically produced. This did not happen by mere volition or direct (patriarchal) institutionalizations of power, but as a consequence of the "doubly historic" second nature of a universalizing system that needs to relinquish everything natural — the closed economic world — just in order to secretly project it onto something that is completely Othered, outside the box, and apparently not of relevance for the second-nature sociality proper. The *naturalizations* that have ever since permeated the rise of "enlightened modernity" are thus ultimately co-functional products of modernity's nature relations: as the dialectic of substance and form can only process in the second-nature domain, it is dependent on constantly emitting motives of "false nature" that serve as the substantial basis for abstract universal forms. This model can be traced back to a patriarchal basis that was however thoroughly transformed in modernity — patriarchy and abstract domination (qua capital) have been conjoined in a binary logic that is starkly hierarchical and thus constantly producing

master-slave-type dialectics as they have initially and brilliantly been uncovered by Simone de Beauvoir.[32] Naturalizations are not limited to gender-issues in the strict sense, though it may be argued that they originated from the above developed separation of labor and the concomitant constitution of nature in the early phase of capitalist-patriarchal evolution.[33] The "other Others" that matter so much when it comes to an assessment of the oppressive character of modernity are thus not reducible to gendered oppression, but they have a common basis in the patriarchal model of GNV as they yield a symbolic yet real core of hierarchical power-relations.

Looking at *energic mediation*, this can symbolically be framed as the domination of an abstract energy system over contextualized and reflexive ("renewable") energy relations that exhibit a non- or less contradictory society-nature relation. The currently prevailing dialectics of energy parallel the dialectics of productive (abstract) labor and reproductive activities, just as the symbolical representations of production are masculinized and those of reproduction feminized. This means that the energic mediation at the core of GNV is itself gendered — the fetishized energic fix that combines fossil energy and abstract human energy is symbolically "male" as it pertains to a patriarchal way of appropriating and creating nature. This energic regime produces a universalizing matrix that is at the same time nature-blind and producing nature. It appears "neutral" — hardly anyone considers gendering energy as such — but is not neutral, if we accept that energy relations are always constitutively social. I want to argue that energy relations, nature relations and value relations are only possible if we see behind the capitalist abstractions that obscure the substantial symbolic determination of these naturalized categories.

I am convinced that such an endeavor can only prevail if the patriarchal dimension of society-nature relations in general and energy relations in particular is highlighted. The character of the dialectical argument changes once we incorporate the substantial gendered determination into our critique. This means acknowledging

that neutrality is actually male and everything female is Othered. The universalist capitalist subsumption of first nature in second nature can only prevail if is accompanied by an Othering/Othered patriarchal naturalizing mode of dissociation. Society-nature relations represent neither a monist fusion nor a "neutral" dialectical duality; they form a *hierarchical dialectic* in which a universal (male, second-nature, capitalist) side subsumes the Other. This *Other is pivotally (first) "nature*." The patriarchal energy fix that mediates energy relations is related to this dialectic; in fact, energy is a way to express this hierarchical dialectic that, in its processing, must relate to first nature but ultimately "ends" with second nature.

First nature is not neutral or a-social; it was originally produced in early modernity as something at odds with culture/society. In this phase, (white, western) men and the "male" symbolic logic they represent are developing on the basis of their opposition to everything female that has consequentially been naturalized.[34] Thus, I hesitate to connect the primordially gendered and patriarchal character of modern domination to sexual difference as such. Rather, I argue, it was construed as a "functional" part of society-nature relations. In order to grasp the character of the kind of functionality at stake, it must be acknowledged that it can only be (totally) understood when its symbolic subtext is highlighted. The modern development of patriarchal relations — which indeed completely altered the meaning of "patriarchy," as it was subordinated to the apparently "neutral" abstract domination of value — has a beginning that corresponds with capitalist "primitive accumulation," as Silvia Federici showed so impressively in her study of early modern ideologies and subjugating practices.[35] Abstract (capitalist) and concrete (patriarchal) domination have been intricately conjoined in a system that on a less general, subjective level yields so many ideologies and exclusions that at times, it seems as if there is no cohesive logic. On the most abstract level of the functionality of modern GNV, we have to assume reciprocity between capitalist and patriarchal logics, as it is the only relation that can ultimately explain the dialectical character of the materiality

with which we are confronted. The principle of domination between abstraction and reciprocal (false) concretion is thus to be conceived of as a ubiquitous *gendered symbolic imaginary* and it is grounded in the relation of first and second nature still prevailing in modern society.

What does this mean for the critical assessment of GNV? Following a materialist perspective, we must differentiate between two different modes of critique: (1) A *deconstructive* critique that directs itself against the naturalizations of and ideological ascriptions to women/the female. (2) A *reconstructive* critique that depicts the specific functionality that the Other plays in relation to the universal one. Both issues are certainly interrelated and on a very general level. It can however be legitimate to split them apart in order to focus on one issue. The first critique is not new — it has been frequently employed since the rise of theoretical feminism and is a hallmark of current poststructuralist approaches. Thus I will move on to the second.

A first step for any reconstructive critique must be the reassessment of nature as something produced and already encountered. In this, the female (as prototypical Other of the universal male) is connected to a (partly imagined/socially constituted) *first nature*, that is the ostensibly "static" basis for the "male dynamic" attributed to the universalizing system of (second nature) functionality and subjugation of nature.[36] This can (metaphorically) be understood as a relation of a symbolically male materiality of a *"machine"* — in relation to a *"natural" body*[37] — the body standing for the quasi-autonomous and quasi-natural "automatic subject" of second nature, which is symbolically male.[38] It is hence clear why the female side is Othered — as symbolic-functional representation of nature, it has to be subdued in order to substantiate the (male) hegemonic body of the capitalist-phallic machine. In the realm of second nature, everything "female" is, as representation of nature, always bound to be inferior — not due to some essential aspect of femininity, but to the genuinely produced character of modern nature relations in which it assumes the functional role of *re*producing; restoring, not creating (right down to the denial of the capacity to create life itself).[39] Seen from an inverted perspective, it

is therefore crucial for the functioning of the whole system that the female is just like nature — in the last instance — always appearing as passive and something static that can be appropriated, used, and depleted.

The capitalist-patriarchal energic fix mediates the creation of passive nature, as it homogenizes energic regimes so as to make them conform to the value abstraction. This explains why energy is always approached from a resource-perspective — the actual, energic metabolism remains fetishized and inaccessible for social actors. The *phallic capitalist machine* is driven by abstract energy relations, but it requires some concrete determination, which it finds in feminized first nature. Just as it should be evident that capitalist productive labor cannot survive without the kind of reproductive work that is usually attributed to women/feminized subjects, it is obvious that nature eventually reproduces the energy system that propels the production of surplus value. If this reproduction fails, form-immanent contradictions must increase. It is important to see that the relation to nature that energy mediates is not one sided, but dialectical. This means that the patriarchal appropriation is never ultimate, but also implies that nature is not conceivable without its determination. Analyses of natural limits have to encompass the character of the society-nature dialectic and it is crucial to understand its gendered symbolic to really grasp the dialectic's logic.

I propose to engage the German theorem of value dissociation (*Wert-Abspaltung*) in order to attain such a renewed theoretical perspective. The germinal theorem was first coined by Roswitha Scholz, who formulated it in critical reference to the dialectical approach of value critique (*Wertkritik*) that itself developed out of the shadows of orthodox German Marxism in the 1980s. Roswitha Scholz's main idea was to conceive the basic logic of societal development in modernity as one ruled by value and its dissociation.[40] Scholz started from the materialist feminist insight that there exists a plethora of reproductive activities that supplement and substantiate abstract labor relations.[41] The alignment of this understanding with an

advanced critique of fetishism extends it greatly. This presupposes that the above shown category-critical mode had already found its way into the usage of Marxist categories. "Value" thus means more than just an economic category as "dissociation" is from the outset integrated.

> Societal totality is not only defined by the fetishist self-movement of money and the tautological character of abstract labour in Capitalism. A gendered dissociation takes place, which is dialectically mediated with value. The dissociated is not just a "subsystem" of this form… but essential and constitutive for societal totality. This means that there is no immanent relation of logical deductibility between value and dissociation. Dissociation is value and value is dissociation. Both partake of another, but don't become identical.[42]

The reciprocal causation, hence the dialectical relationality is very important, as it demarcates a totality-category that — unlike Adorno's identity logic — is explicitly encompassing the Other in its framework and doesn't regress to a partial or positive account of the historically real second-nature universalism. In this, Scholz's emphasis on a radical category-critical take on questions of theory construction is of utmost importance, as it demonstrates how such a perspective needs to partly discard the scientific rationality of "closed objects," as its very subject matter — that which is dissociated — is to some degree only attainable via "non-logically" and "non-conceptually" envisaged categories.[43] This paves the way for a re-reading of dialectical theory of society which gives the "cultural-symbolic" a novel place in theory — its relative and metaphoric semantic and general approach have to be included in the "grand theory."[44] The *cultural-symbolic* imaginary it associated with certain (feminized) sectors, spheres, and practices in everyday life and social structures and thus not only equivalent with general delimitations of a societal "logic" on a totality level. It has its own foundation "in" society. It is value dissociation's central achievement that considerations about gender do not remain at this

"concrete" level. Unlike many perspectives on gender or the social, it aspires to integrate apparently concrete and particular insight into an abstract materialist theoretical apparatus. This means that the "hard" political-economic categories are somewhat "softened" and thus expanded in light of the awareness that the universal aspects need to be understood as primordially dovetailed with the dissociated aspects. Scholz encourages us to read the "hard" categories symbolically without dissolving the critique of political economy in culture, as the dissociation is understood to effect the theory construction itself. Exactly because its "hidden" dialectical connection is a materially real one, value dissociation requires the preservation of the gendered dualism and the relative autonomy that it prompts for both the universalist "male" side and the Othered "female" side and its theoretical problems.

The material, symbolic, and historical operations of value dissociation make imperative a gendered perspective on GNV, which affirms that (first) nature "has" a gender and as such, is relevant for the very functionality of (second) nature-relations as it represents the subsumed substance of the (value) abstraction that characterizes modern patriarchal capitalism. *Totality* emanates from the categories of the critique of political economy, but is not restricted to it: thus, the relations of production dominate nature-relations. This means that we can now understand the relation of *synchronicity and diachronicity* in the GNV as one that depends on a functional relation between value and dissociation, symbolically "male" and "female" aspects. The proposed perspective encompasses the relationship of *production and reproduction*, which can explain — and not only deconstruct — the categorical problems of modern economic understandings. Production of (second) nature, the value principle (as universalist meta-logic) and male symbolic/structural connotations then go together, just as reproduction of nature, dissociation and a female symbolic connotation are connected. The first side produces a synchronic matrix, the second its diachronic rupture, and it is exactly this exempted rupture, the reproductive "in-between" which

constitutes the real solidification of the formal-synchronic closure that we encounter as "economics." The dialectic of synchronicity and diachronicity is in crisis.

The energic dimension of the dialectical mediation foregrounds this crisis. It is incorrect to argue that an *energy crisis* is only about the depletion of (fossil) resources. This would imply an acceptance of the synchronic argument that either the internality in economic forms (i.e. market mechanisms) or a static (externalized) nature determines limits. If energy is approached as a mediating relation, the crisis cannot be reduced to "either/or," it must encompass both aspects at the same time. The second-nature character of the energic fix produces nature and nature reproduces this energic mediation. Limits like peak oil are not natural in a simple sense; first nature must be seen as co-produced by second nature. A picture of *the* economy and *the* nature cannot account for this, only a consideration of the diachronicity produced by and reproducing those synchronic understandings can help here. This means confronting determinist naturalist arguments by pointing to the historical contingency that the diachronic production of nature engenders. It equally means attacking the naturalized economic determination that arguments about the self-regulation of oil markets harbor. Bearing in mind the fetishistic energic fix should lead us to see how the gendered dialectic of synchronicity and diachronicity is fueling a crisis in the mediation of energy itself. Crisis then is gendered in two ways. On the one side, the energic fix is destabilized and its subjugation of first nature aspects is endangered. It cannot continue to (re-)produce nature in its "usual" way, which leads to a friction inside the synchronicity of capitalist forms. The "male" energic appropriation of nature is in crisis. On the other side the character of the diachronic side changes. It loses its relation to the synchronic side, as the dialectic is destabilized. This means an increase of contingency, unpredictability but also plurality of expressions — some of which are radically changing the character of first nature and the dissociated aspects of the naturalized "female" side. The latter development may seem as if it encompasses

positive aspects, but ultimately, both sides still belong together. The dialectical process that is mediated by the energy system will not disappear as such, just as the energic fix will very likely persist even if its contradictions increase.

I will now conclude with an attempt to deduce rough historical-analytical conclusions by giving a few examples of how the gendered GNV and their energic mediation have come into crisis.

Gender-Dimensions of Crisis

The functional relation of synchronic and diachronic moments in the GNV can only prevail if a certain "ideal average" in the reciprocal relationship is safeguarded. Crises are accordingly to be sought in the (gendered) dialectical synthesis itself, but by tendency they will become rampant only in actual bursts visible on the synchronic side, namely, the apparently contingent diachronic "rupture" of a structural ensemble understood to be of relative stability. The synchronic side of capitalist forms and its appropriation of nature is "in crisis," as it is the only observable articulation of the dialectic. For example, financial meltdowns appear to us as crises. Rising contradictions in reproductive work or even first nature cannot be processed as systemic crises, even if at some instance we might believe that they are problematic. These diachronic aspects can only be understood as crisis prone when approached via the synchronic form, like in emission trading or "care work." This however does not mean that there is no substantiality to the diachronic side of crises — to the contrary, it is ultimately this side that is foundational for the rupture, as it constitutes the (hidden) criteria for the reproduction of totality. We need to embrace a perspective that thinks both aspects at the same time together — as they are really intertwined in the process of reproduction — and apart — as they necessarily appear in social reality.

In light of the above-developed enrichment of critical economic categories, the *synchronic dimension* of social synthesis in the GNV should be approached via the above-developed symbolic-imaginary

reading. The economic crises we are facing are not gender-neutral as much of the GNV, the foundation of the economic sphere, are themselves gendered. This means that crisis phenomena at first sight ultimately mostly relate to the "male" domain of value. As such, they represent an actual rupture in the equilibrium, a disruption of the necessary telos of modern economy — the abstract and self-related process of growth as such, that is to say accumulation of capital. Symbolically articulating this relation reveals that the capitalist-phallic machine has *run out of steam*. Framing this in terms of energy means to see that it is crucially the dominant energic fix and the "male" domain of value-productive activity associated with it that is losing momentum. Energy is a social relation and not only a substantial one; hence, the "running out of steam" must not be reduced to resource crises. The steam I talk about is not only propelling engines, it is propelling people who are themselves acting according to machinic imperatives. Following its automatic and objective machine-nature, economic disruptions are unfolding without social control. Crisis is one of fetishistic mediation, just as the system is itself fetishized. Still, it represents a diachronic breach that the logic of capitalist real abstractions cannot tolerate. The machine "needs" to run infinitely, it has to perpetuate the energic fix that fuels it, which becomes harder and harder to accomplish.

This affects both the "reality" of its real-abstract categorical apparatus and its theoretical representation in science. Not only neoclassical theory, but even much of Marxism cannot envisage an internal decay of economic categories. Causes of crisis are thus typically understood as "external." Symbolically, the refusal to accept anything but the machine's functionality represents a defense of an androcentric perspective that ultimately stems from an insufficient theorization of gendered GNV. The reproductive element is omitted — crises call upon (political) regulation and containment, which always aims to reestablish the former order of synchrony. Moreover, reproduction's imbrication in crisis is completely off the table, just as nature and gendered aspects of its appropriation — the sublime

natural body of the machine — remain excluded. This very abstract functional obstruction of (large-scale) conscious alterations in the society-nature relations and their energic fix explains why it is so hard to achieve energy transition. As long as no new energic fix compatible with the value abstraction is in sight, changes in the existing energy system are always imposed and require complex interventions that need to stand against the broader energic momentum. They cannot build on a systematic (synchronic) basis that is necessary as long as capitalist forms prevail.[45] When it appears evident that reproduction is becoming more and more difficult as the secular crisis of fetishistic materiality is unfolding, the limitations to diachronic interventions, the possibility of an internal stabilization of the synchronic rational are revealing themselves blatantly.

Taking into account the *gendered character* of GNV then means to see that crisis-bound change — manifest in the increasing impossibility of a synchronic and neutral "subjugating" perspective on nature due to first nature (i.e. "ecological," reproductive) restrictions — is always also one in the implicit patriarchal residue of the system's apparently neutral logic. Crisis then indeed has a gendered subtext — it is the destabilization of a patriarchal system that becomes evident in the apparently most neutral and "natural" guise of the economic.[46] This destabilization doesn't indicate that the patriarchal system — hence the domination of everything that is Othered as non-universal — becomes less relevant. To the contrary, as crisis is taking place in the realm of second nature, it must rather be conceived of as a "hollowing out" than a "shrinking." Struggles to safeguard an (imagined) *status quo ante bellum* are increasing just as real and categorical synchrony is harder and harder to maintain. Roswitha Scholz has labeled this *Verwilderung des Patriarchats* which may best translate as barbarization or confusion of the system. That something is "getting out of order" becomes evident not only in the economic domain; it is apparent on a global, national, and individual level of societal relations. As I have shown, the problem is that bourgeois consciousness will never see how the plurality of diachronic aspects are combined and form a

larger systemic crisis — for official discourses, science, media, and also the everyday life perspective, only economic crises count. Against this, critical theory must insist that crisis is a broader and complex phenomenon related to problems of societal synthesis as such. The consequences for the Othered aspects — foremost first nature materiality — are then in general detrimental ones, as strategies of regulation — the reestablishment of systemic synchrony — are turning into an unpredictable and accelerating juggernaut wheel.[47] The "new insecurities" in society thus represent a transformation of the patriarchal mode of domination that is concealed behind the economy's neutrality, as the metaphorical "objective capitalist machine" begins to break apart and brings disorder in relation to the subjugated (subjective) aspects of nature.[48]

The functionality inscribed to modern gender relations is breaking apart. This unquestionably affects the side of the ones who are exercising domination and thus — if not every single "man" as an individual or every masculinity — masculinities in as much as they are necessary buttresses of patriarchal domination. Speaking of a *crisis of masculinity* is thus not wrong, but needs qualification, as it is often normatively turned into a legitimizing ideology for reactionary (masculinist) positions.[49] Marxists should read this discourse as a symptom of a larger confluence of crisis points. Crisis of masculinity as understood in the here-developed theoretical context does not refer to a normative but to a functional domain. From this new Marxist perspective, the energy crisis was always going to produce a crisis of masculinity. As such, the market and climate crisis generated by the fossil fuelled content of contemporary capitalism stands for a certain loss of control that has long been tied to a male subject position as expression of the patriarchal, synchronic side of domination. Without its energic fix, capital's social structure, divisions, and historical fabric withers into a wasteland of former subject and object positions. The theoretical thesis stemming from a GNV-perspective — we are dealing with a crisis of masculinities as such and not just one of masculinity — implies that transformations are

encompassing all sorts of masculinities. Yet this crisis of "functional masculinity" is not necessarily to be welcomed as it often enough results in the kind of barbarization that Scholz was attributing to crisis developments in general.[50] We are finding both examples of "re-masculinization" in terms of a return to traditional types and new "hyper-masculinities" that can be understood as a way to cope with the crisis of masculinity as patriarchal position of domination.[51] But not only hegemonic masculinities are struggling and thus radicalizing in many ways, subaltern masculinities are maybe even more affected and changing towards a new "necropolitical" model of open violence and oppression.[52]

This development however does not only have detrimental effects, if we look beyond the male side, and hence embrace the questions of the *subjective* determination of dissociation that is feminized. In fact, the crisis of patriarchal value production has correlated with a considerable emancipation of women inside the functional, "male" side of the value domain, which appears to be not only temporal (as, for example, in war times) or subaltern (as in the poorest parts of the population).[53] It involves serious changes in the cultural and symbolic logics of gender. Crisis thus somewhat paradoxically entails positive consequences for some women and certainly helped to crack the old patriarchal order just as it confused the "ideal average" of gendered societal relations to nature. It did however not provide alternatives to the symbolical masculinity of functional systemic synchrony in the GNV. This means that women now can — to a certain degree — perform within this male realm (when at least partly accepting male rationales). They are however not free from their functional role in the gendered dialectic. Being female thus still implicitly engenders the requirement to be closer to nature, reproduction, and so on. The new opportunities for (some) women thus imply the hardships of a "double socialization."[54] Just as for many, they are simply not in reach. For the less privileged femininities, the insecurity that crisis brings about reduces them to their "natural" role (in modern patriarchal relations) — one of reproduction and stabilization, hence

something like a buffer of crisis phenomena. I would parallel this to problems of the energic mediation — renewable energy sources may have certain place, but they must conform to the general energic fix that is instituted by the value form and its abstract energic human substance. Even if profitable in individual cases, they will not be able to replace fossil energy as long as the fetishist systemic logic behind GNV's energy system remains intact.

If we take the insights of gendered GNV seriously, we must realize that crisis cannot be stopped by the new pluralization and "barbarization" of capitalist-patriarchal nature relations. In the end, the machine loses its fuel and substance — abstract labor as materialized form of fetishized synthesis. And its natural body is equally stressed, as the hitherto functional equilibrium of synchronic and diachronic aspects is more and more in turmoil. This status quo will not cease to perpetuate unless it is consciously overcome. In the current landscape, nothing could be more urgent than the political task of getting our theory right, which is to say that only from a critique calibrated to the energy content of gender, and the gendered materiality of the value form, does anything like an emancipatory position look feasible moving forward.

Notes

1. The term "societal nature relations" that derives from the German *gesellschaftliche Naturverhältnisse* is certainly unwieldly and foreign to English. As this somewhat reflects its origin and as seminal scholars publishing in English keep using this or an akin term. See Ulrich Brand and Markus Wissen, "Crisis and Continuity of Capitalist Society-Nature Relationships: The Imperial Mode of Living and the Limits to Environmental Governance," *Review of International Political Economy* 20 (2013) 687–711; Egon Becker and Thomas Jahn, "Societal Relations to Nature. Outline of a Critical Theroy in the Ecological Crisis," *Kritische Theorie Der Technik Und Der Natur,* eds. Gernot Böhme and Alexandra Manzei (München: Wilhelm Fink, 2005) 91–112; Christoph Görg, "The Construction of Societal Releationships with Nature," *Poiesis & Praxis* 3 (2004) 22–36; and Ulrich Brand, Christoph Görg, and Markus Wissen, "Second-Order Condensations of Societal Power Relations: Environmental Politics and the Internationalization of the State from a Neo-Poulantzian Perspective," *Antipode* 43 (2011) 149–175. I stick to an abbreviation of the German original (GNV) as it is found in the literature (Brand and Wissen, *Second-Order Condensations* 689) in hope that a discussion on a better canonical translation will take place. A thorough explanation of this key concept is presented in the first part of this paper.
2. Hans Baumann, Iris Bischel, Michael Gemperle, Ulrike Knobloch, Beat Ringger, and Holger Schatz, *Care Statt Crash. Sorgeökonomie Und Die Überwindung Des Kapitalismus. Denknetz Jahrbuch 2013* (Zürich: Denknetz, 2013); Alex Demirovic and Andrea Maihofer, "Vielfachkrise Und Die Krise Der Geschlechterverhältnisse. Arbeits- Und Geschlechtersoziologische Perspektiven," *Krise, Kritik, Allianzen*, eds. Hildegard M. Nickel and Andreas Heilmann (Weinheim/Basel: Beltz Juventa, 2013) 30–49; Julia Dück, "Krise Und Geschlecht. Überlegungen Zu Einem Feministisch-Materialistischen Krisenverständnis," *Prokla* 174 (2014) 54–70; International Labor Organization, *Global Employment Trends for Women 2012* (Genf: ILO, 2012); Audrey Podann, "Der Lohn Ist Die Arbeit. Die

in-Wert Setzung Weiblichen Arbeitsvermögens Als Emanzipatorisches Dilemma," *Prokla* 173 (2013) 563–571; Melissa W. Wright, "Necropolitics, Narcopolitics and Femicide. Gendered Violence on the Mexico-U.S. Border," *Signs* 36 (2011) 707–731.

3. Diana Coole and Samantha Frost, *New Materialisms: Ontology, Agency, and Politics* (Durham: Duke UP Books, 2010); Karen Barad, *Meeting the Universe Halfway* (Durham & London: DU Press, 2007); Manuel De Landa, *A New Philosophy of Society. Assemblage Theory and Social Complexity* (London/New York: Continuum, 2006); Elmar Flatschart, "Matter That Really Matters? New Materialism und kritisch-dialektische Theorie," *Critical Matter. Diskussionen Eines Neuen Materialismus*, eds. Tobias Goll, Daniel Keil and Thomas Telios (Münster: edition assemblage, 2013) 96–112; and Tobias Goll, Daniel Keil, and Thomas Telios, *Critical Matter. Diskussionen eines neuen Materialismus* (Münster: edition assemblage, 2013).
4. Edward Fullbrook, *Real World Economics: A Post-Autistic Economics Reader* (London: Anthem, 2007); Michael Krätke, "Neoklassik als Weltreligion," *Realitätsverleugnung durch Wissenschaft. Kritische Interventionen 3. Die Illusion der neuen Freiheit*, eds. Loccumer Initiative kritischer Wissenschaftler und Wissenschaftlerinnen (Hannover: Offizin, 1999); and Claus Peter Ortlieb, "Markt Märchen," *EXIT. Krise und Kritik der Warengesellschaft* (2004) 166–184.
5. Claus Peter Ortlieb, "Markt Märchen."
6. Karl Marx, *Letters, Marx and Engels Complete Works Vol. 40* (New York: International Publishers, 1998) 268
7. Alfred Schmidt, *Der Begriff der Natur in der Lehre von Marx* (Frankfurt a. M.: Europäische Verlagsanstalt 1978).
8. Egon Becker and Thomas Jahn, *Soziale Ökologie. Grundzüge einer Wissenschaft von den gesellschaftlichen Naturverhältnissen* (Frankfurt a.M.: Campus, 2006); and Alfred Schmidt, *The Concept of Nature in Marx* (London: NLB, 1971).
9. The patriarchal character of this pseudophysis was not considered, but plays a crucial role, as I will show.
10. Alfred Schmidt, *The Concept of Nature in Marx* (London: NLB, 1971) 41.

11. Alfred Schmidt, *The Concept of Nature* 43.
12. It is precisely this false identity that is uncritically reaffirmed by recent debates on a "new materialism." Building on a Spinozist monism and a poststructuralist contingency thinking, they fall prey to the very mechanisms that should be at the heart of critique of society. These approaches must be blamed for their uncritical reproduction of societal modes of domination, as in them, the oppressive materiality of the identity of natural and social aspects is not problematized (by means of historic and materialistic critique) but praised. A more elaborate discussion of this argument can be found in Elmar Flatschart, "Matter That Really Matters?"
13. *The Concept of Nature* 45.
14. Alfred Schmidt, *Der Begriff der Natur* 74, 209.
15. Marx, *Capital: A Critique of Political Economy Volume I* in *Marx and Engels Collected Works*, Vol. 35 (New York: International Publishers, 1996) 82.
16. Marx, *Capital Vol. I* 54.
17. Jeff Diamanti, "Aesthetic Economies of Growth: Energy, Value, and the Work of Culture after Oil" (Dissertation: University of Alberta, 2015); Matthew T. Huber, "Energizing Historical Materialism: Fossil Fuels, Space and the Capitalist Mode of Production," *Geoforum* 40 (2009) 105–115.
18. Christoph Görg, *Gesellschaftliche Naturverhältnisse, Einstiege* (Münster: Westfälisches Dampfboot, 1999) 55. All translations from German original sources are my own.
19. Elmar Altvater, *Das Ende des Kapitalismus wie wir ihn kennen* (Münster: Westfälisches Dampfboot, 2007); Elmar Altvater,"Die kapitalistischen Plagen. Energiekrise und Klimakollaps, Hunger und Finanzchaos," *Blätter für deutsche und internationale Politik* H. 3 (2009); Elmar Altvater,"Viele Krisen in einer. Die Finanzmarktkrise mit Geldspritzen zu bewältigen, heisst neue Krisen auslösen. Denn wer wird wie Rettungspläne bezahlen - und wie?" (2009) http://www.die-linke-bs.de/index.php?option=com_content&view=article&id=361:elmar-altvater-viele-krisen-in-einer-&catid=65:krise-2009&Itemid=189; Elmar Altvater and Birgit Mahnkopf, *Grenzen der Globalisierung. Ökonomie, Politik, Ökologie*

in der Weltgesellschaft (Münster: Westfälisches Dampfboot 2004).

20. Money has to be the necessary incarnation of value because an external, fully social entity is required in order to express the fact that in the relationality of two commodities (namely, their respective equivalent and relative value forms), use value is not as such present but only functions as bearer of the equivalent value form: "the opposition or contrast existing internally in each commodity between use value and value, is, therefore, made evident externally by two commodities being placed in such relation to each other, that the commodity whose value it is sought to express, figures directly as a mere use value, while the commodity in which that value is to be expressed, figures directly as mere exchange value" (*Capital I* 71f). Money therefore is the expression of formal developments that are instituted by the real existence of a total value form. It is in other words money that articulates the abstract character of social synthesis central for capitalist totality.
21. Marx, *Capital Volume III, Marx and Engels Complete Works Vol. 37* (New York: International Publishers, 1998) 397.
22. Robert Kurz, *Geld ohne Wert. Grundrisse zu einer Transformation der Kritik Der Politischen Ökonomie* (Berlin: Horlemann, 2012).
23. Kurz, *Geld ohne Wert* 294.
24. Claus Peter Ortlieb, "Ein Widerspruch von Stoff und Form. Zur Bedeutung der Produktion des relativen Mehrwerts für die finale Krisendynamik," *Exit — Kritik und Krise der Warengesellschaft,* 6 (2008) 25.
25. Kurz, *Geld ohne Wert* 263 and following.
26. Mariarosa Dalla Costa and Selma James, "Women and the Subversion of the Community," *Materialist Feminism: A Reader in Class, Difference and Women's Lives*, eds. Rosemary Hennessy and Chrys Ingraham (New York/London: Routledge, 1997) 47.
27. In Germany, the debate was waged quite controversially amongst Ursula Beer and Claudia von Werlhof. See Claudia von Werlhof, "Lohn ist ein 'Wert.' Leben Nicht? Auseinandersetzung mit einer 'Linken Frau.' Replik Auf Ursula Beer.," *Prokla,* 50 (1983), and Ursula Beer, "Marx auf die Füße gestellt? Zum Theoretischen Entwurf Von Claudia V. Werlhof," *Prokla,*

50 (1983).

28. Shulamith Firestone, *The Dialectic of Sex* (New York: William Morrow, 1972) 7 and following.
29. Kornelia Hafner, "Gebrauchswertfetischismus," *Gesellschaft Und Erkenntnis*, ed. Diethard Behrens (Freiburg: ca ira, 1993) 69.
30. Robert Kurz, "Geschlechtsfetischismus. Anmerkungen zur Logik von Weiblichkeit und Männlichkeit," *Krisis* (1992) 139 and following.
31. This hasn't changed much, although the clear separation "public-male/private-female" has somewhat eroded in many western countries during the last decades. Women may not enter the public (although they still virtually never have the same privileges and can never rely on a taken-for-grantedness as men do). But they still haven't lost their symbolic attribution to the private, which is ultimately cemented by biological arguments akin to the kind "reproduction of the species."
32. Simone de Beauvoir, *The Second Sex* (London: Vintage, 2009) 76 and following.
33. Roswitha Scholz, "Der Wert ist der Mann. Thesen zu Wertvergesellschaftung und Geschlechterverhältnis," *Krisis* 12 (1992) 44.
34. Carolyn Merchant, *Der Tod der Natur. Ökologie, Frauen und neuzeitliche Naturwissenschaft* (München: Beck, 1987) 142 and following.
35. Silvia Federici, *Caliban and the Witch. Women, the Body and Primitive Accumulation* (London: Turnaround Publisher Services, 2004) 61 and following.
36. Silvia Bovenschen, *Die imaginierte Weiblichkeit* (Frankfurt a.M.: Suhrkamp, 2003) 27.
37. Christine Woesler de Panafieu, "Das Konzept von Weiblichkeit als Natur und Maschinenkörper," in *Mythos Frau. Projektionen und Inszenierungen im Patriarchat*, eds. Barbara Schaeffer-Hegel and Brigitte Wartmann (Berlin: publica, 1984) 244–68.
38. This model shares many similarities with Lacan's understanding of the psychical apparatus. With Lacan, the male "has" phallus and the female "is" phallus (Jacques Lacan, *Ecrits* [New York: W.W. Norton, 1999] 583). He however doesn't sufficiently highlight the relevance of the female in the dialectical relationship that "post-festum" always appears as male

supremacy.

39. The fact that this symbolic imaginary is at odds with the very "creative" role that women take in birth-giving has produced many ideological compensations like the systematic underrepresentation of the female body in anatomy (which is partly still prevailing) or the infamous "penis envy" in psychoanalytic theory that can be seen as a diversion towards an androcentric oedipal imaginary.
40. In many ways, the (Hegelian) term "diremption" would have been more suitable to express the intended meaning, as the — originally psychoanalytical — concept "dissociation" can be misleading. It might convey the understanding that something is essentially dissociated from the hegemonic body. This however is not the case — aspects that are dissociated are not strictly "outside" of the universal value form, they are a rupture within the form that produces an idiosyncratic "internal externality" as illustrated in the process of Othering. The essence of this figure may be better grasped if we (also) refer to the concept "diremption," the actual status of breaking-in-two of a thing, which articulates the rupture-in-sameness more adequately.
41. Roswitha Scholz, *Das Geschlecht des Kapitalismus. Feministische Theorien und die Postmoderne Metamorphose des Patriarchats* (Bad Honnef: Horlemann, 2011) 21.
42. Roswitha Scholz, *Das Geschlecht des Kapitalismus* 21.
43. *Das Geschlecht des Kapitalismus* 24 and following.
44. Roswitha Scholz, "Die Theorie Der Geschlechtlichen Abspaltung Und Die Kritische Theorie Adornos," in *Exit — Kritik und Krise der Warengesellschaft* (2005).
45. This does certainly not mean that investment in renewables is never profitable. To the contrary — in light of the crisis and the frictions it brings about, alternative energy agendas may prove very profitable for individual capitals and even succeed against fossil ones in some spatial fixes. My argument is targeting a very abstract level of systemic determinations and at this level, a general transition (without prior substantial transformations of the GNV) is very unlikely due to the functional limits the energic fix brings about.

46. It must be evident by now that the natural character of crises (both as phenomenon inside capitalist patriarchal development and as indicator of its very demise as such) is in the last instance only true insofar second nature as a social constitution remains historically true. Economic crises — however uncontrolled and thus un-social they may seem — are indeed a proof of the social character of second nature, as they elucidate the historicity of the economy.
47. This can however not be evidenced in every single instance — this would be an overstretching of propositions which — by their nature — are valid only on an abstract level and thus by tendency. Even though "Green Capitalism" will never be possible, is somewhat of a *contradictio in adjecto* (Ulrich Brand, "Green Economy and Green Capitalism. Some Theoretical Considerations.," *Journal für Entwicklungspolitik* 28 [2012]; and Ulrich Brand, "After Sustainable Development: Green Economy as the Next Oxymoron?," *GAIA — Ecological Perspectives for Science and Society* 21 [2012]), we are witnessing minor steps towards a partial ecological modification of tiny fragments of our societal nature relations. This doesn't contradict the fact that the destructive usage of natural resources persists and indeed still grows on a global scale.
48. See Ulrich Beck, *Weltrisikogesellschaft. Auf der Suche nach der verlorenen Sicherheit* (Frankfurt a.M.: Suhrkamp, 2008). These insecurities are nothing new, although they have certainly increased since the beginning of the new millennium. This corresponds with the thesis of Kurz et al. that the crisis in fact roots back to the end of Fordism and has ever since just increased its momentum.
49. John Beynon, *Masculinities and Culture* (Philadelphia: Open University Press, 2002) 76.
50. Examples for this can be found in many ways and plural global localizations. The theoretical thesis that we are dealing with a crisis of masculinities as such and not just a (hegemonic) masculinity implies that transformations are encompassing all sorts of masculinities.
51. You could think of manifold cultural expressions, but also the hazardous executive-type "leader" kind of masculinity that is running finance capital (Alex Demirovic and Andrea Maihofer,

"Vielfachkrise und die Krise der Geschlechterverhältnisse. Arbeits- Und Geschlechtersoziologische Perspektiven," *Krise, Kritik, Allianzen,* eds. Hildegard M. Nickel and Andreas Heilmann (Weinheim/Basel: Beltz Juventa, 2013, 42). Another example would be the new "strong-men" type of masculinity that attracts many frustrated (male) voters in politics.

52. This is especially evident in the (global and internal) peripheries, where failing state intervention and economic dismay is fostering clans, gangs and other forms of male-societies — with often disastrous effects for women See, for example, Wright, "Necropolitics, Narcopolitics and Femicide."
53. Here, one may ask the question of periodization. As mentioned above, a meaningful time frame for the beginning of crisis as discussed here would be the end of Fordism, which certainly demarcated a break in so many ways that the social sciences still struggle to demarcate them. Ultimately, the problem of a (exact) periodization doesn't really matter for this article´s research focus, as it advances the thesis of its tendential, yet teleological, unfolding, which starting point is by now certainly to be situated in the past.
54. Regina Becker-Schmidt, "Die Doppelte Vergesellschaftung — Die Doppelte Unterdrückung: Besonderheiten Der Frauenforschung in Den Sozialwissenschaften," *Die andere Hälfte der Gesellschaft*, eds. Lilo Unterkirchner and Ina Wagner (Wien: Österreichischer Soziologentag 1987 [1985]).

Long Waves of Fossil Development: Periodizing Energy and Capital

Andreas Malm

Only those who most stubbornly hold fast to their ideological blinders would today deny that there is a link between capitalism and emissions of carbon dioxide. The latter have grown in tandem with the former, not coincidentally but constitutively. But it was not always like that. Originally — and this holds however one wishes to date the birth of this mode of production: to the fourteenth, sixteenth, or late eighteenth century — capitalism relied on what would today be called renewable energies: wood, muscle, wind, and water. It then adopted fossil fuels, coal first of all. By this step — surely one of the most fateful in its history — capitalism sired a peculiar formation I describe as the fossil economy, most simply defined as an economy of self-sustaining growth predicated on the consumption of fossil fuels, and therefore generating a sustained growth in CO_2 emissions.[1] Picture a pair of bellows. If one of the handles is the ceaseless growth that defines capitalism, the other is made up of coal and oil and gas; out of the nozzle comes a blast of CO_2 that fans the flames of the fire of global warming. The more growth you have, the more forceful the push will be, and the stronger the blast.

This observation, however, does not solve the question of how exactly capitalist growth has been linked to fossil fuel consumption over the course of its history; it merely poses it. The easiest way to describe the correlation of the two would be to conceive of capitalism as a smooth, linear curve of perpetual expansion, emitting a stream of CO_2 just as steadily enlarged. But this would be inaccurate.

Capitalist growth is a singularly turbulent process. It moves in spurts and slowdowns, creates and destroys, accelerates and decelerates, clears the ground of established structures for the building of higher stages and tumbles, without fail, into depressions.[2] To be sure, growth as such rarely ceases; rather it sticks to a secular trend, the many deviations and fluctuations moving around an upward curve.[3] But the process of growth proceeds through upsetting contradictions rather than an even, incremental addition of output, which impel the expansion and renew the momentum again and again, and it might be these contradictions and the convulsions they generate that do most to produce and reproduce the fossil economy on ever greater scales. The dents in the curve may hold the secrets to its direction.

The Energy in the Waves

One way of conceptualizing this history of dynamic non-equilibrium, which seems to have a promising but surprisingly overlooked potential for our purposes, is the theory of long waves of capitalist development. Commonly traced to the foundational contribution of Russian economist Nikolai Kondratieff in the early 1920s, the theory proposes that capitalism moves in waves of forty to sixty years' duration.[4] Each wave has two phases: an "upswing" characterized by boom conditions, succeeded by a "downswing" of persistent stagnation. The exact periodization has been a matter of endless controversy, but a standard chronology would look something like this[5]:

	Upswing	Downswing
First long wave	c. 1780–1825	c. 1825–1848
Second long wave	c. 1848–1873	c. 1873–1896
Third long wave	c. 1896–1914	c. 1914–1945
Fourth long wave	c. 1945–1973	c. 1973–1992
Fifth long wave	c. 1992–2008(?)	c. 2008– (?)

When Kondratieff first proposed the wave movement, he claimed to have discovered it through sheer observation: no economic theory predicted such a rhythm to growth.[6] Ever since, the most compelling argument for the existence of long waves has been empirical.[7] Few economic historians would dispute that growth in the advanced capitalist countries has generally been faster in the periods designated as upswings and slower in the downswings: some sort of alternation appears undeniable.[8] But why would capitalist economies develop in this jerky fashion? One part of the answer, on which most theories of long waves build, is the rhythm of technology diffusion. Truly revolutionary technologies, with the power to electrify economies both literally and figuratively, change the way goods are produced and open up fresh venues for general expansion, do not come online gradually. They come in bundles and bursts and thrive on dislocation; only if a crisis has weakened previous technological systems can they break through and advance.[9] Each wave is consequently associated with a certain set of technologies, and the consensus as to their identities is wide and well-supported.[10] A typical list would look like this:[11]

	Constellation of technologies	Leading branches and core inputs
First wave	Water-powered mechanization of industry	Cotton and iron
Second wave	Steam-powered mechanization of industry and transport	Railways, machine-tools, cotton, iron, and coal
Third wave	Electrification of industry, transport, and households	Electrical equipment, engineering, chemicals, and steel
Fourth wave	Motorization of transport and other parts of the economy	Automobiles, aircraft, refineries, petrochemicals, oil, and gas
Fifth wave	Computerization of the economy	Computers, software, telecom equipment, and microprocessors

Two things strike the eye here. First, the emergence of the fossil economy appears to have occurred in the shift from the first to the second long wave: from one based on water to one picking up steam. This is the conjuncture where it all began.[12] Second, each subsequent wave — with the curious exception of the fifth — seems to have surged forward on the basis of technologies producing or transmitting fossil energy in novel ways. Students of long waves have not failed to notice this pattern. "In each wave dominant technologies can be identified that are associated with primary energy sources such as coal, oil, and natural gas," states one; Kondratieff himself saw one of the clearest signs of an upswing in "the rapidity in the increase of coal production and coal consumption"; in a short paper inspired by the oil crisis of the early 1980s, George F. Ray argued that major innovations sparking off long waves were "either directly originating in, or closely connected with, the production of energy, such as steam engines or the railways," always boosting the demand for energy, always dependent on "the abundant supply and almost unlimited availability of fuel."[13] The implication of this statement is significant: capitalism has moved out of its recurring downswings and revived growth on a higher level, first by starting, then by stoking and augmenting the fire. Picture the pair of bellows being blown every fifty years or so, each time with greater force, each time generating a new pulse of CO_2 that rises towards the sky for the full duration of capitalism and, most likely, beyond.

At first sight, the fifth wave is anomalous. Computers are one step removed from fossil energy, at least when compared to steam engines or automobiles, and yet the wave which their generalization appears to drive has generated the most extreme explosion in global CO_2 emissions ever recorded. I will return to this apparent paradox below. It seems, however, that, following the original switch, every downswing has been overcome through a deepening of what is often called "carbon lock-in." The alloy of fossil fuels and self-sustaining growth has been consolidated in three consecutive revivals (late nineteenth century, mid-twentieth century, late twentieth century), which reconfirm combustion as the venue for expansion and suffuse

the economy with coal, oil and natural gas on a progressively larger scale. In the process, each wave has also produced its own "technomass," to speak with Alf Hornborg: an infrastructure of the (for the moment) most advanced technologies, as in railroads, electrical grids, highways, oil platforms, tankers, airports, data centers… the ever-growing bag between the handles, as it were.[14]

Some fossil technomass is flushed away by subsequent waves — Joseph Schumpeter's famous "creative destruction" — and deposited in the earth's crust. Some is incorporated by the new eras. Old railroads, electrical grids, highways, and other infrastructures still in use can be seen as material legacies from previous long waves, the body of the fossil economy swelling and solidifying throughout its history; they represent technologies bequeathed to the present.[15] No wave has, as yet, displaced any fossil fuel; coal has been a mainstay since the second.[16] Urban sprawl is an inheritance from the end of the third and onset of the fourth.[17] Coal mines and airports currently under construction to connect the nodes of globalized production will weigh down on future generations: and so on. The history of the fossil economy takes the concrete form of a sedimentation of layers upon layers — not through gradual accretion, but through successive alluvial deposits from discontinuous, often violent long waves.

Carlota Perez, the most influential wave theorist of the early twenty-first century, who stands on the shoulders of Schumpeter, writes:

> So each great surge [her preferred term for waves] represents another stage in the deepening of capitalism in people's lives and in its expansion across the globe. Each revolution incorporates new aspects of life and of production activities into the market mechanism; each surge widens the group of countries that conforms [sic] the advanced core of the system and each stretches the penetration of capitalism to further corners of the world, inside and across countries.[18]

Exactly the same thing could be said about the fossil economy, because it has been at one with capitalism. The long waves have been capitalist and fossil bound, diffusing new combustive technologies without which business-as-usual would still be stuck in the steam age. Each upswing has been punctured by a signal crisis, marking the arrival of a structural crisis of the capitalist economy, resolved — so it seems — by the adoption of innovative fossil fuel-based technologies across the board, until the globe as whole resembles a bag in the bellows. Why? By what fossil mechanism has capitalism leapt from wave to higher wave? To be able to search for answers to these questions, I need to engage more closely with some theory of long waves. Among the very many proposed since the days of Kondratieff, I select one, nowadays virtually forgotten, that of Ernest Mandel.

A Dialectic of Profits and Prime Movers

A revolutionary Marxist and leader of the Fourth International, Ernest Mandel pioneered the resurgence of scientific interest in long waves from the 1970s onwards. His own idiosyncratic theory was first outlined in *Late Capitalism* (1972) and then elaborated in *Long Waves of Capitalist Development: A Marxist Interpretation* (1995).[19] Long waves, in Mandel's definition, are a cycle of "successive acceleration and deceleration" of capital accumulation.[20] Given that such accumulation originates in the production and realization of commodities, upswings will manifest themselves in high rates of growth in industrial output and world trade and downswings in a slackening of both, a rhythm Mandel claimed to be able to demonstrate with statistics.[21] Contractions do not vanish in the upswing, but are relatively short and mild, while years of feverish prosperity predominate; conversely, fleeting booms are interspersed between the long and severe recessions characteristic of the downswing.[22]

For Mandel, however, long waves are not only or even primarily statistical phenomena. They are real segments of capitalist history. On this point, he took a leaf from his maestro Leon Trotsky, who censured Kondratieff in the early 1920s for imputing a law-like regularity to

the waves, modeled on the shorter business cycle. No ticking clocks automatically set off upswings and downswings, Trotsky argued; instead, the turning points between the phases are determined by such unforeseeable events as wars and revolutions, the colonization of new countries, or the discovery of new resources — "those external conditions through whose channel capitalist development flows."[23] Moreover, the two phases correspond to "entire epochs," in economics but just as much "in politics, in law, in philosophy, in poetry [!]": "in all spheres of social life."[24] They are qualitative totalities, not quantitative artifacts, to be studied in all their complexity and, as one would say today, contingency.[25]

Writing on the other side of one full wave, Mandel could add new material to Trotsky's picture. The first upswing coincided with the French Revolution and the Napoleonic Wars; the second with the heydays of free competition and Victorian progress; the third with classic imperialism and finance capital; the fourth with the golden era of mass production, Keynesianism, consumerism, the welfare state; to which one can now easily append neoliberalism, globalization, bourgeois triumphalism, "end of history," network society, digitalization, and all the other trappings of the fifth.[26] In between lay no less distinctive periods of social upheaval and strife. Others have made similar observations, among them Eric Hobsbawm:

> Each of the "Kondratievs" [sic] of the past not only formed a period in strictly economic terms, but also — not unnaturally — had political characteristics which distinguished it fairly clearly from its predecessor and its successor, in terms both of international politics and of the domestic politics of various countries and regions of the globe. That is also likely to continue.[27]

It follows that the waves cannot be perfectly symmetrical oscillations of the same length.[28] Since they move "in zigzags, looping up and down," with Trotsky; shaped not by any single factor but "by a series of social changes," with Mandel; playing out on "the social, political

and cultural scenes," with Hobsbawm, there is no reason to expect any fixed periodicity.[29] To this argument, however, Kondratieff presented a powerful rejoinder. If the waves are conditioned by random shocks — wars, revolutions, conquests, discoveries — why would there be any discernible sequence to capitalist development? Why would such events cluster around the turning-points — think of the revolutions of 1848, the outbreak of World War I in 1914, the oil crisis in 1973, the final collapse of the Soviet Union in 1991 — if not because they are symptoms of the waves, rather than their causes?[30] Accidents make for bad pacemakers. Trotsky never offered a reply, leaving it to Mandel to try to fuse the two views: long waves are indeed epochs bound by political struggles (Trotsky), but they are also the products of endogenous tendencies in capital accumulation (Kondratieff).[31] How could that possibly be true?

To solve this theoretical conundrum, Mandel introduced the concept of "partially independent variables" acting upon the capitalist laws of motion.[32] Put in the simplest possible terms: suppose inventors have developed a major new technology, lying in wait in workshops until massive investment will diffuse it. Suppose capitalists remain hesitant, because the expected profits are too low to merit the outlays — then all of this falls within the modus operandi internal to the mode of production itself. Now suppose that the main trade unions suddenly fall apart. A piece of anti-union legislation may have been rammed through; ideological infighting, choked funding, or military occupation might have caused the unions — hitherto mighty enough to block all wage cuts — to crumble. None of these factors can be derived from any intrinsic logic of capital. As a result, the profit expectations receive a shot in the arm, capitalists rush to invest in the new technology, and soon a full upswing is underway. In Mandel's theory, this would be a perfect case of how "partially independent variables" — here, the change in union power — interact with the systemic laws of motion, first holding accumulation back and then letting it loose as the historical stage is rearranged. In itself, such an event cannot open up a new epoch, but if it is combined with trends

growing out of the system itself — and this is what happens at the turning points — all the components might fall into place for a step change.[33]

The accumulation of capital has certain inbuilt tendencies — to maximize profits, to ratchet up the rate of exploitation of labor, to raise the productivity in the struggle against competitors, as well as to search for improved technologies, larger markets, cheaper raw materials, and so on — that give the capitalist mode of production its general "push."[34] But these tendencies never operate alone in the world. Capital confronts an environment where foreign and often volatile influences are at work: classes with varying degrees of capacity to advance their interests, states with shifting alliances and geopolitical ambitions, ideological traditions with long lifetimes and irregular breaks, remains of feudalism or actually existing socialism or the welfare state, all with their own forces of gravity.[35] Such variables, and the list could be extended endlessly, are partially independent or autonomous, in the sense that they have roots in historical soils not endemic to capital itself, yet cannot fail to be entangled with capital in a world dominated by it.[36] These variables are not fully inside capital, but not fully outside it either. Capitalist laws of motion therefore assert themselves through an interaction between intra-economic and extra-economic forces, and it is here, in the "concrete dialectic of the subjective and objective factors," that the long waves arise, their epochal essences being, so to speak, amalgamations of innumerable variables with a certain temporal solidity, eventually cracked by new contradictions.[37]

There is reason to ask if this amounts to a theoretical solution. Is it anything more than a blank check for analytical eclecticism? What else does it achieve than reformulating the Trotsky/Kondratieff antinomy on a higher level?[38] A Mandelian response might be that no formulation, however subtle and intricate, can reflect the real jumble of causal pathways between the mechanisms of capital accumulation and their "external conditions": only historical inquiry can disentangle it.[39] For such an endeavor, Mandel put up certain

signposts. First of all, he urged close attentiveness to ups and downs in the rate of profit, the safest indicator of how well the accumulation of capital fares. Since the production of commodities is motivated by the quest for profit, it will grow fast and slow as profits rise and fall; in times of declining profitability, capitalists will be less inclined to invest, and vice versa.[40] As new technologies are introduced in an early upswing, avant-garde investors who avail themselves of the higher productivity will reap super-profits exceeding the average and pulling it up in the process.[41] Further into the upswing, however, clouds will sooner or later gather on the horizon, in the shape of any number of contradictions: too much installed machinery might turn into a burden; too many factories might have been built for the market to absorb the output; full employment might inflate the power of the unions; high demand might drive up raw materials prices — with any amount of input from the partially independent variables.[42]

Whatever the exact nature of these contradictions, they will feed into the rate of profit and lower it. Be it expensive machines, dried-up markets, militant labor, expensive fuels, or any other affliction, the capitalists will experience it as a downward pressure on the rate of profit. Here is the "synthetic index of the system's overall performance," the "seismograph of history" recording and expressing "all the changes to which capital is permanently subject": the single point in which endogenous and exogenous factors converge.[43] It is also the most important measure for practicing capitalists — that which "makes the system tick."[44] Consequently, a declining rate of profit will announce the approaching terminus of the upswing; the signal crisis might see it in free fall; throughout the early downswing, it will stay flat or even fall further. "Only when specific conditions permit a steep rise in the average rate of profit" will capitalists regain their appetite for investment and, if all goes well, launch a new upswing.[45] The moment of steep rise registers the (if only temporary) resolution of the contradictions: afflictions eliminated, profits spike. In other words, movements in the rate of profit set the rhythm of deceleration and acceleration by summing up the general conditions and regulating

the motivations for capital accumulation.[46]

No upswing can transpire, however, Mandel argues, unless any working-class resistance threatening to smother profits is defeated. The eruption of a structural crisis is usually attended by high unemployment, deflation or inflation, deteriorating working conditions, aggressive wage-cuts as capital seeks to dump the costs on labor and widen profit margins — all conducive to intensified class struggle. Integral to the brew of the downswing, the contest between the classes is an inherently unpredictable component. Here, more than anywhere else, "subjective factors" come into play: the organizational strength of the working class, the degree of its self-confidence and autonomy, its militancy or propensity to compromise and the equivalent factors in the camp of the bourgeoisie determine the outcome.[47] Capital can lay the foundations for a new epoch of expansion only if it prevails against all enemies and social impediments, including, but not limited to, organized labor.[48] How does such a victory materialize? What does capital do when it triumphs? It starts a technological revolution, concentrated to one particular sphere. Mandel explains it this way in *Late Capitalism*:

> In order completely to reorganize the technical process new machines are needed, which must previously have been designed.... [Q]ualitative leaps forward are necessary in the organization of labor and forms of energy.... The fundamental revolutions in power technology — the technology of the production of motive machines by machines — thus appears as the determinant moment in revolutions of technology as a whole. Machine production of steam-driven motors since 1848; machine production of electric and combustion motors since the 90s of the 19th century; machine production of electronic and nuclear-powered apparatuses since the 40s of the 20th century — these are the three general revolutions in technology engendered by the capitalist mode of production since the "original" industrial revolution of the later 18th century.[49]

If each wave marks a new phase in capital's capacity to recover profits after crisis, the magnitude and structure of "forms of energy" relative to forms of labor are here isolated as the sine qua non of the long waves. Power technology, in other words, is the key to the upswing. "Once a revolution in the technology of productive motive machines" — or prime movers, in common parlance — "has occurred, the whole system of machines is progressively transformed." Each of the three historical revolutions, between the first wave and the fifth, has remolded "the entire economy, including the technology of the communications and transport systems. Think, for example, of the ocean steamers."[50] If new life is to be breathed into sagging capitalism, it must come in the most basic, most universal guise: energy.[51] Only power technology pervades every nook and cranny of the mode of production, impelling, conveying, lifting, hauling, heating, pumping, communicating, fetching goods of all conceivable kinds. If a rise in profits is the economic precondition for the upswing, a new generation of prime movers is its material embodiment.

But the links between profit and prime mover are more complex than that. As an economic fact if not an ideal invention, the new set of motive machines has its immediate origins in the "attempts by capital to break down growing obstacles" to a rise in the rate of profit: on the shop floor, first and foremost.[52] When capital desperately seeks to restructure the labor process and put it on a more profitable footing, nothing can be more useful than a truly revolutionary power technology. It is the battering ram, the generalizable device with which capital destroys resistance and swings into renewed expansion. Victory over labor, then, does not so much precede as come about through the energy revolution, the two working hand-in-glove as the downswing nears its end.

In a two-way process so typical for Mandel's thinking, however, the prime mover not only assists in raising profits but also spreads throughout the economy as a result of those same raised profits: a positive feedback loop, one might say, propelling capital out of its long crisis. Moreover, the new technology can sustain the momentum of

the upturn only if it is powerful and pervasive enough to maintain high profits, neutralizing any threats in the short term — which, in turn, induces capital to invest deeper in it.[53] In sum, the prime mover is: (1) adopted to remove barriers to higher profits, primarily those erected by labor; (2) widely diffused when and as profits increase, partly as a result of its own exploits; and (3) used for as long as possible to ride the upswing phase of the wave, stimulating accumulation on a grander scale. In all three moments, energy constitutes the material solution to the contradictions of the structural crisis. Working its first wonders in the downswing, it comes into full bloom after a positive turning point, usually precipitated by some concatenation of victories — not only on the shop floor, but on the world arena as a whole.

Any regularity of the long waves, pace Trotsky, is laid down by the constellation of prime movers and their auxiliary machines.[54] Even if the activity of inventors and engineers followed a linear, continuous rhythm, capitalism would still move in jolts and jerks, because the rise of a new constellation could only be coterminous with a sharp rise in profits — always a singular event, determined by the collision of all sorts of variables, in the class struggle above all — and only permeate the economy in heavy chunks, the shift from one power technology to another an exceedingly massive undertaking.[55] But the effects of the energy injection are not everlasting, of course. They seem to last somewhat longer than five years, but never as long as half a century, the span of the upswing approximating — but no more — that of a human generation. Then contradictions resurface again.

Power technology thereby forms the materialist endpoint for Mandel's attempted fusion of endogenous laws and exogenous shocks, Kondratieff and Trotsky, accumulation and politics: a highly original sketch of a theory, identified by the author of *Late Capitalism* as his own special contribution to the field.[56] In *Long Waves*, however, the theme of energy disappears from sight.[57] Other wave scholars pass over it in silence. No one seems to have picked up this particular thread from *Late Capitalism* and followed it backwards and forwards through history; Mandel himself let it fall from his hands.[58] Left to

gather dust, its potentials are quite unlike those of any other long-wave theory, as will be clearer upon a brief comparison with the foremost neo-Schumpeterian version: that of Carlota Perez.

Driving the Bulldozer

"Technology is the fuel of the capitalist engine," writes Carlota Perez.[59] Mandel would have had it the other way around. True to her master Schumpeter, Perez regards technological development as a virtually unmoved mover, advancing in the workshops and laboratories of innovators, always working to improve efficiency; "once a truly superior technology is available," its breakthrough is "practically inevitable."[60] But it demands adjustment from its surroundings. A groundbreaking innovation craves new financial systems, new governmental policies, new forms of education, habits, behaviors, "mental maps of all the social actors" matching its own logic: the computer cannot stand the rigidities of the conveyor belt or the nation state.[61] It compels society to reorganize into networks. Society, however, is slow in adapting, for unlike technology, social relations are characterized by inertia, resistance, vested interests pulling the brakes, always lagging behind the latest machines.[62] When new technologies appear on the scene — "received as a shock" — society is tied to the old ways.[63] These must be pulverized. The period of installation

> is the time when the new technologies irrupt in a maturing economy and advance like a bulldozer disrupting the established framework and articulating new industrial networks, setting up infrastructures and spreading new and superior ways of doing things.[64]

Like a bulldozer without a driver, technology uproots all the inadequate institutions and cart away the hurdles for its own self-realization.[65] "Each technological revolution inevitably induces a paradigm shift" in society at large, forcing through rejuvenation in every sphere — from economy to mentality — in a process both necessary and painful.[66] At

the moment of the bulldozer's first appearance, society is rooted in the manners of obsolete technologies: a crisis of "mismatch" ensues. The whole fabric is ripped apart, until, after two or three decades, society has learned to behave as technology expects: an upswing follows.[67]

Since Perez's waves — or "great surges of development," as she likes to call them — start with the "big bang" of a revolutionary innovation, she has to turn the established chronology on its head: first comes the crisis of mismatch, then the "full expansion."[68] Normally, a Kondratieff wave is understood to begin with an upswing (that is, starting in 1945) and end with a downswing (that is, until 1992), but Perez pairs the halves in the opposite order and, for instance, identifies the early 1970s as the onset of the crisis-ridden first stage of a surge induced by the coming of the computer.[69] Unsurprisingly, she singles out the usual five protagonists — water-powered mechanization, steam, electricity, motorization, information and communications technologies (ICT) — but considers each the instigator of crisis, while Mandel, again, would have it the other way around: each as the creation of crisis.

In the slightly esoteric debate over how to date and define waves or surges, profoundly different views of causality are thus on display. For Perez, technology drives capitalist development; for Mandel, the reverse. Perez's theory has its counterpart in the productive force determinism of old-school Marxists, in which social relations are motionless fetters on technology, to be burst apart by a relentless progress; for Mandel, the most mercurial substance of history is the class struggle. Social relations of power, in Mandel's view, act as "the ultimate determination of the process of undulatory development": the driver steers the bulldozer so that it levels his obstacles, not the other way around.[70] In passing, Perez notices that a technological revolution tends to center on "a source of energy," calling forth a novel "techno-economic paradigm" encompassing all of society — whereas in Mandel, tensions between multiple social variables usher in new energy technologies.[71] While Perez essentially proposes an extension of technological determinism to the history of industrial capitalism in

toto, Mandel can inspire a radically different agenda for research on the history of the fossil economy, guided by two overarching questions in necessary dialogue with each other:

> (1) Have the contradictions of the downswings generated and fashioned new fossil fuel-based technologies, and if so, how? And,
>
> (2) Have those technologies served to resolve the contradictions and fuelled the upswings, and if so, how?

In wave theory *á la* Mandel, that which takes place in one phase is always linked to that which happened in the former. The neoliberalism of the fifth wave can only be understood as a way out of the impasses of the fourth, the Keynesianism of the fourth as a response to the imbalances and catastrophes of the third, and so on — and the same would go for the defining constellations of technology. This appears to be a singularly promising approach to the study of long waves of fossil development, particularly since it allows for free and full reciprocal action between capitalist laws of motion and all manner of partially independent variables: "Interplay: that was what it was about for Mandel."[72] His theory, as I have rendered it here, gives ample room for the struggle between capital and labor, but this is only one battle among many to be brought into the picture; indeed, the theory is open for almost anything: "Averse to determinism, Mandel advocated an integrated analysis of the entire societal reality."[73] That was both his greatest strength and greatest weakness. As a recent critic points out, Mandel ended up adding variable to variable to variable to variable… until the analytical synthesis threatened to spill out into chaos.[74]

On the other hand, "the great advantage of his method consists, above all, in its openness to historical contingency."[75] The explanation of one wave must be unlike that of any other, since each wave — as a bounded historical period, not an interval in a predetermined rhythm — is peculiar to itself.[76] But it is also an instantiation of a recurrent phenomenon. Mandel's theory is messy and labyrinthine

and intended to be so, because it is, first and foremost, a guide to the study of "actual historical dynamics."[77] What, then, can it tell us, more concretely, about the past, present and future of the capital-energy nexus? This is a question for any number of other studies, but at least a couple of signposts for further research are in order here. I offer some brief reflections on the turns from the first to the second, from the fourth to the fifth and from the fifth to a possible sixth wave yet to come.

To make a long story told elsewhere very short, British industrial capitalism surged forth on a first wave of water-power.[78] But in 1825, a signal crisis erupted in the form of a financial crash, followed by a succession of painful, protracted depressions. Extraordinary profits had attracted too much capital to the cotton industry in particular, causing an over-establishment of factories and, consequently, a massive overproduction of commodities, under whose weight the rate of profit now plunged. At the very same time as the banks collapsed — setting the typical pattern of interplay with partially independent variables — the British working-class rose, relieved from the criminalization of all trade union activity when the Combination Laws were repealed, and for the next two decades, the manufacturing districts were shaken by one near-revolutionary uprising after another. It was then that the shift to steam occurred.

The combativeness of key segments of the British working-class — cotton-spinners, handloom-weavers, machine-makers, wool-combers — blocked the path to resuscitated profits. Fortunately for the capitalists, however, they possessed a weapon to do away with them all: automatic machinery. Rolled out in the two decades after 1825, an army of self-acting mules, power looms, machine tools, and other machines effectively wiped out the insurgent collectives, cleared the way for wage reductions and speed-ups and brought the class to the subdued, domesticated state of the high Victorian era. That mechanical army was powered by steam. Fully developed and familiar to manufacturers since the mid-1780s, the new power technology, and I mean *power* in the dual sense of the term (as in energy *and*

dominance), overtook cheap water only after 1825, when the pressure of the contradictions of the first downswing made the transition imperative.

Steam alone could impel the offensive against labor. Water was embedded in the landscape and integrated in the weather, virtually free to use but located outside of towns, subject to fluctuations in river levels, incapable of running a concentrated mass of accelerating machines. Steam engines, on the other hand, could be put up anywhere and used at anytime: for their fuel was severed from the landscape, detached from weather cycles, brought up from underground as a dead still relic of ancient photosynthesis. Setting it on fire, capital released a completely new source of energy to destroy the resistance of labor. A steep rise in the rate of profit followed, allowing for an upswing in which steam-power opened all sorts of venues for fresh accumulation and remolded the economy in toto: a huge blast from the bellows.

Needless to say, the shop floors of Britain constituted but one, albeit crucial, frontier in this turn from the first to the second long wave. The full role of steam remains to be specified in detail. To follow the guidelines of Mandel, one would need to take into account all the buttons that must be pushed for capital accumulation to exit a structural crisis and revive on a higher level — not only a rise in the rate of surplus value, but also a broadening of markets, a reduction in turnover time, a cheapening of raw materials, and other elements of constant capital, to name some. How did steam power contribute to the mid-nineteenth century victories along these frontiers? A study of the origins of the fossil economy in this first full wave movement would need to delve deeply into the empirical data of the period and subject it to that type of open, pluralist, exuberantly complex analysis Mandel pioneered.[79] Yet the outline of the core elements underwriting each successive wave may nevertheless be established as early as the first.

Now jump straight to the apparent paradox of the fifth wave. Unlike steam engines, electricity, automobiles, or petroleum,

computers are neither prime movers or transmitters nor sources of energy in themselves, and yet the upswing they carried caused the most extreme CO2 blast in the history of industrialized capital. How can one shed light on that link? Perhaps by accepting Mandel's view that a major contradiction of the fourth wave was a perilously strong labor movement in the core. As the reserve armies of labor were depleted over the course of the 1960s and the self-confidence of the working class soared towards the wild heights of 1968–73, the high rate of surplus value of the previous two decades could no longer be maintained, and a "fall in the rate of profit became unavoidable."[80] To resolve that crisis, some profound restructuring was exigent. Among the many preconditions for a fifth long wave, Mandel proposed the following: "In order to drive up the rate of profit to the extent necessary to change the whole economic climate, under the conditions of capitalism, the capitalists must first decisively break the organizational strength and militancy of the working class in the key industrialized countries."[81] Did computer technology assist them in that battle? If so, how was it connected to the increased combustion of fossil fuels? An exhaustive inquiry is far beyond the scope of this essay: here I offer a crude hypothesis. It runs something like this:

> (1) The globalization of production broke the strength of labor in the advanced capitalist countries. By pitting workers there against workers in Mexico, Brazil, the post-Stalinist Eastern European economies, but primarily in China, they all became mutually substitutable to an extent never seen before. Armed with the capacity to shift commodity production to distant countries and export from there, within the framework of integrated cross-border supply chains, employers could push unions to the wall, by threatening that "unless you accept our demands, we will relocate." Beginning in the late 1970s, culminating with the admission of China into the WTO in 2001, the globalization of production removed one of the main hurdles to a capitalist renaissance. It gave a critical contribution to the relative rebound of the profit rate after the dismal lows of the 1970s.

(2) The very same process caused an unprecedented explosion in CO2 emissions. In China, the quest for cheap and disciplined workers, with whom all other workers of the world had to compete, set off the largest spree in fossil fuel consumption in history: cross-border chains extending into the People's Republic and, indeed, the four corners of the world demanded fresh infrastructure for the supply of energy, which, incidentally, mostly came from coal. They were held together by the transportation of goods, components, raw materials and personnel in vehicles fuelled by petroleum.[82] Overall, the globalization of production extended the logic of the fossil economy to new territories, giving the main impetus for the epochal boom in combustion outside the traditional core.

(3) Information and communications technology, or ICT, made the globalization of production possible. One of the most revolutionary services of this technological paradigm consisted in linking, coordinating, lubricating world-encompassing production chains: without ICT, globalization as we know it would have been unthinkable. As one geographer notes, the opening of the gates to China from the late 1970s onwards coincided with the rise of virtual bridges: "In the West, the combination of two industries, computers and communications, began providing the *enabling technology for industrial capital to seek out and manage cheap labor on a global scale*."[83] By allowing it to create transnational circuits, ICT turned into a battering ram against the defenses of labor, realizing the substitutability of industrial workers and unleashing the full force of existing power technologies across borders.

Finally yet importantly, humanity is now faced with the imminent prospect of catastrophic global warming, the sum of all the CO2 blasted into the air since the Industrial Revolution. At the same time, since the financial crash of 2008, central components of the capitalist world economy — the European Union, the United States, the People's Republic of China — appear mired in relative stagnation of various

degrees of depth and volatility, with some attendant symptoms of political crisis: a pretty good match for a fifth downswing. That conjunction gives rise to an intriguing possibility. Could capitalism swing itself into a sixth long wave by casting off fossil fuels and switching to renewables — just what humanity needs to stave off the most intolerable scenarios of climate change? Every nook and cranny of the world economy urgently needs to be disconnected from coal and oil and gas and filled with substitutes that come close to zero emissions: a grand transition to impelling, conveying, lifting, hauling, heating, pumping, communicating, doing everything with the power of sun, wind, water. Might such a universal rollout of new power technology breathe fresh air into languishing capitalism *and* ensure that we collectively back off from the cliff in time?

Probably the most elaborate case for such a future has been made by John A. Mathews, who builds directly on the work of Perez. He believes that the crash of 2008 signaled the descent into the crisis-ridden stage of yet another "surge," which will usher in a sweeping adoption of the renewable energy technologies (abbreviated RE) already in store and under development, leading, via a bumpy ride over the next couple of decades, into a rich green Kondratieff. These beneficent technologies perfectly fit the profile of a wave-carrying paradigm: they enable, first of all, "costs and prices to be drastically reduced." They are of virtually unlimited supply. They have "massive potential for applications and so for becoming pervasive," causing productivity to spike, spurring other novel technologies — electric vehicle charging systems, smart grids managed online, cities filled with intelligent green buildings — opening up unimagined channels for the accumulation of capital. The bottom-line is never in doubt. "The point is," Mathews writes, "to demonstrate that the new technology provides superior performance and profits": only by dint of this quality can it be expected to trigger a proper surge.[84]

Hence the agent of the transition in this new wave of capital shed of carbon will be capital itself. "It is capitalist emulation and drive for profits that will accelerate the uptake of renewable energy sources,"

the spirit of creative destruction harnessed for the most virtuous goal, firms scrambling to satisfy consumer demand with the lowest possible emissions and enriching themselves fabulously in the process.[85] More precisely, it is the financial sector that will drive the switch. Applying another model from Perez — the arrival of new technologies are accompanied by financial bubbles (think of the British railway mania in the 1830s and 1840s or the more recent dotcom boom) — Mathews predicts that the profit potentials of RE will attract frenzied investment from venture capitalists, the whole pack of adventurous speculators following the scent of super-profits. "If the last decade has seen REs emerging from out of their long (prolonged) gestation phase and into the installation phase, then we can anticipate a 'Renewable Energy bubble' some time perhaps around 2015–2020" — this was written in 2013 — "reflecting the surge of financing and credit creation into the field of REs and green technologies."[86] In this prognosis, the future is bright green like a budding leaf. "Through direct market connections, and through the aggregating effects of financial instruments, the entire economy will be brought within the ambit of new capitalist eco-calculations that bring ecological limits to the center of concern."[87]

Now what would happen were one to choose Mandel instead of Perez as a source for speculation? The first lesson of his theory is clear: never underestimate the ability of capitalism to reinvent itself.[88] Never stick to orthodox formulas that always proclaim the end of the road. Prepare to be taken aback by capital, whose flexibility and resourcefulness have confuted so many prophecies of breakdown so many times before. That said, there are a number of question marks to be jotted down alongside Mathews's storyline. First of all, it might be a category mistake to conceive of a conversion to renewable energy as analogous to any of the technological leaps experienced since the mid-nineteenth century.[89] Going from fossil fuels to renewables — completely, no delay — is quite unlike adding automobiles, airplanes, and petrochemicals to the arsenal of capitalist productive forces. Since the original switch between the first and the second waves, when the

fossil economy emerged in full, the upswings have been predicated on technologies for more extensive consumption of fossil fuels: but this time, we are talking about a reversion to qualitatively different type of energy. If, since the high Victorian era, every "great surge of development," to use the sanguine neo-Schumpeterian terminology, has materialized through fossil energy, this one would have to break out of that mould and re-embed itself in the kind of energy the very first structural crisis jettisoned. The adequate analogy would rather seem be that singular transition — now in reverse, and on an unfathomably larger scale.

The question to ask, then, is if capital accumulation in general and a phase of renewed expansion in particular are compatible with an exclusive use of sun, wind and water. Or is there something in fossil fuels that make their energy indispensable for capital? As much as ever, the currents that make up "RE" remain integrated in landscapes and subject to fluctuations in weather. Can capital survive if fettered to the places and hours where the sun happens to shine and the wind to blow? More to the point: can it thrive within such fetters? They would seem to contravene the logic of globalized and lean production — a problem Mathews conveniently ignores, when he posits the sixth surge as essentially a renewable continuation of the fifth (whereas it has to remove carbon lock-in inherited from the fourth wave, in the form of *inter alia* the oil industry).[90] But perhaps some sort of reconciliation can come about. Perhaps several different renewables from many topographic regions can be connected in overarching mega-grids that elevate them above the concrete determinants of landscape and weather, making them available practically anywhere anytime. Now that obviously requires comprehensive planning, most probably by other agents than venture capitalists, quite likely by states interfering deeply into the flow of energy. Can capital reconcile itself to such meddling — let alone gain from it?

I have offered some more detailed, though rather skeptical reflections on these issues elsewhere.[91] Here I note one further complication: all upswings so far have rested on the freedom to

consume vastly greater quantities of energy than the previous wave. There has never been any other way to feed growth in commodity production. If this history is anything to go by, a sixth upswing would not only have to replace the current total consumption of fossil fuels by an equal amount of renewable energy: it would have to add a significant margin for growth — not 100 percent of oil and coal and gas, but 120 or 150 or even more would need to be extracted from unfossilized energy within the course of a few decades. It seems a tall order. The alternative, of course, would be to reduce energy consumption, beginning with its wastage: something no previous upswing has ever had to worry about. Growing by slimming seems alien to the workings of capital. But, again, one should not discount its capacity for miraculous reinvention.

Then there are some straightforward empirical problems in Mathews's assessment. The evidence for the emergence of an RE bubble is, to put it mildly, mixed. Total capital invested worldwide in renewables fell by 23 percent between 2011 and 2013. It rebounded in 2014, by some 17 percent over the previous year.[92] Total investment in fossil energy was some four times larger, meaning — it bears repeating — that for every dollar used to build up RE capacity, four other dollars were ploughed into oil, coal, gas. The International Energy Agency predicts a similar distribution until 2035 — no world-saving speculative binge in sight — and notes matter-of-factly: "Getting the world on a 2°C emissions path would mean a different investment landscape."[93] So far, the money does not quite seem to roll into the green Kondratieff corner. Mega-projects for concentrated solar power in deserts — notably Desertec — "promise as many associated investment opportunities as there are entrepreneurs to find them," Mathews has declared, but in reality the entrepreneurs have fled that ship like rats.[94] By the time of this writing, the Desertec project appears to have utterly failed. The eco-Schumpeterian storyline is built on the premise of secularly falling prices for renewables — entirely realistic — and just as secularly rising prices for fossil fuels, which, however, are directly contradicted by the present collapse in

the price of oil. And then it hasn't even considered the possibility that it might not be very lucrative to market a fuel that is practically gratis. Where will the profits to the energy supplier come from when the price of solar power approaches zero?[95]

Finally, Mandel leads me to a rather different set of questions. How could investment in renewable energy not only deliver profits but underpin the *steep rise in the average rate of profit* required for capital to embark on a new upswing? In what sense could it constitute *the solution to the contradictions* of the fifth structural crisis? Could it serve capital as a bulldozer by which to break down the growing obstacles? It does not seem to be a self-driving bulldozer, not a force advancing on its own, spreading "new and superior ways of doing things" while society adapts more or less pliantly. Mathews seeks to distance himself from technological determinism, but he never poses the profoundly *social* question of a Marxist perspective on energy in the waves: what source could help capital to defeat its enemies, including itself?

The answer depends, of course, on the exact nature of the contradictions of the present conjuncture. Let us, for the sake of argument, accept the proposition that capital now, in a reversal of the situation in the 1970s, suffers from too weak labor, unable to purchase all the commodities churned out, so that over-production, over-capacity, over-accumulation have become near-chronic maladies of the world economy. Then perhaps giant public — note public — investment programs in renewables could provide just the injection of demand capital so desperately and impotently craves. But that remains pure speculation. So far, no capitalist class has taken any initiatives in the direction of climate Keynesianism on an epochal scale. Under the banners of free trade and austerity, that class rather continues to push states further away from influence over investment and squeeze out the last drops from public budgets and working-class earnings, and as Naomi Klein has eloquently argued, such strategies for renewed accumulation run exactly counter to the prerequisites for a switch.[96] To speak in the terms of Mandel, climate Keynesianism

seems to necessitate a subjective factor, some sort of social force more external and hostile than internal and congenial to capital. It has yet to appear on the stage.

But then one should not forget the partially independent variables. This time, the climate system itself might prove one such externality. An extreme climate emergency could shove this mode of production in an unforeseen direction. Indeed, if any prophecy about the next phase of capitalist development can be made with anything like certainty, it is that global warming will be a determining external condition through whose channel it must flow. Once in there, all known wave patterns might eventually — this sort of breakdown cannot be excluded — come to an end along with everything else. However, before we reach that point, and to make it slightly less likely, a rediscovery of Mandel's method and painstaking application of it to the realities of our day, always with an eye on the subjective factor, might be of a little help.

Notes

1. Under this definition, non-capitalist fossil economies are perfectly possible and have indeed existed in the shape of Stalinist formations. For some reflections on them, see Andreas Malm, "Who Lit this Fire? Approaching the History of the Fossil Economy," *Critical Historical Studies*, 3.2 (Fall 2016) 215–248.
2. As pointed out by, for example, Leon Trotsky, *The First Five Years of the Communist International* (London: Pathfinder, 1973) 226; Michael Storper and Richard Walker, *The Capitalist Imperative: Territory, Technology, and Industrial Growth* (Oxford: Basil Blackwell, 1989), 202; Ernest Mandel, *Long Waves of Capitalist Development: A Marxist Interpretation* (London: Verso, 1995) 120; Chris Freeman and Francisco Louçã, *As Time Goes By: From the Industrial Revolutions to the Information Revolution* (Oxford: Oxford UP, 2002) 43, 55; Carlota Perez, *Technological Revolutions and Financial Capital: The Dynamics of Bubbles and Golden Ages* (Cheltenham: Edward Elgar, 2002) 162. "The stage on which capitalist history is played out is always on the move." Anwar Shaikh, "The Falling Rate of Profit as the Cause of Long Waves: Theory and Empirical Evidence," *New Findings in Long Wave Research,* eds. Alfred Kleinknecht, Ernest Mandel and Immanuel Wallerstein (London: Macmillan, 1992) 174.
3. As emphasized with particular clarity by Trotsky, *The First Five* 252; Leon Trotsky, "The Curve of Capitalist Development," article originally appearing in Russian in *Vestnik Sosialisticheskoi Akademii*, 1923, available at marxists.org.
4. N. D. Kondratieff, "The Long Waves in Economic Life," *Review of Economic Statistics*, 17 (1935) 105–115. On Kondratieff, his theory, and the theories of his many predecessors, see Freeman and Louçã, *As Time* 66-92. Klas Eklund "Long Waves in the Development of Capitalism?" *Kyklos* 33 (1980) 383–419, remains an excellent survey of long wave theories.
5. Ernest Mandel, *Late Capitalism* (London: Verso, 1978) 122; Mandel, *Long Waves* 1; Freeman and Louçã, *As Time* 141; Phillip Anthony O'Hara, *Growth and Development in the Global Political Economy: Social Structures of Accumulation and Modes of Regulation* (London: Routledge, 2006)

6; Tessaleno Devezas, "Crises, Depressions, and Expansions: Global Analysis and Secular Trends," *Technological Forecasting and Social Change* 77 (2010) 739–761; Chris Freeman, "Technology, Inequality, and Economic Growth," *Innovation and Development* 1 (2011) 11–24; Andrey V. Korotayev & Leonid E. Grinin, "Kondratieff Waves in the World System Perspective," *Kondratieff Waves: Dimensions and Prospects at the Dawn of the 21st Century*, eds. Leonid Grinin, Tessaleno Devezas & Andrey Korotayev (Volgograd: Uchitel, 2012) 48–51.

6. Kondratieff, "The Long Waves." It speaks to his scientific vision that Kondratieff discerned the wave pattern only on the basis of the first two-and-a-half waves.
7. This is not to say that the existence of long waves is empirically uncontroversial — to the contrary — but overall, it has been easier to point to an actual rhythm of alternating upturns and downturns corresponding approximately to the chronology above than to theoretically *explain* it. See, for example, Eric Hobsbawm, *On History* (London: Abacus, 1998) 36–37, 66. For recent collections of an impressive array of data showing relatively high levels of growth of world GDP in the upswings and low ditto in the downswings, see Devezas, "Crisis, Depressions," and Korotayev & Grinin, "Kondratieff Waves."
8. Eklund, "Long Waves" 412–413. Even Angus Maddison, who sets out to refute the theory of long waves, ends up endorsing a (somewhat diluted) version of it under the force of the data: "There have been five distinct phases of economic performance in the capitalist epoch, each with its own momentum." Angus Maddison, "Fluctuations in the Momentum of Growth within the Capitalist Epoch," *Cliometrica* 1 (2007) 171. (This is gleefully noticed and discussed by Devezas, "Crisis, Depressions" 752–753.)
9. Freeman & Louçã, *As Time*, 139–142. Long wave theory is thus based on the crucial distinction between invention and diffusion: "Scientific-technical inventions in themselves, however, are insufficient to bring about a real change in the technique of production. They can remain ineffective so long as economic conditions favorable to their application are absent." "The Long Waves," 112.

10. As noticed by Espen Moe, "Energy, Industry and Politics: Energy, Vested Interests, and Long-Term Economic Growth and Development," *Energy* 35 (2010) 1732.
11. Based on Freeman & Louçã, *As Time* 141. Similar lists, with slight variations, can be found in, for example, Mandel *Late Capitalism* 120–121; Mandel *Long Waves* 33; Perez, *Technological Revolutions* 10–11, 14; George F. Ray "Energy and the Long Cycles," *Energy Economics* 5 (1983) 5; Arnulf Grübler and Helga Nowotny, "Towards the Fifth Kondratiev Upswing: Elements of an Emerging New Growth Phase and Possible Development Trajectories," *International Journal of Technology Management* 5 (1990): 437; Peter Dicken, *Global Shift: Transforming the World Economy. Third Edition* (London: Paul Chapman, 1998) 148; Bo Göransson and Johan Söderberg, "Long Waves and Information Technologies: On the Transition towards the Information Society," *Technovation* 25 (2005) 205; Chris Papenhausen, "Causal Mechanisms of Long Waves," *Futures* 40 (2008) 789; Carlota Perez, "Technological Revolutions and Techno-Economic Paradigms," *Cambridge Journal of Economics* 34 (2010) 192, 195–197.
12. For an analysis of this conjuncture, and more precisely of the shift from water to steam in British industry, see Andreas Malm, *Fossil Capital: The Rise of Steam Power and the Roots of Global Warming* (London: Verso, 2016).
13. Craig S. Volland, "A Comprehensive Theory of Long Wave Cycles," *Technological Forecasting and Social Change* 32 (1987) 127; "The Long Waves" 109; Ray, "Energy" 5. See further W. Seifritz and J. Hodgkin, "Nonlinear Dynamics of the Per Capita Energy Consumption," *Energy* 16 (1991) 615–620; Patrick Criqui, "Energy Crises and Economic Crisis: A Long-Period Perspective," *Energy Studies Review* 6 (1994) 34–46; Bruce Podobnik, "Toward a Sustainable Energy Regime: A Long-Wave Interpretation of Global Energy Shifts," *Technological Forecasting and Social Change* 62 (1999) 155–172; Jonathan Koehler, "Long Run Technical Change in an Energy-Environment-Economy (E3) Model for an IA System: A Model of Kondratiev Waves," Working Paper 15, Tyndall Centre for Climate Change Research, 2002; João Carlos de Oliveira Matias and Tessaleno Campos Devezas, "The Fifth Kondratieff Wave: The Fossil Fuel Apogee," Workshop Presentation, IV International Workshop on Oil and Natural

Gas, Lisbon, May 10–20, 2005; Göransson and Söderberg, "Long Waves" 207–208; Robert U. Ayres, "Turning Point: The End of Exponential Growth?," *Technological Forecasting and Social Change* 73 (2006) 1196–1197; A. T. C. Jérôme Dangerman & Hans Joachim Schellnhuber, "Energy Systems Transformation," *Proceedings of the National Academy of Science* (2013) E554–555.

14. For the concept of technomass, see Alf Hornborg, *The Power of the Machine: Global Inequalities of Economy, Technology, and Environment* (Walnut Creek: AltaMira, 2001) 11, 17, 85, 94. On the construction of energy infrastructures in the long waves, cf. Bruce Podobnik, *Global Energy Shifts: Fostering Sustainability in a Turbulent Age* (Philadelphia: Temple UP, 2006) 61–62.
15. "Railway systems originating in the middle of the nineteenth century are still very important today. Electrical technology is the essential foundation for electronic systems and the automobile has certainly not disappeared." *As Time* 145.
16. The relative shift from coal to oil after World War II coexisted with continued absolute increases of coal output, as pointed out, importantly, by Podobnik, "Toward a Sustainable" 157.
17. See George A. Gonzalez, *Urban Sprawl, Global Warming, and the Empire of Capital* (Albany: SUNY Press, 2009).
18. Perez, *Technological Revolutions* 20. Note that Perez is by no means an anti-capitalist: these insights do not depend upon opposition to the system.
19. Mandel, *Late Capitalism*; Mandel, *Long Waves*. A brilliant biography of Mandel is Jan Willem Stutje, *Ernest Mandel: A Rebel's Dream Deferred* (London: Verso, 2009).
20. *Late Capitalism* 109. Emphasis in original. The waves are said to be most obvious in advanced capitalist countries, as opposed to the lagging peripheries of the system. *Long Waves* 2.
21. On the role of these two indicators, see, for example, *Late Capitalism* 141; *Long Waves* 6.
22. *Late Capitalism* 122; *Long Waves* 21. See also "The Long Waves" 111, and *The First Five* 253–254.

23. Trotsky, "The Curve." An excellent rendering of the debate is Richard B. Day "The Theory of the Long Cycle: Kondratiev, Trotsky, Mandel," *New Left Review* no. 99 (1976) 67–82.
24. "The Curve."
25. See also, Eklund, "Long Waves" 389.
26. *Long Waves* 82. See further, for example, 76–81, 99, and *Late Capitalism* 128–9.
27. Hobsbawm, *On History* 37.
28. For example *Late Capitalism* 133, and *Long Waves* 76.
29. *The First Five* 252; *Late Capitalism* 129; *On History* 66.
30. "The Long Waves" 112–113.
31. See also Day, "The Theory" 81. The third main source of inspiration for Mandel's theory of long waves was, of course, Joseph Schumpeter. See also Francisco Louçã, "Ernest Mandel and the Pulsation of History," *The Legacy of Ernest Mandel*, ed. Gilbert Achcar (London: Verso, 1999) 104.
32. Ernest Mandel, "Partially Independent Variables and Internal Logic in Classical Marxist Economic Analysis," *Social Science Information* 24 (1985) 485–505.
33. Ernest Mandel, "Explaining Long Waves of Capitalist Development," *Futures* 13 (1981) 336.
34. Mandel, "Partially Independent" 489.
35. "Partially Independent" 490–495.
36. "Partially Independent" 492.
37. *Long Waves* 133. See also, Louçã, "Ernest Mandel" 107; William Hamilton Sewell Jr., *Logics of History: Social Theory and Social Transformation* (Chicago: Chicago University Press, 2005) 11. One could of course argue that these types of factors are so interwoven as to be virtually impossible to separate — as is so often the case with an analysis informed by the dialectical method.
38. As argued in "The Theory" 81–82.
39. See also Marcel van der Linden and Jan Willem Stutje, "Ernest Mandel and the Historical Theory of Global Capitalism," *Historical Materialism* 15 (2007) 39–41.
40. For a powerful restatement of this classical view and demonstration

of its validity, see Andrew Glyn, "Does Aggregate Profitability *Really* Matter?" *Cambridge Journal of Economics* 21 (1997) 593–619.

41. *Long Waves* 20, 110.
42. For a stylized scenario, see *Long Waves* 44–46.
43. Mandel, "Explaining" 335; Stutje, *Ernest Mandel* 190; *Late Capitalism* 133. Emphasis in original. See also, Minqi Li, Feng Xiao and Andong Zhu, "Long Waves, Institutional Changes, and Historical Trends: A Study of the Long-Term Movement of the Profit Rate in the Capitalist World-Economy," *Journal of World-Systems Research* 13 (2007) 33.
44. "Explaining" 335.
45. *Late Capitalism* 145. See also 108–9, 114, 120; *Long Waves* 7, 16.
46. *Late Capitalism* 110. In the rate of profit, then, Mandel fuses all the multiple endogenous and exogenous variables in a single factor so "close to the system's heart as to make one understand why changes in *that* factor can precipitate a change in the way in which the system as a whole grows or does not grow." "Explaining" 335.
47. *Long Waves* 33, 36–37, 118–19, 123, 128, 137.
48. In the midst of the fourth downswing — the first edition of *Long Waves* appeared in 1980 — Mandel listed the conditions for a new upswing, among them "a qualitative increase in the degree of integration of the USSR and China into the international capitalist market," a decisive break of "the organizational strength and militancy of the working class in the key industrialized countries," "radical rather than marginal changes in the transformation of some key areas in the so-called third world into large markets," "radical defeats of national liberation movements." *Long Waves* 87–90.
49. *Late Capitalism* 112, 118–119. See also 116–117. All emphases except the first added. Note that the selection of key technologies in this schema deviates from the modern consensus. See also Louçã, "Ernest Mandel" 117. The point here, however, is not the *identity* of the technologies singled out by Mandel, but the historical role he ascribes to them.
50. *Late Capitalism* 118–119.
51. *Late Capitalism* 112.
52. *Long Waves* 33.

53. *Late Capitalism* 115–116, 119.
54. *Late Capitalism* 137, 143–144; *Long Waves* 19.
55. *Late Capitalism* 145.
56. *Late Capitalism* 145.
57. With very rare exceptions, for example, the statement that each wave is associated with "new machine systems, based on different sources of energy" (*Long Waves* 112). In this book, however, the main theme and purported original contribution is the theory of *asymmetry* in the long waves: the turn into a downswing — the outbreak of depression — is exclusively caused by the laws of motion of capital itself, whereas the upturn is precipitated by a beneficial outcome of class and other political struggles. See for example 104. This theory is dubious: there appears to be no *a priori* reason to deny exogenous shocks a role in the outbreak of crises. Be that as it may, it is the power theory of *Late Capitalism*, not the asymmetry of *Long Waves*, that is of value to us.
58. The analytical poverty of energy theory in the Marxist school of long waves is on full display in Matthew Edel, "Energy and the Long Swing," *Review of Radical Political Economics* 15 (1983) 115–130, written at a time when Mandel's influence was at its peak. It contains no discussion of the above passages from *Late Capitalism.*
59. Perez, *Technological Revolutions* 155.
60. *Technological Revolutions* 38. See also 15.
61. *Technological Revolutions* 20–32, 41–43. "Mental maps" 20.
62. *Technological Revolutions* 6, 26, 153, 155; See also Perez "Technological Revolutions" 198.
63. *Technological Revolutions* 23.
64. *Technological Revolutions* 36. Emphasis added. See also, for exmple, 145.
65. *Technological Revolutions* 41–43, and "Technological Revolutions" 188, 194–195.
66. *Technological Revolutions* 15. Emphasis added.
67. *Technological Revolutions* 26.
68. *Technological Revolutions* 29–30, 48. On the "big bangs" — unexplained events of an almost cosmological character — see 11–12, 29.
69. *Technological Revolutions* 11, 57.

70. Louçã, "Ernest Mandel" 113.
71. *Technological Revolutions* 8; "Technological Revolutions" 191.
72. Stutje, *Ernest Mandel* 191. Emphasis added. On the importance of the concept of partially independent variables for opening up long wave theory to history, see also Louçã, "Ernest Mandel" 111; *As Time* 58. John McNeill contends that long waves can shed no light on environmental history — the discipline whose doyen he is — since they are unrelated to the temporalities of nature. "How can one harmonize this outlook with the rhythms of climate change, which in any case are not uniform around the world, and are surely quite independent from any economic cycles that may derive from human affairs?" J. R. McNeill, "Observations on the Nature and Culture of Environmental History," *History and Theory* 42 (2003) 38. But this is to conflate the issue of *how natural processes impact on society* with that of *how social processes impact on nature*: if the latter is in focus, long waves might very well be central to the explanation.
73. *Ernest Mandel* 187. Emphasis added.
74. Michael R. Krätke, "On the History and Logic of Modern Capitalism: The Legacy of Ernest Mandel," *Historical Materialism* 15 (2007) 126–128.
75. van der Linden & Stutje, "Ernest Mandel" 41.
76. See also Freeman & Louçã, *As Time* 111, 131, 150; Rodney Edvinsson, *Growth, Accumulation, Crisis: With New Macroeconomic Data for Sweden 1800–2000* (Stockholm: Almqvist & Wiksell International, 2005) 31, 167–168, 285–286, 289–290; Rainer Metz, "Do Kondratieff Waves Exist? How Time Series Techniques Can Help Solve the Problem," *Cliometrica* 5 (2011) 235–236. On Mandel's different explanations for each wave, see *Late Capitalism* 130–132, 145.
77. Eklund, "Long Waves" 414. Emphasis in original. See also *Late Capitalism* 145; Stutje, *Ernest Mandel* 169, 194.
78. See Malm, "Who Lit?"
79. This task will be taken up in *Fossil Empire*, the sequel to Malm, *Fossil Capital*.
80. *Long Waves* 73.
81. *Long Waves* 88.

82. For a more detailed analysis of this dynamic, see *Fossil Capital* 327–366.
83. Peter J. Taylor, "Thesis on Labour Imperialism: How Communist China Used Capitalist Globalization to Create the Last Great Modern Imperialism," *Political Geography*, 30 (2011) 175. Emphasis added.
84. John A. Mathews, "The Renewable Energies Technology Surge: A New Techno-Economic Paradigm in the Making?" *Futures* 46 (2013) 12–16. Emphasis added.
85. John A. Mathews, "Naturalizing Capitalism: The Next Great Transformation," *Futures* 43 (2011) 872.
86. Mathews, "The Renewable Energies" 17.
87. Mathews, "Naturalizing Capitalism" 874. Emphasis added.
88. *Late Capitalism* 92-93.
89. This mistake is also made from a Marxist standpoint by Podobnik, *Global Energy Shifts*.
90. "The Renewable Energies."
91. *Fossil Capital*.
92. Bloomberg New Energy Finance, *Global Trends in Renewable Energy Investment 2014*; Bloomberg New Energy Finance, *Global Trends in Renewable Energy Investment 2015*, bnef.com.
93. Figure and quotation from International Energy Agency, *World Energy Investment Outlook 2014 Factsheet Overview*, www.iea.org, 1. Emphasis added.
94. "The Renewable Energies" 16.
95. See further *Fossil Capital*.
96. Naomi Klein, *This Changes Everything: Capitalism vs. the Climate* (London: Penguin, 2014).

Nuclear Power and Oil Capital in the Long Twentieth Century

Adam Broinowski

Over more than sixty years since the 1953 Atoms for Peace program was launched, the dominant tendency in public discourse to separate nuclear power into peaceful and military uses has obscured the fact that both aspects of nuclear power (pithily known as "dual-use") are mutually dependent and inextricably tied. Moreover, the commanding presence of nuclear weapons in the high-stakes nuclear brinkmanship that has dominated the post-1945 strategic and geopolitical landscape has masked the important interlocking relationship between fossil fuel and nuclear energy industries that has been central to the consolidation of a U.S.-led global power bloc. If we are to properly understand the dynamics of energy within contemporary geopolitical formations, I argue in this chapter that we must include considerations of both oil and gas ("black" and "blue gold") and nuclear in an interoperable system of power relations. This system not only informs an international hierarchy of states, but it also is based and derived from control over access, flows, and distribution of energy and its capital accumulation. The primacy of energy in capital power relations and the ensuing conflicts to secure control over it that have been integral to the accumulation process suggests that alternative methods of renewable energy generation, distribution, pricing, and use may completely undermine the perpetuation of this system.

The maturation of U.S. unilateralism in the twenty-first century follows two centuries of various Euro-American liberal imperialist maneuvers to make it safe to do business, as it were, in and with

the resources from foreign territories. As U.S. General Colin Powell admitted in 1998, terrorist attacks (referring to al-Qaeda's guerrilla attacks on U.S. embassies in Kenya and Tanzania) were "the cost of doing business" in today's world.[1] As I will discuss in the following section, U.S. imperialism is founded on binding military and economic securitization, or geostrategic and geo-economic control, largely through military, political, energy, and financial instruments.

The post–World War II division and alliance system, continuing on from previous U.S. imperialist exploits and colonial occupations, was established to ensure the hegemony of the United States, a maritime power, through a permanent U.S. forward presence on geostrategic "land nodes," "geographical pivots," and "choke points" around the world.[2] These have been used to advance U.S. national and so-called free-world interests and those of its allies, which are said to be dependent on the "free flow of oil at stable and reasonable prices" and the "freedom of navigation and access to commercial markets." This means, in short, control over wells and pipelines, refining, pricing, and trade routes (mainly sea lanes).[3] This imperialist formation can be seen as the continuation of geopolitical strategy as put forward by British geographer Halford Mackinder in 1904 and developed with other European geographers (Mahan, Ratzel, Kjellan, Spykman): the encirclement and containment from the "Rimlands" by a dominant maritime power of any rival emergent economic and military power from the Eurasian "Heartland."[4] In 2016 world politics seems locked into a full "great game" scenario on the global chessboard, in which attempts by rising powers from the Eurasian Heartland are seeking to establish some autonomy in fossil-fuel pricing, energy supplies and distribution and to slice through U.S.-led containment to gain control over access points in the Rimlands and shipping lanes on the blue oceans.[5] In this system, given that energy, and hydrocarbons in particular, is so crucial to meet social and economic needs and improve conditions; it is at the core of global political economy as well as geostrategy.

As I conclude in this chapter, the potential for an emergent multi-

polar world as represented by Eurasian energic, financial, political, and military infrastructure initiatives to sustain sovereignties amid aggressive destabilization, could represent a major alternative to the largely maritime control of resource distribution and the last seventy years of Cold War bipolarity and post–Cold War neoliberal unipolarity. This could be a positive step given intensifying militarization, erosion of international legal standards, weakening of multilateral institutions, destabilization of state sovereignty, and acceleration in extreme environmental disruption in this transitional period.

It is necessary, therefore, to begin with an overview of the inter-imperialist competition for accumulated capital and power with oil-based energy at its center through the acquisition of colonial pieces in the late-nineteenth and early-twentieth centuries. Second, I trace how nuclear weapons and a military alliance system added a new dimension to the game of oil and global finance in the post–World War II formation of U.S. hegemony through to the oil shocks of the 1970s. Third, through pertinent details in the Persian Gulf War, Color Revolutions, the Iraq War as part of the so-called Global War on Terror (GWOT), and the destabilization of Syria and Ukraine as proxy wars, I explore the intersections of oil and gas, nuclear energy and nuclear weapons. Fourth, touching on the cases of India and Japan, I explain how this (nuclear and oil) energy-military-finance system compels states to ignore crucial economic, social and environmental indicators that would logically demand a turn to large-scale renewable energy programs. I argue that these power relations in late capitalism (including a return to forms of primitive accumulation) as they produce and thrive on systemic crisis are at the root of present tensions and conflicts and their resulting ecological and human chaos. Clearly the mode and underlying purpose of inter-state relations must be reframed as, together with other important considerations, they are proving to be incompatible with the health of the planetary commons that sustains human and non-human existence.

Energy and Twentieth-Century Imperialism

With U.S.-Soviet tensions already manifest during World War II, if not since 1917, the Cold War began with the U.S.-led introduction of atomic weapons into the geopolitical arena, anthropogenic nuclear materials into the environment, and the concomitant development of nuclear energy technologies. As world energy consumption grew 179 percent between 1950 and 1972, nuclear power altered previous forms of empire building through colonial acquisition and augmented the competition for resources in the accumulation of capital through new technologies, military staging platforms, and strategies of dominance, intimidation, and deterrence.[6] While an ideological program based on existential threat of nuclear war extending from President Roosevelt's "Four Freedoms" speech of January 6, 1941 served to inculcate a sense of righteousness, veil, confuse, and intimidate public consciousness, American corporate actors in cooperation with the U.S. Department of Defense (DoD), the U.S. Atomic Energy Commission, research laboratories, and other government agencies accrued influence and enormous discretionary budgets through financing and development of these weapons systems. So much so that U.S. President Eisenhower, who held significant responsibility for its making, was moved to label this the "military-industrial complex" in his final presidential address in January 1961. The division system which redrew the globe in sectors under U.S. command and determined as either pro-Communist or "free-world" allied seemed to justify the rapid development and deployment of nuclear weapons on land and on ships, planes and submarines, as well as sharing and hosting agreements with alliance countries, contributed to a system of U.S. military bases, which officially number 737 but which are estimated to exceed 1,000.[7] How and why this preponderance of overwhelming U.S. military power came to be is directly related to the control of energy in fossil fuel and nuclear forms.

Together with the U.S. occupation of Cuba and the Philippines as a result of its victory in the U.S.-Spanish war of 1898–1899, the

policy initiative signified in Secretary John Hay's "Open Door Note" of 1899–1900 addressed to China during the Boxer Rebellion (1899–1901), was designed to extend U.S. moral, economic, political, and military power through the creation of zones conducive to Anglo-American trade.[8] By lengthening the chain of islands where U.S. ships and personnel could refresh, refuel, and replenish supplies, the United States established monopoly oil cartels (such as Standard Oil) and their dynastic oligarchies as central to imperial expansion. Abundant Indigenous oil supply in the United States fueled its rise to become the world's leading industrial power by the 1890s. Further augmented by the entrenchment of U.S. oil companies in the oil-rich Gulf of Mexico — Caribbean region (Mexico and Venezuela, or the "Western Hemisphere") — to which Great Britain had been forced to concede control shortly after 1900 — provided an advantage over other great powers (Great Britain, France, Germany, Japan, and Russia). Such cartels accumulated power to the extent that many were broken up. Even so, they diversified their projects over the course of the twentieth century to become even more powerful multi-nationals.

When the British discovered oil in Persia in 1908, Great Britain, with the strength of its Royal Navy, was the dominant power in the Middle East and the Mediterranean. As ocean-going navies of the great powers switched from coal to oil with the use of new engines, machine weapons, and manufacturing systems prior to World War I, both Britain and France had to draw on U.S. oil suppliers (roughly 80 percent) and also U.S. navy flotillas to secure sea-lanes for oil tankers en route to Europe. This enabled the United States to further expand its significant naval force by the end of World War I.

Oil production in the Russian empire which had accounted for more than half of the world's oil production in 1900 dropped during the disruptive upheavals of World War I and the Russian Revolution. In the 1920s, with the appropriation and use of oil infrastructure and technologies initially established by western companies and financiers, expansion of its Indigenous reserves mainly in Siberia and access to oil in the newly unified Russian, Transcaucasian, Ukrainian,

and Byelorussian republics, oil production recovered, and, by 1939, the Soviet Union was the second-largest oil producer in the world, slightly ahead of Venezuela. Unlike the United States, which continued to secure holdings and take concessions in the Middle East and the Dutch East Indies, the Soviet Union devoted almost all of its oil production to the formation of an alternative political economic system and social organization within its borders.

In the Sykes-Picot agreement signed in May 1916 and revised at San Remo in 1920, the Arab provinces formerly under the Ottoman Empire and important for oil distribution routes to Russia during World War I were reshaped by British and French powers into artificial administrations rather than diversified national economies to ensure the flow of oil to the centers of capital. Against the wishes of various political minority groups who sought to realize greater political independence, these states heavily depended on foreign powers for extraction technology and oil revenue in exchange for local goods and services.

By the 1920s, with cheap and abundant oil supplies and revenue from security provided for its concessions and transport corridors, the United States economy equaled the combined economies of the next six great powers (Great Britain, France, Germany, Italy, the Soviet Union, and Japan). U.S. companies made up five of the seven largest oil corporations ("the Seven Sisters") in the world. In 1925, U.S. oil production accounted for slightly more than 70 percent of world oil production, with 40 percent coming from regions in which it had holdings outside the United States.[9] With this accumulated capital and the development of its petrochemical industry, the United States rapidly developed its automobile and transportation industry, agricultural industry for feedstock, fertilizers, and pesticides, and further invested in its military industry. With control over one million barrels per day (bpd) by 1941, the United States accrued significant leverage over its allies as it could fuel both itself and its allies' demands. In World War II, Anglo-American control over oil sites in the Middle East and the Western Hemisphere and sea routes

to them forced German and Japanese imperialist powers to seek alternatives, in the Caucasus and North Africa and the Dutch East Indies respectively. These failed, as the Soviet forces shouldered the overwhelming responsibility to eventually repel the German forces from the Caucasus and Volga-Urals regions and the U.S.-led Allied forces cut Japanese supply lines in the Pacific, contributing in large part to their defeat.

Post-1945 New Oil-Nuclear Order

With the Bretton Woods international financial institutions established (at the New Hampshire conference in June 1944) to form the basis of the post–World War II monetary system, the U.S. controlled 70 percent of world monetary gold, and the U.S. dollar was fixed as the world currency reserve secured at $35 per ounce of gold against other national currencies. Mirroring the Anglo-Iranian Oil Company (producing over 100,000 barrels per day in the early 1930s), in 1933, Standard Oil (Socal) discovered and secured oil concessions in Dharan in 1938 and founded the California Arabian Standard Oil Company (Casoc). Socal had merged with Texaco to form Caltex in 1936 for operations east of Suez, and then formed the Arab American Oil Company (Aramco) in January 1944. In the same year, the U.S. diplomatically recognized Saudi Arabia and shortly after transformed Dharan into a U.S. military base at the beginning of 1945 in order to better compete with British interests in Aden, Iran, Jordan and to vie for control over the Persian corridor (established to supply the Soviet effort against Nazi Germany). On February 14, 1945, in a famous verbal agreement between President Roosevelt and King Abdel Aziz Ibn Saud of Saudi Arabia (made aboard the U.S.S. Quincy), U.S. protection of and noninterference in Saudi Arabian society and support for its regional hegemony was guaranteed in return for ensured U.S. access to Saudi oil supply. In August 1945, it was observed in a U.S. State Department memo that "the oil resources [of Saudi Arabia and the Middle East] constituted a stupendous source of strategic power and one of the greatest material prizes in world history."[10] Further,

the Kingdom agreed not to oppose the Jewish homeland in Palestine (future state of Israel) as long as the United States did not support an increase of Jewish peoples in Palestinian territories.

After World War II the United States was estimated to have briefly possessed 50 percent share of global GDP (economic output as compared to six other major powers), largely due to its late entry into the European theater and the negative impact of the war on Europe and the Soviet Union.[11] From a $2.2 billion budget for the Manhattan Project begun in 1942, the United States became the first nation to conduct an atomic weapon test on July 16, 1945. After having further demonstrated its military prowess and intentions with two atomic bombs dropped on the cities of Hiroshima and Nagasaki (and in possession of a data-monopoly over the results), the United States then sought an international ban on atomic weapons through the United Nations. The U.S. failed in this mission, and, in 1945–1946, the United Kingdom Atomic Energy Authority, denied access to U.S. nuclear technology, launched an independent atomic program to develop and test its own atomic weapons. While the U.S., as the sole power in demonstrated possession of such technology, then established the U.S. Atomic Energy Commission in 1946, a civil agency that oversaw nuclear energy research through the Bettis Atomic Power Laboratory run by commercial company Westinghouse, it continued to develop mainly nuclear military applications which led to the launch of the Nautilus, the first nuclear submarine in 1952. The first atomic test by the Soviet Union only came in August 1949. Contrary to popular understanding, the U.S. possessed a vastly superior nuclear weapons stockpile as compared to the Soviet Union until well into the 1970s.

Nuclear weapons presented a major new dimension in strategic thinking. Yet the underlying core of U.S. objectives remained to assume Britain's former hegemonic role as dominant maritime power and guarantor of access to oil from the Middle East and Africa to drive the engines of transnational capital (including Japanese) and military operations. Amid the slow decolonization of former British, Dutch, French, Portuguese and U.S. colonies into sovereign nation

states from the late 1940s on, under cover of fighting communism, the United States designed a Cold War alliance architecture formalized in the San Francisco Treaty of 1951, which eventually led to the official division of the world into distinct sectors of U.S. military protection (NORTHCOM, SOUTHCOM, CENTCOM, EUCOM, PACOM, AFRICOM). It used its military bases to threaten, undermine, coopt, and/or overtly attack self-determinist national movements, authoritarian or otherwise, that were not aligned to U.S. interests (for example, access to resources, territory and markets). Increasingly U.S. agencies used methods at the sub-imperial level: proxy wars often based on aggravated pre-existing ethnic, religious, and historical tensions, economic warfare through bilateral and multilateral sanctions on resources and pricing, and information/psychological warfare through dominant media channels.

Through the alliance system, the Marshall Plan and other bilateral military and economic arrangements, the U.S. also bolstered client states such as West Germany, U.K., Japan, Italy, the Republic of Korea, the Republic of China and the Philippines. That some were former Axis powers with political leaders guilty of war crimes who were rehabilitated and reinstated seemed to hold less significance as compared to their geopolitical and geo-economic potential. Heavily dependent on the supply of foreign energy sources, Japan and West Germany in particular were assured of a steady supply of oil by the United States (among other necessities, infrastructural support, and technologies) as their economies and labor forces continued to transition from coal. During rapid economic growth in the 1950s–1960s, together with deep and coordinated political interference and inducements (and the profits from procurements during the Korean War for Japan), this afforded Japan and West Germany welfare state systems while serving to suppress popular demands for independent unionism, socialism, real democratic reforms, and national independence in foreign policy.

Similarly, as the Soviet Union consolidated its eastern and central European nations in a federation as agreed at the Yalta Conference in

February 1945, it enlisted their resources to rebuild from significant wartime damage (for example, oil from Romania, coal from Poland and Ukraine, uranium and coal from the German Democratic Republic, subsidized oil supplied to Cuba and North Korea). In parallel, over a period of unmitigated nuclear testing between 1945 and 1963 in the first cold war arms race, all five of the permanent members of the U.N. Security Council (United States, the Soviet Union, U.K., France, and China) obtained nuclear weapons. These nuclear tests were mainly conducted on "proving grounds" in internal and Third World peripheries, which were also sourced for raw uranium, infrastructure, labor, and technical support. Effectively, these test sites became "sacrifice zones" wherein the harmful effects of long-lived radioactive fallout were deemed remote enough to be ignored and denied by host governments and perpetrator states and multilateral institutions. At the same time, these tests were part of a psychological campaign to intimidate and/or deter the enemy. As with the atomic bombs dropped on Hiroshima and Nagasaki, the U.S. then threatened to use nuclear weapons many times against North Korea and PRC during and after the Korean War, and against Vietnam during that nation's long wars for self-determination.[12] Similarly, in the U.S. Single Integrated Operation Plan (SIOP-62, 1960), in the event of an "attack," the U.S. threatened most Soviet and Chinese cities with massive, near-simultaneous nuclear "retaliation" and long-lived consequences. This was based on the notion that nuclear war(s) could be won and reflected the U.S. aim to obtain nuclear primacy.[13]

After the Armistice Agreement to the Korean War was signed in July 1953, in December that year the U.S. Atoms for Peace program was launched (by President Eisenhower and promoted by the United States Information Agency [USIA]). The program stressed the distinction between commercial and military uses of nuclear energy and promised to its own population and to aspirant nations a magical uranium elixir. This superior "third fire," it was claimed, could fuel a "second industrial revolution" (although it would appear one was already underway) to create a utopian paradise of cheap and eternal

energy self-sufficiency to power cities, shrink distances (ships, planes, power electronic communications), distribute electricity and water to rural areas, transform deserts into fertile fields, improve crop yields and strains, cure the sick, and provide industry jobs.[14]

In 1957, a nuclear regime was institutionalized through the U.N. International Atomic Energy Agency (IAEA), mandated to promote the 'peaceful' (commercial) use of nuclear power. In this regime, newly-emergent nuclear aspirant nations found it increasingly difficult to develop this technology free of conditions. Unlike highways, trains, hydroelectric dams, and mines, the special dual-use properties of nuclear power plants meant that reactor types and degrees of fuel enrichment were now controlled by the IAEA and U.N. Security Council, thus entrenching an asymmetry between "nuclear haves" and "nuclear have-nots." Often described as a Faustian bargain, nuclear energy symbolized the potential for greater independence (for example, to mitigate nuclear and/or other types of blackmail), leverage, and elevated stature in a cold war hierarchy, while binding the aspiring state to huge capital, construction, technical engineering, finance, resource, and time investments. This made new nuclear states vulnerable to coercion from the supplier or from hegemonic states in case they chose a route of greater military and economic independence. While tantalized by the modernizing dream of energy self-sufficiency that nuclear energy seemed to promise to developing states, nuclear power tied them ever closer to power relations through interrelated technological, fossil, geopolitical, institutional, and capital path dependencies, unless they "went rogue" and developed a clandestine nuclear weapons capability (as was the case with India, Israel, Pakistan and North Korea).

The Defense of "Vital Interests": Oil, Nuclear Power, and Petro-dollars

By the early 1970s, the long-term structural impact of profitability and over-accumulation produced crisis in the form of recessions, inflation, and monetary instability in the domestic economies of

developed capitalist nations. Oil primarily supplied from the petro-state monarchies and secured by the U.S. Navy constituted 47 percent of U.S. energy consumption, while Western Europe accounted for 64 percent and Japan accounted for 80 percent.[15] U.S. domestic oil production alone could no longer supply national demand.

By the late 1960s, pressure had intensified on the U.S. economy from military spending and oil consumption from U.S. absorption in Vietnam and demands were being made by nations like Germany, France and Japan, flush with trade surplus dollars, to return their gold security deposits from the U.S. Federal Reserve. As the U.S. refused to devalue the dollar, its Federal Reserve was drained, and, in August 1971, following the April 1971 Tehran-Tripoli Agreement which raised the price of oil and consolidated the OPEC nations, the Nixon administration created an international shock when it announced the decision to withdraw the United States from the gold standard, ending the Bretton Woods system. A strong nuclear lobby in the United States took advantage of economic crisis to push nuclear generated electricity as a cheap supplement to fossil fuels leading to seventy-five nuclear reactors built between 1966 and 1975 (eventually reaching 104 plants). The cost overruns were enormous and acted as a significant brake on further construction.

A spike of $10 to $12 per barrel in oil prices, anticipated at the Bilderberg Group meeting of May 11–13, 1973, was announced by King Faisal of Saudi Arabia in September, just prior to the Yom Kippur War (October 6–25, 1973) between Israel and an Egypt-Syrian coalition.[16] In the October 1973 OPEC oil embargo, OPEC countries raised oil prices by 70 percent, and the Shah of Iran called for a 400 percent oil price increase in December. Consumers in the United States, western Europe, and Japan were hit with high inflation and oil price spikes while huge profits flowed to OPEC and Seven Sisters oil cartel members.

To turn a cost into a benefit, on June 8, 1974, U.S. Secretary of State Henry Kissinger, who had been negotiating with Golda Meir on Israel's tactics prior to and during the Yom Kippur War, signed

the US-Saudi Arabian Joint Commission on Economic Cooperation. In July 1974, William Simon, newly promoted from energy secretary to U.S. Treasury Secretary, and his deputy Gerry Parsky (later Aurora Capital Group Chairman), met with Saudi officials in Jeddah to confirm the details of Saudi Arabia's financing of America's widening deficit with its new-found petrodollar wealth. By December of that year, Kissinger, Assistant Treasury Secretary Jack F. Bennett (later Director of Exxon) and David Mulford (of Credit Suisse-First Boston and White Weld & Co) had arranged a financial mechanism with the Saudi Arabia Monetary Agency (SAMA) to recycle OPEC petrodollars through the U.S. Federal Reserve Bank of New York and the Bank of England by purchasing new US Treasury securities.[17] The Saudis would plow billions of their petrodollar revenue (roughly $117 billion which is only 20 percent of its $587 billion of foreign reserves in 2016) back into the U.S. economy by purchasing Treasury bonds, making it one of America's largest foreign creditors.[18] These were creatively concealed from official auction totals through "add-ons" and by aggregating Saudi holdings together with fourteen other "oil exporter" nations.

In 1975, Bennett was sent to Riyadh to fix the agreement with the monarchy that Saudi and all OPEC oil would be exclusively traded in U.S. dollars (and not the Deutsche mark, Japanese yen, or French franc), after which he moved to an executive position at Exxon. In return, the United States agreed to continue military protection (including with nuclear weapons) and to boost weapons sales from U.S. arms manufacturers to a cash-rich Saudi Arabia to further its regional control (and to other Gulf states). By 1975 all OPEC members agreed to sell oil only in U.S. dollars, and Gulf petroleum replaced the Federal gold reserve as security against the U.S. dollar as the global reserve currency.[19]

As long as oil has been the world's largest commodity in dollar terms, its sale denominated in dollars maintained demand for dollars from world central banks for their currency reserves to back foreign trade. The flood of petrodollars to OPEC nations from loans from big London-New York banks and from the World Bank and IMF and

repayable in dollars has fed back large commissions to U.S. and U.K. banks ever since. Essentially, while price hikes in petroleum and inflation impacted negatively in the polls in the United States, western Europe, and Japan, for corporate executives of major banks, oil companies, armament contractors, and their political representatives, as well as OPEC nations, higher oil prices were a boon.

Turning point: 1980s–1990s

In 1979, strategic shifts altered the tactics of imperialist capital. As a rash of nuclear reactors in large oil consumer countries (Japan, the U.S., and western Europe) came online in reaction to the oil price shocks of the 1970s, China's Open Door reform under Deng Xiaoping was underway following U.S. rapprochement and PRC-USSR antagonism. With the Soviet Union embroiled in Afghanistan while the U.S. funded and supplied (weapons and training) Islamist insurgents (Afghan Mujahedeen as progenitors of al-Qaeda) to fight them (instigated in the CIA's Operation Cyclone) in 1979–1980, as per the Carter Doctrine, the U.S. continued to fund and supply weapons to Israel, which signed an armistice with Egypt (the Egypt-Israel Camp David accord). It also imposed harsh sanctions on former close ally Iran (a Saudi rival) due to its Islamic revolution to further Israel-Saudi-U.S. control over hydrocarbons in the Middle East. By contrast, the parallel ascension of Saddam Hussein's Ba'ath party to power in Iraq and the shift toward radical Wahabbism due to the Saudi Islamic uprising at Mecca did not seem to attract U.S. opprobrium. Wahabbism spread to Pakistan, where Prime Minister Zulfikar Ali Bhutto was executed under orders from General Muhammed Zia-al-Haq. The subsequent Iranian hostage crisis between 1979 and 1981 would then fatally undermine Carter's presidency, mark the beginning of the Iran-Iraq war (1980-1988), and usher in the Reagan administration which engaged in a second superpower arms race.

To support another boost in military expenditure, in the early 1980s, following a decade of domestic stagnation and inflation, the Reagan and Thatcher administrations targeted domestic organized

labor through new privatization, deregulation, and austerity measures, and instrumentalized through the IMF and the World Bank.[20] This method of economic crackdown had been tested in Chile under the Pinochet regime after the coup d'etat and removal of the Salvador Allende government on September 11, 1973.

This was augmented by the innovation of futures oil trading ("paper oil") introduced by Goldman Sachs in the mid-1980s. By detaching physical oil from oil contracts so as to better manipulate and determine its market value via American and British benchmarks on all exchanges, major Wall Street banks used insider knowledge of traders' motivations to further manipulate the growth or slowdown of the world economy. With the dollar as world reserve currency, this more efficient financial leverage over oil prices alongside greater control over fossil fuel refinement and distribution through U.S. military basing and operations permitted ambivalence toward endless inflation in U.S. federal debt ($18.6 trillion, or 111 percent debt to GDP in 2016, up from 55 percent before the War on Terror).

Iraq War I

The priorities of this oil-military-dollar complex fortified by nuclear weapons was clearly demonstrated in the Persian Gulf War. On July 25, 1990, President Hussein notified U.S. Ambassador Glaspie of Iraqi intentions to invade Kuwait due to the oversupply of oil and theft through slant-drilling by Kuwait and the United Arab Emirates (economic warfare in Hussein's view), which were protected by U.S. security agreements and hosted U.S. troops.[21] Glaspie recommended negotiations and assured noninterference, which was followed up by a friendly letter from President George H.W. Bush, the credibility of which was supported by a legacy of over ten years of U.S. financial and military support to Iraq. Negotiations collapsed when Iraqi forces invaded Kuwait on August 2, 1990. Hussein offered the United States a privileged position in energy exploitation in Kuwait.[22] Bush then condemned Iraq's actions as a contravention of the United Nations Charter, the Arab League Charter, and the Iraqi Constitution.

While implementing an embargo on Iraqi trade ("economic sanctions") and building up U.S. troops in Saudi Arabia over five months, the Bush administration provided three main reasons to justify U.S. invasion of Iraq to Congress and the broader public: to protect cheap oil supplies to the U.S., to avoid a precedent of larger nations annexing smaller ones (invoking Nazi Germany's invasion of Czechoslovakia and the Soviet invasion of Hungary and following the Carter doctrine), and to intervene and stop a dictatorship that was (falsely) accused of killing babies in Kuwaiti hospitals.[23]

The general public exposed to mainstream media narratives was not informed that the CIA had aided Saddam Hussein's return from hiding in Egypt after his failed attempt on President Qassim's life (who had sought to nationalize Iraqi oil) in 1959 and his eventual assassination in 1963, and assisted Hussein's Ba'athist Party to take power in 1979.[24] Nor was it widely discussed that during the Iran-Iraq War (1980–1988), fought primarily over borders, Shiia-Sunni influence, and regional power, the U.S. supplied weapons, logistics and precursors for chemical, biological, and nuclear weapons to Iraq, as well as weapons, covertly, to Iran (the Iran-Contra scandal).[25] Along with being accused of orchestrating a string of domestic bombings to exacerbate diplomatic tensions for the Assad government in Syria in the 1980s, in 1983, the CIA pushed the U.S. government to pressure the Hussein government, along with Israel and Turkey, to threaten to invade Syria, which had closed off an oil pipeline to Iraq due to its war with Iran.[26]

The U.S. launched the Persian Gulf War on January 17, 1991. The Iraqi Army, depleted from its eight-year war with Iran, could not resist Operation Desert Storm, a U.S.-Saudi forty-two-day intensive bombing campaign followed by a massive ground offensive that included the use of depleted uranium shells. This led to the deaths of roughly 130,000 Iraqis. While continuing sanctions and military strikes caused the deaths of 500,000 Iraqi children, true to form, in 1997–2000 U.S. oil corporations like Halliburton sold oil production equipment to Iraq paid for by the Hussein government through

misallocated U.N. Oil for Food Program funds. Such corporations later recouped on this "investment" when the Hussein government was forced to sell them cheap oil on the black market after the Iraq War II.

Rather than to ensure cheap oil supply to domestic U.S. markets, however, U.S. actions and policy in these wars demonstrated a willingness to sacrifice civilian lives in the Middle East for greater control over revenue from oil from Iraq, Kuwait, UAE, and Saudi Arabia through extraction, distribution, pricing, and associated armament sales and foreign purchases of U.S. Treasury bonds to maintain the primacy of the dollar.

As Shimshom Bichler and Jonathan Nitzan argue, while energy control is certainly central to U.S. military interventions in the Middle East, these have done little to keep the real price of oil low, and that its inverse is more likely. Instead, they claim that capital, rather than primarily an economic entity, is a quantitative measure of organized power. They find that capital wealth is better measured in the differential profits accumulated by a corporation backed by state organs relative to those of rival corporations. So the capacity for capital control via energy and military operations is at the core of power relations — or, capital toward monopoly control as power.[27]

Color Revolutions

Activity related to U.S.-centered capital power relations were not limited to the Middle East in this period. As indicated in a 1984 United States policy directive (U.S. National Security Decision Directive 54) to promote :silent revolutions in communist countries," the U.S. exerted pressure, both covert and overt, to aggravate internal tensions in communist countries and pull them from the Soviet orbit. Due to low GDP growth, a war of attrition in Afghanistan, intense arms race expenditure, the 1986 Chernobyl nuclear meltdown, tightening military and economic encirclement, and divisions between ruling factions in Moscow, Presidents Bush and Gorbachev agreed to an end to the Cold War at the Malta Summit in December 1989. The Warsaw Pact was disbanded in February 1991 based partially on a commitment

made on February 10, 1990 by West German foreign minister Hans-Dietrich Genscher to Eduard Shevardnadze that NATO would not expand any further to the east.

Proclamations of the end of history and post–Cold War globalization that followed did not dampen the enthusiasm of the United States government and its NATO allies for covert action, destabilization, coercion, and outright invasion of sovereign states that sought national control over energy reserves (among other resources). Under the neoliberal Washington Consensus, a string of Color Revolutions throughout the 1990s and 2000s (such as Yugoslavia [1992–2000], Georgia [2003, and Southern Ossetia's secession in 2008], Ukraine [2004–2014], Kyrgyzstan [2005], Moldova [2009]) saw the use of strategies to foment tensions along ethnic, religious, and linguistic divisions. Against U.N. Security Council resolutions, Yugoslavia was broken up and tensions created along ethnic and religious lines, and Kosovo was annexed by NATO powers, which then expanded into central Europe. With policy advice from U.S. think tanks and local NGOs, similar tactics were extended to the North Caucasus and Central Asia (and the Far East), the prize being access and control of the bounty in these oil- and gas-rich areas and geostrategic corridors.

Post 9/11

With the pretext of hunting the perpetrators of the September 11, 2001 attacks, the United States invaded and occupied Afghanistan, and currently maintains nine major bases and at least 400 smaller bases and installations with NATO coalition partners excluding those operated by joint command with Afghan government forces. This includes the enormous Bagram Air Base, from which the U.S. could seek to facilitate operations to strengthen control over the Qatar-Baluchistan-Pakistan and Turkmenistan-Afghanistan-Pakistan-India (TAPI) oil and gas pipelines (U.S.-Saudi backed).[28] This has provided further leverage to the U.S. to back Pakistani "rebels," for example, to obstruct the rival Russia-China sponsored Iran-Pakistan (IP) pipeline through Baluchistan. Underway since the 1990s, such pipeline projects

promise to expand as multinational rivalry intensifies for control over the geostrategic trade corridors in Central Asia. As the Tengiz field oil reserves were discovered in the Caspian Sea in 1979, U.S. bases, already present in Afghanistan and in the region, facilitated the U.S. military and oil corporations to vie for a share over licenses and pipelines that pump Kazakh oil with five regional nation-states (Russia, Kazakhstan, Turkmenistan, Iran, Azerbaijan). Pipelines are planned or already pass through Russia to the Black Sea in the west, to Iranian clients in the south, and to China's Xinjiang province in the east. China's considerable assistance to develop Pakistan's Gwadar port as a regional oil-gas sea-land transport hub and India's assistance (together with a railway) to develop Iran's south coast Chabahar port in the Gulf of Oman (72 km from Gwadar) further complicate these capital power relations in Central and South Asia.[29]

Together with the occupation of Afghanistan, it was no coincidence that in 2002 the Bush II administration withdrew from the Anti-Ballistic Missile (ABM) Treaty of 1972 while maintaining the U.S. nuclear first-use policy. The U.S., NATO and Japan (followed by others) then began deploying jointly developed Aegis Ballistic Missile Defense (BMD) shields and radar in strategic areas of Europe and Northeast Asia. Despite repeated demands by Russia and China for the withdrawal of U.S.-NATO installations of tactical nuclear weapons, as they violated the 1968 treaty on Nuclear Weapons Non-Proliferation, these alliance partners dismissed these concerns as irrelevant as the systems were "defensive" and were intended to protect against missiles from Iran and North Korea. Instead they then accused China and Russia of protecting these so-called rogue state targets. The latest example of this scenario is the 2016 Seoul-Washington agreement to install the Terminal High Altitude Area Defense (THAAD) missile batteries deployed in the southern region of South Korea.

Bush II's sequel Operation Enduring Freedom (2003) saw the complete removal of the Ba'athist government based, ironically, on a pretext of Iraqi Weapons of Mass Destruction (WMD or, nuclear weapons). General Colin Powell provided false evidence (with U.K.

support) at the United Nations Security Council, and advanced the vaguely defined Global War on Terror to target the same Islamist "terrorist groups" (such as al-Qaeda) that the U.S. had been funding to fight the Soviet Union in Afghanistan and Russia in Chechnya and Dagestan.[30] In lieu of protecting Israel and the U.S.-Saudi (and Gulf Cooperation Council states) oil-finance mechanism and hegemony in the Middle East, only later was it revealed that a U.S.-led program to recruit mercenary jihadi fighters (including former Ba'athists and Sunnis in but not limited to Iraq) was set up to help "take out seven countries in five years" (Iraq, Syria, Lebanon, Libya, Somalia, Sudan, Iran) and to further prize open strategic territories to Capital energy interests.

Syria and Ukraine: Recent Regime Change Plans for Pipeline Hegemony

The conflicts in Syria (since 2011) and Ukraine (since 2014) are also indicative of the centrality of oil and gas to U.S.-led aims for monopoly control. In the legacy of CIA-led attempts to control oil supply (Trans-Arabia [Oil] Pipeline) running through Syria to Europe since 1949 by the destabilization of elected governments (namely, assassinations, insurgencies, and political interference), and in contrast to the dominant mediations of the "Arab Spring," Syrian "civil war" and "drought" as primary causes of this conflict since 2011, a foreign-sponsored insurgency (loosely known as ISIS/ISIL/IS in part comprised of former Iraq Army soldiers laid off under orders from General Paul Bremer and asembled into Al Qaeda Iraq (AQI), Al Qaeda affiliate Jabhat Al-Nusra renamed as Jabhat Fatah Al-Sham and Hayat Tahrir al Sham, Jaysh al Islam, and the Free Syrian Army brigades among others) has been central to creating favorable conditions for the U.S. and its allies.[31]

In 2009, the Syrian President Bashar al-Assad rejected a $10 billion Qatari gas pipeline project proposed in 2000 to run from Qatar (North Dome field shared with Iran's South Pars field) through Saudi Arabia, Jordan, Syria, and Turkey (Qatar-Turkey Gas Pipeline) to Europe.

Similarly, plans have been long underway for the construction of an oil pipeline from Saudi Arabia through Syria to Europe continue. The construction, saving costs, and expanding volume as it would be cheaper and faster than sea transport, would be carried out by a U.S. corporation such as Halliburton and marketed to Europe by firms like Exxon. Iran, seeking to use Syria as a corridor for its gas, has intervened to defend the Assad government against the U.S.-Saudi-Qatari-backed jihadi insurgency to weaken and overthrow and replace Assad with a government. If they cannot replace the government with one more favorable to their interests, rather than occupy Syria, they seek to secure control over a strip in former Syrian territory through which to run the pipelines.

This oil-gas link would position GCC states to dominate world natural gas and oil markets; accrue power to Qatar, host to two U.S. bases, and Saudi Arabia, host to a drone base and several "units"; deliver huge revenues to U.S. corporations that refine and distribute the oil and gas to Europe and to Ankara through transit fees as a transect hub; and to U.S.-U.K. banks through dollar commissions. It would undercut Russia's major share (70 percent of Russia's gas supply goes to Europe) of Europe's gas supply (Nord Stream to Germany and the planned South Stream pipeline through Turkey), providing a further means to isolate that nation. This could also contribute to a long-planned greater Middle East territorial project and a NATO corridor from Turkey to India as an alternative to the Strait of Hormuz supply route in case of war with Iran.

Instead, with conflicts sparked from the cooption of initially nonviolent protests in Syria and Libya in 2011, in 2012 Syria signed off on a pipeline from Iran's South Pars through Syria to the ports of Lebanon, giving influence to Iran at the expense of Qatar, Saudi Arabia, and Israel, and leaving Iran and Russia to negotiate without U.S. involvement. In 2012, having supplied funding and intelligence to Syrian opposition groups since 2009, the United States joined France, Qatar, Saudi Arabia, Turkey, and the U.K. to form the Friends of Syria Coalition and demand and conduct operations for the removal

of Assad. From around this point, a multinational force of Islamist Sunni mercenaries (as listed above) were armed, trained, and funded primarily by Saudi Arabia, Qatar, Turkey, the United States, NATO, and Israel to destabilize and gain partial control of Syrian territory and ultimately replace the Assad government.[32]

Again, to justify this intervention, in 2013 the Syrian government was widely accused of using its chemical weapons (sarin) on Syrian civilians in the Ghouta chemical weapons attack which left 1,400 dead. Later, numerous investigative journalists revealed a secret agreement in 2012 between the Obama administration and leaders from Turkey, Saudi Arabia, and Qatar to set up a sarin gas attack and blame it on Assad to provide further justification for the "moderate rebels" and pretext for U.S. invasion and regime change in Syria. In 2013, Russia persuaded Syria to relinquish its chemical weapons stockpile, which it duly did. Several investigative journalists then found and corroborated that the sarin came from Libya's stockpile, along with many other weapons, which were being run in "rat lines" through Turkey.[33] These accusations and counter-accusations of chemical weapons attacks have continued since.

As this chapter goes to press, yet another chemical weapons event in Khan Sheikhun on April 4, 2017 was blamed on the Syrian government and used to justify a U.S. unilateral retaliation with tomahawk missiles on the Shayrat airbase and further discredit the Assad government. The United Nations Organization for the Prohibition of Chemical Weapons (OPCW) confirmed that traces of sarin gas found in the attack were not linked to the Syrian government's former stockpile of chemical weapons. The report corroborates the assertions of the Syrian government that armed insurgents were responsible for the chemical attack, along with the preceding attacks.[34]

In October 2013, Russia then sent a flotilla to confront U.S.-NATO naval and air forces to back down from a planned attack on Syria from the Mediterranean. Russia provided further military assistance at the request of the elected Syrian government since September 2015 following ISIS's control of transit corridors and major town centers

including Raqqa, northeastern Syria and Mosul (and Erbil and Kirkuk) in northern Iraq, which have oil fields (matching a possible pipeline route). Although motivated by its strategic interests — to protect its naval base in Latakia, one of only ten Russian foreign military bases and facilities, its share of the European gas market, and to curb a long-term internal Islamist insurgency — Russia's operations remained within international law. By contrast, the U.S.-led coalition has claimed to be fighting ISIS while demanding that the Syrian government negotiate to share power with non-ISIS "moderate" groups who seek to establish a "federal system."[35] While Damascus has largely been brought under control, bitter fighting continues with major flashpoints in Raqqa, Aleppo, Deir Ez-zor, Manbij, Idlib, Ramadi, Homs, and Hama.

As if in revenge for Russia's intervention to protect Syria, a "civil war" in Ukraine was also triggered through an illegal coup d'état to overthrow the elected Yanukovych government in February 2014. When the Yanukovych government defaulted on its loans to Russia and chose to honor a Russian repayment agreement instead of accepting an IMF austerity package, preexisting tensions were aggravated between energy-rich (coal) but politically neglected eastern provinces (Donetsk, Donbass, Lugansk) which favored ties and trade with Russia and more privileged western provinces where populations favored joining the European Union and signing on for IMF loans.

As a traditional energy transit zone and buffer state between Russia and Europe, Ukraine has long been a target for multinational corporations assisted by U.S. and E.U. intelligence vying for shares of Ukraine's resources. In 2008, for example, nuclear conglomerates in western-Ukraine (Tōshiba-Westinghouse/Energoatom, AREVA/VostGOK) attempted to exclude Russian involvement in Ukraine nuclear power by converting Russian nuclear reactors (VVER Water-Water Energetic Reactors) to uranium and plutonium fuels (MOX Mixed-Oxide).[36]

Mediated as a color revolution against an unpopular and corrupt pro-Russia government, the new government was constituted with

members favored by the U.S. "Ukraine hands" (such as U.S. State Department Victoria Nuland and U.S. Ambassador Geoffrey Pyatt) including the former Prime Minister (Arseniy Yatsenyuk) and several Ukrainian émigré or foreign-born parliamentary members (such as former Georgian President Saakashvili as Governor of Odessa).

Russia assumed control of Crimea to defend its access to the Black Sea following overwhelming electoral support for secession (over 70 percent in favor by western polls). Labeled an annexation, Russia was punished with several rounds of economic sanctions and banned from the G8 summit. As Russia attempted to uphold the terms of the subsequent Minsk Protocol (no foreign interference in Ukraine), Russian-speaking populations in eastern Ukraine, Odessa, and Crimea were attacked and besieged on numerous occasions by government and hard-right paramilitary forces (Right Sector, Svoboda, Azov Brigade, Maidan, Bandera) on anti-terrorist and even anti-Communist pretexts.[37] The Poroshenko government also blocked energy supply to Crimea (recovered with an energy bridge from Russia), while natural gas and heating prices doubled in 2016 in Ukraine under an IMF shock therapy program. Coalition allies such as Australia ignored Ukraine's declared intentions to develop nuclear weapons in the next ten years and a significant accident in late 2014 at the Zaporozhye nuclear power plant which has leaked radioactive material into the environment on several occasions, and blocked uranium supply to Russia while signing uranium export agreements with Ukraine.[38] This agreement has since been ratified.

The U.S. "Asia Pivot" and Nuclear Build-up

As befitting a global hegemon, U.S. efforts to control the world economy have not been limited to the Middle East, Central Europe, and Central Asia. In a new doctrine informally known as the Asia Pivot devised in 2009 and announced by President Obama in Canberra in 2011, the intention was declared to deploy 60 percent of U.S. military forces along an arc extending from Northeast Asia to the Philippines and Vietnam to Australia and India. Intended to contain and encircle

China and Russia in the Indo-Asia-Pacific regions, the U.S. called on regional allies to increase their military expenditure to more than 2 percent of GDP. India and Japan, two central nodes in this arc, demonstrate how nuclear and energy supply chains are inextricable from this strategy of military positioning and presence.

In stark contrast to the public opprobrium, heavy sanctions, and military threats to Iran and North Korea for their nuclear programmes, U.S.-led efforts in 2004–2005 (brokered since the mid 1990s) led to an agreement in 2008 to bequeath India, a non-NPT member, with a waiver to trade with members of the forty-eight member Nuclear Suppliers Group (NSG). Although India was finally denied formal membership of the NSG in 2016 as it would breach its mandate not to include non-NPT states, India will likely apply again. It was also able to use the waiver to sign with NSG members in bilateral agreements for supplies of raw and enriched uranium and nuclear power technologies (from United States, France, including parts from Japan, Russia, and likely Japan). In contrast, others (such as Pakistan) continue to be denied either a waiver or full admission to the NSG. In return for this U.S. leveraging, India signed up to a "global security partnership" with the United States to counter, encircle, and contain Chinese military reach and energy supply routes, including in the Bay of Bengal and South China Sea. Against its typical position of independence, building on its "Look East" policy of 1991, India also launched its "Act East" policy of more proactive engagement in Asia, part of which is its closer security alliance with the U.S. and Japan.

India's increased nuclear generating capacity would contribute to boosting power for military manufacturing (such as blue-water navy) while surplus uranium allows it to divert Indigenous uranium to Indigenous reactors and reprocessing facilities (ten out of twenty are beyond IAEA scrutiny) for high-grade fuel for nuclear warheads.[39] These weapons would supply the new nuclear armed and fueled attack submarine fleet (four or five Arihants) in development since the 1980s, and which would make India the sixth nation to possess a credible so-called second-strike deterrent (with U.S., U.K., France, Russia, China)

and places India behind U.S. and Russia in nuclear triad capacity (tactical, intermediate, or multiple nuclear warhead delivery from land, sea, and air). The Arihants are also intended for anti-submarine warfare capability against China in the Indian Ocean.[40]

At the same time, Prime Ministers Singh and Modi both framed India's contracts for fabulously expensive foreign nuclear reactors as an attempt to avert a "power crisis" and provide for "energy-starved" populations (roughly four hundred million) who lack modern cooking and heating. In fact, while national energy consumption is expected to double in the next twenty years, Modi's "Make in India" campaign will exploit the nation's vast supply of cheap labor and growing middle-class appetite for electricity for a transnational capitalist class of investors.[41] Instead of social uplift, these reactors will increase electricity bills for Indian taxpayers while raising electricity capacity by only a few percent. The real burden of this "atomic revolution" is borne by urban working classes in the form of high electricity bills and farming-fishing and tribal communities residing near uranium mines and nuclear power installations in the form of radiation exposures and contamination, who have sought to protect their subsistence economies from nuclear operations since 1988.[42]

Special concessions for India is a familiar story in Northeast and Southeast Asia. While Washington has often called the United States the "indispensable nation" (presumably to "keep the peace") it has long aggravated regional divisions to justify its forward deployments. The United States is the only nation that has agreed to protect favoured states through extended nuclear deterrence which either store/d U.S. nuclear weapons or agree/d to host U.S. nuclear weapons carriers (for example, latent or de facto nuclear states such as Japan, ROK, the Philippines, Australia, Canada), and the only country to "share" its nuclear weapons (in U.S. bases and mounted on delivery platforms) with other states (Belgium, Germany, Italy, Netherlands, Turkey, U.K.).

As a recipient of U.S. extended nuclear deterrence, Japan is also the only non-nuclear NPT member state to date to possess a significant nuclear stockpile via nuclear fuel reprocessing. While it claims to seek

energy self-sufficiency by closing the nuclear fuel cycle (particularly after the 1974–1976 oil shocks), key political leaders and strategists have long claimed Japan's right to develop tactical nuclear weapons in defense of the nation under the U.N. Charter. In the 1980s, during the U.S. Star Wars (SDI) program and Soviet deployment of SS-20 intermediate-range ballistic missiles (IRBMs), Japan committed research and development to missile defense technology. In fact, Japan has maintained a "hedge" capacity to produce high-enriched uranium, plutonium, and tritium for construction and maintenance of nuclear weapons, including for miniaturized warheads.[43] It has used aggressive-defensive North Korean rhetoric and DPRK missile testing since 1998 (nuclearized since 2006) to justify its acquisition of BMD on par with NATO powers and boosting interoperable capacity for U.S.-Japan "collective defence" forces further enabled by the Abe government's forceful reforms of Japan's constitution.

The U.S. Asia Pivot is only a step behind U.S.-NATO military posture in Europe. Since a U.S.-NATO missile umbrella ranging from Greenland to the Azores in Portugal was first announced by Bush II in 2007, in May 2016 a new anti-missile shield (MK 41) facility in Romania was opened and another planned for Poland in 2018 to join those in Turkey and Spain. Russian President Vladimir Putin issued a series of candid statements on this matter. In 2016, for instance, Putin pointed out that the nonexistent "Iranian threat" was a front to carry out the implementation and loading of the NATO Missile Defense (MD) System positioned in Europe. This uses sea-based mid-range Tomahawk subsonic cruise missile rocket launchers that can penetrate territories within 500 kilometers. With advances in U.S. missile technologies these are expected to increase to 1,000 kilometers and further. As Putin elaborated, the MD system is only one component in a larger system of offensive military potential: "one complex blocks, the other launches a high-precision weapon, the third blocks a potential nuclear strike and the fourth sends out its own nuclear weapon in response." Although this system is non-nuclear, as the nuclear element was put on hold in the 1980s, Putin's expressed concern is twofold. First, these

missiles could be used to target Russia's nuclear potential, taking out its retaliatory capability and therefore its deterrent function. The second is the inability of Russian intelligence to determine whether or not these missiles are nuclear, potentially forcing Russia either to launch nuclear weapons in correct or mistaken retaliation for an apparent nuclear attack or to launch in anticipation of a nuclear attack (preemptive or first-use nuclear strike). If this is correct, then Putin is correct to assert that rather than a "defense" system, this system is an "offense" system that is intended not to "prevent aggression" but to enable it. Putin considers this as a disruption to the strategic balance of power underwritten by a system of mutually assured destruction as it allows the U.S. nuclear primacy.[44] Russian and Chinese concerns appear to have been accurate, as these systems could not only potentially neutralize their offensive missile capabilities, they could also be reequipped with cruise missiles with significant reach into Russian and Chinese territories to be used in a "limited nuclear war."

The U.S. also withdrew from the U.S.-Russia megatons to megawatts program and New START treaty signed in 2010, and committed $355 billion for smaller yet more powerful nuclear weapons over ten years. Between 2011 and early 2016, the United States launched fifteen unarmed nuclear missile tests (including Minuteman 3 ICBMs from California to Kwajalein atoll).[45] The Obama administration committed $1 trillion to an overall nuclear weapons upgrade over thirty years (long-range bombers, nuclear submarines, ICBMs, cruise missiles, F-35 fitted B61-12 bombs, nuclear plants, and laboratories).[45] The Trump administration has confirmed this and added an extra $54 billion to defense.

With NATO-Russia military communications cut since the Ukraine crisis in 2013, U.S.-NATO forces have run multinational "rapid reaction" drills (40,000 troops), pre-positioned strategic bombers, tanks, and bases and rotated troops (four battalions or 4,000 U.S., U.K., German) in the Baltic states (Latvia, Lithuania, Estonia), Poland, Norway, and also Jordan.[46] While trading accusations of violations of the 1987 Intermediate Range Nuclear Forces Treaty (INF), Russia

refused to join the 2016 Nuclear Security Summit. It deployed Iskander nuclear-capable short-range ballistic missiles in Kaliningrad and other sites within Russian borders, and also committed to new missile complexes for Russian Strategic Missile Forces (SMF), including a multiple-warhead ICBM (RS-24 Yars) and a new heavy ICBM (Sarmat). Since 2014, China and Russia have been developing new hypersonic intercontinental missiles (China-DF-ZF, Russia-3M22 Zircon) intended to maintain nuclear deterrent capability by breaking through U.S. missile fence systems on their borders, and avoid U.S. monopoly in the Baltic and South China Seas. On April 12, 2016, Beijing tested a DF-41 ICBM missile with multiple warheads that can reach the United States in thirty minutes.[46] At the time of writing, Russia and China are considering building a joint missile defense system comparable to the joint operated U.S. equivalent.

None of this should be surprising. In 2010, a telegram leaked from the U.S. State Department signed by Secretary of State Hillary Clinton, outlined a NATO plan for attacking Russia. In 2016, an election year in the United States, while U.S. think tanks targeted their rhetoric on Russian aggressive "adventurism" in Europe and Beijing's push for "hegemony in East Asia," economic warfare was ongoing to provoke and/or break Russia.[47] With the Iranian oil export and nuclear energy embargo lifted in late 2015, Saudi Arabia glutted the world oil market by overproduction, forcing down oil prices from $103 per barrel in June 2014 (compared to an $80 per barrel average) to below $30 per barrel in February 2016 (up to $50 per barrel in June).[48] Characterized as "cancer treatment," Saudi Arabia gambled that it would suffer less than the world's other largest oil producers — Russia and Venezuela.[49]

Alternatives to Interlocking Unipolarity

After more than seventy years, the U.S. division and alliance architecture is stressed from "imperial overreach" with a military budget greater than the next twelve nations combined and increasing every year to fortify strategic territories and energy corridors to maximize control over supply and finance. The Beijing-Moscow "anti-

system" of Belt, Road, and Pipelines (Belt and Road Initiative) across the Eurasian heartland and supported by a complex of multilateral financial and trade institutions (such as the Shanghai Cooperation Organization [SCO], Asian Infrastructure Investment Bank [AIIB]) indicates the emergence of a potential alternative.

As oil output in the North Sea declines, in 2016 Russia detached Russian crude oil from the U.S. dollar to trade in ruble on the St. Petersburg Exchange (SPIMEX). Russia further agreed to be paid in yuan in 2017 for its oil and gas pipeline supplies (ESPO pipeline and also Northeast Asia) to China which is the world's largest oil importer at 8.9 percent (6.6 million bpd, November 2015).[50] China also launched an independent yuan oil benchmark on the Shanghai Exchange (INE).

A multi-polar world could be the most significant alternative to the dominant power system established at the end of World War II. On one hand, as attrition of infrastructure and public services and precarity in lower- and middle-income working classes grow more acute in advanced capitalist societies, denying the dominance of the dollar fixed to the world's biggest commodity of black and blue gold (both finite non-renewable resources) could at least expose this systemic production of self-perpetuating and opportunistic crises to fairer competition. Instead of the neoliberal shock tactics of proxy wars, military intervention and "regime change"; financial manipulation; foreign loans with heavy interest; austerity, deregulation, outsourcing, integrated robotics (to replace labor); and extreme and excessive resource extraction (coal seam gas, seabed mining, super-trawler driftnet fishing, water privatization, trafficking), long-term macro and micro, local and transnational energy and infrastructure projects could foster greater trust through cooperation and could boost real employment, tax revenue, technology-access, new markets, and industries. If there is a significant and coordinated push to adopt renewable energies and reduce carbon-based dependence it could mean avoiding desperation as vital resource depletion hits harder as well as a cleaner environment. This could positively strengthen supranational institutions and sovereign states to rein in

a transnational executive class through the universal ratification and enforceable execution of international legal standards to create more equitable opportunities for development and less uneven distribution of wealth.

Conclusion: Fukushima Daiichi as Exhaustion by Capital

The spread and diversification of capitalism has depended on the military and economic (including energy) organizational capacities of a succession of global hegemons which have sought to foster accumulation and control on a progressively expanding and penetrating scale.[51] In 2016, as in 1945 and throughout the intervening decades, nuclear energy and nuclear weapons remain instrumental in and inextricably bound to the operations and ambitions of nation states, transnational corporations, alliances, and power blocs within the global power apparatus. Nuclear power structures bind nation states within a regional and global security calculus and institutional order, while commercial or "peaceful" nuclear energy, although not completely fictitious, has provided a "fig-leaf" for military uses. Not limited to chessboard security, however, nuclear weapons states, de-facto nuclear weapons states, nuclear energy states, and non-nuclear states are simultaneously entangled in a web of energy-financial-military power relations. The nuclear power industry represents some of the starkest class divisions due to its centralized and concentrated system operated by a transnational power elite and insulated within exclusive domains of decision making and information access while disempowered communities bear most of its weight in the form of dispossession, loss of political agency, corruption, cheap labor, radiation exposures, and a contaminated commons.

For decades in Japan, for example, informal laborers from the most vulnerable parts of society are picked up by labor brokers, often with yakuza connections, for labor on power plant construction, maintenance, and cleaning.[52] As nuclear reactors grow older they become more contaminated and corroded (average forty-year life span) and these workers, vulnerable to a regime of misinformation,

become increasingly exposed to radiation. They develop chronic illnesses, cancers, and leukaemia, and shortened life spans, which also have generational impacts in the form of mutagenic effects.[53]

Five years after the Tokyo Electric (TEPCO) Fukushima Daiichi nuclear disaster began on March 11, 2011 ("3.11") it would appear that recovery, reconstruction, and revitalization is underway in Fukushima Prefecture. With the dominant narrative under control, the mainstream public assuaged, high radiation levels normalized, and a planned return to nuclear power generation (with twenty-five reactors expected to be supplying 20 percent total energy by 2030), as distinct from the response to the Chernobyl disaster the Japanese government and TEPCO have continued to vent, dump, incinerate, and redistribute radioactive materials into the atmosphere, onto land and water in Japan, and into the Pacific Ocean.

To maintain a semblance of legality, the Japanese government institutionalized an armature of plausible deniability by raising its legal limits for radiation exposure.[54] With the support of the international nuclear regulators, the authorities also deployed a "risk-communications" narrative by trivializing radiation danger and diverting focus from scientific understandings of available data to psychological responses so as to facilitate community acceptance and resilience in contaminated areas. To return capital loss to economic profit for the major corporations involved and their shareholders and investors, these social costs are being externalized and mostly "informal labor" is being employed to convert this once high-yield organic region of Fukushima into decommissioning and radiation research and waste storage and incineration hubs. Meanwhile the radioactive waste continues to be distributed around the country and recirculated in various forms. "Debt" in the form of radiation burden has been forced on human and non-human biota inside and outside Japan, while those who attempt to protect their fundamental rights to good health, well-being, and safety have been suppressed.

As graphically reinforced in Fukushima Daiichi and more recently the Kumamoto earthquakes on July 14–16, 2016 (1,026 earthquakes

including two of seven-plus magnitude) and close to two nuclear power stations, it is painfully obvious that no safety measures are adequate to protect nuclear power plants against seismicity and other extreme weather events (not to mention neglect, sabotage, or military attack). Together with many other nuclear energy related accidents, these systemic conditions outlined above indicate that utility profits, regulatory capture, and "cheaper" electricity are only some of the drivers of Japan's nuclear power program.

As I have discussed above, the influence of the transnational nuclear industry (particularly Japan-U.S.) together with other factors such as oil pricing and distribution, financial exchange rates, and a geopolitical alliance apparatus that includes nuclear security, means that nuclear power in Japan is an energy and weapons hedge. When all costs are included, however, particularly in the local economic, social, health, and broader environmental sectors, nuclear power is symptomatic of the deep violence of late capitalism as an apparatus of capital power relations. In its colonization of the most intimate bio-ecological bonds over several generations relative to different species and its large-scale destructive capacity, it mimics Indigenous dispossession and erosion of precapitalist economic and social relations in abrogation of their rights to shared resources at the base of production and sustainable environments and living standards.

In the neoliberal state-corporate accord for unlimited exploitation of "cheap nature," externalizing costs and risk, protecting private assets, and emptying out public institutions to facilitate their financial growth margins, in the aim to own and commodify almost anything, Capital as subject is exhausting the planetary commons (as manifest in carbon emissions, heating, ocean acidification, biodiversity loss, accelerated consumption, and human population growth, among other things).[55] Triggering profits through energy conflicts which stimulate price fluctuations, hydrocarbons access, weapons sales, stock investment, financial commissions, reconstruction contracts, and weakened regulation, its irrational kernel is exposed as it suppresses the same social and ecological forces which repair and regenerate

conditions for life's flourishing.[56] If the planetary commons are to be recognized as a common inheritance and to be legally held in public trust for for collective and sustainable use by all people as necessary for the continued thriving of planetary life, then understanding the mechanisms of the nuclear-oil-dollar-weapons complex may be a strategic step toward this goal.[57]

A multipolar system may offer one of the few realistic interim alternatives to the current U.S.-U.K.-led petro-nuclear corporate state model of "cheap" fuels, permanent war, privatized public institutions, tax insulation for an executive class, mass incarceration, immiserated and exposed labor, and religious and political fundamentalisms. Over the longer term, however, reinvigorated forms and praxes of trans-local social organization for worker-communities deploying renewable energy systems and subsistence economies on a mass scale could be more viable to remain within planetary boundaries. In the present interregnum, avoiding the cooption of "mixed economies" by neoliberal Capital and its political representatives remains a challenge.[58]

Notes

1. Jay Hughes, "Terrorism targets citizens, Powell says," *Newsok*, August 12, 1988, http://newsok.com/article/2622322.
2. Control points of the U.S. maritime power (5th and 7th Fleets) include the Strait of Hormuz, Strait of Malacca, Panama Canal, Turkish Straits, Danish Straits, the Bay of Bengal, as well as land-bases in the Gulf states, Central Asia, east Europe, India, the Philippines, Japan, South Korea and northern Australia.
3. See USCENTCOM, "Shaping the Central Region for the 21st Century," *Strategic Plan II 1997–1999* (MacDill Air Force Base, Florida: Office of the Commander-in-Chief, 1997) 5.
4. Halford Mackinder, "The Geographical Pivot of History," *The Geographical Society*, 23-24 (April 1904) 421–437.
5. This fulfills the geostrategy formulated by Zbigniew Brzezinski, *The Grand Chessboard: American Primacy and its Geostrategic Imperatives*, (New York: Basic Books, 1997).
6. David Painter, "Oil and World Power," *Encyclopedia of American Foreign Policy*, 2002, http://www.americanforeignrelations.com/O-W/Oil-Oil-and-world-power.html.
7. The United States supports 737 U.S. bases officially recognised in sixty-three countries as of 2005 and a likely total of 1,000 bases worldwide (including domestic military bases). See Chalmers Johnson, *Nemesis: The Last Days of the American Republic* (New York: Metropolitan Books, 2006) 139.
8. See "Commercial Rights in China ('Open Door' Policy): Declarations by France, Germany, the United Kingdom, Italy, Japan, and Russia accepting United States proposal for 'open door' policy in China," September 6, 1899–March 20, 1900, 1 Bevans 278, http://www.loc.gov/law/help/us-treaties/bevans/m-ust000001-0278.pdf.
9. Painter, "Oil and World Power."
10. Coordinating Committee of the Department of State, "Draft Memorandum to President Truman," *Foreign Relations of the United States*, Diplomatic Papers, The Near East and Africa, 8 (1945) 45. Prepared by the Chief of

the Division of Near Eastern Affairs (Merriam) and submitted to the Director of the Office of Near Eastern and African Affairs (Henderson) early in August 1945.

11. William Wohlforth, "The Stability of a Unipolar World," *International Security* 24 (Summer 1999) 14–15.
12. See for example, Jon Mitchell, "'Seconds away from Midnight': U.S. Nuclear Missile Pioneers on Okinawaa Break Fifty Year Silence on a Hidden Nuclear Crisis of 1962," *The Asia-Pacific Journal: Japan Focus*, 10.1 (2012) http://www.japanfocus.org/-Jon-Mitchell/3800/article.html; Steve Rabson, "Okinawa's Henoko was a storage location for nuclear weapons: published account," *The Asia-Pacific Journal*, 11.1 (2013) http://apjjf.org/2013/11/1/Steve-Rabson/3884/article.html.
13. Herman Kahn, *On Thermonuclear War* (New Jersey: Princeton UP, 1960); Henry Kissinger, *Nuclear Weapons and Foreign Policy* (New York: Harper & Brothers, 1957).
14. This was argued, for example, in a report written in 1957 by M. Louis Armand, Franz Etzel, and Francesco Giordani entitled "A target for Euratom" cited in Roy Herbert, "Progress in Euratom," *New Scientist*, 282 (April 12, 1962). In Japan, from as early as 1945 through to the mid-1950s, media commentaries focused on nuclear power as a "vital technology" and a benchmark of civilization. See Takekawa Shunichi, "Drawing a Line between Peaceful and Military Uses of Nuclear Power: The Japanese Press, 1945–1955," *Asia-Pacific Journal: Japan Focus*, 10.37 (2012) http://apjjf.org/-Shunichi-TAKEKAWA/3823.
15. "Oil and World Power."
16. Founded in 1954 by Jozef Retinger and Prince Bernhard of the Netherlands, the Bilderberg Group invited a conservative and liberal representatives from the United States and Western Europe to find ways to promote Atlanticism and bolster free market western capitalism through political, economic, and military means. The group continues to comprise some of the major stakeholders in the world's largest oil corporations.
17. F. William Engdahl, *A Century of War: Anglo-American Oil Politics and the New World Order* (London: Pluto P, 2004) 153, 162.

18. Andrea Wong, "The Untold Story Behind Saudi Arabia's 41-Year U.S. Debt Secret," *Bloomberg*, May 30, 2016, http://www.bloomberg.com/news/features/2016-05-30/the-untold-story-behind-saudi-arabia-s-41-year-u-s-debt-secret. See also David Spiro, *The Hidden Hand of American Hegemony: Petrodollar Recycling and International Markets* (New York: Columbia UP, 1999).
19. See, for example, Robin Rowley, Shimshom Bichler, Jonathan Nitzan, "The Armadollar-Petrodollar Coalition and the Middle East," *Working Papers* 89:10 (1989) 1–54, http://bnarchives.yorku.ca/134/01/890101RBN_ADPD_Coalition_and_the_ME.pdf.
20. Alan Freeman and Boris Kagarlitsky eds., *The Politics of Empire: Globalisation in Crisis*, (London: Pluto P, 2004); Leo Panitch and Steve Gindin, *Global Capitalism and American Empire*, (London: Merlin Press, 2012) 50.
21. Stephen M. Walt, "Wikileaks, April Glaspie and Saddam Hussein," *Foreign Policy*, January 9, 2011, http://foreignpolicy.com/2011/01/09/wikileaks-april-glaspie-and-saddam-hussein/, and Joseph Wilson, *The Politics of Truth: A Diplomat's Memoir: Inside the War and the Lies that Betrayed my wife's CIA identity* (New York: Carol and Graf 2004) 101–104.
22. Editor, "Text of Bush's Letter to Saddam Hussein," *LA Times*, January 12, 1991, http://articles.latimes.com/1991-01-13/news/mn-412_1_u-n-security-council-resolution, and Editor, "Confrontation in the Gulf: Excerpts on Iraqi Document on Meeting with U.S. Envoy," *The New York Times*, September 23, 1990, http://www.nytimes.com/1990/09/23/world/confrontation-in-the-gulf-excerpts-from-iraqi-document-on-meeting-with-us-envoy.html.
23. This testimony by fifteen-year-old "Nayirah" (only first name provided) before the Congressional Human Rights Caucus was mediated on American prime-time television. Only later was she revealed to be the daughter of the Kuwaiti Ambassador to the United States Saud al-Sabah, supported by the Citizens for a Free Kuwait. Amnesty International's corroboration was later retracted and the testimony was exposed as fabricated by PR firm Hill and Knowlton. Susanne Roschwalb, "The Hill & Knowlton Cases: A Brief on the Controversy," *Public Relations Review*

20:3 (1994) 267–276.

24. Andrew Cockburn and Patrick Cockburn, *Out of the Ashes: The Resurrection of Saddam Hussein* (London: Verso 2000), and Patrick Cockburn, "How the West Set Saddam on the Bloody Road to Power," *The Independent*, June 29, 2007, http://www.independent.co.uk/news/world/revealed-how-the-west-set-saddam-on-the-bloody-road-to-power-1258618.html.
25. For more detail see, for example, Douglas Frantz and Murray Waas, "U.S. Loans Indirectly Financed Iraq Military: Foreign Aid: Baker Pushed through Agriculture Credits that Helped Hussein Free up Money for Arms," *The Los Angeles Times*, February 23, 1992, http://articles.latimes.com/1992-02-25/news/mn-2628_1_foreign-policy.
26. See for example, Central Intelligence Agency. Government of the United States. "Bringing Real Muscle to Bear Against Syria," September 14, 1983, Approved Release Date May 17, 2008, *CIA Reading Room*, https://www.cia.gov/library/readingroom/docs/CIA-RDP88B00443R001404090133-0.pdf.
27. Shimshon Bichler and Jonathan Nitzan, "The Weapondollar — Petrodollar Coalition: Still about Oil?" *Philosophers for Change*, December 16, 2014, https://philosophersforchange.org/2014/12/16/the-weapondollar-petrodollar-coalition-still-about-oil/
28. See for example, "Politics: U.S. Policy Towards Taliban Influenced by Oil — Authors," *Inter Press Service News Agency*, May 6, 2016, http://www.ipsnews.net/2001/11/politics-us-policy-towards-taliban-influenced-by-oil-authors/, citing Jean-Charles Brisard and Guillaume Dasquie, *Forbidden Truth: U.S. Secret Oil Diplomacy and the Failed Hunt for Bin Laden* (New York: Nation Books/Thunder's Mouth Press, 2002), and Ahmed Rashid, *Taliban: Militant Islam, Oil and Fundamentalism in Central Asia* (New Haven: Yale UP, 2001) 145.
29. Government of the United States, Department of Defense, "Nuclear Posture Review Report," April 2010, http://www.defense.gov/npr/docs/2010%20nuclear%20posture%20review%20report.pdf.
30. Wesley Clark, *Winning Modern Wars* (New York: Public Affairs, 2003) 130.
31. This pattern has a long legacy. Since 1949, the CIA began interfering in the politics of the newly recognized sovereign state of Syria which, with the aid of the British and Australian forces, had expelled the French

Vichy colonial rulers. Flush with success from the engineered coup in Operation Ajax that oustered Mossadegh in Iran in 1953, in 1956–1958, for example, Allen Dulles, Frank Wisner, and the CIA together with MI6 (such as the prototypical Friends of Syria Association) arranged support for a series of assassinations by the Muslim Brotherhood and others in the name of "holy jihadism" against Arab nationalism putatively to hold off communism in Syria, Jordan, Egypt, Lebanon, and Iraq. Actually it was to establish governments that would support American oil, gas, weapons and geostrategic interests. See Robert F. Kennedy Jr., "Why Arabs Don't Trust America," *Politico*, February 22, 2016, http://www.politico.com/magazine/story/2016/02/rfk-jr-why-arabs-dont-trust-america-213601, and Frank Weiner, *Legacy of Ashes: The History of the CIA* (New York: Random House, 2008). This CIA "kingmaking" activity is sharply criticized in the U.S. Bruce Lovett Report, 1956 on covert actions by the CIA/Operations Coordinating Board (OCB), https://en.wikipedia.org/wiki/Official_reports_by_the_U.S._Government_on_the_CIA#1956_Bruce-Lovett_Report. U.S. funding for Syrian opposition groups at least since 2005 when the Bush administration froze diplomatic relations with Syria. The U.S. State Department provided $6 million to Barada TV (U.K.) to promote an anti-government message. See Craig Whitlock, "US secretly backed Syrian opposition groups cables released by Wikileaks show," *Washington Post*, April 14, 2011, https://www.washingtonpost.com/world/us-secretly-backed-syrian-opposition-groups-cables-released-by-wikileaks-show/2011/04/14/AF1p9hwD_story.html.

32. Secretary of State Hillary Clinton indicated as much in an email in which she advocated the overthrow of Assad in order to undermine Iran and strengthen Israel's regional nuclear hegemony. Hillary Clinton, December 31, 2012, U.S. Department of State Case No. F-2014-20439 Doc No. C05794498, *Wikileaks*, https://wikileaks.org/clinton-emails/emailid/18328. See Tim Anderson, *The Dirty War on Syria: Washington, Regime Change and Resistance* (Montreal: Global Research 2016) 102–103. See also, Editor, "Turkey is key supplier of weapons, military hardware to ISIS — Russian envoy to UN," *Russia Today*, April 1, 2016, https://www.

rt.com/news/338038-isis-weapons-turkey-churkin/.

33. Seymour Hersh, "Whose Sarin?," *London Review of Books*, 35:24 (December 19, 2013) 9–12, http://www.lrb.co.uk/v35/n24/seymour-m-hersh/whose-sarin; Seymour Hersh, "The Red Line and the Rat Line," *London Review of Books*, 36:8 (April 17, 2014) 21–24, http://www.lrb.co.uk/v36/n08/seymour-m-hersh/the-red-line-and-the-rat-line; Johnlee Varghese, "Libya: ISIS takes over Gaddafi-era chemical factory, steals tons of mustard gas, sarin," *IB Times*, February 23, 2015, http://www.ibtimes.co.in/libya-isis-takes-over-gaddafi-era-chemical-factory-steals-tons-mustard-gas-sarin-624301; "ISIS stole gas from Libya stores and has used it, Gaddafi's cousin tells RT," *Russia Today*, December 19, 2015, https://www.rt.com/news/326497-gaddafi-cousin-isis-sarin/; Chrisof Lehmann, "Top US and Saudi Officials responsible for chemical weapons in Syria," *MSNBC International*, October 7, 2013, http://nsnbc.me/2013/10/07/top-us-and-saudi-officials-responsible-for-chemical-weapons-in-syria/; Richard Lloyd and Theodore Postol, "Possible Implications of Faulty US Technical Intelligence in the Damascus Nerve Agent Attack of 21 August 2013," January 14, 2014, http://www.voltairenet.org/IMG/pdf/possible-implications-of-bad-intelligence.pdf.
34. Theodore Postol, "Assessment of White House Intelligence Report of April 11, 2017 About the Nerve Agent Attack in Khan Shaykhun, Syria," public correspondence, April 17, 2017, available at http://imgur.com/a/W4zQx
35. A declassified 2012 U.S. Defense Intelligence Agency document made several clarifying revelations that included that Al-Qaeda Iraq drove the opposition in Syria from the beginning; external and Western powers identified with this opposition; the establishment of ISIS would derive from the Syrian insurgency comprising Salafists, Muslim Brotherhood, and AQI; the establishment of a "Salafist Principality" or a "Sunni Islamic State" in East Syria was desirable to desired to "the West, Gulf Countries, and Turkey," "safe havens" (or "no fly zones" permitting "humanitarian intervention") were recommended in areas conquered by Islamic insurgents; this could destroy a unified Iraq and could renew re-entry of terrorist elements into Iraq. http://

www.judicialwatch.org/document-archive/pgs-287-293-291-jw-v-dod-and-state-14-812-2/. This point has been followed and examined, in varying degrees, by numerous journalists, authors, and analysts. See, for example, Stephen Gowans, "The Pentagon's Plan to convert the Islamic State Caliphate into a US-backed Syrian Rebel puppet regime," *Global Research*, May 5, 2016, http://www.globalresearch.ca/the-pentagons-plan-to-convert-the-islamic-state-caliphate-into-a-us-backed-syrian-rebel-puppet-regime/5523653?print=1. Further, it is important to recognize that Israel, in the aim of weakening the Syria-Iran-Hezbollah alliance, has strengthened its ties with Saudi Arabia and other Sunni states contravening traditional alignments.

36. Rosatom produces MOX fuel in Beloyarskaya in direct competition with French producers in the Rhone and Languedoc-Roussillon regions, with U.K. producers in Sellafield (and possibly Hinkley Point) and U.S. producers (potentially at Savannah River).
37. Paul Moreira, "Ukraine: Le Masques de la Revolution: Reponse au critiques," *Mediapart*, January 30, 2016, https://blogs.mediapart.fr/paul-moreira/blog/300116/ukraine-les-masques-de-la-revolution-reponse-aux-critiques, and Phil Wilayto, "Eyewitness Odessa: Anti-Fascist Resistance in Ukraine," *Counterpunch* May 13, 2016.
38. "Radioactive leak at major Ukrainian nuclear plant — report," *Russia Today*, January 1, 2015, https://www.rt.com/news/218807-ukraine-nuclear-plant-leak/. The Ukrainian Defense Minister Valerie Geletei stated that it would develop nuclear weapons to protect itself. "Ukraine may create nuclear bomb in 10 years — experts," September 17, 2014, *ITAR-TASS*, http://en.itar-tass.com/world/749875.
39. Just hours after India signed an agreement with Canada to buy 3,000 tons of uranium in 2015, India tested an Agni III nuclear-capable ballistic missile. Evan Dyer, "Arms control experts say Canada sends the wrong signal to countries that play by the rules," *CBC News*, April 17, 2015, http://www.cbc.ca/news/cbc-news-online-staff-list-1.1294364.
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56. The uranium by-product (spent fuels and nuclear waste) must be cooled in storage pools on site for roughly a hundred years before it is to be relocated to storage caskets and/or underground vaults for storage periods that far exceed the human species' planetary existence (100,000 year average). This material is insecurable as it is beyond the capacity of human society to safely contain it from the environment, considering extreme weather, political and economic instability, conflict, and other effects.
57. Similar struggles include protecting farmers and small producers from seed patenting under WTO intellectual property provisions, open source software, and free internet information.
58. Due to renewable energy nuclear power is declining. France plans to reduce from 80 percent to 50 percent nuclear-generated electricity. Post 3.11, the German government transitioned from 30 percent to 24 percent renewable energy of total electricity supply. Subsidized at €16 billion, new businesses are estimated at €40 billion per year and additional employment at 400,000 people. Although nuclear energy is 20–30 percent of electricity supply in East Asia (Japan still near zero in 2016), 20 percent in U.S., 2 percent in South Asia, 1 percent in Latin America, and near zero in Africa and the Middle East, several nations including the U.S. are forced to close old plants due to age limit. See also Emily Steward, *ABC*, October 29, 2014, https://au.news.yahoo.com/vic/a/25372077/germanys-renewable-energy-incentives-and-regulations-attracting-australian-companies/

Keeping the Lights On: Oil Shocks, Coal Strikes, and the Rise of Electroculture

David Thomas

Writing as the belle epoch drew to its acrimonious conclusion amid a hail of pickets and truncheons, Raymond Williams took issue with a stagist model of social analysis that has remained a stubborn feature of historiographic writing into the present. Williams complained that a scholarly preoccupation with "epochal" social formations often occluded recognition of the historical movements and tendencies that were concurrently active "within and beyond" the "dominant" regimes.[1] Intent on moving beyond this kind of blinkeredness, he prompted cultural sociologists to focus more intently on the effects of "residual" and "emergent" forces, thereby attempting to grasp historical and cultural processes in all their contingent and mutually determining dynamism.[2] In this chapter I apply Williams's triadic conceptualization of social process — one attentive to the effects of residual, dominant, and emergent forces — to the study of energy systems and their attendant "energy cultures." I attempt to draw out the political implications of these imbricated systems' different technological and social compositions. Repurposing the term "electroculture,"[3] I claim that a distinctive set of social formations and relations of production emerge in the wake of the 1970s energy crisis, as policymakers start to develop electricity into the signature fuel — and material medium — of a sweeping cybernetic restructuration of the global energy system.[4] Yet, in accord with dynamics that Williams found to be typical of historical process, the mainlining of these new technologies not only changed the structural practices

of the dominant petroculture, it also served to reactivate residual modes of class struggle that had first been developed in the heyday of steam. As Britain's miners attempted to assert their interests in the context of a changing energy system they used modified versions of their old steam-era tactics to force the British government into an embarrassing series of political capitulations. The short-term success of their struggle hinged on the historical irony that the U.K.'s electricity — the lifeblood of the cybernetic turn — was in large part a product of domestically mined coal.

In discussing "energy cultures" in this fairly loose and expansive fashion, I define "culture" in the broadest possible sense, and again I follow Williams in considering it as the shared experience of "the institutions, manners, habits of thought, and intentions" that together constitute a way of life.[5] Yet in focusing on energy I also take up Imre Szeman and Dominic Boyer's claim that "[w]e can no longer fully understand developments in culture, society, politics, and economics without paying attention to the role played by energy in each domain."[6] I build on this contention by attempting to parse the distinct forms of life and modes of struggle that arise through the socio-ecological production of the different — and overlapping — energy systems that are concurrently operative in a given time and place. For energy systems do not simply "power" life in a hidden or subterranean fashion. They are instead lived in such a complete way that we can begin to identify "the institutions, manners, habits of thought, and intentions" that are proper to each. Despite the near self-evident truth of this claim, however, it has taken a surprising amount of time for historiographic analysis to acknowledge how fully questions of energy have determined the unfolding of political struggle and technological development. Indeed, as I review key materialist accounts of the miners' strikes and the cybernetic turn, it is clear that — with the notable exception of George Caffentzis — contemporary commentators have a tendency to overlook energy's central significance. Thus at the same time as this paper seeks to revive some of the central categories of Williams's historiographic theory, it

also seeks to address the energy lacuna that reside at the heart of his account of this cycle of struggles.

The Body Electric — Defining Electroculture

The logic of understanding steam and petroleum systems as "residual" and "dominant" is perhaps obvious enough not to warrant too much explanation. But the idea of petroculture being slowly modified and displaced by the emergence of electroculture is arguably more contentious. Can electricity even be said to be a fuel? There is something inherently ambiguous about the abundant and precisely controlled electron flows that now mediate and animate so many facets of life and work in the present day. For one thing, we can never be entirely sure of their provenance. Though "noiseless and, at the point of conversion, absolutely clean," we know that electricity is produced through diverse means.[7] Some, such as nuclear fission and coal combustion, threaten titanic forms of ecological misadventure. Others, such as solar and hydro, promise to help the world system evade the grim prospects of climate change and nuclear disaster. No such ambiguity surrounds the combustion engine. We have but to turn the key to see the chemical agents of anthropogenic climate change escaping from the tailpipe. Yet in activating an electrically powered device we are left unsure if the current that supplies it is carrying us into a cleaner future, or a hotter, darker, and dirtier tomorrow.

Electricity's ambiguity stems from the fact that — unlike the other fuels that we routinely use in the course of a day — it cannot be traced back to a signature raw material such as natural gas or oil. In the bulk of its industrial and commercial forms, we encounter electricity as a flow of electric current produced through the turbine-driven rotary stimulation of electromagnetic fields. Channeled through the conductive mediums of wires and cables, traveling at somewhere between 50 to 99 percent of the speed of light, electricity is deployed on a planetary scale with industrial force. Moved with infinitesimal precision through silicon microchips in the near instantaneous interplay of billions of mutually responsive transistors, electricity

serves as the universal medium of late capital's social-machinic cognition. This comprehensive range of applications has allowed developers and policymakers to use electricity as a terraforming agent, a means of propulsion, and an unrivaled means of informational production and exchange. Energy historian Vaclav Smil writes that the "precise control" of electrical delivery now ranges "from less than one watt for the most efficient microchips to multi-gigawatt flows in large national or regional grids," while its "focused applications" can be found "on any conceivable scale… from micromachining to powering the world's largest excavators and the world's fastest trains."[8] The near universal range of the potential use values of electricity — even commercial electric flight now seems within reach — allows global governance to countenance the possibility of a wholesale transition to a post–fossil fuel economy.[9]

Yet although the distinct features of what I define as electroculture begin to predominate in the wake of the 1970s energy crisis, it can of course be argued that electroculture began its emergence much earlier. Key breakthroughs in electrical engineering — including the development of experimental electrical trains — were made throughout the nineteenth century, and the world's first electrical supply network was operational by the century's close. The rapid pace of technological innovation that characterized the two world wars also led to key electromagnetic communicational developments such as radio, sonar, and the proto-computer, the Turing machine. In the immediate postwar period, electric lighting and consumer electronics such as refrigerators and radios began to wind their way into the vast bulk of households in high-income countries, while state subsidized research and development departments established the foundations of what Ernest Mandel describes as a "third industrial revolution."[10]

It was not, however, until the oil shock of the 1970s that global governance began in earnest to build toward deploying electricity as its signature fuel and its key instrument of worker control and production management. Doubtless, much of the groundwork had been laid in the immediate postwar period. Written at the close of the

1960s, Mandel's magisterial *Late Capitalism* had already identified the harbingers of a "third industrial revolution" centered on computing technology and the intensified automation of the productive process. Yet Mandel's work, so pioneering and prescient in its vision, was still in some respects the fruit of a more energy-innocent age, one that had not yet been compelled to fully countenance the complex socio-ecological contingencies and consequences of capital's ever-deepening dependency on fossil fuels. Indeed, from our own vantage, it is genuinely surprising that the 1975 English translation of *Late Capitalism* declines even to index the word "energy." Historiography's apparent reticence to grasp the historically determinative significance of energy is, however, in no way characteristic of attitudes in policy making circles of the era. Arriving only a few years after the first publication of Mandel's magnum opus, the 1970s energy crisis brought the matter of energy to the forefront of policy making agendas. And as the initial computational research that Mandel so exhaustively documented concurrently issued in the development of the microchip — Intel launched the world's first commercial microchip, the 4004, in 1971 — the stage was set for the full emergence of electrocultural policymaking.

After Oil? — The Energy Crisis and the Electrical Fix

The emergence of electrocultural policymaking in key economies such as the U.S. and the U.K., unfolds through two key initial phases. In its first phase the dominant concern of policy makers — spooked by the prospect of peak oil — is that of energy efficiency. Yet, in time, the immediacy of concerns over the burgeoning stagflation crisis begin to override the initial long view. In the U.K., electrocultural policymaking enters its second phase at the cusp of the new decade as Tory party think tanks begin to consider redirecting information technology as a means of improving the "economic efficiency" of the entire productive process. As other governments plotted a similar course, and as the original goal of energy efficiency was made increasingly subordinate to the concept of cost efficiency, the total energic inefficiency of

the world system increased dramatically. Commodity production became a fully globalized phenomenon, distributed across immense intercontinental tracts of time and space. The search for deeper profit margins ("cost efficiency") saw capital reaching out beyond the old industrial zones, undertaking kilowatt-hungry logistical projects whose end goal was the exploitation of less politically enfranchised workforces. As this tendency became increasingly normative, the effect of this cybernetically orchestrated, just-in-time productive process was to make global GDP contingent on a globalized energy system that relied on continually escalating levels of electrical input. Concurrently, under the ideological banner of "globalization," shipping lanes and supply lines multiplied and proliferated, leading to the consolidation and expansion of a global seaborne petroculture. This restructuration led to massive carbon outputs, and dependency on coal (and, ironically, oil) has only substantially increased year over year in the aftermath of the oil crisis. In their initial attempts to improve capitalism's energic efficiency, planners accelerated carbon emissions as they increasingly redesigned the global energy system around coal, an energy-dense fuel whose combustion is now regarded as the single greatest source of global carbon emissions.[11]

The proximate causes of our own climate quandaries are, then, in evidence in the "fixes" that capital's developers and policymakers supplied to an earlier series of problems that first erupted around the so-called energy crisis. The "oil shock" had been very keenly felt in the United States; indeed, disquiet rippled throughout oil-dependent economies of the global north. With oil production in the U.S. in apparently terminal decline, the Organization of the Petroleum Exporting Countries (OPEC) began to flex its new-found political clout, enacting an oil embargo in response to the U.S.'s support of the Israelis during the 1973 Arab-Israeli War. The resulting shortfalls in oil supply had complex and varied consequences, helping to destabilize the already sluggish global economy, and forcing the Global North to reconsider the geopolitical ramifications of its oil dependency. A new "energy security" discourse emerged in key policy making circles of

high income countries.[12] Oil companies began to diversify, investing in coal production in low-income countries, while governments began to consider how they could lessen their dependency on OPEC. In addition to the immediate geopolitical considerations, the jarring prospect of fossil fuel exhaustion — prefigured by the depletion of the U.S.'s vast oil reserves — lurked in the background, and determined the subsequent strategizing by elites.

The response of planners and experts was more considered than a simple reshuffling of their primary fuels. As elites began to consider the prospect of transitioning away from "the oil-auto assembly line economy of the post-war era" their emphasis was not just lessening oil dependence, it was also on increasing the efficiencies of the entire energy system.[13] In 1975, key U.S. energy advisor — and one time member of the Manhattan Project — Edward Teller drafted a document that exemplified this logic. Moving away from the rough parity that had been established between oil and electricity consumption in the U.S.'s postwar years, Teller's "Energy: A Plan for Action" "envision[ed] a radically new system where electricity would demand 50 percent of the total energy, with transportation reduced to 11 percent."[14] Though anti-nuclear activism and concerns over profitability hindered the development of the nuclear generators that Teller saw as crucial components of this plan, and though electricity use has yet to overshadow transportation to the extent that Teller projected, his roadmap for energic consumption proved influential. The erstwhile dominance of oil slipped into decline as coal began to regain its market share. And as the planners' IT-driven restructuration began to unfold, the British coal industry, which had been in constant decline in the postwar period, temporarily regained political traction.

But to supply this emergent electro-economy it would initially be necessary to once again ramp up coal production and bring a new generation of nuclear reactors online. Britain was at the forefront of these developments, with the publishing the government white paper the *Plan for Coal* in 1974, and the commissioning of a new series of nuclear reactors the following year. At the heart of the *Plan for Coal*

was a new cybernetic flow monitoring system, dubbed MINOS (Mine Operating System), a "highly centralized, hierarchically organized system of remote control and monitoring in mines comprised [of] a series of computerized systems, which allowed control room operators, as remote supervisors, to collect data and monitor the work of the miners."[15] This system offered an exemplary instantiation of the strategy that Teller proposed, in which cybernetic systems were mainlined as a means of pushing back against the "inefficient" depletion of the earth's reserves of usable energy:

> Computers have been introduced in central control stations to control inertia for the purpose of optimizing the use of energy by drawing at any time on the cheapest available source of electricity. These computers are also beginning to be used to store and display data about the state of the major components of the generating plants and transmission lines.[16]

In the British context — and extending somewhat beyond the plan Teller proposes here — cybernetic technology would be used to manage the energy commodity chain's every stage, from extraction of raw materials, to distribution of the final product. Faced with the contradictory demand to ensure economic growth while reducing inefficient energy expenditures, the precision with which electricity could be delivered and monitored helped establish it as the informational medium and preferred fuel of the cybernetic restructuration. The functioning of the global economy's fixed capital rapidly became, in Smil's words, "universally" contingent "on electronic monitoring and automation" as "electricity's role as the controller, regulator, and enabler of materials and information flows became… fundamental" to every aspect of the productive process.[17] From this juncture onward capital became more and more irreversibly dependent on electrical current, to such an intrinsic and intensive extent that it would soon become easier to imagine the end of the combustion engine than the end of computing.

By increasing efficiencies, engineers hoped to forestall the danger of resource depletion. Yet in a historical irony that was intrinsic to this particular strategy, the very methods used to ward off the danger were themselves dependent on electrical current. Planners found themselves locked into a recursive loop in which they improved energy efficiency at the same time as electrical demand underwent ongoing expansion. Smil identifies the essential fallacy at the heart of this "anti-limitationist" approach by repeating "Jevons's venerable paradox" that "it is wholly a confusion of ideas to suppose that the economical use of fuel is equivalent to a diminished consumption. The very contrary is the truth."[18] But despite its apparent contradictions, the anti-limitationist strategy helped to kick-start the frenzied pace of innovation that has defined the tech industry since the early 1970s, leading to the "rapid doublings of performances" and "relentless decline in prices" that has characterized the industry in the intervening decades.[19] A relatively simple material strategy underlies the subsequent complexification of computational technology, in which developers sought an "ever-denser" concentration of transistors on microchips, in order to accelerate the number of multiple inter-transistor exchanges that could be executed in increasingly tiny fractions of time.[20] Innovations within this sector reshaped the productive process, and its attendant social relations, to such a comprehensive extent that it became difficult to grasp the full scale of their impact.

Importantly, however, it has thus far proved all but impossible to replicate the technological gains made in the area of microprocessing in the domain of energy production itself. While consumers in high-income countries have been acclimatized to exponential growth rates in the speed and complexity of information technology, we have yet to find "any established energy production or conversion technique" capable of following the "path of improving performance" that characterized the "microchip era" that was initiated in 1971.[21]

One way to conceptualize the divergent technological tendencies that have subsequently defined electroculture is to distinguish

between the system's "input" and "output" sectors. In the latter sector, microprocessing technology spearheaded a massive cybernetic transformation of the productive process, one that was premised on unlocking the unique material properties and use values of electricity. Although the effects of these developments were certainly felt in the former sector — most notably in management's deployment of cybernetic flow-managing technologies in mines and power plants — no comparably radical revolution of electricity generation actually materialized. Instead, as the projected transition to nuclear stalled it could even have been said to have undergone a prolonged regression, as policy makers and investors increasingly fell back on technologies whose fundamental operational principles were known to the nineteenth century. Identifying this problem, while critiquing the key fallacy at the heart of capital's stubborn attachment to its anti-limitationist energy strategy, Smil writes:

> Any expectations that the future performance gains of renewable energies in general, and solar PV [photovoltaic] electricity generation in particular, will resemble the post-1971 record of packing transistors on microchips are thus a consequence of succumbing to what I have called Moore's curse, an unfortunate categorical mistake that takes an exceptional performance as a general norm of coming technical innovation.[22]

In referring to this "categorical mistake" as "Moore's curse," Smil alludes to Gordon E. Moore, the computer developer who first forecast microprocessing's decades of exponential developmental growth. Writing in 1965, Intel's cofounder correctly anticipated the annual to biannual doublings of transistor density that defined technological advance in the coming decades. This phenomenon — which has only begun to wane in very recent years — was subsequently dubbed "Moore's law."

Smil's somewhat classicist recasting of Moore's prediction is designed to illustrate that the cultural experience of these

developments fatefully warped popular understanding of technological innovation. In contrast to Teller's hopes, it has thus far proved all but impossible to reconcile the conservation of usable energy with the rapid development of an ever-more automated and energy-hungry productive process. In Smil's estimation, the only reason that this situation surprises us is that consumers in high-income countries have been habituated to the lived experience of Moore's law, and have thus come to mistake an exception set of circumstances for a universal norm. A more sober appraisal of the underlying dynamics forces us to confront the fact that planners are given little scope to reduce absolute energy consumption when energy demands are at the same time being universally expanded in order to sustain the continually rising organic composition of capital.

From "Energy Crisis" to "Climate Crisis" — The Developmental Arc of Electroculture

There are, however, some signs of progress in the domain of renewable energy generation. Peter Simon Vargha — Chief Economist at Hungarian oil and gas company MOL — avers that there is good reason to anticipate a more rapid and economically viable energy transition than agencies such as the IEA (International Energy Agency) have tended to project. Indeed, highlighting "collapsing" renewable energy installation costs, Vargha argues that we are fast approaching a crucial "tipping point" in an emerging energy transition.[23] Writing in 2015, Vargha noted that rapidly changing energy markets have seen the IEA compelled to modify its renewable energy outlooks in a more favorable direction, with every recent report heralding a progressively larger market share for the emerging technologies. His reading of this overall trajectory was apparently confirmed as the IEA's 2016 WEO (World Energy Outlook) report recently trumpeted the "decoupling" of global emissions and economic growth.[24] An encouraging, but by no means, specular development lay behind the sweeping rhetoric: The IEA had found that global carbon dioxide emissions had held steady at 32.1 billion tons, "having remained essentially flat since

2013."[25] The institution's "preliminary data" suggests that emerging renewable energy markets played a key role in these developments and attributes much of the apparent success to progressive Chinese policy making initiates. They concluded that China's "restructuring towards less energy-intensive industries and [its] government's efforts to decarbonize electricity generation pushed coal use down."[26] To what extent this reduction of carbon emissions and coal usage simply indexes the much-storied slowdown of the Chinese — and, indeed, global — economy is something that the report declines to address.

Yet however capital's energy future actually unfolds, thanks in no small measure to Smil's decades of research, the basic outlines of electroculture's historical development are now clear. While the development of electricity's potential applications unfolded with intensifying velocity, the technologies used to *produce* electricity stagnated and became increasingly dependent on fossil fuel driven turbines. While decades of climate science struggled to divert policy making attention from "energy crisis" to "climate crisis" these divergent trends continued to ramify leading to a contemporary situation in which capital's championing of the apparently "immaterial" tech industry manages to both mask and exemplify its underlying and ongoing dependency on the carbon-driven engines of anthropogenic climate change. For the time being, the net effect of these dynamics is that the signature products of the tech industry — the microchip, device, server, automaton, and network — form a complete postindustrial circuit with the power plant and the strip mine.

The situation in which we find ourselves is not, as I have already begun to suggest, simply a product of random contingencies or inadequate foresight on the part of planners. The conflicted developmental arc of electroculture was determined as capital's general laws of motion — specifically the tendency of the organic composition of capital to rise — became embroiled with the complex material structures and feedback loops of the world's ecological

systems. Compelled by its inner laws of motion to intensify the automation of the productive process, capital has become more and more deeply dependent on electricity, the indispensable fuel of its most sophisticated technologies, and the effective material lifeblood of its key monopolies in the tech industry.

It is no accident that it is within these fields that capital's postindustrial circuitry works at the highest rate of profit. Indeed, as the viability of the entire postwar valorization process became increasingly contingent on more and more rapid cycles of technological renewal, innovators in key sectors were well placed to effectively monopolize the "technical process." As Mandel demonstrates, in the postwar period "technological rents" become a key means of profit extraction as "discoveries and inventions which lower the cost of commodities but cannot be generalized (at least in the medium-run) become generalized throughout a given branch of production and applied by all competitors."[27] The structural dynamics that underlay the exercise of "technological rent" are facets of the general functioning of monopoly capital itself, where "difficulties of entry, size, of minimum investment, control of patents, cartel arrangements, and so on" allow key players to function as the gatekeepers of economic survival.[28] George Caffentzis identifies a similar set of fundamental patterns at play within the energy sector. In a key essay from the early 1980s, Caffentzis argued that utility companies and extractive industries were now effectively extracting a "power tribute" from a vast network of consumers who depended on electricity for the very reproduction of life.[29] It was not only the productive process that demanded escalating energy inputs, but the reproduction of human bodies was now a predominantly electrocultural phenomenon.[30]

Yet while this deepening electro-dependency resulted in an intensely sophisticated productive process, capital has yet to evolve a means of generating electricity that has proved capable of freeing it from the prospect of massive ecological blowback. In understanding this divergence it helps to recall there are two very different kinds of material and infrastructural challenge under discussion here.

Microprocessing — the beating heart of the automotive turn — relies on the construction of tiny, intensely complex, channels and gates for electrical current. To give an idea of the current complexity of the technology we could look to the Xilinx, which chip boasts the largest FPGA (Field-Programmable Gate Array), containing more than twenty billion transistors. Energy production entails the massive planetary-scale harnessing of the world's contingently concentrated animate forces. The different scales of magnitude on which these tasks are necessarily pursued should not be overlooked, for as the mathematical biologist D'Arcy Wentworth Thompson demonstrated in his study of organic life forms, the intrinsic potentialities of material enterprises are always in key respects determined by the divergent ways in which physical forces impact material structures of different size.[31] Indeed, the scale of fixed capital's energy appetite has increasingly forced planners into a corner. As governments backed away from fission generators — in deference to public fears over the potential scale of nuclear disasters, and in response to unpromising returns on their investments in nuclear power — they retreated to the use of fossil fuels, a familiar set of energy sources that still, in time, served as the causes of a wholly unfamiliar set of world-ecological quandaries.[32] Yet in many respects the apparently divergent prospects of nuclear disaster and climate crisis simply recognize the same fundamental problem: postindustrial capital's energic appetite now necessarily plays out on a fully planetary scale, with fully planetary consequences.

Lights Out — Syndicalist Struggle in the Age of Microprocessing

With these far broader considerations in mind, I want now to return to the case study that anchors this essay. For despite the conflicted and confounding outcomes of the anti-limitationist turn to electricity, for the British coal miners of the 1970s the changing policy-making climate arrived as an unanticipated boon. In the golden age of Fordist petroculture, oil cut radically into coal's market share, but in the years following the oil crisis of 1973 this transition slipped into reverse.

In the immediate postwar period, British coal supplied more than 90 percent of Britain's inland energy consumption: "This coal was priced below what it would fetch on the market, in order to subsidize the profits of the rest of British industry. Miners were constantly exhorted to produce, first by the 1945–51 Labour government, then by its Tory successors."[33] But in 1957 the industry went into steep decline as cheap oil began to displace coal as heavy industry's chief fuel. Things worsened in the 1960s as the development of the North Sea gas fields and the use of diesel engines on the railways deprived Britain's National Coal Board (NCB) of two of its key markets: "Coal dropped from 85.4 per cent of inland energy consumption in 1955 to 46.6 per cent in 1970."[34] As demand slowed, the NCB looked for ways to cut production costs, inaugurating a period of rapid mechanization. Here, the "most important development was the spread of power loading, which involved coal-cutting and loading in one single mechanical operation."[35] By 1968, 92 percent of British coal was power loaded, a dramatic rise from only 23 percent in 1957. As Alex Callinicos and Mike Simons write, "[t]he result of these changes for the miners was catastrophic. In 1955 there were 698 collieries. By 1971 the number had fallen to 292."[36] Concerns over global oil supply thus arrived at a particularly opportune moment for Britain's miners. As electricity emerged as the indispensable medium of capital's post-Fordist restructuration, some of King Coal's old luster returned. The emergent energy economy's intensifying reliance on the signature raw material of the steam era had the effect of revitalizing the residual strategies of Britain's trade union movement. Thus rather than a simplistic sequential development of energy infrastructures and corresponding modes of struggle — in which new political and technological modalities simply displace the old — we instead observe complicated interrelations between residual forms of class struggle and newly emergent productive forces.

The decade's definitive conflict arrived in 1974. Yet prior to the 1974 strike, global elites and labor unions had already begun to sense the slowdown that prefigured the oncoming global recession. In

the years immediately prior to the oil crisis both parties had grown restive. On the cusp of the technocrats' full-fledged summons to post-Fordist electroculture, trade unionists had begun a return to modes of combative self-assertion not seen in Britain since the prewar period. In a pattern that would define British coal worker militancy in the aftermath of the belle epoch, the miners' first strike in 1972 — the first in some fifty years — targeted the nation's power stations. Arthur Scargill — the leader of the NUM during the famous 1984 strike — was then a rising force in the NUM's newly militant wing. Looking back on the successes of the early 1970s he describes the miners' methods: "We produced a thousand pickets in an hour and a half on Ipswich dock, and stopped the dock in an hour. We left a token picket at the docks, moved on, and closed down the power stations one by one. Within two days we'd shut the whole of East Anglia."[37] In tandem with the cessation of coal production, the miners' picketing strategy allowed them to choke off the coal supply to East Anglia's power stations.

On the ground, the conflict played out as an essentially logistical struggle that relied on identifying crucial chokepoints in the country's energy distribution systems. Yet these logistical struggles ultimately took their bearings in relation to a more theoretically grounded appraisal of the coal industry's changed structural position in Britain's real economy. The miners had ascertained that the circuit of money capital was now in key respects dependent on the electrical circuits of Britain's domestically powered grid. With this knowledge in hand, and against the backdrop of a waning oil supply, the miners exerted their new found political clout. Faced with energy shortfalls in oil and coal, Heath capitulated to the miners' demands, leading to a bump in pay rate that would set the terms for the subsequent strike of 1974. Only a year after the miners' successful strike, Heath responded to escalating levels of inflation by freezing pay levels throughout the public sector. This policy produced a pushback from workers who had seen real wages fall into decline under the very same set of economic pressures.

By 1973 the NUM was squaring up for another strike. In preparation, union leaders mandated a work-to-rule policy, eating

into the nation's coal stocks. When the miners finally struck again in 1974 Heath put in motion a contingency plan that proved one of the most comprehensive political miscalculations of recent British history. In response to the threat that the miners now posed to the viability of Britain's coal-fueled power stations, Heath returned to the kind of emergency measures that Britain had relied upon in the course of the Second World War. In an attempt to manage consumption, and preserve the nation's scanty coal stocks, Heath mandated a "Three-Day Work Order" which dictated that commercial use of electricity be restricted to only three consecutive days in a week. The policy — popularly known as the Three-Day Work Week — revived the concept of rationing which had been such an entrenched part of the besieged islanders' wartime psyche.

Yet as "the lights went out" across the country, the Three-Day Work Week served as a punctual and spectacular demonstration of how contingent the postwar economy had become on electricity. This was an ill-designed form of political theater that effectively functioned as a monumental illustration of the miners' resurgent power at the heart of Britain's emergent electroculture. Compounding his first mistake Heath then called a snap election, proposing that it would determine "Who governs Britain?" The conservative government lost, returning Labour to power with a mandate to lessen industrial tensions.

In the miners' conflict with Heath it had become evident that the question of "who governs" — the question of sovereignty and popular legitimacy — was now in part contingent on who controlled "the lights." In the course of the strike of 1974, in their attempts to stake their claims to energy sovereignty, Pierre-François Gouiffes writes that "[b]oth parties deployed quasi-military resources during these conflicts."[38] It should be no surprise, however, that the government's and the miners' different assemblages of strategies and tactics should be recognized as "quasi-military resources" for, as Deborah Cowen has demonstrated, the very concept of logistics originated in the context of military planning. Indeed, the militaristic rationale of logistical practice has remained a crucial feature of its exercise, even in its most

superficially benign applications.[39]

The same field of conditions that produced the planners' turn to electricity had thus presented Britain's miners with a complex confluence of pitfalls and opportunities. The bitter experience of contraction in the postwar years left the miners acutely aware of the threats that technological developments posed to the workforce. Yet taking heart from the new centrality of coal, and fired by the resentments of workers who were increasingly feeling the pinch as global boom turned to global downturn, the miners aimed to redefine how the *Plan for Coal* was implemented. For, while the miners could scarcely stand to reject the government's plans to revitalize their industry, it was clear that the cybernetic project at its heart promised to erode worker autonomy.

Given this field of conditions, what subsequently ensued was a struggle between the residual steam-era political strategies of a resurgent syndicalism and the new strategies of elites who increasingly repurposed electrocultural technologies in reactionary fashion. In their subsequent negotiations with the newly incumbent Labour government the mining unions attempted to hold ministers to their commitment to expand coal development while resisting the fully fledged implementation of MINOS. This strategy was still in effect in 1983, on the cusp of the confrontation with Thatcher. At the national level, the NUM's *Interim Assessment of MINOS* "focused upon the job loss projections which confirmed the existence of a major pit closure programme."[40] Yet "[r]ank-and-file miners who were experiencing the impact of MINOS upon the labour process… were equally concerned with the issues of deskilling and control."[41] In the course of the miners' discussion of the subject the NUM's South Kirby branch put forward a motion that was ratified at the union's 1983 conference:

> The draft agreement sought to establish a procedure for negotiating technological change with the *status quo* prevailing until agreement is reached. The agreement would have preserved jobs through reductions

> in working time… Moreover, it would have eliminated computer-based work-monitoring systems like FIDO which would be unlawful under the Swedish and Norwegian Work Environment Acts.[42]

Miners had long been famed for their success in holding Taylorist management techniques in abeyance. In 1925, Cater Gooderich argued "the very geography of the working place inside a mine" underpinned the miner's longstanding capacity for autonomous self-assertion. The characteristic technique of pit mining in the early days — the room and pillar method — saw men working in small teams, compelled to determine "where to cut and how much rock to leave in place to prevent cave-ins."[43] As Gooderich puts it "the miners' freedom from supervision is at the opposite end of the spectrum from the carefully ordered and regimented work of the modern machine-feeder."[44] The miners' evasion of full-bore Taylorist working conditions had thus been contingent on the ways in which their remote working environment — deep pits sometimes saw teams of men working over a kilometer underground — insulated them from the prying eyes of management.

It was now evident, however, that innovations in the microprocessing sector threatened to considerably expand the surveilling capacities of management. As computer monitoring and data collection techniques penetrated into the full depth of the mine, pit miners found themselves exposed, for the first time, to the possibility of constant real-time remote supervision. Moving information at near light speed from periphery to center, new cybernetic technology would allow management to vault the informational distance between coalface and command center. Harnessing the material properties of electricity, engineers furnished management with the capacity to assess situations and dictate actions in the most remote locations. Under such conditions, miners could no longer count on maintaining the modes of autonomous self-management that they had exercised in the days prior to the microprocessing revolution. The precision and speed with which electricity could be controlled promised to become

the speed and precision with which workers could be managed.

As we already have seen, in the postwar period, Taylorist production methods had already made some significant incursions into the miners' workspace. Yet, relative to other sectors, miners continued to enjoy high levels of workplace autonomy, and indeed, though in decline, the old room-and-pillar method was still in use in many quarters. As Timothy Mitchell observes "[t]he militancy that formed in these workplaces was typically an effort to defend this autonomy against the threats of mechanization, or against the pressure to accept more dangerous work practices, longer working hours or lower rates of pay."[45] The miners drew on this residual set of concerns and tactics that as they assessed the proposed introduction of MINOS. Of particular concern was FIDO (Face Information Digested Online), a crucial component of the larger system, one "that would allow extensive levels of [coalface] supervision over and above that which had previously existed."[46]

In forestalling the implementation of this fully electrocultural environment the miners attempted to revitalize a second set of strategies that were, in Timothy Mitchell's view, the most effective feature of their old modes of militancy. Mitchell argues that while the autonomous nature of their working experience had given miners a taste for self-determination, they were only able to exercise and defend this autonomy as they came to understand their crucial position at the heart of the steam economy's commodity chains. Strikes in the energy sector proved unusually powerful political tools because of the dispersed and widespread impact of energy shortfalls: "the flows of carbon that connected chambers beneath the ground to every factory, office, home or means of transportation that depended on steam or electrical power."[47] The outcome of these dynamics was that "[t]he flow and concentration of energy made it possible to connect the demands of miners to those of others, and to give that argument a technical force that could not easily be ignored."[48] For a time, electroculture's full emergence actually amplified the potential reach of the old methods. For in the decade or so that stretched from

the oil crisis to the 1984 strike, control over domestic coal flows effectively acted as a proxy for control over the nation's electricity. The strikes of the early 1970s not only reminded the miners of how effective these residual methods could still prove to be, they also served to underscore how essential electrical circuits had become to the smooth functioning of the valorization process — to the circuits of investment, production, circulation and consumption that lay at the heart of capital's real movement.

But just as the unions were reviewing the ways in which the *Plan for Coal* could be turned to their advantage, so too with the Conservatives intent upon regaining the upper ground. These were the years that geographer Matthew Huber defines as the incubation period of neoliberalism.[49] In Britain, a chastened and radicalized conservative movement licked its wounds and began to await the opportunity to outmaneuver the miners. In particular, the conservative think tank the Selsdon Group had learned from the miners' successes. They mirrored the miners' strategies, drafting a new playbook of logistical tactics that explicitly understood political power in relation to the nation's grid system. Thus as the Conservative party began to draft a new economic strategy, one of its keys concerns was circumventing the miner's control of the British economy's energy inputs.

"The Enemy Within" — The Ridley Plan and the Changing Face of Energy Security

The Ridley Plan was circulated in 1977, and it proposed to reverse the British recession through the application of a new mode of quant-heavy corporate governance.[50] The first step toward the marketization of Britain's nationalized heavy industries was obtaining and publishing "unit costs." Ridley spelled out his rationale in the terms of new "cost efficiency" protocols: "any attempt to improve efficiency must start from unit costs."[51] Obtaining this information would allow the government to measure the economic efficiency of every sector, breaking each field down into its smallest constituent units in the hope of isolating, and expelling, elements that were punching below their

weight. This was, of course, an atomizing discourse, which inherently subjected industries and workers to a panoptic mode of surveillance. Not for nothing was this process defined, by its exponents, as one of "fragmentation."

Ridley was explicit that this mode of economic rationality marked a departure from the kinds of industrial management that had prevailed in the postwar period, in which production costs had been determined by a "mixture of the political pressures and the union pressures."[52] In such a context "striving after efficiency" had tended to be "fruitless — because the financial inputs and the financial outputs were the product of political determination."[53] Informational analysis would play a key role in restoring industry to market "rationality." The shift of emphasis — from concerns over energy efficiency, to concerns over cost efficiency — is key to understanding the subsequent shape of Britain's economic reorganization, and defines two of the initial phases of the emergent electroculture.

In laying the ground work for the British energy sectors' entry into a more fully "globalized" energy market — a project that entailed restructuring the large publically owned industries that had prevailed since the postwar nationalizations — Ridley argued that the new Tory government's "principal instrumental of control should be to set each concern a financial obligation to achieve."[54] This new mode of "financial discipline" — government by audit — was tasked with establishing that "the required rate of return was entirely inflexible."[55] Spelling out this facet of his plan, Ridley deployed a phrase that was to serve as the Tory's primary cudgel of the mining sector: "If the required rate of return on capital was not achieved, either management must demonstrate that it was taking effective action to rectify the omission, or it must be replaced. Effective action might mean that men would be laid off, or uneconomic plants would be closed down, or whole business sold off or liquidated."[56] The goal of unit cost analysis was to identify and expel cost inefficient — or "uneconomic" — units. It should also be noted that audit management and computational technology were natural bedfellows, and the drive

to render the productive process in the terms of unit costs was in key respects also a way of making it legible to the fast emerging computational matrix.

It is in the context of these cost efficiency discourses — which emerge in dialectical interaction with declining rates of profit, and the renewal of syndicalist struggle — that the Conservative government finally proved able to push the domestic energy market into completion with emerging extraction industries in low-income countries, many of which were in the Global South. The rise of electroculture's second, reactionary phase is crucial in the development of what we might term the last and largest phase of the fully dominant petroculture, a moment that arrives as the emergent force of microprocessing helps to orchestrate and stabilize the expansion of the just-in-time process's seaborne, and petroleum-powered, distributive matrix. Cowen describes the intensified relationship that subsequently developed between information technology, audit governance, and the logistical management of increasingly far-flung supply lines:

> At least as important as the rise of computer technologies that enabled new kinds of cost calculation… total cost analysis itself identifies for a firm the "opportunity to increase its profits that it could not have identified or taken advantage of in any other way." Total cost analysis produced new sources of profit with very different kinds of effects on corporate strategy, and this strategy was inherently spatial. Whether a firm invested in more warehouses, changed the location of production, or invested in more transportation infrastructure would all be decisions made relationally in the broader interest of total cost, or overall profitability.… Because of the "interdisciplinary" nature of the analysis, senior executive support was necessary to undertake total cost analysis, thus propelling logistical questions to a much higher level of management. In fact, with the adoption of total cost, corporate strategy became ever more defined by logistics.

Electronic technology's capacity to effectively collapse the informational distance between core and periphery would prove an indispensable material instrument of this new mode of governance. The spatial expansion of the productive process, the multiplication and coordination of supply lines, production plants, and distribution centers, would all be synchronized through the key electrocultural command centers of the newly emerging logistical giants.

Yet before British policymakers could begin to initiate this project it proved necessary for them to break the power of the trade union movement. In managerial circles the preferred term for this undertaking was "modernization," a phrase that implicitly consigned the objectives and commitments of the trade unionism to a now obsolete past. Roughly seven years after the Ridley report's first circulation, the Thatcher government began to follow through on its recommendations, announcing its ambition to "modernize" Britain's mining industry. The appointment of infamous union-breaker Ian MacGregor as head of the NCB signaled the government's turn to a more confrontational industrial strategy. As the first details of the plan began to hit the presses the government declared that it intended to close twenty "uneconomic" pits. The language was that of the Ridley Plan, and as the government prepared for inevitable strike action, they drew on the contingency plans that Ridley had outlined almost a decade ago. The report itself had actually been leaked to the press in 1978, and *The Economist* accurately summarized its contents in the following terms:

> (1) The group believes that the most likely battleground will be the coal industry. They would like a Thatcher government to: (a) build up maximum coal stocks, particularly at the power stations; (b) make contingency plans for the import of coal; (c) encourage the recruitment of non-union lorry drivers by haulage companies to help move coal where necessary; (d) introduce dual coal/oil firing in all power stations as quickly as possible.

> (2) The group believes that the greatest deterrent to any strike would be "to cut off the money supply to the strikers, and make the union finance them." But strikers in nationalized industries should not be treated differently from strikers in other industries.
>
> (3) There should be a large, mobile squad of police equipped and prepared to uphold the law against violent picketing. "Good non-union drivers" should be recruited to cross picket lines with police protection.[57]

The strategic core of the plan entailed circumventing the strategies that the trade union movement had employed to exert control over crucial energy flows. And as the Ridley Plan made clear, the Conservative's government's new energy strategy was not directed at engineering energy efficiency, it was instead designed to accomplish cost efficiency. In exercising this approach, the Ridley Plan instructed Conservative policymakers that they would be compelled to find new methods of ensuring a docile and compliant workforce.

By this juncture, the Tellerist goal of energy efficiency was already utterly subordinated to economic considerations, and the energic and environmental cost of outmaneuvering the miners accordingly gave the Selsdon group little pause for thought. Instead, the ensuing struggle coalesced around the miners' claim to not only have a say in wages and working conditions but to actually collectively determine the nature of their work. Essaying the fundamental stakes of the conflict, Raymond Williams unequivocally took the side of the miners, arguing that "to deny it or even qualify" the miners' claims to self-determination was to "subordinate a whole class of men and women to the will of others."[58] Williams writes that, as the struggle unfolded, "the term management mutated in the eyes of miners into a label defining the desire of the powerful to run a business for solely financial, rather than social, profitability."[59] As we have seen it was not only the miners that took this view of cost efficiency discourses, the Ridley Plan itself understood the stakes in precisely the same terms.

Yet the same logic that declared that an enterprise would be run "for solely financial, rather than social, profitability" also played out in an ecological register.[60] Indeed from today's vantage it is perhaps best to rethink Williams's contention in the terms of Jason W. Moore's world-ecology — audit governance proved to be a way of organizing not just the input and outputs of production, but nature itself.[61] In their attempts to revive the ailing economy, technocrats subordinated the industrial working class — and the energic flows of the world-ecology — to a managerial calculus that gave little consideration to socio-ecological "costs" that could not be rendered in the terms of "economic rationality." It is curious that this dimension of the struggle largely escaped Williams' notice. Indeed in his contemporary commentary on the 1984 Miners' Strike, Williams outlines the four "keywords" that, to his mind, defined the fundamental stakes of the struggle. The word "energy" is not found among them.[62]

Although the vying parties were focused of the foundational role that energy played in the struggle, even contemporary observers as astute as Williams found it hard to conceptualize how radically emerging technologies were changing the socio-ecological praxis of political struggle. Part of the explanation for Williams's uncharacteristic oversight is perhaps found in the fact that although elites would conclude this series of struggles through a vast cybernetic reorganization of socio-ecological forces, the final event in Britain's postwar mining struggles was internally structured around the question of worker autonomy. MacGregor understood the full dimensions of the miners' claim to self-determination. He was on record as stating that his primary concern over the mining sector was not the depletion of coal reserves, or the threat of cheap imports, it was rather that the miners had "evolved a feeling that [they] can be isolated from the benefits to the community as a whole — [they] can operate in a vacuum if you will, and set [their] own conditions for… operation."[63] The concern, then, in the 1984 strikes was explicitly that of worker autonomy, but it was at the same time clear — at least to the parties engaged in the struggle — that the effective exercise

and maintenance of this autonomy was now contingent on control of electricity's circulation.

Cost efficiency management and worker self-management were thought, by both sides, to be fundamentally incompatible. It was precisely for this reason that the two parties assessed the value of cybernetic technologies in inverse terms. In the context of a sluggish economy, information technology offered social planners access to data that could be used to squeeze additional surplus value from their workers, a project that would entail fragmenting the effective exercise of solidarity, allowing managers to isolate and pick off the weakest members of the herd. From the miners' vantage it was evident that these technologies would decisively disable the material conditions on which the effective exercise of their autonomy was contingent. Yet in forestalling these developments the miners had at their disposal an array of techniques that had very recently proved capable of unseating the nation's government. As the final decisive strike loomed into view the miners and the government found themselves at opposite ends of electroculture's divergent "output" and "input" sectors. For the government to bring the full weight of its emerging electrocultural apparatus to bear, it was necessary for them to first wrest control of the nation's electricity generation from the miners' hands.

The events of the 1984 strike itself are well documented. The Ridley Plan's tool box of strategies and contingency plans finally prevailed over the miners, in the course of a year-long struggle that was waged at greater length and cost than either party had originally thought possible. In addition to the modes of logistical cunning that the Thatcher government employed, the unvarnished use of brute force became an increasingly integral element of their strategy as the confrontation came to a head. The effectiveness of the NUM's pickets was countered with the newly militarized police force that Ridley had first proposed in 1977. In preparing the public for these televised displays of state force, Thatcher infamously characterized the miners as "the enemy within," a phrase that bought the quasi-military nature of the conflict entirely to the fore, as the uninterrupted flow of

energy supply lines was explicitly redefined as a matter of national security. According to the same logic NUM senior management also became the target of Britain's security establishment. MI5's assistant director Stella Rimington personally oversaw "the most ambitious counter- subversion operation ever mounted in Britain," a project that saw MI5 launch "the country's largest-ever bugging and telephone-tapping effort."[64] By this juncture, mining communities found themselves threatened with surveillance, cybernetic discipline, and a militarized police force. It is no accident that that these politically oppressive conditions so nearly foreshadow the experience of "surplus populations" in the post-Fordist economy. The experience of immiseration and disenfranchisement that has characterized life in the postindustrial rusts belts has been maintained through a fortification of the repressive arm of the state that has in many instances relied on the signature technological capacities of the cybernetic turn.

Currents of Capital — Electroculture in the Wake of Syndicalism

Yet although many features of the mining disputes were products of new dynamics brought into play by an emergent electroculture, other features were as old as what Andreas Malm calls "fossil capital."[65] Nothing better illustrates the paradigmatic aspects of the miners' struggle than the fate of Britain's mining industry in the aftermath of the failed strike. Reviewing the consequences of the wholesale implementation of MINOS, David Allsop and Moira Calveley observe that in tandem with the rise of "immaterial laborers" tasked with managing and "informating" the productive process, the same restructuration also produced a more highly-surveilled and data-disciplined coalface workforce: "[The] technology has allowed for the creation of information systems that have become 'information panopticons,' which are so all-encompassing that they 'do not even require the presence of an observer.'"[66]

The material properties of electricity were instrumental in effecting

this state of affairs, allowing for the construction of vast "surveillent assemblages" that afforded management greater — and more centralized — control over a "fragmented" and globally distributed workforce.[67] The fragmenting impact of this electrical apparatus was evident to sociologists who surveyed working conditions in British pits of the mid-1990s who found that "the predominantly Taylorist design philosophy, with its emphasis on the removal of workers' skills and autonomy, has a negative impact on workers and serves to limit the potential of the new technologies, as well as stifling worker ingenuity."[68] Here, then, was the lasting impact of the emergent electroculture in Britain's mining sector. Britain's "rank-and-file" miners had clearly offered a more incisive appraisal of the long-term consequences of automation and cybernetic flow monitoring systems than was proffered by the techno-utopian theorists of immaterial labor. To paraphrase E.P. Thompson, the British working class was present at its unmaking.

The handful of workers that managed to keep their jobs now told of working conditions that proved less emancipated than scholars such as Maurizio Lazzarato had once anticipated:

> [Y]ou have got Big Brother watching from upstairs, so if you have a stand down, they will know up there and questions are asked (Tailgate, underground supervisor).
>
> They sometimes put the brake on if I am cutting too fast for them to cope with the coal that is coming off (Mechanics, face worker).
>
> They know what we are doing all the time and sometimes they slow down the machine (Winders, face worker).
>
> We are easily clamped and easily got at (Tailgate, face worker).[69]

The techno-utopians were not wrong, however, to identify the vast technical ambition of the new age of automation. Among managers in

the mining sector it has now become fairly commonplace to anticipate the development of entirely unmanned coalfaces:

> We have the technology to take the men off the face, we haven't done that yet. They have coalfaces in Australia that have no men on them, but they have a different union system and union agreements. It is only on the coalface and in the headings, where machines are operated underground. Everything else is operated from the surface, conveyors, bunkers and stage loaders are all automatic (a U.K. Coal automation engineer).[70]

The end result of these kind of strategies has been the widespread blackboxing of the energy production process. The trajectory inherent in the energy security discourse of the early 1970s arrived at a strange apotheosis in which the energy production system was increasingly rendered secure, not against the depletion of fossil fuel reserves or the machinations of petrostates, but against workers themselves.

In truth, the need for wholesale automation is largely moot. Manned by small corps of engineers and technicians, heavily automated fixed capital allows for a workforce so small that it can be kept compliant with a handsome salary. As Nick Dyer-Witheford has recently demonstrated, in the post-Fordist economy elites have increasingly relied on automation to ensure the docility and security of key sectors of the economy.[71] In the decades prior to its recent dissolution, the fate of the U.K. mining sector provided an exemplary case of a broader tendency that continues to play out on a global scale.[72] These considerations draw attention to another facet of the turn to microprocessing that has perhaps been underplayed in the course of this discussion; for the microprocessing revolution has not only facilitated the precise remote management of workers, it is also — in tandem with the ongoing refinement and miniaturization of the electric motor — allowing for the machinic reduplication of even the most complex and highly-skilled forms of human labor.

In the face of automation on this kind of scale, the characteristic

modes of self-assertion that the miners had once so successfully practiced have dwindled. Yet the net result of the rise of electroculture has not been to universally draw workers into the informational sector, as Lazzarato and others had once proposed.[73] Instead, alongside new crops of engineers and informational managers there has arisen an increasingly vast vulnerable sector of precariously employed service workers, who have as yet not successfully asserted their interests. As George Caffentzis puts it "[t]he burly, 'blue collared' line worker seems to blur in the oil crisis, diffracted into the female service worker and the abstracted computer programmer":[74]

> And it all feels so different! Your wages go up but they evaporate before you spend them, you confront your boss but he cries that "he has bills to pay," and even more deeply, you don't see your exploitation any more. On the line, you literally could observe the crystallization of your labor power into the commodity, you could see your life vanishing down the line, you could feel the materialization of your alienation. But in the service industries, your surplus labor seems to be non-existent, even "non-productive," just a paid form of "housework," cleaning bedpans, massaging jogger's muscles, scrambling eggs.[75]

Yet those that have managed to hang on to a wage in the service sector seem by some measures to be in a more favorable position than others among the growing numbers of people unable to access either a viable legal income or a stable means of subsistence. Many of those expelled from the industrial sector have had to contend with what we now know as characteristic features of life in the post-Fordist rustbelts, the triple-fronted trap of "destitution, drugs, and prison."[76]

It is salutary to note that elites are hardly in a position to welcome this increasingly volatile state of affairs. Indeed, in Marx's terms, we can see that capital has again emerged as a limit to itself. Yet the present form of its self-limitation proves in key respects particular to our own historical moment, and proper to the socio-ecological characteristics and energetic demands of post-Fordist electroculture.

Contemporary capital's rising organic composition has not only left it entangled in a toxic, and climatically disruptive, coal dependency, it has also seen it unable to reincorporate living labor back into the productive process. As the research collective Endnotes write:

> [C]omputers not only have rapidly decreasing labour requirements themselves (the microchips industry, restricted to only a few factories world-wide, is incredibly mechanised), they also tend to reduce labour requirements across all lines by rapidly increasing the level of automation. Thus rather than reviving a stagnant industrial sector and restoring expanded reproduction — in line with Schumpeter's predictions — the rise of the computer industry has contributed to deindustrialisation and a diminished scale of accumulation — in line with Marx's.[77]

In short, the success of elites in countering the threat of worker militancy has also undercut their capacity to secure adequate rates of return on capital; the same strategies that secured the energy production process against sabotage and disruption have also spurred, rather than rectified, the ongoing freefall in rates of profit. Clearly, the emergence of electroculture — and the signature capacities and technologies that define it — has been instrumental in producing this field of conditions.

Yet in contrast to the original forecasts of Marx and Engels, Bue Rübner Hansen finds that "[w]hat is interesting and challenging" about today's situation "is that, unlike the immiseration thesis of the *Communist Manifesto,* [today's political strategy] is not predicated on a thesis of the gradual embourgeoisement of the world, or on the homogenization of the proletariat. The reality of surplus populations poses instead the issue of a generalized crisis of reproduction, and the multitude of survival strategies that arise from it."[78] The practices of Britain's mining communities during the year of the strike actually anticipated many of these "survival strategies." As the Thatcher government struggled to render Britain's mining communities

superfluous to the functioning of the nation's economy — as they cut off the supply of money, and rerouted crucial goods and energetic flows from increasingly far flung corners of the globe — mining communities were thrown back onto the kinds of hard-scrabble survival tactics that have come to define the globe's burgeoning "surplus" communities in the aftermath of the informational turn.

Electroculture "After Oil" — Conclusions and Conjectures

Looking to the future as the global economy generates larger surplus populations, and as the energy demands of fixed capital continue of necessity to rise rather than decline, capital faces two key threats to its popular legitimacy that it has as yet no means to combat. The success of the British government in the early 1980s, and the experience of Britain's mining communities in those decades, ironically prefigured these dual dilemmas. Having once managed to cut off the monetary supply to mining communities while at the same time ensuring a steady supply of coal, elites now seem unable to incorporate increasingly large numbers of their surplus populations into the wage relation, and are as yet unable to wean the global economy off the coal dependency that serves as the primary engine of anthropogenic climate change.

As we have already noted, significant moves have been made toward a transition from fossil fuels to renewable energy sources, and in recent months the IEA's newest report has offered solace to those venture capitalists and governments that remain blithely optimistic that "innovation" can supply capital with adequate carbon neutral electrical inputs. Yet even analysts such as Vargha, who adopt a relatively optimistic stance, tend to concede that Smil's more circumspect appraisal of renewables is founded on a formidable body of scholarship. Indeed, in course of his critique of the IEA's historically cautious appraisal of renewable energy markets, Vargha poses a rhetorical question that lies near the heart of contemporary energy policy debates and investment strategies: "[S]o will solar and wind energy become dominant in a few years in

energy demand?"[79] He answers by deferring to Smil: "Of course not. As Vaclav Smil has argued convincingly, such transitions are generally slow, because energy investments are capital intensive — we need a large new infrastructure to supply it."[80] In the course of the paper that Vargha cites, Smil explains why — despite robust government subsidies and widespread public support — the renewable energy industry still meets such a small fraction of global energy demand: "The slow pace of this energy transition is not surprising. In fact, it is expected. In the U.S. and around the world, each widespread transition from one dominant fuel to another has taken 50 to 60 years."[81] The fundamental challenge is infrastructural. Of the various renewable alternatives on offer, Smil finds that only solar energy can hope to match the quantitative heft of fossil fuels. But even allowing for the abundance of solar energy, Smil argues that a key impediment to a rapid solar transition is the fact that contemporary energy systems are contingent, not just on vast quantities of energy, but on vast quantities of densely concentrated energy. Developers have thus far only discovered this energy density in fossil fuels and nuclear fission. Consequently, a wholesale transition to renewable energies will "necessitate a fundamental reshaping of modern energy infrastructures."[82] Before it is able to collect and concentrate sufficient quantities of energy in the world's metropolitan zones and production plants, a post–fossil fuel energy system will have to compensate for the relatively low density of renewable energy dispersal, casting a wider net, and spreading a new photovoltaic apparatus over large expanses of the earth's surface. The kind of dispersed energy input infrastructure needed to accomplish this feat is poorly served by our own fossil fuel system which is presently dominated by the need to globally distribute highly concentrated fossil fuel energies, extracted at a relatively small number of key input nodes.[83]

It is here that the attempt to engineer an anti-limitationist response to anthropogenic climate change seems set to encounter profound challenges. The rapidity of information processing advance was in part premised on unlocking the intense energy density of

the raw materials — coal, in particular — that fueled it. The pace of change that defined this era serves as no guide at all to the speed with which technology will develop if it is made to rely on weaker energy streams. In truth, however, such considerations seem for the time being entirely theoretical concerns, for, under capitalism, the viability of a renewable energy infrastructure will always remain contingent on its capacity to meet the ever-expanding demands of the planetary assemblage of fixed capital. Should innovations within the renewable energy sector fail to meet this demand, we can anticipate a return to nuclear power and intensified investment in geoengineering technologies such as carbon capture. Although the IEA's newest report tenders a more promising appraisal of the nascent capacities of renewables that the agency had thus far adopted, it remains the case that the end goal of a wholesale energy transition extends beyond simply arresting the ongoing expansion of fossil fuel demand pushing out toward the more distant prospect of actively reversing it. Whether this latter goal is actually compatible with "business as usual" remains the fundamental conundrum of all contemporary anti-limitationist energy policy.

Still, caveats aside, as global governance attempts to transition to a renewable energy base — leveling increasingly punitive legislation against the oil and coal industries — we can clearly observe electroculture moving into a third phase, one that sees it consolidate its new position as the dominant field of force within which other residual and emergent energy cultures now make their way. Naturally, the old petroculture infrastructure will continue to exert a profound residual influence in the decades to come. Indeed, as Kate Gordon remarks, "[e]ven if they're now, finally, cost-competitive at the point of sale, low-carbon technologies are still working within an infrastructure — a utility regulatory system, a power grid, a highway system, a combustion engine-centric fueling system — built for a world powered by fossil fuels."[84] Yet as capital attempts to supply itself an anti-limitationist fix to the problem of anthropogenic climate change, and as it remains apparently irreversibly locked into its

self-defeating attempt to evade secular stagnation through an ever-intensifying automation of the productive process, there can be little doubt that its assemblage of electrocultural technologies and research hubs will remain indispensable tools.

Here a word of caution regarding the political potentialities of the transition to renewable energy infrastructure is in order. It has become a cliché to point out that fossil fuels are a form of solar power — one condensed, through the contingencies of the geological past, into locally distributed deposits of fossil-stored energy. The cliché is worth repeating, to the extent that it helps us conceptualize the full scope of this nascent infrastructural project. The size of the terraforming projects required to synthetically replicate this geologically-scaled process of energy concentration — one that took place over the course of five hundred million years — should at least lead us to raise the question of how benign renewable energy infrastructure would prove to be under the anti-limitationist prerogatives of electrocultural capital. It is quite conceivable that utility-scale solar facilities would in time — and in the course of attempting to not simply supplement but actually supplant and replace the existent fossil fuel dependent apparatus — develop a sprawling and uncanny resemblance to the Athabasca tar sands, those sites of late petrocultural sublime that Edward Burtynsky's aerial photography helped to make infamous.[85] Though the development of such utility-scale projects would help to significantly reduce carbon emissions, while releasing fewer toxins and pollutants, their vast scale would also threaten to transform the ecological dynamics of large tracts of the earth's surface, rendering them less hospitable to Indigenous life forms, and setting in motion a series of socio-ecological aftereffects that would in all likelihood serve as the proximate causes of a new set of ecological quandaries. In Moore's terms, we must remember that all energy systems and human economies are "co-produced" with nature, and that in our understanding of the contemporary moment — and the emerging "futures" that it bears within it *in potentia* — "[o]nly a conception of *historical nature* will suffice."[86] With these qualifications in

mind, I offer two tentative conjectures about the likely outlines of a "renewable-driven" electrocultural capital.

(1) Even if the transition proves economically viable, fixed capital's demand for solar-rich space is likely to follow a similar pattern to its voracious appetite for the time-condensed energy of fossil fuels. The IEA estimates that world energy consumption is due to rise thirty-seven percent by 2040,[87] a figure that seems somewhat conservative in light of the doubling of global energy consumption since 1971.[88] During the same decades conservative estimates see the global population projected to rise by two billion, to over eleven billion total. The amount of arable land required to sustain this population will expand accordingly, and as the land footprint of a renewable energy infrastructure also rises — the projected square mile to megawatt ratio is still hotly contested, but a 2013 NREL (National Renewable Energy Laboratory) report puts the figure at 8.3 acres per MW — it becomes harder and harder to imagine a scenario in with an anti-limitationist strategy can perpetually prevail.[89]

(2) A "successful" transition to a renewable — or, for that matter, nuclear — energy base seems unlikely to have immediately propitious political consequences for the world's burgeoning surplus populations. For, under capital, such a transition would effectively guarantee the ongoing technical viability of the electrocultural apparatus that currently subjects them to surveillance, immiseration, and digital control. The one caveat to add here is that the project of constructing the sprawling infrastructure of a photovoltaic energy system would — in the initial years of its construction — likely demand a significant uptake of labor, though only in the very short term. Whether capital's beleaguered financial system and cash-strapped governments are actually capable of coordinating such a feat remains to be seen.

However these political and technological questions are ultimately resolved, it seems safe to conclude that there is no end to capital's electro-dependency in sight. While it is now technologically and politically conceivable that capital could entirely transition away from the combustion engine, there is no prospect of it departing from electricity, which functions as the material medium of its digital brains, and which is capable of being repurposed into its all-but-universal fuel. Just as the concept of petroculture has proved an important means of understanding how the world-system found itself in its contemporary climactic predicament, the concept of electroculture exposes key features of how capital will attempt to sustain its anti-limitationist energy strategy in the face of climate change. Yet as Williams first pointed out decades ago, if these kind of periodizing concepts are to remain incisive — and if our analyses are to "connect with the future as well as the past" — it is crucial that we avoid abstracting them into static systems.[90] We must instead remain attentive to the residual and emergent forces that are even now attempting to make the way within and beyond electroculture's newly consolidated dominance.

Notes

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3. The term "electroculture" was first coined to describe a set of techniques that employ electromagnetic technology to stimulate plant growth. My differing use of the word takes its bearings in relation to the concept of "petroculture," an analytical concept that was developed to explore how oil use has shaped technological, political, and cultural practice. In the spirit of Williams's historiographic intervention, I suggest that we can understand petroculture and electroculture as distinct but mutually determining socio-ecological forces. I argue that as electrocultural social formations emerge we can see them modifying and at last displacing the signal social forms and material practices of the dominant petroculture.
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17. *Energy Transitions* 39.
18. *Energy Transitions* 150.
19. *Energy Transitions* 121.
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21. *Energy Transitions* 121.
22. *Energy Transitions* 124–25.
23. Peter Simon Vargha, "Does the IEA's New World Energy Outlook Miss the Global Transition?" *Energy Post* (November 30, 2015) http://www.energypost.eu/ieas-new-world-energy-outlook-miss-global-transition/.
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26. "Decoupling of Global Emissions and Economic Growth Confirmed."
27. *Late Capitalism* 192.
28. *Late Capitalism* 192.
29. *In Letters of Blood and Fire* 30.
30. See Jasper Bernes's piece in this collection for an account of how energy-intensive agriculture and the reproduction of the body become foreshortened as form of energy capital.
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Peak Oil after Hydrofracking

Gerry Canavan

> The nightmare, in good nightmare fashion, has something absurd and nearly inescapable about it: either we will begin running out of oil, or we won't.[1]

"What happens," Brent Ryan Bellamy asks, "when the apocalypse, correctly foretold by the right portends, does not come to pass?"[2] Leftists in the United States have had to contend with multiple versions of this problem since the end of the Bush administration and the election of Barack Obama signaled the collapse of the Left's alliance with the Democratic Party around 2009 — but nowhere is this sense of deflated apocalypticism more pointed, I would suggest, than in the complicated and intertwined double helix of energy and climate politics. For a time in the mid-2000s the urgent union of these two crises seemed to offer a sort of silver-bullet argument against late capitalism. At times the question of "peak oil" matched or even exceeded the salience of climate change as a driver of pessimistic futurological projection; the petroleum energy basis on which contemporary capitalism depended was not only radically destabilizing the climate of the planet (which, bizarrely, was by itself an insufficient argument for change) but was actually running out altogether. There simply *was* no future for petroleum-based capitalism. As Imre Szeman's crucial articulation of the "oil ontology" of twentieth-century capitalism suggests, oil has undergirded the production chain of *everything* in the twentieth and twenty-first-centuries, from agriculture to worker mobility to transportation and

distribution to the boundless creation of plastic consumer goods — and so the prospect of an imminent oil-less future seemed at the time to suggest an inevitable near-term endpoint to capitalism as such.[3] The moment of reckoning was finally at hand; things simply could not continue on as they had. Civilization still faced the old choice between socialism and barbarism — but, either way, *something* would have to change.

The energy boom of the 2010s, coupled with the Democrats' retaking of the White House and the consequent retreat of the party apparatus from oppositional rhetoric, completely upended these ideological assumptions. First, Obama was popularly taken to be the wise guarantor of the future just as Bush was taken to be its idiot destroyer; the focus of liberal (as opposed to leftist) activism consequently shifted away from issues that might counter or threaten that position. More importantly, however, the discovery of a major new fossil fuel energy source in hydrofracking (as well as new ability to utilize oil reserves once thought inaccessible through such practices as deep-sea drilling and oil-shale extraction) suggests that the true moment oil "peaks" may yet be many decades or even centuries in the future. Meanwhile the location of many of these new reserves within the geopolitical boundaries of the United States has inverted the familiar, moral-panic rhetoric around "energy independence" to remap the U.S. *itself* as the globe's leading petrol state. The seesaw of Kunkel's "nightmare" seems now to have tipped permanently in the "we won't" pole of the dialectic. The wish has been granted: there is plenty of oil after all, so much oil in fact that at time of writing consumer gasoline prices had plummeted to prices so low they have not been seen since the 1990s.[4] But this is the sinister sort of wish granted by the monkey's paw or by an evil genie: there is plenty of oil for us to permanently raise the temperature of the planet, drastically raising sea levels around the globe, while threatening to toxify the freshwater-table of huge portions of the U.S. in the bargain.

A green Marxism which had allowed itself to become invested in peak oil as proof of capitalism's incipient vulnerability now faces a very

different sort of futurity, one in which capital seems more vital and more *energized* than ever. This chapter thus looks back at the ideology of peak oil and the impending energy scarcity it implied alongside the emergence of hydrofracking as a hydrocarbon-extraction technology and the cultural dominance of post-Obama liberal optimism in order to situate a new Marxist politics of energy. I use peak oil's example of apocalypse-gone-wrong to show the pressing need for Marxist ecological critique that is not predicated on a logic of impending collapse but which is rather able to challenge capitalism in a moment of triumph: a moment like our era, when renewed possibility of rapid economic growth goes hand-in-hand with horrifying prospects for new and permanent ecological devastation. Marxists must find ways to confront the new energy "normal" — glut over scarcity, expansion over decline — that now structures the global economic system, as it rapidly and recklessly generates new financial, legal, and social forms around the fracking industry with which liberal politics is already too complicit to critique, control, or oppose.

Whatever Happened to peak oil?

As a concept, "peak oil" is organized around a number of claims that are not only valid on an abstract theoretical level but which have been empirically — if somewhat problematically — confirmed in the historical decline of actual oil production in different localities (most famously in the United States in the 1970s).

> (1) The natural processes that produce petroleum in the Earth's crust take place on a million-year geologic timetable far exceeding the timetable of human use (or, indeed, the world-historical lifespan on the human species as such), rendering petroleum by definition a finite, nonrenewable resource.
>
> (2) Oil within a bounded geographic region (whether local or global) will tend to be produced in a roughly bell-shaped curve, as rapid discovery and extraction first cause exponential growth in the rate of

> oil production which reaches a peak and then declines, as discoveries of new reserves peter out and what oil remains in the ground becomes harder, and thus more expensive, to extract.

The bell-curve model was generated famously by M. King Hubbert in 1956 and accurately predicted oil production patterns in the U.S. in the late 1960s and 1970s, among its other confirmations. The pre-hydrofracking peak for oil production in the U.S. occurred at 9.6 million barrels in 1970, precisely in Hubbert's predicted range between 1965 and 1971, and oil production declined along a Hubbert curve for the following four decades, also as he predicted.[5]

Peak oil is not, of course, the day oil "runs out" altogether — the United States is still producing oil using traditional drilling methods to this day. Peak oil represents instead the moment when oil production in the locality ceases to grow — the apex of the curve when you are, roughly speaking, halfway through your total extractable reserves.

Hubbert's theory of peak oil — implicit, in some sense, in the notion that oil is a finite resource that must run out eventually — suddenly rose to great cultural prominence in the U.S. and elsewhere during the 2000s, as multiple production indicators seemed to predict that *global* peak oil was imminent or even perhaps had already been reached. (The uncertainty derives in part from lack of reliable data around oil reserves, especially in OPEC nations.) In the mid-2000s it was common to see predictions that global peak oil had *already* been reached, often around 2006, with various academics, lobbying groups, the International Energy Agency (IEA), and even the Texas oil magnate T. Boone Pickens coalescing around that date. Other predictions and studies placed the supposed deadline around 2010, with an even wider consensus approaching universality if one expanded the locus of concern to "in the next few decades"; relatively few observers believed peak oil was further off than that, or indeed that it would never be reached, with those advocating for this Panglossian, "cornucopian" position typically associated with either oil companies or oil-producing states.

The global peak is obviously quite different, and much more disastrous, than any local production peak; oil can be transported from this locality to that locality relatively easily — but if the oil production of *the entire globe* has peaked without any novel energy form on the horizon to take oil's place at the heart of capitalist production, that would appear to augur permanent economic recession and long-term civilizational decline, even, perhaps, a rapid and permanent collapse. The threat posed by global peak oil, in other words, exposes something fundamental about the nature of the global economy. The capitalist world market is predicated on permanent year-over-year growth — small declines in the *rate* of growth are considered economically catastrophic, much less actual declines in GDP — and growth has historically corresponded closely with increased energy consumption. Consequently, an inability to continue growing the total amount of oil available to the system suggests a permanent constraint on the possibility of permanent economic growth forever (the fantasy logic on which the entire financial system is predicated).[6] Even a relatively small shortfall (which, post-peak, would grow larger each year) would upend this foundational assumption of contemporary global capitalism, threatening the stability of the entire system and presaging economic catastrophe in both the short and long term. Even supplemented with new sources of renewable or non-renewable energy, nothing like the total energy available during the golden age of oil is likely to ever return without new oil.[7]

The prospect of global peak oil was thus a vision of an imminent end of the world at least as we have come to know it. Alongside and often in concert with other 2000s-era apocalyptic fears, the popularization of peak oil as a concept contributed to widespread mass anxiety about the shape of the near-term future, as well as spawned marginal survivalist, or "prepper," discourse communities (facilitated by online media), in which people concerned about peak oil attempted to prepare, now, for the harsh struggles coming in the post-oil world.

One of many figures gaining international notoriety on the strength

of peak oil fears — perhaps, indeed, its most globally influential prophet of doom — has been James Howard Kunstler, author of *The Long Emergency: Surviving the End of Oil, Climate Change, and Other Converging Catastrophes of the Twenty-First Century.* The extended title alone suggests how seamlessly different anxiety categories could be integrated within the panicked ideology of post-9/11 America; Kunstler's book is itself quite self-conscious about this phenomenon, inviting its readers on the first page to see peak oil as the ontological equivalent of the 9/11 terrorist attacks, a crisis for which the country is similarly unprepared:

> Even after the terrorist attacks of September 11, 2001, that collapsed the twin towers of the World Trade Center and sliced through the Pentagon, America is are [sic] still sleepwalking into the future. We have walked out of our burning house and we are now headed off the edge of a cliff. Beyond that cliff is an abyss of economic and political disorder on a scale that no one has ever seen before. I call this coming time the Long Emergency.[8]

Peak oil loomed this large because

> The American way of life — which is now virtually synonymous with suburbia — can run only on reliable supplies of dependably cheap oil and gas. Even mild to moderate deviations in either price or supply will crush our economy and make the logistics of daily life impossible.[9]

Popular documentaries like *The End of Suburbia: Oil Depletion and the Collapse of the American Dream* (in which Kunstler appears as an expert) similarly linked oil with the very idea of America itself. The cultural narratives Kunstler attaches to oil — the dialectic between abundance/prosperity/progress vs. deprivation/catastrophe/collapse — and the vision of America as a sleeping nation poised on the brink of its own destruction is predicated on the same foundational assumptions that underscore the larger politics of the period, drawing

on images of imminent disaster that were deployed both on behalf of, and as critique of, the Bush administration.

The idea of peak oil is thus revelatory of how America understood itself in the Bush-era mid-2000s: a fragile superpower living on borrowed time, facing a moment of final reckoning. Such fears cut to the heart of U.S. self-perception, inverting the techno-utopian optimism that had historically structured its popular culture — an optimism that was itself the ideological by-product of the now-sputtering fossil fuel economy, as Chad Harbach writes:

> America and the fossil-fuel economy grew up together; our triumphant history is the triumphant history of these fuels. We entrusted to them (slowly at first, and with increasing enthusiasm) the work of growing our food, moving our bodies, and building our homes, tools, and furniture — they freed us for thought and entertainment, and created our ideas of freedom. These ideas of freedom, in turn, have created our existential framework, within which one fear dwarfs all others: the fear of economic slowdown (less growth), backed by deeper fears of stagnation (no growth) and, unthinkably, contraction (anti-growth). America does have a deeply ingrained, morally coercive politics based in a fear that must never be realized, and this is it. To fail to grow — to fail to grow ever faster — has become synonymous with utter collapse, both of our economy and our ideals.[10]

Peak oil likewise became, from the perspective of the peak oil community, the secret paranoiac key to explain everything that was happening in the mid-2000s: the sometimes inscrutable behavior of the Bush administration (first and foremost the disastrous invasion and occupation of Iraq) becomes perfectly comprehensible, the argument goes, when understood as an attempt to establish a permanent American military presence on top of the world's largest remaining oil reserves in an attempt to manage the coming decline, over and against hostile imperial competitors like Russia and China.[11] It was even understood by many such thinkers to be the hidden truth

lurking behind the global Great Recession that began in 2007. The central idea was that we were already living with peak oil, whether or not it was technically already here: on the level of speculation and preparation, the world was already adapting to the miserable constraints peak oil would soon place upon us all.

Moreover, regardless of the concrete production data or the actual timetable, the math of peak oil was said by its proponents to be implacable: nothing could prevent the collapse of industrial civilization and the return to a generally pre-twentieth-century standard of living, as visualized in multiple media, including Kunstler's own prognosticative science fiction novel, *World Made By Hand* [2008], set "sometime in the not-distant future" (as well as its sequels The *Witch of Hebron* [2012] and *A History of the Future* [2014]).[12] The novel depicts the breakdown of civil society in the United States — the collapse of electricity, mass media, and consumer capitalism; military coups; a "fiasco in the Holy Land"; the abolition of Congress; brushwars with Mexico; a return to religious fundamentalism — and the necessary return to hyperlocal production of food and other goods.[13] Implicit in that return to a nineteenth-century standard of living was the prospect of a mass die-off of the human race; it was a common observation of peak oil proponents that the population of the earth was approximately one billion people in the pre-oil age, which Kunstler and others posit is "about the limit that the planet Earth can support when it is run on a nonindustrial basis."[14] Only a seventh of the people alive today would even survive the transition to the poverty-stricken, disease-ridden Long Emergency, almost a full decimation of the human race. And the prize of survivorship would disproportionately go, in a cruelly Social Darwinist logic, to the meritorious few who heeded Kunstler's warning and prepared now.

"The future sure isn't what it used to be, is it?" one of Kunstler's characters asks another in *World Made By Hand*.[15] Whereas once technological progress was imagined to transcend all possible technical or ecological limits — the happy *Star Trek* future — the ideology of peak oil saw the energy limit as transcendent above all considerations,

and soon humanity would come crashing cataclysmically down. What's worse, oil replenishes in the Earth's crust far too slowly to ever give humanity a second chance at a techno-utopian future, having squandered this one. Not only the American nation, but the entire species, would be extinct many millennia before the oil came back.

Oil after Peak Oil

It would be perhaps a bit unfair to say that Kunstler and his acolytes — and I would certainly have counted myself among them, at least intellectually — were *wrong*, exactly. The peak oil prophets of doom were right in the sense that technological modernity really has been radically dependent on oil as what Matthew Huber calls its "lifeblood": oil is essentially stored-up free energy, releasing far more energy than it costs to extract, allowing tremendous amplification of mankind's powers and fueling all the technological wonders of the twentieth century.[16] They were also correct that it would not take a large decrease in our ability to extract and produce oil to send the world spiraling into severe economic depression. If that decline increased year over year and became permanent we really would be looking at a steep permanent decline in the global standard of living, likely including severe dislocation, wars, deprivation, and hardship as people attempted, in crisis mode and under new conditions of austerity, to retrofit local production to replace what has become a global marketplace. All this without even mentioning the knock-on social catastrophes promised by carbon-sourced climate change, which would themselves be harder to respond to in the austerity mandated by a slowed-down post-oil economy.

What's more, oil is *still* a finite resource and *will* begin to run out eventually; the clock is still ticking on generating an alternative source of energy to power civilization before that happens. Something like peak oil is a necessary and inevitable consequence of the natural conditions that produce oil and the economic forces that govern our extraction of it; an economy that never transitions away from oil onto some other form of energy storage (whether renewable, like solar or

wind, or, ecologically disastrous, some substitute derived from our still-ample coal reserves) *will* eventually experience a peak oil event.

It is clear, however, that despite these caveats the concept of peak oil no longer has much political salience as an apocalyptic prediction about the future. We've stopped worrying about it. What happened? I suggest a number of factors have collided to make peak oil proponents lose the influence they had garnered over the liberal-left in the mid-2000s. First, as suggested, the election of Barack Obama as president in 2008 reorganized the liberal left around a politics of optimism rather than pessimism, as well as around a politics of continuity rather than resistance. One can note a similar deflation not only in other wings of the environmental movement but in the antiwar movement, which largely evaporated following his election even as the wars continued. The global economic collapse of 2008 masked oil scarcity significantly by causing demand to plummet; the crisis was severe enough that global carbon emissions declined for the first time in decades (as well as causing a significant crash in oil prices that have still not returned to their mid-200s peak). In the years since 2009 there have been genuine social investments in alternatives to oil, especially in a rapidly expanding solar market, that have allowed some of this declined reliance on carbon energy sources to become permanent.

But one of the major factors in the decline of peak oil as a cultural-ideological phenomenon is the fact that peak oil has, seemingly counter to Hubbert's logic, actually been reversed within the United States.

Hubbert's model explicitly excluded petroleum derived from oil shale and oil sands, focusing exclusively on conventional drilling. This assumption was justified in part by the longstanding technical difficulty and inefficiency of extracting oil from such sources, which had suggested that they may never be tapped in any significant way. However, recent technological innovations have turned these geological formations into important sources of both petroleum and natural gas hydrocarbons; a side-drilling technique called

"hydrofracking" in which oil shale formations are dislodged with a blast of water and chemicals, developed by a Texan driller named George Mitchell in the late 1990s and refined in the decade following, has now made them viable as oil and natural gas reserves. The effect of the so-called "shale revolution" on the market since 2010 has been so significant as to allow the United States to regain its pre-1970s historical position as the top producer of hydrocarbons in the world (overtaking Russia). In 2013 and 2014, the last year data was available at the time of my writing, the United States had even overtaken Saudi Arabia as the top producer of petroleum hydrocarbons.

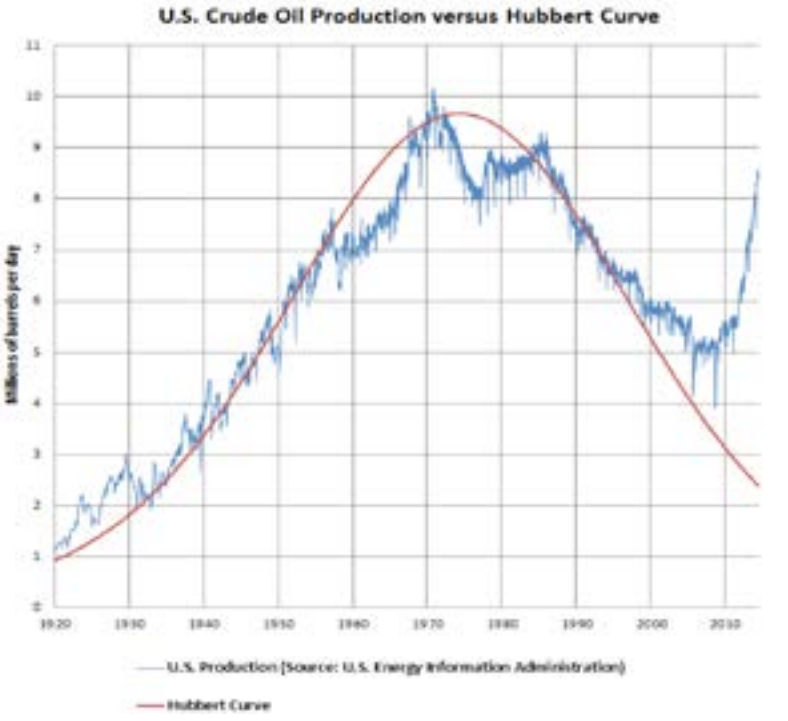

Figure 1. U.S. Crude Oil Production versus Hubbert Curve. Wikipedia.

The unexpected return of the United States to the position of the world's leading petrol state — at least for the time being — has sparked an economic boom in many otherwise economically isolated or depressed areas, most famously in the Bakken oil fields of western North Dakota, a state which was able to sustain economic growth even through the catastrophic Great Recession of 2007–2009 (as well as through the following period of very slow growth that followed elsewhere in the early 2010s). Similar periods of outsized or countercyclical economic growth have been seen in regions of Texas, Wyoming, West Virginia, Pennsylvania, and other U.S. states as well. Increased and improving extraction of unconventional oil from the "tar sands" of Alberta in Canada — said to match the conventional oil reserves of the entire rest of the world — have similarly fueled outsized economic growth in that region.

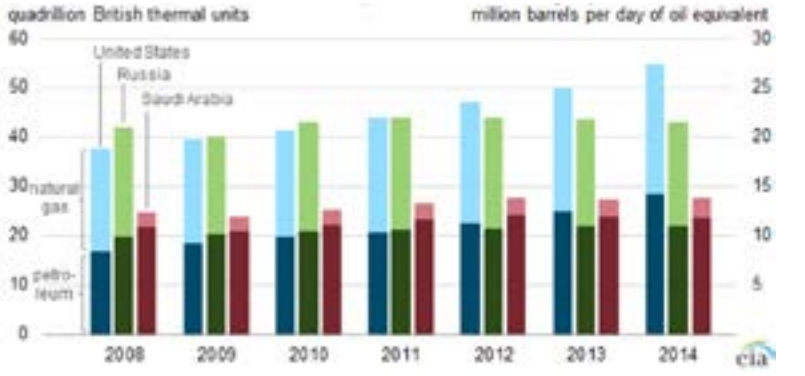

Figure 2. Estimated U.S., Russia, and Saudi Arabia petroleum and natural gas production. U.S. Energy Information Administration.

The fevered "gold rush" atmosphere of the current hydrocarbon revolution has induced a race to legalize and promote hydrofracking across the country and indeed across the world, oftentimes with little or no public debate or oversight. Indeed, as I was finishing this chapter, Britain was just beginning to award licenses for shale exploration

across England and Great Britain. As *Mother Jones* has recounted, promotion of oil shale extraction by U.S. oil firms was a major priority of the Clinton Department of State following the election of Barack Obama in 2008, leading to development projects across Eastern Europe and Africa, and continued to be so under John Kerry's tenure.[17] While not all of these development projects have been successful — in part due to nuances in property law that make the United States an especially attractive place for fracking projects, and in part due to local anti-capitalist and anti-U.S. resistance movements — the amount of currently recoverable global shale gas resources numbers in the thousands of trillions of cubic feet while the amount of shale oil (or "tight oil") is estimated to constitute over four hundred billion barrels, constituting decades of fossil-fuel consumption at current levels.[18]

Hydrofracking has, in just a few years, utterly reversed the moods and discourses previously associated with oil capitalism: rather than seen as the exhausted token of a capitalism whose internal vitalism is slowly wearing down — the harbinger of a coming collapse — oil is once again seen as plentiful and ubiquitous, both a source of economic growth and the guarantor of a consumer-capitalist with a long future ahead of it. While something like a peak oil event still awaits industrial civilization if no successor energy source is ever developed, the combination of oil shale and oil sands development now places this event significantly into the future, well beyond the typical scope of planning or political struggle in the present. Capitalism has been saved.

Energy, Law, and the Monkey's Paw

The good news, then, is that peak oil seems to have been something of a false alarm: a genuine threat to global safety and to the future of industrial civilization that has been averted, at least for now, through the development of new sources of energy. But the bad news implicit in the Benjamin Kunkel quote with which I began remains just as crucial: while the fracking of natural gas provides an energy source that releases less carbon and fewer pollutants into the air than coal

plants, and is likely at least part of the reason for the decline in U.S. carbon emissions since 2005, it is still a fossil fuel and will nonetheless contribute to the climate crisis going forward. (Indeed, multiple studies indicate that when methane leaks at the site of extraction are taken into account, natural gas fracking may be as bad for global warming as coal.[19]) Moreover, to the extent that hydrofracking corporations gain political influence as a result of both their growing wealth and their ability to create local economic booms, they will likely use this power not only to combat their own regulation but to prevent state support for noncarbon and renewable sources of energy, a so-called "lock-in" effect that could stymie environmentalist efforts to finally move beyond hydrocarbons.[20] Additionally, to the extent that hydrofracking lowers energy costs, it also lowers the potential market value of new battery and energy-efficiency technologies, disincentivizing private investment in these sectors even as the fossil fuel industry consolidated the political power necessary to block publicly funded research.[21]

Hydrofracking also poses significant environmental risk simply in its own terms. The years since the beginning of the fracking boom have seen countless studies on the negative consequences of fracking on public health, including a Yale University study that indicates people living close to fracking sites are twice as likely to develop respiratory illness as people living further away; another from the University of Missouri ties fracking to disruption of the endocrine system a phenomena that has been linked to heightened risk for cancer; another shows a risk to newborn babies born near fracking sites; still another links fracking to premature births and high-risk pregnancies; and on and on.[22] According to a 2013 estimate, more than fifteen million Americans lived within a mile of a fracking well — a number that will inevitably climb as more and more oil shale begins to be extracted.[23]

The water table may represent fracking's worst environmental and public health threat. Despite a recent report from the Environmental Protection Agency (EPA) claiming "we did not find evidence that

[hydrofracking has] led to widespread, systemic impacts on drinking water resources in the United States," there have in fact been thousands of cases of new well-water contamination confirmed in Pennsylvania, West Virginia, Texas, and elsewhere since the fracking boom began — though government complicity and nondisclosure agreements following lawsuits often prevent a direct link between fracking and well-water contamination from being confirmed.[24] (In North Dakota, the state is not even required to tell the public about oil spills, meaning 300 spills and 750 "oil field incidents" went unreported just between January 2012 and October 2013, according to an an Associated Press report.[25]) A University of Texas study discovered extremely high levels of arsenic near fracking sites, above EPA limit for safety, in 2014.[26] Even the EPA's own exculpatory study confirmed the presence of fracking chemicals and wastewater in multiple sites while denying the problem was systematic:

> In fact, at the five sites EPA selected for its retrospective studies, they found problems everywhere and most of the time, the only available explanation was fracking. An aquifer was contaminated with wastewater and tert-butyl alcohol in North Dakota and EPA concluded that the only possible cause was a blow-out during fracking; in Northeastern PA, where gas is often naturally found in water supplies, 9 out of the 36 wells EPA analyzed were newly contaminated due to fracking activities (25%); salty groundwater contamination in Southwestern PA likely came from a fracking wastewater pit; in two of the drinking wells EPA studied in Wise County, TX, the only explanation consistent with the EPA found contamination was brines from fracked rock layers and a third drinking well may have also been similarly polluted; and in Raton Basin, CO, EPA found pollution but couldn't "definitively" link it to the coalbed fracking done in the area.[27]

In California, state officials allowed fracking companies to pump wastewater directly into its underground aquifers, in defiance of EPA standards, at the height of its current historic drought;

another California firm was found and fined for simply pumping its wastewater into an unlined pit, making groundwater contamination extremely likely.[28]

Public access to water is threatened by fracking in another sense as well: as the American southwest battles unprecedented drought, the oil industry's new demands on water for its fracking wells have contributed to water scarcity; in some counties in Texas, for instance, the fracking industry alone is responsible for 25 percent of local water use, exhausting reservoirs and underground aquifers.[29] Elsewhere in the country fracking firms have sued to gain access to water over and above local residents.[30] In light of the extreme toll hydrofracking takes on local water resources it would perhaps not be too extreme to describe fracking as a process for turning water *into* natural gas and oil.

Meanwhile the fracking rush has made North Dakota the most dangerous state in the country to work in: 17.7 deaths per 100,000 workers, five times and the national average and far and away the highest rate of any state in the United States. The rate was 7 in 100,000 before the fracking boom began.[31] Since a 2015 study, it has also been linked to a steep rise in earthquakes in fracking zones, including a day in August 2014 where Oklahoma registered twenty earthquakes in a single day.[32]

Despite an obviously pressing need for study and regulation of this new industry, localities, states, and the federal government have not only pushed for deregulation of drilling and fracking but have even made it impossible to acquire necessary information about fracking or publicly discuss its possible negative consequences. California, for instance, does not track the use of chemicals in fracking at all, and as of July 2015 has performed only a single water contamination study.[33] In a court case in which the Pennsylvania Department of Environmental Protection has admitted severe misreporting and multiple errors in its determination about the contamination of a local well, even the drilling company itself "was unable to provide information to the court about what chemicals it uses, despite being

requested by the court to do so multiple times." The chemicals were provided to them by third-party manufacturers, and so even the drillers don't know what they were using.[34]

Many states have either passed laws or developed regulations that conspire to keep fracking chemicals secret. A well-known and well-litigated "gag" law in Pennsylvania even prevents doctors from discussing fracking chemicals with their patients in pursuit of treatment; the state Department of Health has also instructed its employees not to discuss the negative health effects of fracking with residents, according to whistleblowers.[35] This logic of obfuscation and secrecy has been extended even, absurdly, to a lifetime ban on two children aged seven and ten from *ever* talking to anyone about fracking, even other children, for the remainder of their lives, as part of a settlement between their parents and the drilling company that allegedly destroyed the family farm.[36]

The United States' federalist system of government, in which legal authority is vested across multiple overlapping levels of government, is being mobilized to help the fracking industry grow. In cases where localities have attempted to ban fracking, the overawing state government can overturn such bans, as has already happened in Texas and Oklahoma. When individual states require disclosure or regulation burdens on drillers, the federal government can neuter or obviate those requirements, as bills currently under consideration in the Republican-led Congress would. Only three states — New York, Vermont, and Massachusetts — have permanently banned fracking; of these, only New York is known to actually have natural gas reserves. Meanwhile hydrofracking projects are currently underway in over twenty-five states, at more or less every location in the country where such shale reserves are known to exist.

The future prospects for the current boom vary: some indications exist the shale revolution may be relatively short-lived, a "resource curse" like that seen in oil-rich countries in the Global South that enriches absentee drilling billionaires while leaving behind pollution, abandoned wells, and ghost towns in its wake, while other projections

suggest that some major oil shale and natural gas formations in the U.S. alone may in fact be viable drilling sites for decades (to say nothing of the prospects for hydrofracking the rest of the world). Either way, fracking provides the Marxist left with an important object lesson about the immense power and flexibility of the contemporary neoliberal state, and the radical difficulty of intervening against the total capture of the local, state, and federal agencies ostensibly meant to regulate drilling in the name of the public interest. Hydrofracking has in just five years become a major part of both the U.S. economy and the global energy marketplace without any significant legal or regulatory challenge at all, with government officials at all levels frequently intervening to undo or preemptively prevent any oversight whatsoever. The allure of an energy-sector economic boom is simply too attractive to risk being left behind — especially insofar as the negative effects (in accordance with the typical patterns of environmental racism and environmental classism) have thus far typically been felt on isolated and impoverished localities, rather than felt in rich and politically influential suburban enclaves or across the state as a whole.

To the extent that liberals and the left took up peak oil as a slogan, they have therefore missed entirely the much more significant threat to the common good originating not from having too little oil, but from having too much. Indeed, hydrofracking has been misleadingly presented to the public as the quasi-miraculous answer to both horns of the crisis Kunkel named, a supposedly environmentally friendly solution to the coming energy scarcity disaster. In promoting an atmosphere of crisis, the left has in some sense done the drillers' advance PR for them.

But hydrofracking has a more generally applicable lesson for the left as well, beyond the particularities of the energy field. I cannot help but think of a response from a Marxist economist I received several years ago after giving a talk on ecological Marxism and the concept of ecological debt at the Center for 21st Century Studies at the University of Wisconsin-Milwaukee. My respondent thought the

environmental critique of capitalism had certain merit, but worried that it was being taken up from a position of fear; the Left, he said, had been so traumatized by the catastrophic failure of the Soviet project and by the triumph of neoliberal capitalism that followed, it was turning to environmentalism out of the wounded desire to never be wrong again. He saw ecological Marxists like myself as making the fundamental ideological error of wishful thinking, committing the analytic sin of inevitabilism — as well as signaling a retreat from the pressing issues of labor and exploitation we no longer believed we could win on in favor of an ostensibly scientific certainty on which we believed we could never lose.

David Harvey has issued a similar warning. In a 1998 debate with John Bellamy Foster in *The Monthly Review,* Harvey argues that "the invocation of 'limits' and 'ecoscarcity' as a means to focus our attention upon environmental issues makes me as politically nervous as it makes me theoretically suspicious." This kind of apocalypticism, Harvey said, risks becoming a depressive anti-humanism that both disempowers political work in the present and is fundamentally at odds with the Marxist project of human liberation.[37] But it also, perhaps most crucially, misleads the left into trusting that natural limits and automatic historical processes will somehow passively do the work of opposing capital for us. In fact, as Harvey notes in a later 2010 essay:

> The history of capitalism is replete with many phases when "nature" is held to be an ultimate limit to growth. But the Malthusian scenario has never as yet really grabbed hold. This history is a very good example of how capital, when it encounters limits, exhibits considerable ingenuity is turning them into barriers that can be transcended or circumvented (by technological changes, opening up new resource regions and the like).[38]

This is, it goes without saying, a precise anticipation of the way the hydrofracking boom of the 2010s has completely dislodged and

discredited the apocalyptic futurity of mid-2000s peak oil proponents, written in advance of its imminent happening.

Naturally, Harvey qualifies this proclamation immediately: "Because capital has successfully done this in the past does not necessarily mean, of course, that it is destined to do so in perpetuity. Nor does it imply that past episodes of supposed natural limits were negotiated smoothly and without crises."[39] There *are* still limits; the technological power of humankind is by no means total or absolute. But all the same the collapse of the pessimistic ideology of peak oil in the face of hydrofracking suggests that the radical flexibility and adaptability of capitalist technological innovation in the face of apparent hard limits can never be underestimated.

The true site of "limit" is not material or natural, but social — and thus inevitablism of any sort, whether positive or negative, remains the left's most seductive and dangerous cognitive trap. After peak oil — exactly as before it — the future is a site of class struggle: over the rights of workers, property owners, and municipalities to resist the exploitative, bottom-line thinking of privately held energy corporations; over the possibility of collective or governmental action to shape economic markets; over the rights of citizens to protect the integrity of their own water supply; over the constitution of the regulations, laws, special protections, and public expenditures whose terms will define our environmental and energy future. If hydrofracking indeed saved America from a deep depression — or from some even worse nightmare future after oil — that fact only registers the ongoing radical dependence of contemporary capitalism on its fossil fuel energy basis. The deep vulnerability made visible by that ecstatic swing from peak-oil panic to hydrofracked prosperity thus proves the field of energy production as a crucial strategic target for the resurgent socialist left. What capital has admitted it can't live without, the left must seek to control.

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Oil and Corporate Personhood: Ida Tarbell's *The History of the Standard Oil Company* and John D. Rockefeller

Daniel Worden

The evil oilman is a powerful and recurring figure in twentieth- and twenty-first-century culture. Perhaps most widely disseminated in the character of J.R. Ewing on the TV series *Dallas* from 1978 to 1991, and then again from 2012 to 2014, the evil oilman exerts his shadowy power over both the extraction and transportation of oil, seeking to corner the market, inflate prices, and consolidate his power over producers and consumers alike. The real-life precursor to this often fictionalized oilman figure — not just J.R. Ewing, but also Jett Rink in *Giant* (1956), Daniel Plainview in *There Will Be Blood* (2007), Tex Richman in *The Muppets* (2011), and Hap Briggs in the TV drama *Blood & Oil* (2015), to name just a few — is John D. Rockefeller, especially as he is portrayed in Ida Tarbell's *The History of the Standard Oil Company* (1904). A central text in the history of investigative journalism, Tarbell's *History* represents Rockefeller as a monomaniacal, secretive, and pernicious businessman, a man who crushes independent and small oil businesses and repeatedly seeks to, and eventually does, establish a criminal monopoly. While notable for its role in the history of investigative journalism, Tarbell's *History* is also a petrofiction, one that fuses individual desire to corporate structure and personal emotions to fossil fuel. While Tarbell's intent in narrating Rockefeller and Standard Oil's intertwinement was most certainly to critique this monopolistic consolidation of corporate power in one individual, it also problematically provided a model and rationale for thinking

of corporations as individuals. What this has accomplished, today, is a set of ideologies that endow corporations with the imagined personalities of their chief officers, and this is particularly acute in representations of the petroleum industry where chief executives are often represented as oil workers, thus rendering invisible the laborers and structures that make oil available as fuel and that naturalize the refined petroleum that powers much of our society. Indeed, by thinking of Tarbell's representation of Rockefeller and Standard Oil through Marx's account of how civil society, sovereignty, and personhood function in capitalism, I will argue that the figure of the oilman and the corporation he embodies function as the major mode through which personhood overwrites and occludes ways of thinking of capitalism as a structure or system.

As Tarbell's representation of Standard Oil makes clear when viewed dialectically, oil facilitates the ideological slippage from the inhuman to the human — oil as natural substance gives way to entrepreneurial individualism as natural substance, gives way to corporate structure as equivalent to individuality. A more literary way to think of this is as a series of tropological shifts. The personification of a corporation is a metaphor, as is oil's routine figuration as "blood" in American culture, most recently rendered overt in the 2015 television series *Blood & Oil*, set in the Bakken oil fields of North Dakota, but familiar in other petrofictions such as *There Will Be Blood* (2007) and the negative formation of "No Blood for Oil" common in protests against the 2003 Iraq War.[1] These metaphors become metonyms in Tarbell's history, as Rockefeller is figured as the whole out of which oil and the corporation emanate as parts. The breakdown of distance between personhood, oil, and corporateness signals a collapse from metaphor to metonymy, a collapse that occludes our ability to think of corporations as nonhuman agents and, therefore, as objects without human rights and subject to other kinds of regulation. As Joshua Barkan argues, the allowances granted to corporations that would result in corporate personhood were initially meant to make the corporation "a tool, enabling the state and individuals to deal with

problems of government under conditions of scarcity."[2] As Barkan notes, the corporation's unique status as an entity safeguarded from the free market by its claim to personhood even led Marx to posit that the corporation was a precursor to socialism, yet that possibility of an escape from the logic of the free market has, in a perverse dialectical maneuver, become not an alternative to subjecthood under capitalism aimed at the public good but instead the ideal form of subjecthood within capitalism.[3] Being able to think of corporations — and of oil — as objects, not subjects, must be central to any critical project committed to imagining modes of life without either — modes of life, in other words, where both corporations and oil can be discarded, neglected, and left behind.

The collapse of the inhuman into the human, and especially of natural substances into the products of human labor, is a central ideological position of capitalism. In the first section of "Critique of the Gotha Program," Marx critiques the social democratic platform in Germany, shorthanded "the Gotha Program," for its anti-dialectical claim that "[l]abour is the source of all wealth and all culture."[4] Marx counters that "[l]abour is *not the source* of all wealth. *Nature* is just as much the source of use values (and it is surely of such that material wealth consists!) as labour, which itself is only the manifestation of a force of nature, human labour power."[5] The elision of nature's own contribution to value allows "the bourgeois" to "falsely [ascribe] *supernatural creative power* to labour," thus forcing others to become subservient to those who have simply claimed ownership over nature.[6] This supposition is key to a Marxist critique of oil, for in our cultural imaginary, the oilman takes on the primal value associated with oil itself. The oilman becomes, then, the carrier of "supernatural creative power" — he (and it is always a "he," it seems) has not just found oil; he has made oil and, in turn, made nature valuable. Yet what is made external from this formulation is both the work of nature and the wage labor paid to facilitate and enable the extraction, transportation, refinement, and delivery of oil. As Ross Barrett has noted in his reading of the Drake Memorial commissioned by Standard Oil at the turn

of the twentieth century, which features Charles Henry Niehaus's primitivist sculpture *The Driller*, "the collective and technologically mediated process" of oil extraction is figured as "a Spartan struggle between the individual body and the natural landscape."[7] The chief oilman, then, not only exploits but subsumes and renders invisible both laborers and economic structures, casting oil's extraction and availability as a magical act of individual exertion. Oil, and its prototypical character, helps fetishize both the sources of and figures for value as such.

This confusion of nature with labor is compounded by the confusion of personhood with corporations. In a dialectical shift, the oilman who creates value from nature also comes to embody not just an individual but a corporation. This corporation, however, exists not only as a political entity, but as an individual as well. To draw from another moment in Marx, his "On the Jewish Question," one of the contradictions inherent to the capitalist state is the division of civil society from politics, a division that has produced a sense of the corporation as both political sovereign and mere individual. In the passage below, Marx describes the way that the divide between politics and civil society functions as a divide between the sacred and the profane:

> [M]an leads, not only in thought, in consciousness, but in *reality*, in *life*, a double existence — celestial and terrestrial. He lives in the *political community*, where he regards himself as a *communal being*, and in *civil society* where he acts simply as a *private individual*, treats other men as means, degrades himself to the role of a mere means, and becomes the plaything of alien powers. The political state, in relation to civil society, is just as spiritual as is heaven in relation to earth. It stands in the same opposition to civil society, and overcomes it in the same manner as religion overcomes the narrowness of the profane world; i.e. it has always to acknowledge it again, re-establish it, and allow itself to be dominated by it. Man, in his *most intimate* reality, in civil society, is a profane being. Here, where he appears both to himself

> and to others as a real individual he is an *illusory* phenomenon. In the state, on the contrary, where he is regarded as a species-being, man is the imaginary member of an imaginary sovereignty, divested of his real, individual life, and infused with an unreal universality.[8]

This schism between the individual as "profane" and the individual as belonging to an "unreal universality" matures into a mode of economic regulation in the figure of the oilman where the corporation itself appears worthy of human rights despite its nonhuman status: another name for an individual that also possesses sovereign authority. An outgrowth of the oilman who forges value out of nothing, or so we believe, the oil corporation populates the political imaginary as a rational individual, representing the will of the oilman, and is excused as a "profane" actor because everyone behaves badly sometimes, makes mistakes occasionally. Because we cannot think of human beings as merely profane beings, this passage from Marx implies, we can certainly not think of imaginary entities like corporations as merely profane things. Instead, we endow them with supernatural powers. This tension between the supernatural and the profane marks not just people, but also corporations. And, as I will argue through Ida Tarbell's *The History of the Standard Oil Company*, John D. Rockefeller occupies this tension, a tension between the supernatural and the all-too-human that projects the oil tycoon as a personal embodiment of the corporation. Through Tarbell and her construction of corporate power, the oil magnate and his corporation become a target for criticism but also, more importantly, a site where we expect to encounter another human, rather than a system. Because of this, the oilman and the oil corporation that he represents come to embody not just a facet of capitalist production, but also the state and civil society, insofar as those entities stand as external arbiters of capitalism that are nonetheless fully enmeshed in capitalism's modes of production. Because the corporation is figured as human, society itself takes on its qualities and modes of consolidation, thus refiguring the very concepts of subjecthood and sovereignty.[9]

The right to endow a corporation with human properties was fully ratified in the recent Citizens United Supreme Court decision. Though not "natural persons," corporations nonetheless have the right to free speech, as agents in a democracy.[10] Like so many maneuvers in neoliberalism, this understanding of corporate rights takes a Left critique of corporate power and negates it. Just as conservatives and creationists use the discourses of tolerance and identity politics to assert their right to representation in public school curricula and university faculty, the granting of human rights to corporations takes a long-standing criticism of corporate power — that it acts as an agent in the social and political world, thus overpowering individual and other collective agencies — and affirms it, finding in corporate personhood a reinforcement of, rather than an infringement upon, basic freedoms. As Jane Bennett has argued in her analysis of the U.S. electrical power grid, we lack the ability to think of nonhuman entities as possessing agency. Instead, she argues, "wherever it looks, social science tends to see only the social activity of *humans*... The agentic power of human-nonhuman assemblages... appear as merely an effervescence of the originary agency of persons."[11] Bennett goes on to argue that the 2003 blackouts in North America trouble this androcentric view of agency, because the blackout was not the fault of one, or even a set of, individuals, but instead the fault of an electricity assemblage, including human traders, executives, and engineers, but also electrical current, wires, transfer stations, and computer programs. Coming up with ways to think nonhuman agency could, she argues, allow us to "detach ethics from moralism" in our responses to the multifaceted energy crisis.[12]

Bennett's new materialist critique of anthropocentrism comes at the end of the long twentieth century, however, while Tarbell's intervention reads as a prologue to the fossil-fueled anthropower of the twentieth century's sovereign figure. In the United States, Ida Tarbell played a major role in developing the terms of the Left critique of corporate power. Relatively moderate in her politics, and certainly not as leftist as her fellow journalists on staff at *McClure's Magazine*

in the early twentieth century — Lincoln Steffens and Ray Stannard Baker — Tarbell applied the biographical approach that she had developed in her early magazine studies of Lincoln and Napoleon to her most famous contribution to *McClure's*, *The History of the Standard Oil Company*, originally published from 1902 to 1904.[13] In Tarbell's account, John D. Rockefeller is indistinguishable from Standard Oil. Indeed, the personal qualities that Rockefeller biographer Ron Chernow cites in his subject — "The life of John Davison Rockefeller, Sr., was marked to an exceptional degree by silence, mystery, and evasion" — are also the qualities that made Standard Oil such a promising target for Tarbell's profile of a trust.[14] Standard Oil hid behind shadow companies, was notoriously secretive in its operations, and was the subject of constant rumors in the oil press. For example, after the Spindletop oil field started producing in Texas, a state in which Standard Oil would be severely limited in its operations due to the state's strong antitrust legislation, a rumor circulated in the state's newspapers: "[T]hese papers printed as fact an incredible account of an alleged Standard Oil project to build, under cover of darkness, a pipeline from the Gulf of Mexico to the Spindletop field. The reported purpose of this secret project was to pump salt water from the Gulf of Mexico into the field, thereby stopping production by Standard [Oil]'s competitors."[15] While inaccurate, claims of this sort were nonetheless believable because of Standard's secretiveness and, moreover, the sense that Standard Oil was, ultimately, an expression of a single individual's will.

Tarbell's description of Rockefeller further supported the collapse of the man into the corporation:

> If Mr. Rockefeller had been an ordinary man the outburst of popular contempt and suspicion which suddenly poured on his head would have thwarted and crushed him. But he was no ordinary man. He had the powerful imagination to see what might be done with the oil business if it could be centered in his hands — the intelligence to analyse the problem into its elements and to find the key to control.

> He had the essential element of all great achievement, a steadfastness to a purpose once conceived which nothing can crush.... [H]e was willing to strain every nerve to obtain for himself special and unjust privileges from the railroads which were bound to ruin every man in the oil business not sharing them with him. He was willing to array himself against the combined better sentiment of a whole industry, to oppose a popular movement aimed at righting an injustice, so revolting to one's sense of fair play as that of railroad discriminations. Religious emotion and sentiments of charity, propriety and self-denial seem to have taken the place in him of notions of justice and regard for the rights of others.[16]

Standard Oil and Rockefeller are conflated here; they both "creep" and "burrow." And, most tellingly, Rockefeller's own concerns have been far too personalized, just as Standard Oil is too monopolistic of a corporation. A well-known Baptist and supporter of religious charities, Rockefeller, according to Tarbell, is focused too much on himself, ignoring the more altruistic moral imperatives, such as "justice" and "regard for the rights of others."

In Tarbell's account, Rockefeller himself was the shadowy, controlling force behind Standard Oil's operations. Following the oil war of 1872, which saw the forcible dissolution of the South Improvement Company, one of Standard Oil's first trust incarnations, Tarbell writes, "[i]t was the Standard Oil Company of Cleveland, so the Oil Regions decided, which was at the bottom of the business, and the 'Mephistopheles of the Cleveland company,' as they put it, was John D. Rockefeller" (*History* 41). Rockefeller appears to have "a power verging on the superhuman — a power carrying concealed weapons, fighting in the dark, and endowed with an altogether diabolic cleverness... The Oil Regions as a whole looked on Mr. Rockefeller with superstitious awe... [as] a dread power, cruel, omniscient, always ready to spring" (*History* 125). These passages figure Rockefeller as a demon, a superhuman being. Tarbell's *History*, though, finds the practical realities behind these oil field myths, showing the processes, for example, by which

Standard Oil gathers data on other oil producers. This deflation — Rockefeller is not, in fact, Mephistopheles but instead a mere mortal — has been appropriated by the celebratory discourse of corporate personhood. What was, for Tarbell, an exposé of monopolistic power has now become a justification for the inherent validity of corporate agency. The fact that a single man can amass such power, and appear to have such supernatural control over a vast industry, is broadcast through popular oilmen antiheroes like J.R. Ewing as menacing but aspirational, as the natural outcome of the petroleum industry and the target of entrepreneurial fantasies.

In Tarbell's *History*, Rockefeller's hands are a recurring metonym for the corporation. Unlike Adam Smith's invisible hand of capitalism and its benevolent regulation of the marketplace, Rockefeller's hand is tyrannical; independent oilmen are caught in "Mr. Rockefeller's steel glove" (*History* 127); "the oil is in Mr. Rockefeller's hands, and he, not the producer, can decide who is to have it" (*History* 213). Rockefeller is also compared to Napoleon, as a leader with imperial ambitions: "Mr. Rockefeller again bent over a map of the refining interests of the United States. Here was the world he sighed to conquer... [W]e may suppose him to have begun his campaign as a great general with whom he has many traits in common — the first Napoleon" (*History* 62). Rockefeller's role as sovereign is reinforced here with Tarbell's reference to Napoleon, the subject of one of her earlier works for *McClure's* magazine. Just as the sovereign's body famously illustrated in Thomas Hobbes's *Leviathan* extends outward to his lands, so does Rockefeller's own body and consciousness extend below and above ground, subsuming oil, pipeline, railroad, worker, and refinery into his sovereign claim. Granting personhood to corporations also entails the corporatization of people, it seems. This vision of Rockefeller, then, entails a biopolitical revision of the subject. The body itself gets recast as the capitalist mode of production.

The "hands" imagery would be reiterated in the Supreme Court's 1911 decision that forced the dissolution of Standard Oil, where the phrase "hands of Standard Oil" is used to describe the company's

holdings.[17] The slippage in the Sherman Anti-Trust Act, the basis for the Court's decision, between a corporation and a person — the court clarifies that a "corporation" is a "person" in the act — points to the tradition of granting corporations rights, especially the right to enter into contracts. Enforcing the Anti-Trust Act, Standard Oil argued, was a slippery slope; after all, couldn't any contract appear to be a step toward monopoly? Today, in an increasingly neoliberal environment, this logic is clearly ascendant, over and against its dismissal by the court as violating the principle of "reason" by which any judge, or the public, could distinguish a monopoly from a mere business. What this amounts to, then, is that no matter how much an illusion we know corporate personhood to be, the granting of emotions, desires, character, even political perspectives is common and even natural in our understanding of corporations. Standard Oil is miserly and domineering, and therefore John D. Rockefeller is, too, or vice versa, just as Chick-Fil-A is homophobic or Whole Foods Market is environmentalist. Just as commodities take on the qualities of personhood in capitalism, so do corporations. In the *History*, Standard Oil has "not a lazy bone in the organization, nor an incompetent hand, nor a stupid head" (*History* 152). This personification serves to give form to an organization that otherwise seems to have "no legal existence. It was a force powerful as gravitation and as intangible" (*History* 160). A critique of capitalism should not only acknowledge how, for example, a corporation like Whole Foods exploits prison labor in order to deliver purportedly "sustainable" products, but also how the personal qualities associated with corporations are structural components of their ability to project profit-making as a social good.[18]

Throughout Tarbell's *History* and in her later two-part profile of John D. Rockefeller, published a year after *The History of the Standard Oil Company* in *McClure's*, Rockefeller is cast as a miserly figure, someone who rejoices at the slightest rebate or saving:

> [Rockefeller] watched the details with a hawk's eye — not a cent must go astray — not a pint of oil be lost — not a rivet or bung be wasted.

> "Pay a profit to nobody," he began to say, and it was he and his partners who, themselves, went to Oil Creek for oil, and so saved commissions; he who made his own barrels and so saved a middleman's profits; he who hauled and loaded, bought and sold. Nobody but him must make a cent on his oil, from the well to the lamp. It was combine, save, watch. A sort of mania for saving seemed to possess him. It was over this he brooded from morning to night, and it was the realization of this alone which awakened in his face, already grave with incessant reflections, a sign of joy. Indeed, the men who worked there in Cleveland at his elbow will tell you to-day that the only signs of hilarity John D. Rockefeller ever showed in those days were over a good bargain. This would make him clap his hands. Let it be a very good bargain, and he would throw up his hat — kick up his heels, hug his informant. This was joy for him, this was the satisfaction of passion — this good bargain.[19]

Once again, this personification of Rockefeller is both critical — his Scrooge-like behavior makes him a ridiculous, even pathetic, figure — and also humanizing. By demystifying Rockefeller and by so closely associating his own personal traits with Standard Oil's corporate practices, it becomes difficult to see where the corporation ends and the man begins. The unfortunate byproduct of this, today, is that it is difficult to conceive of corporations as mere objects. Doing so seems to connote some kind of harm, a denial of rights, when in fact this points out how metaphor has collapsed into metonymy, rendering the ascription of agency to non-human entities hard to fathom.

The illustrations of Rockefeller included in the *History* and in Tarbell's subsequent character study also emphasize his shadowy, secretive character. Among these illustrations, one of which is captioned ironically as a "casual portrait"; this "casual portrait" nonetheless portrays a stoic Rockefeller in a business suit, gazing seriously and directly at the viewer. In the *History*, Tarbell quotes an independent refiner from Titusville's description of Rockefeller's behavior during a meeting between independent refiners and Standard Oil:

> Everybody talked except Mr. Rockefeller. He sat in a rocking-chair, softly swinging back and forth his hands over his face. I got pretty excited when I saw how those South Improvement men were pulling the wool over our men's eyes, and making them believe we were all going to the dogs if there wasn't an immediate combination to put up the price of refined and prevent new people coming into the business, and I made a speech which, I guess, was pretty warlike. Well, right in the middle of it John Rockefeller stopped rocking and took down his hands and looked at me. You never saw such eyes. He took me all in, saw just how much fight he could expect from me, and I knew it, and then up went his hands and back and forth went his chair. (*History* 47)

This omniscience and muteness signals an alternative to figuring Standard Oil as an extension of Rockefeller's person. Instead, Rockefeller here appears as a cipher, more mechanical than human. This nonhuman quality is perhaps the starting ground for thinking of corporations — especially those vested in energy — as other than human. The flows, desires, knowledge, and actions of such entities merely appear, at first glance, to be reducible to human agents.

As Roger and Diana Olien summarize Tarbell's *History* in their book *Oil and Ideology*, Standard Oil is portrayed as a ruinous force in the otherwise Edenic days of the early oil industry.[20] Privileging and romanticizing individual producers, Tarbell, for the Oliens, is one of a series of writers in American culture who fundamentally misunderstand the oil industry, making the public skeptical of it and its profit margins; ultimately, they argue that federal regulations have been by and large dysfunctional because of unfairly negative representation of the oil industry, and they cast oil companies as victims of nefarious pubic discourse. The Oliens' apologist account of the oil industry, though, is blind to the ramifications of the oil industry and oil culture for any conception of the future. And, arguably, this is where any question of oil must inevitably arrive. Any understanding of petroculture must ask not just historical questions about oil culture's formation, but also future-directed questions about

the effects and residues of those formations. The Oliens fail to see, for example, that the history of negative representations of the oil industry is not a record that should be corrected but a record that, instead, needs to be reaffirmed, over and against constructions of corporate agency as somehow beset in our contemporary, neoliberal moment. The corporate personhood that violated Anti-Trust laws in the late nineteenth and early twentieth century is, today, vindicated in the Supreme Court and viewed as a natural way of constructing the public. If we think of corporations not as speaking agents, as Citizens United asks us to, but instead as cagy, silent, secretive agents, as Standard Oil and Rockefeller were, then corporations might seem to be outside of the bounds of human rights. Corporate personhood is embodied not by the benevolent, invisible hand of the marketplace but the monstrous, ever-grasping hand of Standard Oil, a figure that is best thought of not as an affective body but as a material object or assemblage. Leftist politics have long found promise in personification; in identity politics movements, imagining "liveable lives" is a political act, and the denial of personhood — or, some parallel to personhood for animals, even plants and objects — a violation of human rights. Just as we must struggle to imagine a future without oil, we must also struggle to depersonalize corporations, to depersonalize entities that might have been initially personalized to be better dissolved. Moreover, we must recognize how civil society itself has been figured according to the logic of corporate personhood documented so influentially by Tarbell at the beginning of the twentieth century and later codified into law in the United States in the early twenty-first century. Since the turn of the twentieth century, oil corporations have been represented as subjects engaged in the primal magic of producing oil, and therefore fostering the possibility of civil society. Today and in the future, as we engage in the necessary work of finding alternatives to petroculture and the logic of capital it underwrites, we must seek to undo the elision and invisibility of the labor and exploitative structures that underlie petroculture and that render its conveniences difficult to resist.

Notes

1. For an account of how this process worked in Victorian England, in a way that also privileged the individual as the focal point of what were otherwise structural shifts in capital, see Anna Kornbluh, *Realizing Capital: Financial and Psychic Economies in Victorian Form* (New York: Fordham UP, 2013).
2. Joshua Barkan, *Corporate Sovereignty: Law and Government Under Capitalism* (Minneapolis: U of Minnesota P, 2013) 64.
3. As Barkan argues, corporations "are one of the primary institutions by which states, social groups, and individuals regulate, channel, and direct *life toward value*" (12, emphasis in original).
4. Karl Marx, "Critique of the Gotha Program," *The Marx-Engels Reader*, 2nd ed., ed. Robert C. Tucker (New York: Norton, 1978) 525.
5. Marx, "Critique of the Gotha Program" 525, emphasis in original.
6. "Critique of the Gotha Program" 526, emphasis in original.
7. Ross Barrett, "Picturing a Crude Past: Primitivism, Public Art, and Corporate Oil Promotion in the United States," *Oil Culture*, eds. Ross Barrett and Daniel Worden (Minneapolis: U of Minnesota P, 2014) 56.
8. Karl Marx, "On the Jewish Question," *The Marx-Engels Reader* 34.
9. This is in keeping with the way that Antti Salminen and Tere Vadén describe oil's function in capitalism, as a "surrogate God with very straightforward utility" (2). What this implies, similar to my claim here, is that the qualities of sovereignty and personhood are laid onto the oilman and the oil corporation, thus placing these figures and their products outside of the realm of profane, or the changeable, and into the realm of the seemingly eternal and sacred. Therefore, oil extraction, refining, and consumption is naturalized. See Antti Salminen and Tere Vadén, *Energy and Experience: An Essay in Naftholog*y (Chicago: MCM', 2015).
10. *Citizens United v. Federal Election Commission*, 558 U.S. 310 (2010), No. 08-205, Supreme Court of the United States (January 21st, 2010) *Legal Information Institute*, https://www.law.cornell.edu/supct/html/08-205.ZS.html

11. Jane Bennett, "The Agency of Assemblages and the North American Blackout," *Public Culture* 17.3 (Fall 2005) 455.
12. Bennett, "The Agency of Assemblages" 464.
13. For more on muckraking journalism and *McClure's*, see David Chalmers, *The Social and Political Ideas of the Muckrakers* (New York: Citadel, 1964), and Ellen F. Fitzpatrick, ed., *Muckraking: Three Landmark Articles* (Boston: Bedford/St. Martin's, 1994).
14. Ron Chernow, *Titan: The Life of John D. Rockefeller, Sr.* (New York: Random House, 1998) xiii.
15. Joseph A. Pratt, "The Petroleum Industry in Transition: Antitrust and the Decline of Monopoly Control in Oil," *The Journal of Economic History* 40.4 (Dec. 1980) 821.
16. Ida M. Tarbell, *The History of the Standard Oil Company*, ed. David M. Chalmers (Mineola, NY: Dover, 2003) 42, 44. Hereafter cited in parentheses as *History*.
17. *Standard Oil Company of New Jersey v. United States*, 221 U.S. 1 (1911), Supreme Court of the United States, (May 15, 1911) Legal Information Institute, https://www.law.cornell.edu/supremecourt/text/221/1
18. See Allison Aubrey, "Whole Foods Says it Will Stop Selling Foods Made with Prison Labor," *npr.org*, (October 1, 2015) http://www.npr.org/sections/thesalt/2015/09/30/444797169/whole-foods-says-it-will-stop-selling-foods-made-by-prisoners. Thanks to this volume's editors for bringing this story to my attention.
19. Ida M. Tarbell, "John D. Rockefeller: A Character Study," *McClure's* 25.3 (July 1905) 235–238.
20. Roger Olien and Diana Olien, *Oil and Ideology: The Cultural Creation of the American Oil Industry* (Chapel Hill: U of North Carolina P, 2000) 83–118.

The Belly of the Revolution: Agriculture, Energy, and the Future of Communism

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> In the days when man's members did not all agree amongst themselves, as is now the case, but had each its own ideas and a voice of its own, the other parts thought it unfair that they should have the worry and the trouble and the labour of providing everything for the belly, while the belly remained quietly in their midst with nothing to do but to enjoy the good things which they bestowed upon it; they therefore conspired together that the hands should carry no food to the mouth, nor the mouth accept anything that was given it, nor the teeth grind up what they received. While they sought in this angry spirit to starve the belly into submission, the members themselves and the whole body were reduced to the utmost weakness. Hence it had become clear that even the belly had no idle task to perform, and was no more nourished than it nourished the rest, by giving out to all parts of the body that by which we live and thrive, when it has been divided equally amongst the veins and is enriched with digested food — that is, the blood.[1]

Many on the left still subscribe to a view of technology that G.A. Cohen, in his reconstruction of Marx's thought, called "the fettering thesis."[2] From this perspective, the technological forces that capitalism employs in its quest for productivity-driven profit are the foundation upon

which an emancipated humanity will erect its new dwelling. Humane cultivation of these forces is, however, "fettered" by capitalist social relations. Capitalism is pregnant with *what could be*, a deployment in the conditional tense of given productive forces. In a resonant moment of triumphal phrasing at the end of the first volume of *Capital,* Marx describes capitalism as tending toward a moment of crisis, its property relations an "integument… burst asunder" by the maturation of increasingly centralized and concentrated productive forces. The consequences, for Marx, are clear: "The knell of capitalist property sounds. The expropriators are expropriated."[3] At a critical point in the development of capitalism, the fragmented, unplanned allocation of wealth that characterizes production for profit in competitive markets no longer conforms with the complex, industrialized labor process of modern workplaces: only socialist planning and the supervision of the direct producers themselves can make effective use of the technology whose adolescence the bourgeoisie oversaw. Today, many will advance these arguments only with significant caveats, avoiding some of its more embarrassing iterations. Few would argue, for instance, that the deskilled, socialized labor of the factory system contains the germ of a new world in the making. They will not hesitate, however, to pour new wine into old bottles and say much the same thing about 3-D printers and self-driving cars.

The fettering thesis appears throughout Marx's mature writings, especially in those rare, speculative moments when he considers the transition to communism. It sits uneasily, however, with a view developed most pointedly in his writing on large-scale machinery, in which the factory system actualizes capital's control over labor, confiscating "every atom of freedom, both in bodily and in intellectual activity."[4] For much of the twentieth century, the fettering thesis dominated Left thinking about technology. Beginning in the postwar period, however, numerous Marxists set to work developing a critical theory of technology. Herbert Marcuse, Raniero Panzieri, and Harry Braverman, as exponents of the critical insights offered by the Frankfurt School, *operaismo*, and labor process theory, respectively,

revealed the many ways in which the productive forces of capitalism were saturated with the political imperatives of capitalism.[5] Today, few people can fully ignore this critical legacy. Even the "accelerationist" authors of *Inventing the Future* (2015), whose primary hypothesis consists of a hyberbolic deployment of the fettering thesis, acknowledge that contemporary technology is sometimes inextricable from capitalist function at the level of design.[6] Their solution seems to be a sort of mix-and-match theory of transition, in which we discard unusable technologies (nuclear weapons: bad) and cultivate useful ones (antibiotics: good). Such a view is possible, however, only if one thinks of technology as a series of discrete tools, rather than an ensemble of interconnected systems. I have attempted elsewhere to intervene in this discussion by providing a different way of looking at the problem.[7] Rather than assume the Olympian point of view and ask ourselves what we would do with given technologies if we were allowed to rearrange things as we wish from one end of the earth to the other, we need to start with a much more difficult question: how do revolutionary struggles beginning in the here and now find a way to meet their needs, survive, and grow, while producing communism? Looked at from this perspective, there may indeed be arrangements of given productive means that are impossible because there is no way for them to unfold as the result of class struggle. History is, in this sense, like a board game in which there are appealing configurations of pieces that the rules render impossible. These arrangements can never result from a sequence of play.[8]

The standard assumption among Marxists and many others is that, despite its toxic excretions, the more developed technology becomes, the easier it will be to produce communism. But what if these technologies actually make it harder? What if they are also fetters, blocking attempts to break free from class society? This is obvious when it comes to the technologies for repression, surveillance and warfare, which have effectively removed certain revolutionary strategies from play. But consider, for example, the energy system upon which industrial and postindustrial capitalism is built. Few

people doubt that fossil energy use drives climate change by packing the air with greenhouse gases, and that these effects will massively constrain human and extra-human life over the course of the twenty-first century and beyond. The problem is that the energy system and the technology it powers is not at all modular; it is not possible to swap out dirty energy and swap in clean energy, even if all political obstacles were removed and some polity found itself able to rearrange the building blocks of industrial society as it saw fit. The technology they would inherit works with and only with fossil fuels. This lack of modularity is clearest in the case of the more than one billion vehicles built around combustion engines; these can be replaced by non-fossil energy only by manufacturing batteries through highly energy- and resource-intensive processes. At present, even if one were to ignore everything but the arithmetic of greenhouse gases — and given the highly destructive mining processes these batteries require, this means ignoring quite a bit — the benefits of such an energy transition are uncertain, especially if overall energy use continues to grow year on year. As for electricity itself, while one can generate it from cleaner, renewable sources such as wind and solar, the inconsistency of these sources means that, if people want continuous, on-demand energy (and most current technology requires it) they would need to invest massively in resource- and energy-intensive technologies for storage and transmission that would render the emissions-reducing benefits of such reconfiguration uncertain. The technologies of capitalism fit together into technical ensembles that exhibit a strong degree of *path-dependency*, meaning historical implementation strongly influences future development, precluding or making difficult many configurations we may find desirable. The authors of I*nventing the Future* are, by contrast, path autonomists. Their blindness to the way that technological systems fit together into non-modular ensembles is what leads them to assert, incredibly, that "clean energy technologies make possible virtually limitless and environmentally sustainable forms of power production."[9]

The fettering thesis continues to manacle thinking about revolution

and technology in part because no alternative perspective has been consolidated. In the pages that follow, I build upon my previous work and consider the obstacles, infrastructural and technological, that a twenty-first-century revolution will encounter. I take as my primary object of inquiry agriculture and the food supply chain, the belly of the revolution, as I call it, not only because revolutions will either provision themselves or die but because agriculture and food supply depend upon all the other technical systems of industrial capitalism: energy supply, manufacturing, and logistics. In the ancient political fable I use for my epigraph, the belly admonishes the rebellious organs of the body, reminding them that if they revolt they die, since all nourishment passes through the belly before being distributed outward. This is the counterrevolutionary lecture that capitalism continually whispers into the ears of would-be rebels; its words are the technical arrangement of the means of production, the organization of the land and its powers.[10] The two "revolutions" capital effected in the last half of the twentieth century — the green revolution and the logistics revolution — are really counterrevolutions. Together, they have reorganized agriculture and the food supply system in such a way that real revolutions must break with them or perish. Furthermore, as I will show, although many leftists continue to believe that these technologies provide the basis for an ecological reorganization of industry capable of warding off the worst effects of capital's ecological destabilization, whether within capitalism or beyond it, these hopes are misplaced. Our best hope is communism, and communism means, as we will see, breaking the spine of this industrial infrastructure and ending the tyranny of the belly.

In order to respond to these old agrarian fables, we need a new theory of technology, one that reckons with path dependency. We also need to return to an insight that has been lost but which was at the center of Marx's thinking — technology *is* nature, an organization of natural elements and powers.[11] The productive forces are social forces through and through, determined by the *social* relations of capitalism, but they are also *natural* forces. Technology utilizes, reconfigures,

and shapes nature, but part of what a path-autonomous view of technology overlooks is that the qualities and characteristics of natural forces themselves, along with social relations, determine the range of possible uses a technology affords. Here I find two new contributions to Marxist ecology, Andreas Malm's *Fossil Capital* and Jason W. Moore's *Capitalism in the Web of Life*, quite helpful.[12] Malm argues that the direction of capitalist development and industrialization was influenced by the difference between coal-fueled steam power and the water power that preceded it. As technologies, coal power and water power feature entirely incongruent profiles that have to do with the different natural forces they recruit as much as the social relations through which these natural forces are organized and developed; capitalist development selects from and eventually synthesizes these forces, based not only upon their ability to meet human needs but upon their fit with the imperatives of accumulation. Steam power cannot be made to do what water power can do, nor vice versa. The limits these technologies present to those who would adapt them are double: they have to do with their social character but also the material character of the powers and forces they use.

The natural and the social are not two separate layers, one base and the other superstructure, but intermixed. In Moore's account, capitalism is a way of "organizing nature"; capitalist reproduction involves the reproduction of certain social relations and institutions as well as the reproduction of nature in forms conducive to capitalist accumulation. Moore for his part emphasizes what he calls "the double internality" of "humanity-in-nature/nature-in-humanity."[13] Reprising Marx's own dialectical understanding of human labor, where "man acts upon external nature and changes it, and in this way… simultaneously changes his own nature," Moore reminds us that humans are animals, whose social and cultural forms regulate a constant transformation of the material world, including themselves.[14] An attentive reader of Justus Von Liebig's works on soil chemistry, Marx borrowed from Liebig the term *stoffwechsel* (metabolism) and used it to describe human activity in the most expansive sense.[15]

Liebig's term helped Marx to think about the transformative character of human activity, "a process between man and nature, a process by which man, through his own actions, mediates, regulates, and controls the metabolism between himself and nature."[16] Largely associated now with biological processes internal to human bodies, metabolism is a particularly salutary concept for thinking the double internality. Metabolism captures the connection between the social belly and the belly as such. Neither Malm nor Moore put things in exactly this way but the implications are clear: the productive forces of capital are natural forces, their productivity derives not only from the organization of people and processes but also from the characteristics of various material elements, from powers of water, earth, air, and fire, from biological, chemical, and physical processes, from gravity, electro-magnetism, and the forces internal to atoms.

Town, Country, and the Double Internality

The romantic or post-romantic perspective on these matters opposes nature and technology — the machine in the garden and against the garden, the tractor as leveler of wilderness.[17] But the garden is also a machine, a way of organizing nature. In a certain sense, the difference between these views is semantic. If nature means a forest, then it makes sense to see it as opposed to technology. If nature means something like fire, though, then it is easy enough to see it as both a spontaneously emerging extra-human force and a human technology. Agriculture and the food system mediate between these different meanings of the word "nature," since a farm is a collection of living things organized toward human needs, and unlike an oil refinery much more clearly both social and natural.

Agriculture is also the place where the relationship between capitalist social relations and labor-saving innovation is first established, as Robert Brenner's persuasive account makes clear. Brenner's writing on the transition to capitalism is, among many things, an argument against technicism and against the fettering thesis.[18] The emergence of capitalism in the English countryside

did not naturally evolve through the increase-seeking decisions of peasants and lords, such that the underlying productivity gains in agriculture made feudal property rights into "fetters." All things being equal, the direct producers and their exploiters under feudalism would struggle against each other in ways that stabilized feudal relations and inhibited increased productivity. Only a shock to this system could introduce a new set of specifically capitalist property relations in which producers were compelled to exchange their product on a competitive market in order to reproduce themselves. Medieval agriculture relied on fallowing to restore soil fertility, but in the sixteenth century a new agricultural regime emerged, chiefly in the Netherlands and England, based on crop rotation rather than fallowing. Planting of fodder crops would follow the planting of cereals, with no rest for the land. This had two advantages for soil fertility — the fodder crops, such as clover and alfalfa, were nitrogen-fixing rather than depleting, but they also fed animals that produced manure and thus fertilized the soil. Peasants were unable to adopt the system, however, given the open field system of property rights, where fallow lands were common property on which anyone could graze their animals. If anyone tried to plant fodder crops there, they would run the risk of having them eaten by someone else's animals. Furthermore, the new system required more animals, not only to graze on and fertilize the newly cultivated lands, but also to replace human labor, since the activity required per cultivated acre increased massively in the crowded calendar of the crop rotation system, with more animals and lands requiring care and work.[19] Most peasant producers were without these resources, relying on the labor of a single family and, at most, one or two animals. For all these reasons, crop rotation was adopted in the sixteenth century only when common lands were enclosed and the peasants turned into wage laborers who could then be set to work on larger, non-fallowing farms involving increased animal power and new tools. As yields per acre and per worker increased, the peasants whose lands had been enclosed were no longer needed as agricultural wage laborers. This provided the

engine for development elsewhere. As the productivity of labor in the countryside increased, ex-peasants dispossessed of their right to the land migrated to the towns, forming the labor pool for industry. Fed by the surplus of grain and meat, the towns fattened into cities. The takeaway here is that the reorganization of human society prompts a reorganization of nature. Changes in the relations of production prompt a change in the productive forces, whereas the fettering thesis imagines the reverse.

Agriculture is a complicated area of study in part because it is easy to confuse two important forms of technical change — land-saving innovations, which increase yield per acre, and the more familiar labor-saving innovations which increase yield per worker. The first agricultural revolution involved both types, but the chief importance of the crop rotation system was in land-saving. Afterward, and until the twentieth century, land-saving innovations were few and far between. Most of the important agricultural innovations of the nineteenth century were labor-saving and involved better use of draft animals through new tools and motorless machines for plowing, cultivating, and harvesting.[20] Moore argues that nineteenth-century increases in yields came primarily from aggressive farming on heretofore uncultivated land in the Americas, stripping it of nutrients and then moving on to new plots once the fertility plummeted.[21] The nineteenth century also saw a scramble for fertilizer imports — first guano from South American islands, then saltpeter from South American deserts, but these extractable deposits were scarce and the imminent depletion of these resources formed the context for Marx's reading of Von Liebig and his critical commentary about the self-undermining character of capitalist agriculture. For Marx, the nineteenth-century crisis of soil fertility originated first and foremost from the division between town and country, which the transition to capitalism from agrarian society deepened rather than overcame. By concentrating workers and the natural fertilizers they produce in cities, capitalism "disturbs the metabolic interaction between the man and the earth, i.e., it prevents the return to the soil of its constituent

elements consumed by man in the form of food and clothing; hence it hinders the operation of the eternal condition for the natural resource of the soil."[22]

As Marx saw it, the solution to this problem, the rebalancing of the metabolic interaction between humans and the land, involved a revolutionary project that has largely been forgotten despite its centrality to most nineteenth-century conceptions of society after capitalism: the overcoming of the division between town and country, returning human excrement to the land from whence it came. People forget that this was one of the revolutionary measures (many of them comparatively modest, and easily incorporated by liberal reformism) outlined by Marx and Engels's *Communist Manifesto*: "Combination of agriculture with manufacturing industries; gradual abolition of the distinction between town and country, by a more equable distribution of the population over the country."[23] The first part has already been achieved by today's factory farms and industrialized food systems, but once we read on we see that Marx and Engels imagined something very different: the breaking up of big cities, the localization and dispersal of food production, so that it was close to where people actually lived, and the dispersal of industry throughout the countryside, so that its polluting effects were mitigated. This was not a passing fancy but something that Marx and Engels referred to continuously from 1848 on, taken up by many of the socialists they influenced. Today, questioning urbanization or imagining the destruction of cities as part of a communist revolution is seen by accelerationists and other proponents of the fettering thesis as concomitant with primitivism, despite the centrality of these objectives to the nineteenth-century radical tradition.

Finding agreement on this point with the utopian socialists he typically criticizes, Engels puts it rather pointedly in *Anti-Dühring*:

> The abolition of the antithesis between town and country is not merely possible. It has become a direct necessity of industrial production itself, just as it has become a necessity of agricultural production and,

> besides, of public health. The present poisoning of the air, water and land can be put an end to only by the fusion of town and country; and only such fusion will change the situation of the masses now languishing in the towns, and enable their excrement to be used for the production of plants instead of for the production of disease.[24]

For Engels, this does not mean isolated, autarkic villages. He remains a proponent of decentralizing some productive processes and centralizing others. Bebel, discussing the same thematic in his book *Women and Socialism*, notes that it is "due to the complete remodeling of the means of communication and transportation... that the city populations will be enabled to transfer to the county all their acquired habits of culture, to find there their museums, theaters, concerts halls, reading rooms, libraries."[25] The abolition of town and country requires extensive coordination, and the communication of both goods and information. However, some things do not need to be and should not be so communicated. He continues:

> Each community will, in a way, constitute a zone of culture; it will, to a large extent, itself raise the necessaries of life. Horticulture, perhaps the most agreeable of all occupations, will then reach the fullest bloom. The cultivation of vegetables, fruit trees, and bushes of all nature, ornamental flowers and shrubs — all offer an inexhaustible field for human activity, a field, moreover, whose nature excludes machinery almost wholly. Thanks to the decentralization of the population, the existing contrast and antagonism between the country and the city will also vanish.[26]

On this point, contrary to received opinion, the Second International writers share a good deal with anarchist communists such as Piotr Kropotkin and Elisée Reclus, who also imagined an intermingling of industry and agriculture and, contrary to later mischaracterizations, saw need for balance between self-sufficiency and communist distribution among productive sites.[27] The difference between the

anarchists and the Marxists will of course concern the mechanisms whereby such coordination is achieved. Even on this point, however, Marx and Engels were less statist than many supposed, locating the ultimate power of decision in the hands of the people themselves, though both did have more faith in the possibility of a layer of administrators and technicians who could decide what goes where.[28]

Moore argues that interpreters of Marx's writings on metabolism have reinstantiated a Cartesian duality (society vs. nature) that the concept was meant to transcend.[29] In places, Marx describes an "irreparable rift in interdependent processes of social metabolism," a formulation that has sometimes been read as describing a rift between nature and humans rather than, as Moore has it, a rift within "singular metabolism."[30] The split between town and country becomes, in this dualist reading, an ontological split between humanity and nature. What Moore proposes in the place of this cloven understanding is a picture of human and extra-human nature as a "flow of flows of matter and life."[31] Humans are biological organisms, Moore reminds us, whose activity, building up matter into bodies and transforming living and nonliving things, is regulated by language and culture and other oddly powerful mediations such as value. But thinking the unity of humanity and nature does not overcome the practical rifts in this flow of flows; it does not overcome the division between town and country, which is a real break within matter, not merely a theoretical one. For Marx, there was no contradiction between thinking humanity as a part of nature *and* separate from nature; this was because, at a practical level, humans were a part of nature that had separated itself from nature. Through labor "man regulates and controls the metabolism between himself and nature" and at same time "confronts the materials of nature as a force of nature."[32] This is not an epistemological division so much as a real one, and dealing with its effects requires practical reorganization of the relationship between humans and nature, not a mere rethinking of the problematic. Moore has little to say about this practical reorganization, and misses what is a fundamental point for those of us investigating these matters from a

revolutionary perspective: the abolition of the division between town and country and the metabolic rift stands as part of the *realization* of the double internality, the instantiation of a state of affairs in which humans no longer stand over and against external or internal nature.

Filling in the Rift

The union of industry and agriculture that Marx and Engels and others advocated has happened, but not at all in the way they imagined. In one sense, the old oppositions between town and country have vanished in the developed world and in most of the developing world too. One can browse the web via smartphone from many a backcountry road. Farms operate with million-dollar machines as complex as those in any factory. And yet, the rifts remain, widening every year; our food travels ever-greater distances from farm to table and undergoes complex industrial processes before being digested by us. The fundamental issue which Marx and Engels identified, that the resources which are taken from the soil are not returned to it, remains with us in a transmuted form. Soil fertility is limited first and foremost by the amount of biologically available nitrogen; such nitrates and ammonia are produced regularly from atmospheric nitrogen by bacteria, a process that can be sped up by certain crops, such as legumes. Biologically available nitrogen is also found in decaying plant material and in manure and human waste. The rate at which nitrogen can be converted to a usable form is limited, however, and even the most careful management of inputs and waste material runs the risk of depleting the soil. Without nitrogen, plants cannot produce protein, and without plant protein humans and other animals cannot produce themselves.[33] The nitrogen cycle is "singular metabolism" in a very basic sense, a chain of biochemical reactions moving from the air to soil and back to air, passing through the bodies and bodily excretions of plants, animals, and humans. In the twentieth century, the limits of various systems of managed organic inputs, such as the crop rotation discussed above, were radically transcended by the invention of the Haber-Bosch process, which uses natural gas to

convert atmospheric nitrogen into ammonia. As such, the amount of nitrogen now available is constrained only by the supply of natural gas. The invention of nitrogen-fixing technology averted the imminent crisis of soil fertility Marx and Engels identified, obviating the need to return organic wastes to the land, and therefore widening the metabolic rift while filling it in with megatons of synthetic fertilizer.

One of the most intriguing moments in Malm's *Fossil Capital* (2015) may help us theorize the shift to synthetic nitrogen, developing our sense of the ways in which productive technologies incorporate both social and natural forces whose character strongly determines their possible use. Malm helpfully extends Marx's categories of formal and real subsumption in order to explain the difference between water power and steam power.[34] Most attempts to expand these important categories misconstrue their original meaning for Marx, or attempt to make them the basis of an impossible periodization.[35] Subsumption is often seen as identical to commodification — that is, producers are subsumed when they are made market dependent and begin to produce for exchange. Subsumption as Marx defines it, however, has to do with the labor process and with capital's control over workers. Formal subsumption occurs when capitalists take over an existing labor process, owning the means of production that peasants or artisans formerly possessed as well as the products generated by those means of production, and paying wages out of the revenue they earn. Yeoman farmers or artisans who produce for the market using their own labor are not in this sense formally subsumed, even though the products of their labor were commodified. Real subsumption occurs when capitalists not only own but reorganize and materially transform the means of production, in order to increase productivity and profit. Malm's extension of these categories works because it concerns the labor process and direct capitalist control. For Malm, nature is formally subsumed in the case of energy sources, like water power, derived from what he calls "the flow" — a category that also includes solar and wind power. The flow is curiously resistant to commodification; it can be appropriated but not exactly owned, since

it does not have a precise location, diffused throughout the landscape and atmosphere in ways that resist contract. It is also unpredictable; levels of rivers swell and subside in ways that cannot be controlled, clouds cover the sun for days, and wind rises and falls.[36] This makes water power inferior to things like coal, despite the fact that it is free as a result of its uncommodifiability. Coal and other energy sources like it form what Malm calls "the stock," and these things *can* be really subsumed by capital, meaning that, with coal, capital can produce energy when and where it wants it, disciplining and regulating nature's provision of motive power. In the context of the early nineteenth-century class struggle, Malm argues, the turn to the stock was necessary — capitalists who used water power were exposed to destabilizing class struggle by their need to stay close to water sources, where workers were in short supply and could thus drive up wages. Furthermore, water power displayed great seasonal variation. The mills would capture water in a mill pond overnight and then let it out during the day; in the summertime when water was low, this could power only a short working day, such that mill owners made up for lost time when the water returned in the autumn, driving their workers toward very long days. When the Factory Acts of the 1830s were passed, limiting the working day, this latter practice was rendered impossible, further compromising the ability of water power to compete with steam. Despite being cheaper, the unpredictability of water power combined with the resistance of labor to render water capitalists less competitive. Only steam power could deliver the needed predictability. Water mills did, of course, involve complicated mechanisms unavailable before capitalism and therefore featured a really subsumed labor power, but Malm argues that really subsumed labor is incompatible with an only formally subsumed nature. Factories need a steady energy source that can be increased or decreased at will.[37]

Jason Moore would perhaps critique Malm's use of these categories for their latent Cartesianism. If nature is seen as something that can be subsumed, formally or really, then it is treated as something

external to humans that is only brought under human control through technology. But as I argue above, this terminological precision risks occluding very real differences in different types of relationship between human and extra-human nature, making it difficult to gauge how much extra-human nature is or is not radically reorganized by humans. Perhaps the useful term, in addition to subsumption, is *synthesis:* in the case of coal power, gasoline, electricity, and nuclear power, natural forces are not simply appropriated by humans but actively synthesized by them. The implications of synthesis and real subsumption for the discussion of the nitrogen cycle above are, I would hope, obvious: in the system of managed inputs, the life-making powers of nitrogen are formally appropriated through the conservation and recycling of organic wastes, crop rotation, mixed farming, and the planting of legumes. With the Haber-Bosch process, these powers are actively synthesized by humans.

Food and Logistics after the Green Counterrevolution

Malm's use of the terms "stock" and "flow" is an interesting modification of their standard usage by economists, where the first refers to a simple mass of value (or commodity units) and the second to a rate, given in value or commodity units over time. Joan Robinson, quoting Michał Kalecki in conversation, is remembered for her acerbic description of economics as "the science of confusing stocks with flows," because people tend to treat these two measures as commensurable, comparing GDP (a flow) to national debt (a stock), for example.[38] Though not commensurable, one can make the two things into a ratio: debt to GDP, for instance, or the profit rate. Stock is simply what builds up where inflows, into a bank account or a factory, are greater than outflows, and thus the relationship between the incommensurables can be modeled mathematically, as one can model the relationship between the depth of a river in feet and its rate of flow.[39] Malm's use of the terms means to indicate a distinction between energy flows that build up into a meaningful stock and those that do not. The inflows of wind and solar energy are always passing

into outflows in ways that never form a stock, unlike the chemical energy of former biomass contained in coal deposits. In political economy, the concepts offer ways of thinking about the relationship between revenue, investment, costs, and value transferred. The fixed capital invested in a waterworks would typically be measured as a stock, an initial outlay sunk into machinery at a particular date in time, but one might also calculate its depreciation as a flow of value transferred to the goods the mill produces. Likewise, the coal used by a steam-powered plant will typically be measured as a flow (of value or tons per year or day), but one might also measure it as a stock, by taking its level at a particular moment or its average level over the course of the year. This is where Malm's usage gets interesting, and perhaps confusing, since the turn to coal and the stock that Malm describes was a turn to an increased flow of circulating commodities, traveling ever-further distances, and requiring a vast transportation network, itself powered by coal and itself requiring the very coal flows it made possible. Conversely, the waterworks that preceded the turn to steam required no circulating energy inputs but did involve costly fixed capital investment. The free use of the flow was a way of avoiding cost flows for energy inputs but involved fixed capital stock, and the turn to the stock was a turn to flows of energy inputs.

In the postindustrial era, the so-called "logistics revolution" has focused on reducing stocks through a careful management of flows. The goal of "just-in-time" production is to reduce standing inventory as much as possible, by making sure that inputs arrive at the plant exactly when they are needed. Since stock is usually treated as the average level of inventory, this kind of distribution system ends up being "capital saving," inasmuch as it reduces the level of capital tied up in production, freeing it for other uses. Capitalists measure their profit rate as flow of net profit over capital invested for a given period of time, taking the average level of circulating capital; therefore, by reducing the latter, the rate rises (though there is the question of what happens to the capital freed up and whether capitalists can find productive uses for it, which is no easy matter). But inventory is not

the only cost that capitalists seek to reduce. Fixed capital is inferior to circulating capital because it must be paid for far in advance of its use, making accurate prediction difficult. If demand for the product that a factory produces falls precipitously, one cannot go back in time and change the size of the factory one built, whereas circulating capital can be adjusted as one goes in order to correspond to existing demand. Labor costs are similar, given the difficulty of firing workers, either because workers will strike and shut down plants when fired or there is legislation preventing arbitrary dismissal. By making the circulation and coordination of various inputs easier, the contemporary logistics revolution should really be understood as an outsourcing and contract-production revolution. Instead of producing goods or services directly themselves, many firms reduce their permanent employees as well as their fixed capital investments to the lowest level possible, engaging a network of contract producers and service providers as needed and according to changing market conditions. The result is that capital's power over labor — now fragmented and dispersed across the logistical grid — increases massively. As I have argued, such logistical restructuring cannot in any way be understood as a simple increase in efficiency. Though costs of circulation and transportation are reduced through more efficient technologies, the gains wrought from these restructurings come largely from their ability to drive wages to the floor and force workers to accept the greatest possible insecurity. This critical understanding of logistics extends the critique of technicism and productive force determinism one finds in Malm. Indeed, the turn to logistics and the turn to steam are remarkably parallel, undertaken in both cases in order to disarm an insurgent laboring population.

Food is logistical now, too. Under the coordinative power of the supermarket system, food travels farther than ever before. But even where source and destination are proximate, the logistics of agricultural inputs — from seeds, to fertilizers, to machinery — are themselves complex and likewise dependent upon long supply chains for their production. And so on and so forth, until after a dozen

iterations, the commodity circuit more or less turns back in on itself. Grain and other stable agricultural products have been traded across vast distances since at least the first millennium BC, but in the postwar period international agricultural trade has expanded massively not just by volume but by type of good traded. From 1973 to 2013, the volume of agricultural exports grew by 250 percent. Some of this can be attributed to the underlying growth in agricultural output during the height of the Green Revolution, as chemical fertilizers and pesticides began to be used in great volume. But total output only grew by 142 percent during this period.[40] In money terms, the increase was sharper still: the real value of exports grew 1,364 percent. Part of that astronomical increase derives from the commodity and energy boom that occurs from 2002 to 2012. The real value of agricultural exports increased six times more quickly from 2001 to 2013 than it did from 1973 to 2001, but the steeper increase also reflects a shift in the type of agricultural products imported and exported during this period, from bulk goods to "high-value products" such as fruits and vegetables, enabled by new refrigeration technologies and long-range transportation and logistic networks. By 2013, 19 percent of the food that Americans consumed was imported.[41] As indices of international travel, these numbers are only partly useful in estimating the extent to which logistics has canalized the food system and with it the productive flows of the earth. A tomato may travel farther from farm to refrigerator when grown in California and sold in Washington, DC than when grown in Mexico and sold in Colorado.

The effect of all this has been a reorganization of agriculture in many areas toward high-value cash crops and away from staples and cereals, which are now imported from places where they can be grown with the most capital-intensive, high-yield techniques, such as the American Midwest. One of the reasons for the logistics revolution is that productivity increases are not uniform across different sectors, and even today, there are many activities that remain unmechanized. For example, while the manufacture of components in electronics is highly automated, the assembly of these components is not, and so

assembly companies, Foxconn being the most notorious, are located in places where wages are lowest. Similar processes hold in the garment industry, where textile production is automated but sewing is not. In agriculture, most of the labor takes place during harvesting but this work has only been automated through more or less crop-specific and highly expensive machines, leaving a number of fruits and vegetables to be harvested by hand, despite the near-total automation of other crops. What Bebel says about the machinery-exclusive nature of horticulture still holds true in many areas 135 years later. Harvesting is seasonal, too, meaning that the labor needs of modern farms fluctuate massively, shrinking to zero for much of the year and then ballooning at harvest times. Under capitalist social relations, only a population of marginally employed and underpaid workers, dismissible for any reason, can satisfy the fluctuating labor demand of farms. In the U.S. and Europe these needs are met by populations of informally employed immigrant laborers, though often logistics enables retailers and distributors to go directly to zones and countries with large unemployed populations and low wages to purchase labor-intensive foods. The result is that the distribution of agricultural capacity over the crust of the earth has little to do with the direct food needs of the nearby population, and everything to do with the antagonistic conditions of production for profit.

Malm argues that the real subsumption of nature, and the need for consistent, predictable energy sources has to do with the imperative to really subsume labor, to create massive machine works that can be run at all hours and at any speed and that will determine the discipline, pace, and quality of work by the character of their material design. But the unpredictability of labor, he notes, is constitutive and impossible to extirpate fully. No technology yet exists whereby capital can control the human nervous system and compel motion directly; there is still need for coercion and incentive of one form or another. Even in slavery, with the most violent coercion imaginable, the laborers have the power to refuse work and suffer the consequences. Indiscipline can only be controlled, not eliminated. The unpredictability of nature

is, also, difficult to eliminate completely. However much the nitrogen cycle is really subsumed in modern agriculture, the productive powers of the earth analyzed and manipulated at the molecular level, agriculture remains a high-risk business, dependent upon climactic factors that are impossible to anticipate let alone control. Like labor, the weather can only be managed indirectly. The result is that few small- or medium-sized farmers producing for market can survive without relying on complex forms of credit, insurance, state subsidy, price control, or other support. The prices of agricultural products fluctuate wildly, and the intervention of powerful distribution and supply monopolies has the effect of imposing terms on producers. After the final and total defeat of the global peasantry, meaning that nearly all farmers are market-dependent, food prices always run the risk of being sent to the floor by competitive forces. The result is that states often intervene in the market. (The U.S. has for decades, as many know, paid its cereal producers to destroy excess grain in order to maintain market conditions, such that the price of U.S. grain is often far below its actual production cost). Given such interventions, and the effect of profit taking at every level of the chain from farmer to consumer as well as complex forms of credit, there is often little relation between the prices that consumers see and the actual production costs of agriculture. For example, the expansion of commodity futures and other agricultural derivatives means that small rises in cost due to changing conditions can be amplified into massive price explosions, as seems to be partly the case for the now-deflating commodity and food boom of 2003–2012. This has the effect of creating massive overinvestment with the ultimately perverse result that, once conditions settle down, such strong deflationary pressures emerge that revenue can no longer cover costs, initiating a wave of bankruptcies that bring down costs for the next generation of producers. Production for profit stamps agriculture, with growers changing the crops they offer according to the shifting winds of the market and a series of complex guarantees from states. What is grown first is money, and only then food for human needs.

The rise of contemporary logistics has enabled a shift from so-called "push production" models. In push production, suppliers build out capacity and output, first, and then subsequently clear the market through promotions and sales. In "pull production," output is linked directly to demand signals, with retailers replacing inventories as they are sold. The limit case, and the ideal for firms like Walmart and the network of suppliers, is one where items aren't produced until they have already been purchased. Inventory never builds up anywhere, and stocks are kept near zero. Pull productions effect a shift in power from producers to retailers or, in some cases, distributors. In agriculture, one notices that distributors such as Cargill and Archer Daniels Midland have enormous power, but retailers or producers for consumption such as Walmart and McDonald's can also cut out distributors and go directly to farmers. Under logistics, supermarkets become a new locus of power.

The combination of the logistics and green revolutions has led to an increasingly wasteful food supply system. One might think that elimination of standing inventories from retailers and distributors would make for less waste, but unlike manufacturers, food producers have far less ability to alter their output. Agriculture has relatively long turnover times, and farmers have to make decisions about output levels far in advance of actual sale, all while anticipating the possibility of a bad harvest due to uncontrollable factors. They often make advance contracts with distributors and retailers, but given unpredictability, find it more profitable to overproduce, as the costs of producing too much are lower than the opportunity costs of producing too little. In other words, push production remains the norm in agriculture, despite the demand-side dominance of the industry, and thus producers are often left with more food than they can sell at decent prices. Supermarkets also have stringent aesthetic and quality standards, rejecting agricultural products that do not conform to rather superficial consumer values. And because retailers and distributors now dominate, their contracting allows them to switch from supplier to supplier, forcing the costs of compelled

overproduction further down the value chain. This dynamic results in a staggering scale of food wastage, with somewhere between 29 percent and 34 percent of all food produced globally not consumed.[42] In industrialized countries, a good portion of food wastage happens during consumption, as food rots in refrigerators or pantries. But the relative power that logistics has given retailers and distributors over farmers is a big part of the problem. As the edges and vertices of the food system multiply, so too do the cracks into which food might fall, never reaching human bodies. The reorganization of the food supply by the green revolution has doubtless led to increased output per acre, but it has done so while massively amplifying waste and severely compromising its ability to meet human needs. The system looks highly inefficient even before we begin to consider energy-intensive and water-intensive methods for production and distribution, and how much they contribute to total carbon emissions and, in turn, destructive climate change that will adversely affect food production. In Moore's account, the ratio of energy calories to food calories has almost doubled since the 1970s and grown by almost ten times since the 1930s under "petro-farming" conditions.[43] Scaling up such a system to meet the needs of nine or ten billion people will be difficult, to say the least. Doing so while reducing overall emissions and energy use will be impossible.

Revolution and Agriculture

With a few important exceptions, the social revolutions of the nineteenth and twentieth centuries were agrarian revolutions, undertaken in societies that had not yet fully transitioned to capitalism and where agricultural production was still mediated by the conflict between peasants and landlords. Some of these revolutions were led by peasants, as in China, or by alliances between peasants and workers, as in Russia and Spain. In many cases, the rebellious workers were newly proletarianized and still retained some connection to peasant traditions and values. The question of land reform was central in all these cases, as the peasantry was squeezed by the encroachment

of capitalism on one side and the rapacity of the old regime on the other. To say that these social revolutions were agrarian means that their dubious successes had the effect of accomplishing, through various processes of expropriation and violence, what the normal development of capitalism in many other countries could not: in Russia and China, the landlords were eliminated and the productive use of the land entirely reorganized. In other parts of the developing world, the old landed powers retained their hold for much longer, even after the peasantry had been more or less dispossessed, and as a result reorganization of agriculture there has been much more slow going. Yevgeni Preobrazhensky, one of the most clear-sighted of the economists that the Bolsheviks had on their side, explicitly describes what needed to happen in the Soviet Union as a form of "primitive socialist accumulation," displacing the peasantry and converting the land to new use, though he doubtless imagined something different than Stalin's genocidal collectivizations.[44] By 1936, the Soviet Union was producing 112,000 tractors per year, nearly double the number of 1933 and only slightly below the number of motor vehicles produced, part of a massive push to industrialize agriculture.[45] By the 1970s, the Soviet Union was the world's second largest producer of both potassium and nitrogen fertilizers.[46] Though the Soviet food system was mired by chronic shortages and inefficiencies in production and distribution, something that derived from the contradictions of what Hillel Ticktin called its "non-mode of production," this was not for want of industrializing nature. Indeed, the peculiarities of Soviet accumulation made it particularly wasteful, even judged by the standards set by capitalism.[47] Since defects marred nearly all final goods, the system tended to overproduce raw inputs (steel, coal, or cement) in enormous quantities, and to generate stockpiles of intermediate goods that could not be utilized because of bottlenecks in the supply system.[48] The fact that the Soviet system could produce things like fertilizer more easily than it could produce wristwatches or radios no doubt contributed to its high utilization.

An authentic twenty-first century revolution, breaking with

capitalism and all class society, will likewise have to be an agrarian revolution, though in a far different sense than those described above. It will have to radically transform the way food is produced and distributed, not only because the present food system is wasteful, toxic to humans, and environmentally destructive, and not only because climate change stands to radically alter what can be grown and how and where it can be grown, but also because, even more importantly, the capitalist organization of nature as agriculture will, if relied on, entirely incapacitate such revolutions, guaranteeing the restoration of class society. Agriculture as we know it now is saturated with market relations; the distribution of various domesticated organisms across the surface of the planet, as well as the inputs which make their cultivation possible, has been undertaken with an eye toward the maximization of profits first and satisfaction of human needs second. Based on the historical record, we must assume that revolution will break through — that is, defeat the reigning powers, and find itself in possession of the means of production — in isolated zones first, as part of a global revolutionary wave. The partisans in such situations will find among their most immediate tasks the maintenance of an adequate food supply, most likely under conditions of civil war. In modern societies, maintaining the food supply depends, in turn, on several other essential industries and infrastructures: for water and energy, for transport, and for the manufacture of the goods used directly or indirectly by agriculture.

Revolutions cannot survive persistent food shortages, inasmuch as the absence of food activates the most powerful forms of self-interested and survival-oriented activity, even among those who are committed to the revolution — pilfering, hoarding, marketeering. Exhorting people to sacrifice and discipline will only work for so long; eventually a split will emerge, between the activist minority fanatically devoted to the revolution, even unto the point of death, and those masses whose attachments are weaker, who want the revolution to succeed but will withdraw their support when the risks are too high, the prospects uncertain, and the miseries unbearable. In most

revolutions, the activist minority turns, at this point, from moral exhortation to violent coercion, inducing even more demoralization, distrust, and disaffection. The Bolsheviks provide an object lesson; having earned the distrust of a partially sympathetic peasantry during the war years, when the Red Army was in the practice of seizing grain, they encountered intractable underproduction and hoarding of grain during the 1920s. The Bolsheviks concluded that they could regain control over agricultural production only by violently dispossessing the peasants, arrogating to themselves a degree of state power that assured the revolution was definitively dead, albeit a better-fed sort of dead. In Civil War Spain, where many of the partisans were significantly more skeptical of state power and violent coercion, and committed to democratic ideals and participatory, locally controlled organization of agriculture, the fact that the Francoist rebels controlled the rich grainlands and cattle-grazing areas of the Southwest meant that the Republic and its armies were continuously undersupplied. The predicament induced all manner of cynical, opportunist, and survival-oriented behavior among peasants and townspeople that only increased as the militants betrayed their democratic ideals and instituted forms of military policing and punishment in order compel compliance.[49] Revolutions that rely on such police action in order to insure compliance — which is not at all to argue against the use of violence as defense against counterrevolutionary forces — effectively sign their own death warrant.

Fortunately, twenty-first-century revolutions will not have to reckon with the problem of the peasantry, especially if we define peasants as those who produce for their own subsistence first and for the market second. Almost all global agricultural production is market-oriented now. In developed countries like the U.S., while the number of farms has stayed the same for decades at around a few million, many owner-operator enterprises generate negligible output (with the owners usually working elsewhere); a few hundred thousand farms generate most output, a number that has fallen decade after decade as average farm size rises. As such, the number of people

who control the land differs from that of Russia or Spain by a few orders of magnitude, and most of these farms are highly capitalized if also noncorporate enterprises that employ significant numbers of workers. These people will need to be won over to the cause or expropriated, but they form an incredibly tiny minority compared to the great masses of people that would be involved in such an undertaking. In less-developed countries, control over agricultural resources is more fragmented and involves a higher number of underclass people, but still fewer people than the thoroughly peasant-based societies of old.[50]

More significant will be the problem, seen already in the Spanish case, that revolutions confront when they discover that neither the necessary means of subsistence, nor the means to produce such means of subsistence, exist within the revolutionary zone. In such conditions, partisans will have to decide between, on one hand, trading with capitalist partners for necessaries and therefore organizing production for export or, on the other hand, radically reorganizing agriculture in order to meet endogenous need. If the partisans choose trade, they expose themselves to the powerful disciplinary effects of the global market and the law of value, needing to produce at competitive levels, even when they do not confront more active intervention in the form of embargo and blockade. Capital flight happens immediately in conditions of political instability, and in all likelihood, by the time the reigning powers have been deposed, international capital markets will have exerted profound disciplinary pressure, offering credit under the most punitive terms. Since exchange rates are connected to the credit system, everything imported will cost much more. Unless revolutionaries try to go it slow and not freak the credit markets, guaranteeing their total ineffectiveness (see, for instance, the sad fate of SYRIZA), the only solution that import-dependent revolutions will discover is to hyperexploit their producers in order to maintain competitive terms. But revolutions generate conditions in which managerial control over the workplace breaks down entirely; productivity levels will certainly fall, especially if wages and money

continue to be used, fostering antagonistic relations in the workplace. The only way to raise productivity for partisans in such conditions will be through indirect and direct violence — instituting systems of incentive and punishment that will run, probably very quickly, from the use of piece rates to the establishment of work camps. This is precisely what happened in Spain, accepted as baleful necessity even by the erstwhile libertarians. The result: massive demoralization, insubordination, and all but the most fanatical turned against the revolution as a matter of survival.

Recognizing that this way lies certain failure and that revolution will not break through globally in the short time frames that would be necessary to prevent the relative isolation of revolutionary zones, one can only hope that partisans will try a different way, reorganizing agriculture (and everything else) in order to meet existing needs independent of trade with capitalist enterprises and powers, or with, at the very least, a very small amount of such trade, not large enough to induce the crippling effects described above. I take as my framework here a view that the horizon of revolution in our time involves "communization" of all resources and relations: that is, the immediate abolition of money and wages, of state power, and of administrative centralization, and the organization of social activity without these mediations on the basis of direct, personal, or immediate social relations.[51] The inherited impasses of the logistical reorganization of production are one of the reasons why I think revolutionaries will turn to communization, but they will do so in situations in which various factions are trying out different paths and in which state power and trade may continue to exist at the same time as people are breaking with them, inaugurating a revolution within the revolution and attempting to organize in order to meet their needs directly.[52]

As far as food production goes, this will mean, by necessity, a return to the old nineteenth-century project of abolishing the division between town and country and recognizing more clearly Moore's double internality, a project that will involve everything

from neighborhood gardens and urban farms to large-scale farming projects at the suburban perimeters of various towns and cities as well as the replanting and reorganization of vast tracts in agricultural heartlands. Even when the revolutionary zone is rather large and production at a distance of thousands of miles is possible, the sensible path will be to localize food production as much as possible, not only in order to cut down on energy use in transportation but also to establish a situation in which some large portion of people's food needs is immediately available and ready to hand, within some reasonable distance, making it much harder for them to be subjugated by a bureaucratic layer, a hostile power, or an emergent attempt at capitalist restoration. Partially localizing the production of foodstuffs and other necessaries would obviate the need for money or pseudo-money, wages or labor tickets, allowing the ready-to-hand goods to be distributed on demand, with a relatively low level of administration. Production and distribution of the fruits of social activity could, on this basis, happen voluntarily and freely; even if money and exchange persisted on the fringes for a time — most likely due to the presence of different factions, pursuing different revolutionary paths — if most of what people needed to live were organized this way successfully, on a communist basis, communism would stabilize. And if it stabilized it would spread, as the existence of people meeting their own needs and thriving without the mediation of money, wages, or violent compulsion would be enormously destructive for capitalism and class society elsewhere. It would mean either the beginning of the end for class society or the moment at which class powers gathered their forces to extirpate the threat. Although the aspiration of communism is to be global and universal (if also full of endless internal variation) and to establish a situation in which everything belongs to everyone and no human has more of a claim on the necessaries of life than any other, it must begin somewhere. Previous generations of communist theorists have misunderstood the transition to communism as temporal in nature, passing through the intermediate stage of socialism, when it is in fact better thought of as spatial transition: the geographical

spread of an immediately social communism that is contagious for the precise reason that it is fully realized. Such geographical extension will itself take time, however, and even though communization means the establishment of immediately communist relations, the material basis of such relations as well as the processes through which they are effected will no doubt develop, deepen, and stabilize in time.

In a thoughtful essay on contemporary logistics, Alberto Toscano asserts, contra my views here and elsewhere, that "the world market remains, in however arduous a way, a presupposition (not a framework!) for any transition out of capitalism."[53] Toscano suggests that I am more right than I know: the reorganization of global production has made breaking from the world market not only difficult but impossible. On one aspect of the problem, we agree: revolutionaries will undoubtedly use, when possible, the technologies of transportation and storage upon which the world market depends. But they will find such resources inadequate and even, in some cases, inimical to their needs: located in the wrong place, designed in the wrong way, and so on. The world market is a presupposition, inasmuch as it is the world revolutionaries inherit, but it is a presupposition that will provoke, by its very inadequacy, new techniques and methods. The market is more than a means for distributing necessary goods in space; it is the circulation of such goods as mediated by exchange, stamped by the contortions of the law of value. Markets involve numerous activities — banking, retailing, advertising — that have no reason for being aside from exchange and no purpose except for the reproduction of the commodity form, that is, production for exchange.

Many of these counterarguments derive their force from a commitment to Marxist modernism, a belief not only in the progressive character of technological development but the "civilizing" effects of the world market, which, for all its violence, breaks down national and cultural barriers and provides the basis for international proletarian solidarity. For many, the scenarios described above violate a deeply held commitment to "internationalism" and an allergy to "socialism in

one country." Evaluating the contemporary conjuncture with a crudely dogmatic schema inherited from the 1917 revolutionary sequence, these critics confuse a set of normative positions on international proletarian organization and solidarity with a description of the actual conditions in which revolutions will unfold. Obviously, *it would be better* if revolution could break through in several parts of the world all at once. But revolutions occur on the basis of what is, not what ought to be. The problems described here depend very little on the character of organizing; even if there are proletarian organizations linking struggles in different parts of the world, proletarians in zones where they do not control the resources will be limited in their ability to help the revolutionary zones, except inasmuch as they force revolutionary breakthrough where they are. This should not in any way be seen as an acceptance of the framework of national boundaries and the nation state as the basis for a revolutionary unfolding. On the contrary, the immediate establishment of communist reproduction and relations, making it easy for people to feed themselves directly and without money or centralized administration, dissolves state control and national designation, producing rifts within and across national boundaries. The opposition of "internationalism" to "nationalism" discounts the ways in which Marxist internationalism was, in practice and as far as the Second and Third Internationals were concerned, something that proceeded *through* nation states and on the basis of nationally coordinated blocs of proletarian power mediated by the world market. The necessary turn to communization described above would do more to destabilize the nation and state power than those forms of "internationalism" that take these institutions as their basic presuppositions.

Neither would this revolutionary trajectory involve what Toscano calls a "re-ruralization, where social form is based on comradeship, friendship, or some kind of band of brothers bond."[54] Overcoming the division of town and country would mean the end of the rural, through processes involving at a minimum tens of millions of people and probably hundreds of millions if not billions; it would involve

the coordinated distribution of necessary and useful things at all sorts of scales from the immediately local to the intercommunal and across the revolutionary zone. The salient distinction, however, is that such coordination would take place under conditions in which as many basic and necessary goods as possible are generated close to those who need them, making it much more difficult to dispossess or disempower people, who would both understand and have control over the processes that matter for them. This is what is at stake in the abolition of the division between town and country. Nonetheless, one need not fear a retreat into autarkic, isolated communities, which is as impossible as remaining tied to the world market. Many infrastructures, such as those for water or energy, will require coordination at scale, as will the generation of many necessary and useful goods. Furthermore, not all food production can be shifted close to where people live, nor can people be quickly shifted to the places where food is grown without great suffering, and until a reorganization of towns and cities through processes of voluntary resettlement can take place, people will no doubt rotate seasonally out to the agricultural heartlands where food is currently produced.

In the scenarios described above nearly everyone would have some hand in growing the food they eat. In such a state of affairs, agriculture would doubtless become more effort intensive in the developed world, as breaking with the world market will leave many without access to the machines and fertilizers and pesticides that industrialized agriculture uses today. This is not such a problem: as a share of total human effort, the amount of time devoted to agriculture in countries such as the U.S. could increase by a factor of ten and still not account for a very large part of people's overall activity. In the developing world, agriculture would no doubt become less effort intensive by eliminating the need for the poorest producers to work the most marginal plots of land with the worst techniques and equipment. This is not to imagine anywhere some regression to premodern techniques and relations. Agriculture will be immediately social, rather than organized by family or clan (or capitalist firm), and people

will doubtless continue to employ many of the technologies, if not the chemicals, used to grow food today. There will surely be tractors and other machines for working the earth and harvesting its fruits, trucks for the transport of produce, but these will, I suspect, exist alongside methods that rely more on the human hand, associated with permaculture, mixed planting, and other "traditional" techniques. In certain areas, people may find it impossible to meet their food needs without synthetic fertilizers and as such will have to figure out, for instance, how to run the ammonia plants and supply them with natural gas or track down phosphorus and potassium deposits. In any case, the use of such fertilizers will surely decline, if they are not eliminated altogether. Agriculture under such situations will involve a mix of high and low technique, where methods are selected for their suitability for human needs and their ecological imprint rather than their usefulness in production for profit.[55] Though many like to imagine "planning" as only referring to centrally administered production occurring at national or international scales, any activity that is social at any sort of scale will involve planning — though not central planning — and partisans in the scenarios I imagine will need to engage in various infrastructure projects: for irrigation, for the recycling of organic wastes, and for energy generation and transmission.

Revolution and its Motive Forces

Speculation of the sort I engage in here is essentially impossible without making assumptions about the kinds of choices people might make in such a scenario, and this implies speculating, as well, about the reasons for those choices. I take as my baseline an assumption that people organize their lives with an eye to their own survival and well-being and the survival and well-being of those they care about, where the radius of care can be as small as the family nucleus or "friend group" but far more expansive as well. This makes thinking about a less destructive organization of nature both human and extra-human extremely difficult. Most attempts by anti-capitalists to think

through meaningful political response to the ongoing ecological catastrophe that is capital fail because of their inability to reckon with human motives and with the fundamentally human-centered character of human action. The absence of significant response to the mass extinction wave sweeping the planet, not to mention the mounting certainty that anthropogenic ecological change will have profoundly negative impacts on human life in the near future indicates that, unless their immediate well-being is at stake, people are unlikely to engage in the risky, difficult action that revolutionary change requires. The exceptions to this comparative quiescence almost always occur in the case of groups, such as Indigenous or agricultural communities, whose livelihood and social forms are endangered by ecological destruction. Those who would point to the radically different conceptions of human nature and its relationship to extra-human nature that occur in various cultural formations are no doubt correct, but these conceptions usually articulate the interdependence of human and extra-human forces and therefore do not provide exceptions to the rule of human-centered action, only an awareness that valuing human life means valuing extra-human life as well. Revolutions emerge when human reproduction is at stake, though in some cases people are more aware that human reproduction is also the reproduction of nature. To summarize, the argument of the preceding pages might be understood thus: if twenty-first century proletarians communize the food supply and reorganize agriculture, overcoming the division between town and country, they will do so not because this accords with their ideals but because these communist measures will emerge as the best, and indeed only, way to meet their needs in a revolutionary conjuncture, given the path dependencies of productive resources they inherit from capitalism. Seen from the vantage of the ideal, however, these measures will fortunately also involve a profound break with the toxifying food regimes of capitalism, dumping less carbon into the air and less nitrogen into the oceans and fewer poisons into the groundwater. These ecological benefits will emerge, however, as a result of choices that are more or

less anthropocentric.[56]

Despite its lucid account of the path dependencies fossil fuel technology engenders, when Malm turns to the present crisis of fossil energy, he ends up relying on a normative theory of motives or perhaps no theory whatsoever, giving us an account of what we must do or should do rather than what we can do. In the first pages of the book, he illuminates nicely the strange temporality of anthropogenic climate change. The consequences of fossil energy use present a singularly difficult problem for collective action: by the time their effects are felt most pressingly, obliging people to act in order to preserve their well-being, *it will already be too late*. In a phrase in which we can hear echoes of Marx's discussion of rising organic composition — that is, the rising relative weight of dead labor to living labor — Malm tells us that, with fossil energy, "the causal power of the past inexorably rises."[57] At a certain point, the moment of "too late," one witnesses the "falling in of history on the present," as the weight of past action breaks through the ceiling. Unfortunately, Malm's answer to this predicament leaves much to be desired, relying on wishful thinking rather than sober realism. Malm rejects the "revolutionary" response to ecological destruction — that is, the response which says capitalism is incapable of averting ecological disaster — for the simple reason that revolution will not come quick enough to stop a temperature rise of two degrees Celsius. But deciding that two degrees is your line in the sand does not necessarily mean that anything will be done to stop it. And, of course, too late is relative. There is, when it comes to these matters, bad and worse. We appear to have long missed our chance to avert the bad, if not the worst, and sober analysis may require accepting this fact and preparing accordingly.

Malm's own account of the origins of fossil capitalism and the turn to steam appears to put in question his confidence that climate change can be averted from within capitalism simply because it has to be. His central claim is that capitalism can return to the flow as an energy source, leaving behind the carboniferous stock. However, as he knows, the very properties of the flow which led capital to turn away from

it remain a powerful obstacle to such a transition, haunting wind and solar power just as much as they did the streams of the English midlands. The flow is unpredictable; it cannot be turned on and off at will. This causes a problem for industrialized societies that run on the premise that energy is available on demand, part of an "abstract spatiotemporality" in which neither distance from energy source nor the variable rhythms of natural forces matter at all. One can store the electricity generated but doing so requires manufacture of energy-intensive batteries, such that the ultimate environmental benefits of such a switch are unclear. In confronting this problem, Malm returns to an intriguing counterfactual account he developed when examining the decline of water power: *it might have been possible*, he tells us, to build massive waterworks, capable of delivering steady, reliable energy to various factories, across large distances, had capitalists been able to solve their coordination problem. The competitive urgencies of production for profit, however, made this impossible. If it were the twentieth century, the state might have undertaken such projects, as it would eventually with the highways, railroads, utilities, and other vital infrastructures individual capitalists could not fund on their own. Now, however, it is not the nineteenth century but the twenty-first, and Malm argues that we might "return to the flow" through a massively coordinated global effort, led by states and international organizations, in which the variability of flow energy (due to diurnal rhythms and weather) is rendered predictable through a planetary network of energy transmission from flow sources. Since the sun is always shining and the wind always blowing somewhere, long-distance transmission can, potentially, overcome the unpredictability of the flow, rendering it as homogeneous as stock energy and as capable of meeting the abstract spatiotemporality of capitalist production. It is not at all clear, however, that the energy and emissions accounting will really work in the favor of such scheme — even with high-voltage direct current, much electricity is lost in transmission and those losses increase as a function of distance traveled. Second, the transformers, power lines, and wind and solar fields will themselves require massive

energy outlays to build and install and those costs will also increase as a function of transmission distances. To build clean and cheap energy generation, one will almost certainly have to use dirtier, less-efficient energy, and this may render any benefits nil.[58]

Even if we were to allow for the possibility of producing the materials in such a way that net emissions fall, why would states engage in such a process? As Malm indicates, the resources mobilized by such an undertaking would be massive, on the order of tens of trillions of dollars at least. He makes a comparison with World War II, which is a good benchmark. World wars, however, represent immediate existential threats for states and capitalists and also offer strong opportunities for capital to profit; they also involve alliances that, because of the antagonistic character of warfare, are actually less extensive than the sorts of alliances Malm envisions. The temporality of future threats still obtains in the case of states, and, furthermore, the hurdle is much higher, since a significant fraction of capitalists (petro-capitalists, in particular) will be ruined by such a turn. One must imagine, then, either an international political elite willing and able to act in the interest of human life in general, or a social movement capable of exerting massive pressure on the state. The first scenario is absurd, and the second returns us to the question of motives and the belatedness of action. Such a social movement will appear only when severe consequences of anthropogenic climate change have already begun to manifest. Even if such a turn were likely in the next decade, these states would face the problem of social democratic governments everywhere: infrastructure projects of this sort require, as their primary condition, that states first ensure general conditions of profitability. Otherwise, they will find themselves without sufficient credit or tax revenues. How does one maintain conditions of profitability while ruining a large sector of the capitalist economy and spending trillions of dollars on unprofitable utilities? And how does one do this with a stagnating world economy, mired by low profit rates and high debt overhangs? Here and elsewhere, latter-day social democracy depends on scenarios far less

plausible than the revolutionary ones. Malm might be said to offer a strange inversion of the fettering thesis; instead of attempting to overturn the social relations of capitalism in order to accord with the underlying technical possibilities, he imagines reconfiguring those technologies to suit the requirements of abstract spatiotemporality. Both approaches capitulate to the extortionist logic of the parable of the belly, and therefore preserve, in one form of another, the very forces which will ensure their failure.

In short, we have to accept that our only hope of averting the worst effects of the present ecological crisis lies in the rekindling of revolutionary class struggle in our time, either in response to the first effects of climate change or the continuing meltdown of the world economy. Belatedness, however, is at this point a given, and such a revolution will be forced to reckon with the problems of a warming planet, rising sea levels, acidifying oceans, creeping deserts, depleted water supplies, and the human displacements to follow. The biggest problem for such revolutions will concern energy: how to continue to supply electricity? How to run or replace the motorized machines which require refined petroleum? Answers to these questions will vary from place to place. For the next couple of decades, few areas will find it possible to break free from the stock completely, but by the same measure they will also find themselves compelled to conserve energy sources massively, devoting energy to the most important human needs, in ways that capitalism never could. Renewables will likely form a part of this, though people will need to reckon with the mining processes that some of these technologies involve. The so-called "rare earth" minerals that solar panels and wind turbines require are not actually very rare at all; the extraction processes they involve are, however, so environmentally destructive and toxic at present that they are currently confined to countries, such as China and the Democratic Republic of the Congo, willing to convert hundreds of square miles into toxic "sacrifice zones." In any case, without profit or price mechanisms and without a need for continuous growth, diurnal or seasonal variability of energy supply would be much less

of a problem. Though certain systems will require continuous energy, communism will prove itself much better able to adapt to the rhythms of flow energy, turning machines off and encouraging afternoon naps, perhaps, when the clouds cover the sun or the wind dies.

There are no guarantees, it should be clear: the revolutionary horizons described in the preceding pages are happy outcomes surrounded by tragedy and affliction on every side. The obstacles that capitalism has placed in the path of revolution, defeating all half-measures and vacillations, are formidable indeed. This is a cause for optimism as much as pessimism: because of capital's total transformation of the earth, an immediately communist reorganization of human society makes rational sense today in a way that it did not in 1917. In any case, these are the futures visible from here. Not what must happen, but what can.

Notes

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1. In Livy's history of the Roman republic, patrician Menenius Agrippa relays this older Greek fable of the body politic to the plebeians who have seceded from Rome in protest and encamped on a nearby mountain. Livy, *History of Rome: Books 1-2*, trans. B. O. Foster, Loeb Classical Library, no. 114 (Cambridge: Harvard UP, 1948) 253.
2. G.A. Cohen, *Karl Marx's Theory of History: A Defence* (Princeton: Princeton UP, 1978) 326–341. For a critical response to the technicism of Cohen, see chapters 2 and 3 of Derek Sayer, *The Violence of Abstraction: The Analytic Foundations of Historical Materialism* (Oxford: B. Blackwell, 1987).

3. Karl Marx, *Capital: A Critique of Political Economy Volume I*, trans. Ben Fowkes (London: Penguin Books, 1976 [1867]) 929.
4. Marx, *Capital Vol. I* 549.
5. Harry Braverman, *Labor and Monopoly Capital* (New York: Monthly Review Press, 1975); Raniero Panzieri, "The Capitalist Use of Machinery: Marx Versus the Objectivists," *Outlines of a Critique of Technology* (London: Ink Links, 1980) 44–69; Herbert Marcuse, *One-Dimensional Man: Studies in the Ideology of Advanced Industrial Society* (Boston: Beacon Press, 1991).
6. Nick Srnicek and Alex Williams, *Inventing the Future: Postcapitalism and a World Without Work* (Brooklyn, NY: Verso, 2015). See in particular the section "Repurposing Technology" at the end of Chapter 7, which engages with my argument in Jasper Bernes, "Logistics, Counterlogistics, and the Communist Prospect," *Endnotes* 3 (September 2013) 172–201.
7. Bernes, "Logistics, Counterlogistics, and the Communist Prospect."
8. I am thinking here of the concept, in evolutionary game theory, of "evolutionarily irrelevant equilibria." While most neoclassical microeconomics and game theory model situations of equilibrium, these disciplines rarely consider how such stable states may be arrived at from an out-of-equilibrium situation. Evolutionary game theory tries to distinguish between equilibria that are viable, that might emerge from an out-of-equilibrium situation, and those that are not. Samuel Bowles, *Microeconomics: Behavior, Institutions, and Evolution* (Princeton: Princeton UP, 2004) 63.
9. Srnicek and Williams, *Inventing the Future* 5.
10. *Capital Vol. I* 481–2.
11. Notice how, for Marx, capital's power is a scientific organization of natural forces against labor, establishing a ternary rather than purely binary relation: "The special skill of each individual machine-operator, who has now been deprived of all significance, vanishes as an infinitesimal quantity in the face of the science, the gigantic natural forces and the mass of social labour embodied in the system of machinery, which, together with these three forces, constitutes the power of the 'master.'" (*Capital Volume I* 548.)

12. Andreas Malm, *Fossil Capital: The Rise of Steam-Power and the Roots of Global Warming* (Brooklyn: Verso, 2016), and Jason W Moore, *Capitalism in the Web of Life: Ecology and the Accumulation of Capital* (Brooklyn: Verso, 2015).
13. Moore, *Capitalism in the Web of Life* 5.
14. Karl Marx, *Capital: Volume II: A Critique of Political Economy*, trans. David Fernbach (New York: Penguin, 1993) 283.
15. For a fascinating history of the metabolism concept, see Hannah Landecker, "The Biology of History: From the Body as Machine to the Metabolic Community," (Talk, IAH, Boundaries of the Human in the Age of Life Sciences, November 6, 2015). Parts of this essay began as a response to Landecker's talk: http://sites.psu.edu/iahboundaries/jasper-bernes/. Many thanks to Heather Davis and Michael Berubé for the invitation.
16. *Capital Vol. I* 283.
17. Leo Marx, *The Machine in the Garden: Technology and the Pastoral Ideal in America*, 35th anniversary ed. (Oxford: Oxford UP, 2000).
18. Robert Brenner, "Property and Progress: Where Adam Smith Went Wrong," *Marxist History-Writing for the Twenty-First Century*, ed. Chris Wickham (London: British Academy, 2007), 49–111.
19. Marcel Mazoyer and Laurence Roudart, *A History of World Agriculture: From the Neolithic Age to the Current Crisis* (New York: Monthly Review Press, 2006) 313–353.
20. Mazoyer and Roudart, *A History of World Agriculture* 355–372.
21. Moore, *Capitalism in the Web of Life* 248.
22. *Capital Vol. I* 637.
23. Karl Marx and Friedrich Engels, *The Communist Manifesto* (New York: Penguin Books, 2002) 244.
24. Quoted in CDW, "The Transformation of Social Relations," *International Review* 14.25 (1996).
25. August Bebel, *Woman Under Socialism* (New York: New York Labor News Press, 1904) 316.
26. Quoted in CDW, "The Transformation of Social Relations."
27. Marshall S. Shatz, *Kropotkin: "The Conquest of Bread" and Other Writings*

(Cambridge: Cambridge UP, 1995) 68–74, and Elisée Reclus, *The Evolution of Cities* (Petersham: Jura Books, 1995), https://libcom.org/files/Reclus%20-%20The%20Evolution%20of%20Cities.pdf.

28. See Kristin Ross's writings on the aftermath of the Commune for an account of the way these themes cut across the lines drawn between anarchists and Marxists. Kristin Ross, *Communal Luxury: The Political Imaginary of the Paris Commune* (Brooklyn: Verso, 2015).
29. *Capitalism in the Web of Life* 75–91.
30. Karl Marx, *Capital Volume III*, trans. David Fernbach (New York: Penguin, 1991) 949.
31. *Capitalism in the Web of Life* 84.
32. *Capital Vol. I* 283. For a dialectical exploration of these themes, see Alfred Schmidt, *The Concept of Nature In Marx* (Brooklyn: Verso, 2014).
33. For a discussion of the nitrogen cycle and its manipulation by humans throughout history, see Vaclav Smil, *Enriching the Earth: Fritz Haber, Carl Bosch, and the Transformation of World Food Production* (Cambridge: MIT P, 2001). Nearly every agriculture system has emerged as an attempt to conserve or, in the case of slash and burn, gain biologically available nitrogen, as well as other important nutrients (phosphorus, potassium). For a history of these systems, see Mazoyer and Roudart, *A History of World Agriculture*.
34. Malm, *Fossil Capital* 309–315.
35. For a corrective account, see "History of Subsumption," *Endnotes* 3 (April 2010) 130–54.
36. See Hitchcock in this volume.
37. Intriguingly the argument formally resembles the fettering thesis with its idea of mismatch between energy source and labor process. Unlike the fettering thesis, though, Malm's argument describes a mismatch between different technical regimes, rather than between technique on the one hand and social relations on the other.
38. Joan Robinson, "Shedding Darkness," *Cambridge Journal of Economics* 6.3 (September 1, 1982) 295.
39. For a lucid, though technical, treatment of simple and expanded capitalist reproduction in terms of stocks and flows in time, see Duncan

K. Foley, *Understanding Capital: Marx's Economic Theory* (Cambridge: Harvard UP, 1986) 62–90.

40. Calculated from Table A1A WTO, "International Trade Statistics 2014," 2014, https://www.wto.org/english/res_e/statis_e/its2014_e/its14_appendix_e.htm.
41. Alberto Jerardo, "Import Share of Consumption," United States Department of Agriculture (2016), *Economic Research Service*, http://www.ers.usda.gov/topics/international-markets-trade/us-agricultural-trade/import-share-of-consumption.aspx.
42. Calculated from Jenny Gustavsson et al, *Global Food Losses and Food Waste: Extent, Causes and Prevention* (Rome: Food and Agricultural Organization of the United Nations, 2011) 5.
43. *Capitalism in the Web of Life* 252.
44. Eugenii A. Preobrazhensky, *The Crisis of Soviet Industrialization* (London: Palgrave Macmillan, 1980) 20–30.
45. Donald A. Filtzer, *Soviet Workers and Stalinist Industrialization: The Formation of Modern Soviet Production Relations, 1928-1941* (Armonk: M.E. Sharpe, 1986) 126.
46. CIA, "Soviet Fertilizer: Expansion of Output and Exports," March 1975, *CIA Reading Room*, https://www.cia.gov/library/readingroom/docs/DOC_0000316269.pdf
47. Hillel Ticktin, *Origins of the Crisis in the USSR: Essays on the Political Economy of a Disintegrating System* (Albany: M.E. Sharpe, 1992) 33.
48. Filtzer, *Soviet Workers and Stalinist Industrialization* 254–271.
49. Michael Seidman, *Republic of Egos: A Social History of the Spanish Civil War* (Madison: U of Wisconsin P, 2002), and Michael Seidman, *Workers against Work: Labor in Paris and Barcelona during the Popular Fronts* (Berkeley: U of California P, 1991).
50. Many of these semi-peasants are forced by the overproduction of the market elsewhere to farm with the most rudimentary of techniques on the most marginal land, contributing very little to overall output, which is to say that overproduction in certain countries leads to underutilization of the land elsewhere, and a large population of people who remain in the countryside but are more or less dispossessed. Mazoyer and

Roudart, for instance, argue that problems of undernourishment in the developing countries and not at all technical but in fact social (*History of World Agriculture* 440–491).

51. For a good description of communization as practice, see Gilles Dauvé and Karl Nesic's explanation from *Troploin*: https://libcom.org/library/communisation.
52. I borrow this conception of communization as revolution within revolution from Theorie Communiste: R.S., "Self-Organisation Is the First Act of the Revolution; It Then Becomes an Obstacle Which the Revolution Has to Overcome," *Revue Internationale Pour La Communisation*, September 2005, http://meeting.communisation.net/spip.php?page=imprimir_articulo&id_article=72.
53. Alberto Toscano, "Lineaments of the Logistical State," *Viewpoint Magazine* 4 (Fall 2014) https://viewpointmag.com/2014/09/28/lineaments-of-the-logistical-state/.
54. Toscano, "Lineaments of the Logistical State" 4.
55. For an account of the necessary mixture of high- and low-tech in future agriculture under conditions of climate change, see the article "Contemporary Agriculture: Climate, Capital, and Cyborg Ecology," *Out of the Woods*, July 27, 2015. They emphasize the plasticity of "traditional" farming systems and their ability to incorporate practical, modern technologies where useful.
56. This is a difficult point, and one that requires more attention than I can give it here, not least because of the difficulty of speculating about human motives in general. While revolutions are ineluctably human-centered, not all action is, and people are for the most part not simply indifferent to their effect on extra-human nature. Given a choice between two ways of arranging their lives that seem more or less equally acceptable, where one will lead to the degradation of ecosystems, the death or diminishment of species, most people will choose the kinder path. They will even, in many cases, give up substantial comforts for the sake of the birds, rivers, and forests. But these values are, for the majority of people at least, too weak on their own to provide the motive force for revolutionary change. One way to think about a classless

society of the sort described above is as a situation where, inasmuch as everyone's needs are met, people can value the flourishing of life as such for its own sake. Furthermore, once people are no longer driven by the day-to-day demands of survival, on the one hand, or the imperatives of accumulation on the other, they can begin to think about the generational effects of their actions and may care about human effects on extra-human nature for reasons that are, in the end, human-centered. I hope to develop a theory of revolutionary motives adequate to these questions elsewhere.

57. *Fossil Capital* 9.

58. For a more pessimistic take, see this piece by former researchers at a Google-sponsored initiative to develop cheap renewable energy. They argue that even if one could develop renewables to replace all electricity, it would still be impossible to reduce emissions significantly, partly because capitalist producers would not switch over quickly enough. Their argument assumes, like Malm, transition within capitalism. Ross Konigstein and David Fork, "What It Would Really Take to Reverse Climate Change," *IEEE Spectrum,* November 18, 2014, http://spectrum.ieee.org/energy/renewables/what-it-would-really-take-to-reverse-climate-change.

Energy Imaginaries: Feminist and Decolonial Futures

Sheena Wilson

> We understand nothing about impasses of the political without having an account of the production of the present.[1]

One of the many radical changes inaugurated in the United States on January 20, 2017, was an environmental vision dramatically at odds with the COP21 agreement, which had dominated headlines only a year earlier.[2] Under the banner of "The Most Important Climate Stories in 2015," *Wired* magazine led with "The Paris Agreement" and an image of the Eiffel Tower, explaining the significance of the fact that after twenty-one years of trying, 194 countries had come together to agree not only to a climate target but to the rather "lofty goal" of "keeping average global temperatures well below 2 degrees Celsius, and as close to 1.5 degrees Celsius as possible."[3] Now, with the Trump administration's position on climate change, the commitments of the other 195 signatories to the climate agreement become all the more urgent. The competing interests articulated in these two moments of media spectacle can be read as figures for the ongoing impasse that defines current climate politics in North America and beyond — what I see as a result of an atrophy of the imagination that blockades transformative action. In this chapter, I explicitly relate the affective impasse of the politics of energy to its material production, reproduction, and uneven distribution, to ask: What does energy do? What is energy for? What from the age of oil is not working? And, most critically, for whom is it not working? More specifically, this chapter

triangulates the historically specific confluence of cultural, affective, and economic imaginaries by grounding this discussion in the world-after-oil that Jonathon Porritt creatively, albeit polemically, sketches out in his book *The World We Made: Alex McKay's Story from 2050* (2013). Through an intersectional feminist reading of this text, I illustrate the limits of current mainstream imaginaries, and I argue that taking leave of oil as our main energy source could provide opportunities to develop more socially just ways of living that put the concerns of those most exploited — women, people of color, and the global 99 percent — at the core of energy transition politics. What is required to achieve this is an energy transition that confronts and comes to terms with the systemic violences of the age of oil that rely on logics of white-supremacist-cis-heteropatriarchal-neoliberal-setter-colonial-petro capitalism deployed in the names of development, economic growth, energy security, and a host of other seemingly innocuous terms, which abstract the ongoing pillage of natural resources and the exploitation of bodies marked by race, class, and gender around the world. The antidote to these ways of thinking and being in the world is, to my mind, the reintroduction of Other knowledge systems and world views, including but not limited to feminist and Indigenous, which can help us collaboratively imagine and collectively move toward socially just — decolonized and feminist — energy futures.

Energy Impasse

We currently find ourselves at an impasse, unsure about how to transition to less carbon-intensive energy systems on the scale and within the timeframes required by the climate crisis. This energy impasse is the political, economic, and environmental deadlock created by the limits of Western ontologies and epistemologies that need to be newly thought. The task ahead is daunting, but is also rich with possibility. Instead of thinking of impasse as simply a "foreclosure of possibility," it can be understood (as we in the *After Oil* collective have argued) as a moment of "radical indeterminacy… in which we might activate the potential obscured by business-as

usual.... This moment is the transition to a society after oil."[4] A society "after oil" does not imagine a world without any oil products, but rather a world that is not predominantly powered by fossil fuels; in other words a world whose social systems and cultures are no longer shaped by the relations of petro-capitalism but by alternative configurations of energy and political economy. Which energies power future economic and political systems, and how they give form to our lives, depend on how we think and mobilize through this impasse. The impasse is the outcome of a complex set of contradictions inherent to the political economy of fossil fuels. In short, the path to transition is laden with political blockades, largely of our own making, as we confront infrastructures and superstructures of a society mired in and largely committed to ways of being and doing that are, in and of themselves, the root cause of the current crisis: imperial extractivist cultural values and their related economic valuation. Creative energy solutions of all varieties — social, economic, political, techno-scientific — are being stymied by Western worldviews, which inevitably define the contours of our systems, social realities, and, therefore, in many cases, the limits of our imaginaries. How people embark on an energy transition in different local communities and at a global scale has the potential to either intensify the inequities that have been generated by oil-fuelled capitalism, or allow for the reintroduction of other non-patriarchal, non-Western ontologies erased by histories of conquest and domination in the interest of profit. Feminist, Indigenous, decolonial, and anti-capitalist visions for caring newly and differently for our ecologies can in turn create ecologies of care.

Many of the potential trajectories of the energy transition impasse are as yet unmapped and unmappable, as are their outcomes. To mobilize energy transition, therefore, demands the courage to act in the face of multiple unknowns. A transition away from fossil fuels has no template. There is insufficient knowledge of how we adopted earlier forms of energy and shaped our systems to suit those sources. Even when models of transition exist, they prove inadequate to the

current challenge: never before in human history have we had to make an intentional energy transition on a global scale at such speed. We have an unreliable understanding of energy histories, and the ecologies of the future are taking shape in often unpredictable ways. These unknowns are disconcerting and destabilizing. But it's precisely for these reasons that affect has an important role to play in energy transition, as it so clearly does in the many current efforts to resist or deny the need for change. Any materialist critique that fails to account for affective production will fail to fully conceptualize the impasse we find ourselves in. Without a comprehensive understanding of past energy transition, we must have, as Lauren Berlant counsels in *Cruel Optimism,* an "account of the production of the present" to imagine an alternate future.[5]

It is in this light that Porritt's *The World We Made* is of interest, not for the vision of the future it promotes but for the fact that the future imagined in the book captures and illustrates the dangerous and irresponsible ideas that dominate our contemporary mainstream media and political discourses. Porritt's future is grounded in the *zeitgeist* that promotes incremental technological and economic solutions as all that are needed to manage the current environmental crisis. It is a fantasy that promises those of us in the West that we will be able to conveniently replace one form of energy for another and continue to live as we always have. This self-serving vision is increasingly informing both right- and left-leaning political and economic corporate and government practices and policies, gaining support among leading capitalists and entrepreneurs around the world.[6] The flawed fantasy of *The World We Made* is one of radical sameness — business as usual disguised as radical innovation — that does not account for the different paths that alternative energy production can and will necessarily forge. Nor does it express any self-awareness of how privately controlled paths constrain the ways that we might imagine commonly held alternative energy.

It is urgent and necessary to identify and unmask those imaginaries, of which *The World We Made* is only one example, that

limit the possibility of the moment by promising to salvage the "benefits" of the age of oil. The benefactors of such imaginaries are largely found in the Global North; thus the flip side of their promise is, of course, the perpetuation of the inequities of the age of oil suffered by the most precarious citizens (women, children, people of color, and those located in the Global South). In undertaking an analysis of these imaginaries, it is critical to interrogate successful visual and textual rhetorical strategies being deployed to dominate specific energy transition directives, in order to reorient them to promote other energy transition possibilities. These could help to build the interest and momentum necessary to trigger a more socially just energy transition informed by a range of feminist and Indigenous knowledges, and allow those 195 countries to realize not just a 1.5 degree target, but new futures organized differently around other energy sources. In so doing, we can begin to collaboratively uncover past stories and weave future narratives that reintegrate feminist (at times possibly Marxist-feminist) and Indigenous knowledges and histories that have been scrubbed from patriarchal capitalist accounts of the present.

The ontologies of modernity that have shaped the global present limit our ability to imagine other futures. For women, Indigenous people, and for most in the Global South, these ways of thinking the world are not of our own making; they have been passed down to us and have now been proven obsolete. Prevailing modern logics have been, through time, sanitized of non-patriarchal modes of thinking and being, namely feminist and Indigenous modes. While some of these date back millennia, grounded in religious and cultural beliefs about what it means to be human and to live in society, much of what we have inherited are products of Western Enlightenment modes of relating to the world.[7] Cartesian dualism nurtured a worldview that separated mind from body, human beings from nature and from one another, resulting in racial and gender subjugation, conquest, and colonialism. Adam Smith's vision of social and moral harmony through self-interest was radicalized and formalized into Rational Choice

theory. Then there are the scientific (and pseudo-scientific) notions of survival of the fittest that have fed notions of economic competition between individuals, classes, and nation states. Likewise, Keynesian models of utopian progress and economic growth are just some of the many theories and worldviews that inform our current Western realities, with our high standards of living and our excessive and consumption-heavy ways of being.[8] Starting with Westphalia in 1648, modern humans have reproduced the nation-state structure rather than the historically small local communities organized through social obligations to family and community. These post-Westphalian logics were (and continue to be) organized around control of labor forces, nature, and resources. They were (and are) intended to strengthen the nation state and, at least at the level of ideology, to benefit the body politic. However, in a less abstracted sense, they also function for the profit of an elite few. These logics were never formulated to function cohesively on a planetary scale. Therefore, new logics are needed to address global governance within a generation or two from inside our current conundrum and without the luxury of objectivity or distance.

Art, Research Creation, and Positive Affect: Strategies for the Impasse

As both members of local communities and as part of a larger global network of systems, we must aim to collectively move from knowledge to transformation (knowledge => transformation) before all of our creative energy and will to transform has burned out or, as Lauren Berlant says, before "the situation destroys its subjects or finds a way to appear as merely a steady hum of livable crisis."[9] In an effort to motivate change, environmental campaigns have presented us with endless facts, stories, and images of climate crisis and our own destructive potential. Despite herculean efforts on the part of many progressive individuals and organizations around the world, nations and their populations seem incapacitated to (re)act. The significant shifts required of us at the scale necessary — from global governance (both in terms of the policies produced, as well as the role of the

nation state, which is proving inadequate to the challenge) to the reproduction of daily life — have simply not occurred. Business as usual carries on and, in fact, economic crisis is exploited as profitable opportunity, manufacturing endless needs/desires and greenhouse gases.

These grim realities and our failure to respond adequately have provided a heightened awareness of the disjuncture between knowledge and transformation. As Slavoj Žižek has articulated so brutally, riffing on Fredric Jameson, "it seems easier to imagine the 'end of the world' than a far more modest change in the mode of production, as if liberal capitalism is the 'real' that will somehow survive even under conditions of a global ecological catastrophe."[10] However, I'd argue that doomsday eco-narratives are not working to produce fundamental change. In "It's Not Climate Change, It's Everything Change," Margaret Atwood, one of Canada's greatest living novelists and an avid advocate for the environment, creatively outlines a range of competing optimistic and pessimistic future narratives. Positioning hopeful and foreboding visions against one another, and in relationship to what is needed next, Atwood's essay taps into potential solutions — some of which already exist and others that are emerging.[11] Similarly, scholar Stephanie LeMenager rightly articulates, in theoretical terms in *Living Oil*, "the relay of media → empathy → action."[12] From a feminist or Indigenous perspective, empathy, not just knowledge, clearly plays a role in action or stasis. In fact, the potential of positive affect (such as empathy), deployed from a right-of-center perspective, has been instrumental in creating the current moment, whether for ideological and political ends or as part of advertising campaigns promoting consumer lifestyle as the key to happiness and satisfaction. Recent strategies by environmental activists and artists have, likewise, experimented with more positive affective visual and textual narratives that allow room to imagine our way out of the current conundrum.

One of the first and most extensive examples of this tactic — to mobilize optimism and happiness in relationship to climate change

— is Jonathon Porritt's fiscally and politically conservative vision for environmental mitigation and sustainable capitalism in *The World We Made*.[13] In a 2013 CBS interview, Porritt claims that through this book he has attempted to engage people's affect to make environmental issues "personal" (that is, accessible).[14] Indeed, Porritt's fictional scrapbook aims at moving us through the impasse caused, in part, by what LeMenager has termed "petromelancholia": the grief felt for the end of (petro-)modernity and our collective mourning for the loss of cheap and easily accessible oil (in a time before tar sands extraction, ultra-deep ocean and ice/Arctic drilling, and fracking). As a creative research project of the future, *The World We Made* aims to creatively bridge the gap between knowledge and transformation by addressing the petromelancholia that leaves us immobilized: subverting these feelings with positive affect — with optimism.

As a variation on what Naomi Oreskes and Eric M. Conway have termed a science-fiction historical novel — or more specifically a collective science-fiction historical scrapbook — this book makes full use of visual and textual rhetoric, addressing both the age of oil and arguably the age of the image, as photography is itself a product of oil.[15] Published by Phaidon, this research-creation piece also aims to attract an audience interested in art and high culture. The story is narrated by fictional character Alex McKay and his students, reaching from 2050 all the way back to the year of McKay's birth in 2000, but focusing on the last nineteen years of his career.[16] It makes use of its multi-genre platform of text/story and artwork. A bright sunny yellow cover that parallels the positive science-based vision of the future wraps around graphs, maps, hand-drawn sketches, aerial photography, microphotography, handwritten notes, blueprints, copies of posters, magazine covers, manifestos, and other political materials. The combination of text and image not only narrates but visualizes for readers and audiences a future already physically mapped out in vivid color. Published in October 2013, the story flirts with nonfiction, including endnotes and an index of researched materials, weaving together seamlessly the speculative elements

with existing technological experiments around the world. At this level, the book plays a game with readers: it allows for — demands even — an interactive engagement with a wide range of issues related to environmental reform. Porritt creates a sense of urgency around addressing the looming environmental crisis through the insertion of fictional responses, critical to achieving eventual success, which are integrated into the near future of the story's chronology (almost simultaneous to the book's publication in 2013).

On one hand, this book creates a space for us to imagine something other than a blind destructive forward march toward apocalypse. There is much to be learned from this book, in terms of form, and its use of art, photography, creative research, and positive affect — techniques that might ideally be employed to other more progressive ends, to help readers imagine other futures. On the other hand, while this book is a model for what art and creativity can contribute to imagining and driving change, it is simultaneously a cautionary tale.

The World We Made: Flawed Imaginaries of Life After Oil

The impasse demands new imaginaries. Futurecasting, in whatever form it takes — art, literature, film, the mainstream media — often illustrates the limits of our imaginaries. What poses as innovation in energy and environmental discourses is too often, upon closer reading, a mere repackaged/re-glossaried perpetuation of petro-capitalist relations greenwashed with tech solutions, fulfilling Jameson's claim that narratives of the future are actually rearticulations of the present. In "Progress Versus Utopia, Or, Can We Imagine the Future?" he explains that science fiction's "deepest vocation is over and over again to demonstrate and to dramatize our incapacity to imagine the future… the atrophy in our time of what Marcuse has called the utopian imagination, the imagination of otherness and radical difference." He goes on to conclude that science fiction ends up becoming a mediation, willingly or not, "of our own absolute limits."[17]

Read critically, *The World We Made* exposes the limitations of the increasingly accepted, if misguided, vision of the future whereby

anxiety around the disappearance of oil is turned on its head and supplanted with fetishized notions of alternative energy, aiming to sustain the webs of relations, as though alternative energies will cause very few disruptions to the middle-class standard of living, worldviews, or ways of being. What we must be careful to remember in our rush to implement alternative energy systems, as though they in and of themselves hold the key to cleaner and therefore more socially just futures, is that energy itself does not create transformation. It is the valuation of energy sources and the ways in which they are socially, economically, and politically integrated that will be transformative. Oil did not create climate change, although it is often fetishized as the "stuff" of life that produces not only wealth but also war and a host of other dehumanizing outcomes.[18] Moreover, according to David Harvey, "'resources' can be defined only in relationship to the mode of production which seeks to make use of them, and which simultaneously 'produces' them through both the physical and mental activity of the users."[19] In short, capitalist practices that use oil to fuel growth, and not oil in and of itself, have created greenhouse gas emissions on a scale sufficient to alter the climate. In Porritt's imagined future, solar and wind farms fuel the "good life." Technological solutions are promoted as the main way to address climate change in *The World We Made*, much as in popular discourse and in the halls of power, despite the inadequacy of tech alone to address the core causes of climate change. In the book, air travel caps are in place and "slow travel air cruisers" exist. Virtual tourism is a $500 billion dollar industry that provides a full sensory experience through internet and second life platforms. In this future, the virtual is described as augmenting the real.[20]

Communications technologies, in fact, feature as the solution to the restrictions on mobility described in the book, without accounting for their resource intensive materiality. Alex McKay's home, for example, includes a media room with two video walls that serve multiple purposes: one a background to suit the mood, the other a means to communicate with and maintain relationships with friends

and family.[21] This vision of the future is troubling at several levels: it reproduces the social atomization of early twenty-first century life, rather than designing more communal ways of being; it sustains people's distance from the outer world including nature, rather than developing more intimate relationships with the environment; but at a basic environmental level, the energy intensity required to sustain this type of virtual life is problematic.[22] Popular conceptions of wireless communication technologies render them immaterial and invisible, when in reality the infrastructure of servers and cable networks that power and disseminate virtual worlds are resource intensive, using enormous amounts of energy and water. In an ironic reversal, the sci-fi nightmares of isolation in Ray Bradbury, E.M. Forster, Kurt Vonnegut, and Philip K. Dick and the sociological anomie of the theorists of alienation (especially Herbert Marcuse) are here presented as positive and, indeed, not only desirable but ecological. The social-atomization-presented-as-luxury is a naïve fetish of the commodity à la *Debord*. Screens and communications equipment are taken to be wondrous manifestations of social relations, while they actually inhibit the formation of community-based relationships. Porritt mistakes the symptoms of the worldwide division of labor for the solution to globalization's problems. Furthermore, as Mél Hogan's research explicitly details, virtual realities and big data, not to mention surveillance and privacy, "can never be disconnected from the material infrastructures that allow and render natural the epistemological state of mass surveillance."[23] As her analyses make blatant, social media companies, surveillance, and big data are all "deeply material."[24] The greening of big data is part of a particular worldview invested in solving the problem of our carbon-intensive (auto)mobile lives through communications technology, without recognizing the corresponding footprint. This is just one example of how technological solutions allow for a sleight of hand, whereby those aspects of daily life we associate with high emissions (daily commutes and air travel) are replaced by what we assume are low-energy solutions (paperless practices and wireless communication),

without accounting for the energy required to sustain these tech habits at the level of manufacturing — which is the largest cause of global emissions. Even if alternative energy could fuel all of the energy demands of this high-tech virtual life, the production, distribution, and maintenance of solar panels on the scale needed would be a massive industrial project, not without a significant environmental footprint.[25] All energy sources have their limits, which puts a fine point on the fact that even a transition to more renewable energy sources still requires radical social and cultural adjustments in regards to our relationship with energy: how much we use and for what purposes. The issue at stake is not our energy sources but our excessive and unabating appetite for energy consumption.

I argue that Porritt's optimistic future falls under the category of "cruel optimism." This is Berlant's term for "the condition of maintaining an attachment to a significantly problematic object," which looks optimistic but in reality limits our ability to flourish.[26] For Porritt, the object of attachment is capitalism, with its high-tech immaterial fetishes that disavow labor as the ongoing source of value, which are bound up in what Berlant defines as the good-life fantasy. This fantasy harks back to Aristotelian notions of a moral and happy life over the long term; in Berlant's analysis, however, the fantasy is gutted of its authenticity, and we are living in constant pursuit of a dream that remains somehow out of reach. In her critique, she details how this chimera of late monopoly capitalism has produced precarity and disparity, the very antithesis of the promise of the American Dream: the twentieth-century mirage, made possible by fossil-fueled capitalism. Practices of lending and borrowing have created a new class able to own cars and homes. Oil's energy density facilitated mobility, (sub)urban sprawl, and high-speed communication, all of which have reified the illusion of individual autonomy. Perhaps most important to this fantasy is the illusion that the successes of the "self-made man" are the result of *his* own choices — with little regard for the ways that the conditions for *his* success are entirely facilitated by the collective infrastructures of cities, roadways, and

telecommunication networks intended to support a vision of white middle-class America (and Canada), built on the heteronormative nuclear family. Porritt's imagined future sustains the American Dream into the mid-twenty-first century — Capitalism 2.0 — by imagining ways to salvage capitalism and the environment as though the survival of one is not reliant on the destruction of the other.

Instead, Porritt's text touts these technology fixes to the way we live and move about the world as not only sufficient to mitigate climate change, but as positive in other respects, such as contributing to "Gross Domestic Happiness."[27] On the inside cover, the character Alex McKay writes that, in 2050, "the world's countries are both more stable and more content." Overall, happiness is a pervasive message throughout the book that affirms the future is generally a more fair and happier place, linked to more cooperative models of capitalism. The chapter, "Work, Wealth and Wellbeing" includes a chart illustrating how the hours of work demanded each week in the European Union have been significantly reduced from 38.2 in 1995 to 24.8 in 2045.[28] As a result, the future is a generally happier place.[29] McKay says, "By the early 2020s that age of selfish consumerism was over, personal ownership became much less important, while renting, sharing, swapping and bartering became the new norm."[30] This rhetoric, however, is not upheld by events as played out in the narrative. For example, the car-share program, which suggests a cooperative initiative, is, in fact, run by a capitalist for-profit organization. The work McKay does in the community garden is also part of a for-profit TimeBank project that pays through local currency. On first read, this TimeBank suggests a renegotiation of social-economic relations: a contribution of time to communal projects for the collective good. But exchanging labor for a local currency (wages) maintains a specific capitalist relation, rendering moot a shortened workweek, if a second job at the community garden is an imperative: McKay does "25 hours of work each week as a teacher, another 5 hours (unpaid) as a governor of another school, and then about 10 hours a week on different activities — coordinated through our very active local TimeBank and paid in

local pound — including working on our Community Farm."[31] Porritt proclaims the value of the shortened workweek, only to elaborate that citizens in 2050 are actually working more or less the same amount of hours, simply being paid less in regular currencies and more in local currencies, which ideally supports local economies, but which, of course, would forcibly limit mobility for certain members of society, while other more affluent members would be able to convert surplus local dollars to more widely accepted currencies. Furthermore, this exploration of a secondary local economy, where value is linked to labor time, fails in that it continues to reproduce capitalist relations. The capitalist mantra "time is money" literally becomes formalized through this imagined time-based currency: it is a solution not dissimilar from the nineteenth-century Proudhonist time-chits that Marx himself critiqued.[32] This future vision of labor, however, is further complicated by the fact that certain types of labor (that is, those performed outside the twenty-five-hour workweek), are reframed as leisure. And, ironically, it is some of the most labor intensive forms of classical labor — gardening and farming — that are reinvented. It was this very labor that the promise of technology was meant to save people from having to perform. Once again, the status quo is sold as innovation. This future text imagines an idyllic relationship to the land and to food-systems.

This fantasy remobilizes eighteenth-century romantic notions of nature that grew out of the first industrial revolution. Porritt's future — like many imaginaries of the future driven by capitalist imperatives to maintain as much as possible of existing systems of domination and extraction of resources and labor — feeds into notions of the entrepreneurial spirit of the late twentieth and early twenty-first centuries that leave the majority of the world's population living more precarious lives, working more for less remuneration, striving to claim as their prize not only greater material comfort but the ever-elusive promise of more free time. But free time is on the decline in the present and seems not really to exist in this future imaginary either; despite the narrator's assertions to the contrary, simple mathematics

unravel this claim. Porritt's vision greenwashes an invocation of present employment conditions in the West that are increasingly contractual, precarious, and inadequate.

In short, the concepts of high-speed communication and slow travel technologies are mobilized as solutions to the energy and environmental climate crisis in very specific ways that protect what is really at stake: capitalism itself. Porritt's future world is founded on an ideological belief that capitalism is the only economic system that can address the current crisis, what he calls "the least worst economic system we have."[33] His claim is that the current system merely needs to be tamed (which is the title of one of the later chapters "Taming our Capital Markets"). In his nonfiction book called *Capitalism: As if the World Matters* (2005), he uses the term "sustainable capitalism" to define a tamer version of existing market dynamics. However, Porritt's representation of the relationship between the cooperative commons and capitalism are conflicted. There is an uneasy relationship between the loyalty that he maintains to the capitalist paradigm, his desire to expose its failings, and the extreme injustices it has created in our time — if not the future. In the future world of Alex McKay, capitalism's failings are mitigated at the local level through community-based sharing initiatives. Multinational corporations are disciplined by the market when entrepreneurs realize it is profitable to behave in environmentally sustainable ways. McKay explains that

> There are still plenty of very successful multinationals — although fewer and fewer every year, it has to be said, as people around the world show their preference for more local and national businesses.... So capitalism is still thriving, but in a very different way from 30 or 40 years ago. Nobody planned it that way... [but] given where we are now, something about today's more sustainable version of capitalism must be working.[34]

In this future narrative, a reconfiguration of the market is represented as a "natural" outcome of the self-regulating mechanisms of

capitalism — the invisible hand — rather than as part of political will.[35] Meanwhile, the inequities of the future are reported rather unselfconsciously as imperfections of the system that we can all feel guilty about, but which are inevitably part of a common-sense understanding of reality under capitalism. Much like combined and uneven development in the present, Porritt's vision relies upon the erasure, or at best subsistence, of large parts of the planet to ensure safe, quiet (almost pastoral) lives within cities in the disambiguated West.[36]

What Porritt's book illustrates best are the ways an uncritically affective, cruelly optimistic loyalty to capitalism will limit our possibility to imagine new systems. The optimism of cooperative capitalism sustains itself on innovations as no more novel than private property, entrepreneurism, profit, and perhaps most strikingly, the unselfconscious need to maintain the inequities inherent to capitalist relations. For example, in *The World We Made*, solar energy is considered a source of capital. It is described in terms that fall under private capture of solar energy, much like existing systems in California, where solar panel owners are able to manage their own energy needs and sell any excess energy back to the grid. This is not a social commons model for energy management. Rather, it is an enterprising system where those with capital — in this case privately owned solar panels — can benefit and enclose, develop and exploit what could otherwise become common solar resources as a revenue generating initiative to subsidize privileged lives, while others are shut out. In twenty-first century North America, energy commons project (or publicly owned utilities) are often discussed as impossible, or even radical.[37] This is, however, symptomatic of our ahistorical posture — trying to make change from within a system that we cannot step out of — because until quite recently (into the 1980s and 1990s in Canada, for example), utilities were largely government owned. Profits fed back into social programming: roads, schools, and so on. Porritt's future plays on a worldview that takes as a given that solutions are found in free markets. While it might appear optimistic to readers of the "rich

world" to believe that the current climate crisis provides opportunities to be seized, it is a vision sustained on the grim miseries of resource shortages, displacement, and ultimately death for a vast percentage of the world population.[38] As Porritt puts his theories into practical — if imagined — application, the world that unfolds reveals the contours and limits of a vision that brushes over but fundamentally relies on the slow violence of environmental devastation, particularly as they manifest under capitalism (cooperative or not), exposing upon closer reading the cruelty of his optimism.

The coming energy transition will demand much more of us than simply the use of alternative energies. Neither can it be solved with technical or economic solutions alone. *What does energy do?* It shapes the societies we build, create, and live in; an energy transition is therefore also social and cultural. As such, it is not solely the responsibility of individuals. Transformation demands collective political action and an associated social movement that will hold industry and government to task — not to mention individual citizens who will have to radically transform their habits and ways of being. An energy transition adequate to the challenges of climate change demands of us the complete reinvention of daily-lived reality. We must rethink everything from the clothes we wear, to where those clothes are manufactured, to what we eat and where it is grown, to how we wash those clothes and dishes, to how we collect and use natural resources including water, solar, and wind — and ultimately how, and how fast (or slow), we move about in the world and how we live together in community: sharing our food, energy, shelter, labor, and lives. In short, an energy transition requires us to exchange what Ruth Irwin has described as our solipsistic, modernist, and consumerist worldview, which "foreshortens our imagination and ability to find alternatives," for an "integrated, embodied, future oriented 'world-scape.'"[39] Imaginaries of a future, where technology allows for only modestly transformed lives, are part of a larger project concerned with maintaining capitalism.

While Porritt might have intended his book as a contribution to the

deployment of optimism as a strategy, this book should be seen as a lens onto the present that exposes the cruelty of the optimistic sales pitch of sustainable capitalism, which relies on unevenly distributed slow violences of capitalism and climate crisis. This fictional account illustrates beautifully (the text itself something of an *objet d'art*) that the fulcrum of sustainable capitalism is capitalism itself — sustaining capitalism — not the environment or even human life.

Wasted Lives and Troubling Erasures: Decolonization and Feminism[40]

In the future world of Alex McKay, capitalism's failings are mitigated or managed.[41] Within the book's global context, gender and racial inequities are unselfconsciously reproduced as the outcomes of national mismanagement. There is some acknowledgement, to be fair, of the environmental struggles that will be faced by people in developing nations as a result of climate change, but the issues of race, class, and gender in the West are largely absent, with only a passing (troubling) reference to Canada's oil sands.

The book foretells a rather unimaginative re-invocation of the past as future, through a neocolonial project that demands that African countries again reclaim their sovereignty:

> Initially, this expansion was driven by what was described as "the worst resurgence of colonialism since the time of slavery," as both the big agri-tech companies and the land-hungry countries like China and Saudi Arabia bought up vast tracts of productive land in Africa.... But all that "land-grabbing" came to a dramatic end after the Great Famine in 2025, as one African country after another took back control of its own land.[42]

In the scrapbook, poverty is mitigated but not eliminated. In fact, the numbers of the poor have increased, "but the lives they lead today are very much more comfortable than 30 years ago and fewer than half a billion are now living in absolute poverty."[43] A Solar Salvation scheme

in Nigeria is described as "an extraordinarily generous commitment," and so, while Porritt claims elsewhere in the book that the need for charity has been eliminated, the economic relations of the rich world and poor world maintain very similar geographies to the present, and the language of aid and "generosity" reproduce current global power relations.[44] Nigeria is no less short of sunlight than it is of oil and yet the country is clearly not thriving within the continued capitalist relations of the mid-twenty-first century. The narrator acknowledges the injustice of these events, but accepts these as historical struggles that have been resolved. This narrative strategy leapfrogs the impasse of the present, in all its complexities and potential for building knowledge toward other outcomes that has not yet been imagined. What's skipped over is precisely what Berlant articulates as an activity of living that demands "a wandering absorptive awareness and a hypervigilance that collects material that might help to clarify things, maintain one's sea legs, and coordinate the standard melodramatic crises with those processes that have not yet found their genre of event."[45] This leapfrogging leads to the enclosure of other possibilities that might be produced by thoughtfully exploring decolonialization and reintegrating feminist thinking into future systems.

When the narrator does mention the tar sands, the foreclosures of Porritt's sustainable capitalist future are violently articulated as the ecocidal and genocidal project of extractivist Canadian politics. McKay describes "a disastrous release of waste water from one of the largest tar sands operations, contaminated with mercury, lead and other toxic elements, killed off almost every living creature along a 160-kilometre stretch of the Athabasca river. It's taken the Athabasca a full 30 years to recover."[46] What such "recovery" after death looks like in the landscape after thirty years is not detailed. This ambiguous vision for the future feeds into concepts of "reclamation" that are part of larger discourses of scientific and managerial control. Such techniques are grounded in the colonial worldview of *terra nullius* that continue to justify the claiming and settling of land in what is now recognized as Canada. Just as a wetland cannot be reconstituted,

neither can there be 'recovery' from death and genocide, whether it is the extermination of flora, fauna, or human species. Furthermore, the concept of *claiming* or *reclaiming* the land raises the question: claiming for whom? Given the historical context, it is only wise to be skeptical of any project that claims or reclaims territory. Many real-world reclamation projects in Northern Alberta take what were once wetlands belonging to Indigenous communities and transforms them first by extracting the oil and then by landscaping them into new environments much better suited for living and building on — settling — than the original wetlands.

In the fictional rendition provided by the story, the deadly tailings-pond breech compromises 160 kilometers of downstream territory that includes Indigenous communities such as Fort McKay, Fort Chipewyan, and others beyond, many of which are using treaty rights as a mechanism to resist the ongoing colonization of their lands by government and industry. Rather than acknowledging the historical and ongoing struggles of these communities, who are being brutally impacted by the violences of late capitalist oil production *right now*, the book enacts an eco-genocide of Indigenous communities, mentioning only their erasure as part of the inevitable fallout of oil extraction and petro-politics — not as a result of ongoing capitalist relations. No mentions of land and treaty issues or pipeline blockades are raised. Instead, dissenting Indigenous voices are silenced through exclusion from the text overall, erased from the land by a tailings bond breech.

Capitalism and the project of modernity (mobilized by the modern nation state) require as their prerequisite the erasure of certain bodies. In Canada, for example, colonial logics have produced and continue to perpetuate cultural genocide, displacing Indigenous peoples to reserves, forcibly removing their children from homes and communities (first in the form of residential schools and later as part of the Sixties Scoop and ongoingly through child protective services and policies) and by continuously disregarding land and treaty rights into the present in the rush to "develop" minerals and resources. In recent years, over twelve hundred Missing and

Murdered Indigenous Women (MMIW) have been documented. The mere existence of Indigenous women, argues Audra Simpson, is an affront to the colonial project, since they are the historical owners/guardians of the resource and oil-rich lands now occupied by settler Canadians. In short, the exploitations of the age of oil fueled by carbon intensive energy are not simply the result of a disconnect from the environment and other species. These exploitative attitudes are reified in the relationships between people as well, whereby some classes and cultures of people believe themselves to be superior to others, resulting in the extraction of labor for surplus value, and ultimately the dehumanization of those who become a barrier to profit margins — which in its most extreme form results in the murder and genocide of those deemed superfluous.

Porritt's storified version of the future exemplifies a dominant strand in environmentalism. Many green capitalists of his ilk are unwilling to muddy accepted narratives of progress. As such, they gloss over the systemic violences intrinsic to any colonial project that, by definition, demands territorial takeover and the displacement of peoples. Porritt fetishizes the systemic violence of the past (our present) as the outcomes of oil and not as intrinsic to logics he aspires to maintain, namely capitalism; meanwhile Porritt imagines the violences of the future as being in the service of progress toward greater equality among those who survive — a perpetually elusive promise. The logics of colonialism that are evidently still in operation in these imagined futures cannot be resolved under capitalism, because one is dependent on the other in its reliance on the exploitation of labor and resources for the accumulation of capital. *The World We Made* illustrates our failure to imagine new futures, given that these futures mirror post–World War II independence movements that failed to achieve autonomy, as nineteenth- and twentieth-century nation-to-nation (colony-to-empire) relationships were replaced by alliances with multinational corporations.

Oil is a Feminist Issue. Energy Transition is a Feminist Issue

In *The World We Made* one of the few references to women is in relationship to population control — a strategy aimed at controlling the bodies of women, largely women of color in developing nations. In omitting women and their perspectives, the book reproduces the marginalized status of women around the world, along with the many ongoing struggles of race, class, and Indigenous rights. Porritt writes these issues out of the historical account of sustainable capitalism, much as these perspectives have been written out of the official historical record. The category of "woman" is, of course, diverse and fraught, given the "viscous porosity" unacknowledged by classic dualistic ontologies of nature/culture, sex/gender, and so on that require a rematerialization of the social that "takes seriously the agency of the natural."[47] All of this means that different categories of women are impacted differently by the networks of oil. However, Porritt's text lacks even a basic awareness of how the culturally constructed relationships between women and things — many of them either products of the petrochemical industry and/or powered by oil — directly shaped women's lives in the early twenty-first century: the ways in which spectacles of resistance continue to be performed by or draped on the female body. From the runways of high fashion to the hallways of high schools in popular culture and late capitalism, women's images, and women as a concept, are widely recuperated to drive consumerism and to serve national petro-politics and imperial expansionist aims.[48] Porritt's text also fails to acknowledge eco-feminist theories that aim for greater gains in a post-oil culture.

The discussion of population control becomes a key moment for the text to redefine the term *environmentalist*, reclaiming it for fiscal conservatives invested in mitigating environmental damage as an opportunity to reinvent and sustain capitalism. In the text, abusive language is used to deride the "not just stupid, but cruel" approach of that "great army of environmentalists and left-wing

politicians in Western countries… [who thought] the real issues were poverty, injustice and overconsumption" — not population control.[49] Through this naïve pop-Malthusianism, the book project, and the project of sustainable capitalism are de-linked from other "radical" environmental movements. In the context of this story, radical comes to name any movement interested in transforming the social and power relations of late capitalism, making it quite explicit that sustainable capitalism is about redirecting environmental concerns away from any vision of the future that will disrupt not only capitalist accumulation, but its patriarchal, heteronormative, white racialized bedrock.

For important historical reasons, many feminist environmentalists resist discourses around population control, refusing to accept that women's sexuality be controlled by patriarchal logics, institutions, and socially held values that limit a woman's control over her own body without first demanding social changes on the part of both men and women. Population control discourses perpetuate women's alienation from their bodies, imposed by patriarchal cultural values and norms.[50] It has been over a quarter of a century since Marxist-feminist scholars Vandana Shiva and Maria Mies articulated ecological concerns as feminist issues. They challenged ecofeminists to "see the devastation of the earth and her beings by the corporate warriors, as feminist concerns," since "it is the same masculinist mentality which would deny" women the right to their "own bodies and [their] our own sexuality, and which depends on multiple systems of dominance and state power to have its way."[51] The thinking of Shiva and Mies, combined with Berlant's more recent theorization of cruel optimism — which analyses how people adapt to crisis over time, seeing it as ordinary and integrating the contradictions into their own social relations as part of a new normal — demand that as twenty-first century moderns we step away from current reality to take a long hard look at how we have adapted ourselves to ideas that in themselves are so contradictory that they can do nothing but perpetuate the status quo, while we continue to act as if these same ideas have the

potential to mobilize radical transformations. Once again, promises of innovation are used to sell the status quo; the emperor has no clothes. This myopia requires that the world be assessed from new perspectives, namely feminist ones. The environmental movement has, in fact, been identified as a women's rights and feminist movement.[52] However, the blanket identification in Porritt's book of Other perspectives as radical strategically undermines both feminist movements and progressive environmental resistance movements, many of which are led by women activists and Indigenous communities around the world.

In short, women and feminists are virtually absent from this history of the future — exactly as they are from the historical accounts to date: those stories and records that have disrupted our ability to archive and build feminist knowledges across generations and cultures. To reinvigorate feminist knowledge in the present and future, we can look to examples of other feminist cultures, such as the traditional (historical) feminist practices within European cultures largely erased by the witch hunts, the enclosures of the commons, colonization, and capitalism.[53] Many Indigenous communities also provide other models of thinking through gender identities, kinship, and community relationships. These knowledges working symbiotically will provide new entryways to rethinking our relationships to each other, to our communities, to other species and the planet. Donna Haraway makes a call to consider as kin all life on earth. Earthlings, she says, "are kin in the deepest sense, and it is past time to practice better care of kinds-as-assemblages (not species one at a time)."[54] Her slogan for what she calls the Chthulucene epoch is to "Make Kin Not Babies!" While conversations around climate change often focus on *human* survival — only one species — there are millions of species who have become or are becoming extinct.[55] Reconsidering who we are talking about when we define communities can have both a direct ecological consequences for addressing population growth, but can also positively impact the shape of women's communities and lives.

Ways of living together, particularly in newer urban cities in the Americas and Global West, have not been organized to sustain

ecosystems or even the people living in them. Crudely stated, urban settings have been deployed by industrialists as a way to extract cheap labor.[56] More recently, such cities have been increasingly designed around automobility and the facilitation of flows of traffic moving labor power and merchandise. Western modernity's focus has not been on supporting local living and community relationships.[57] The work of energy transition now demands that we begin to *care* about how we live and whose interests daily-lived realities and "habits of mind" serve.[58] As moderns, we have organized our lives and our cities around what we value: oil is the lubricant for all of our social relations. In Canada, for example, the population resides in sprawling urban cities with even more spacious suburban developments, tied together by thousands of kilometers of train tracks, pipelines, highways, and fiber-optic telecommunication cables, dependent on oil. The value we in the developed West have attributed to oil generates corresponding social, economic, and political *power* dynamics and infrastructures that create immense wealth for some and inordinate precarity for others. We measure what we value: oil is measured on a daily basis by the global markets. Even carbon emissions are now valued within capitalist logics. What we do not measure (value) falls under the umbrella of externalities, or even casualties: glaciers, clean water, clean air, environmental rights, Indigenous rights, Indigenous peoples, women, or the Missing and Murdered Indigenous Women (MMIW) in Canada. As transitions to new energy systems occur, this valorization needs to change. Switching energy sources alone will not reconfigure our problematic relationships with one another, or our natural and built environments. To think otherwise is to fetishize oil, as though oil has produced these inequities. In actuality, oil is merely the fuel for the system.

Beyond the Impasse: Disrupting Left-Right Discourses with Feminist and Indigenous Worldviews

The World we Made is a multi-genre text and image narrative that captures and re-entrenches many of the ways of thinking and being

that allow for the reproduction of extreme disparity, across time and geographies. It registers the mentality that has produced what is now being referred to as the Anthropocene — or human induced climate change. Many mainstream attempts to mitigate climate change are grounded in what Ladelle McWhorter explores as "guilt as management technology," which builds on Heidegger's notion of *Bestand*. This worldview produces managerial and technological thinkers who see the world and its natural resources as ready for the taking — there for human use.[59] McWhorter claims that the Western sense of guilt is merely a reassertion of our technological dream of perfect managerial control when what is required of us is to "begin to live with the earth instead of trying to maintain total control. Guilt is part and parcel of a managerial approach to the world."[60] This vision is consistent throughout Porritt's book with chapter titles such as "Putting Nature to Work," "Containing the Biotech Genie," "Fixing the Climate," "Malaria Tamed," "Redesigning the Building Blocks of Life."[61] What is not required in this vision of the future is any radical revision or transformation of the relationship we maintain with different environments. We remain distant from the earth: only able to interact with it in new managerial ways. This becomes explicit in an image near the end of the book: "Whether we like it or not, we've fundamentally transformed the way the world works, and our destiny now lies primarily in our own hands. Nothing else will sort it out. So the Holocene is dead — long live the Anthropocene!"[62] Of course, Porritt's deliberately buoyant misinterpretation of the geological term "Anthropocene" risks redistributing responsibility for human induced climate change across the entire global population when, of course, it has largely been inflicted by those from the most privileged classes in the global West, with greatest access to *power* whether in the form of energy/fossil fuels or capital (labor power, access to resources, and so on), whose individual lives and capitalist exploits are the most energy intensive and environmentally damaging.

Linked to this move to flatten and redistribute responsibility for human induced climate change is another rhetorical sleight of hand

that fetishizes alternative energies and issues of ecology, uncritically associating environmental concerns with progressive leftist politics. Our particular historical moment is rife with the possibility for dramatic social transformation linked to the means of production (carbon-intensive energy/oil/coal), but if we are not vigilant about the ways "environmental" concerns are fetishized as inherently innovative, egalitarian, or leftist, the discourses of the right will succeed in perpetuating the existing social injustices of the age of oil, into the After-Oil period — thereby sustaining capitalism and all its inherent inequalities, this time fueled by wind and solar power. As others have argued before me, it isn't oil that created these injustices. Just as I argue that it isn't alternative energies alone that can undo these injustices.[63] Because energy systems (whether oil or alternative energy) merely fuel the capitalist networks of relations that ensure some lives are worth more than other lives.

Given Porritt's status as an environmentalist and longtime politician with an economic focus, his book exposes both the expansive project of sustainable capitalism and its limits. His vision is shared by many. Porritt, who has dedicated over forty years to the environmental movement, has imagined for us a world virtually without Indigenous communities and without women. At best, it is a world that contains these categories at the margins, much as patriarchal capitalism always has. This, to my mind, highlights the urgency for interdisciplinary and intersectional forms of engagement between arts, humanities, and social science researchers with current political and business leaders so that we might all develop a more complex understanding of the current petroculture.

Thus, our project must be to decolonize existing hegemonies of thought and action that exploit peoples and lands. As Mél Hogan argues, "The objects of technology are always more valued, even when disposed of, than the bodies marked and mangled by an economy that reinstates and reinforces rapid cycles of technological development for the few by the many."[64] Most obvious, of course, are those bodies caught up in international conflict and wars, on one side or the other,

all in the name of resource control. Then there are the increasing numbers of environmental refugees: "Since 2009, an estimated one person every second has been displaced by a disaster, with an average of 22.5 million people displaced by climate or weather-related events since 2008."[65] Of course, there are also the bodies left cleaning up and covering up oil spills who suffer toxic exposure to Corexit, or farmers and their families whose bodies absorb the fertilizers and pesticides required by genetically modified Monsanto seed. Moreover, these toxins filter down the food chain and water supply. The list of eco-genocidal practices goes on. Whether flora, fauna, land, or water, these casualties of profit are the "wasted lives" we have accepted as collateral damage of modernity's quest for progress.[66] Energy transition politics can continue to intensify inequities grounded in particular epistemologies, or introduce new alternatives. In other words, energy transition is an issue of social, political, and economic impasse — of radical indeterminacy filled with potential.

So where to go from here? We must be vigilant not only to the limits of capitalist theories and economic models to achieve an adequate energy transition, but to the lacunae of traditional Marxism and its tendency to undertheorize issues of race and culture, gender and sexuality, and the concerns of other equity-seeking groups.[67] This essay's critique is situated within the context of interventions that Marxist feminists have been making for decades. Far better that we use the impasse — not to optimistically leapfrog this critical moment in pursuit of easy futures that are ultimately harshly cruel, but instead — to interrogate and disrupt ongoing conversation with feminist knowledges of all kinds, including Indigenous feminisms, womanism, decolonial love, ecofeminisms, Marxist feminisms, feminist system's change, standpoint feminism, Xeno feminism, matrixial and maternal ecologies, feminisms yet to come that can inform new material realities as we imagine them into existence. To my mind this is a radically necessary response if any of the solutions imagined by local communities or global decision makers are to undo the injustices of our extractivist exploitative past and present in order

to ensure the equitable distribution of energy and *power* (in all its forms) in a future after oil.

Notes

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1. Lauren Berlant, *Cruel Optimism* (Durham: Duke UP, 2011) 4.
2. COP21 stands for the United Nations Framework Convention on Climate Change's twenty-first annual Conference of the Parties, which took place in December 2015.
3. Nick Stockton, "The Paris Climate Agreement," *Wired* (December 22, 2015) http://www.wired.com/2015/12/the-paris-climate-agreement/
4. Petrocultures Research Group, *After Oil* (Edmonton: Petrocultures Research Group, 2016) 16.
5. Berlant, *Cruel Optimism* 4.
6. Porritt himself is a well-known and respected environmentalist and long-standing member of Britain's Green Party. He has served as environmental advisor to Prince Charles, and *The World We Made* is endorsed by Bill McKibben, Richard Branson, Jeffrey Hollender, and others of similarly green pedigree. The book also describes the social projects of the Bill and Melinda Gates foundation, speaking of them with high regard.

7. Ruth Irwin, "Ecological Ethics in the Context of Climate Change: Feminist and Indigenous Critique of Modernity," *International Social Science Journal* 64.211–212 (2013): 111–123.
8. Irwin, "Ecological Ethics" 111123.
9. *Cruel Optimism* 196.
10. Slavoj Žižek, "The Spectre of Ideology," *Mapping Ideology*, ed. Slavoj Žižek (New York: Verso, 1994) 1.
11. Margaret Atwood, "It's Not Climate Change, It's Everything Change," *Medium* (July 27, 2015) https://medium.com/matter/it-s-not-climate-change-it-s-everything-change-8fd9aa671804
12. Stephanie LeMenager, "Introduction," *Living Oil: Petroleum in the American Century* (New York: Oxford UP, 2014) 17.
13. Jonathon Porritt, *The World We Made: Alex McKay's Story from 2050* (London: Phaidon Press, 2013).
14. Jonathon Porritt, "A Friend of the Earth: Longtime Environmentalist on Sustainable Future," Interview, "CBS This Morning," *CBS* (October 10, 2013) http://www.cbsnews.com/videos/sustainable-future-for-earth-has-to-be-personal-environmentalist-says/
15. Thank you to Sourayan Mookerjea, who suggested the idea of the scrapbook to me after I first presented on Porritt's book at MLG 2014 in Banff, Alberta.
16. The character Alex McKay has been a history teacher for the last twenty-eight years, nineteen of them at Ashton Vale Community College (4). His family has lived in the same house "just a few hundred meters from the college" for the nineteen years he's taught at Ashton Vale. He's now moving to start a new job in another part of the country (4). His stable life exists in stark contrast to the displacement of global populations addressed only in passing throughout the book but clearly a result of ongoing colonial projects around the globe.
17. Fredric Jameson, "Progress Versus Utopia, Or, Can We Imagine the Future?" *Science Fiction Studies* 9 (1982) 153.
18. Matthew Huber, *Lifeblood: Oil, Freedom, and the Forces of Capital* (Minneapolis: U of Minnesota P, 2013) 1–6.
19. David Harvey, "Population, Resources and the Ideology of Science,"

Economic Geography 50.3 (1974) 265.

20. The narrator of the story explains that "before we went to Tibet for real, we 'visited' dozens of places (including the Potala Palace) with some of our best friends, and on one occasion with the Dalai Lama himself a our guide! Brilliant stuff — and it just made the real experience all the more astonishing" (238). The virtual experience allows access not only to distant geographical locations but somewhat inaccessible cultural sites and persons, such as the palace and the Dalai Lama.
21. Porritt, *The World We Made* 12
22. In the section on virtual holidays, it is explained that a friend hiked the whole Santiago de Compostela from walking machines in their living room (238), illustrating a dissociation from actual nature.
23. Mél Hogan, "Data Flows and Water Woes: The Utah Data Centre," *Big Data and Society* 2.2 (Jul. 2015) 1.
24. Hogan, "Data Flows and Water Woes" 1.
25. For insights into the environmental impacts of clean energy, which make it clear that the consumption of alternative energies too is finite, see Ozzie Zehner, *The Dirty Secrets of Clean Energy and the Future of Environmentalism* (London: U of Nevada P, 2012).
26. *Cruel Optimism* 24.
27. *The World We Made* 82.
28. *The World We Made* 205.
29. *The World We Made* 82.
30. *The World We Made* 13.
31. *The World We Made* 209.
32. Karl Marx, "The Chapter on Money," *Grundrisse: Foundation of the Critique of Political Economy,* trans. Martin Nicolaus (London: Penguin and New Left Review, 1973). https://www.marxists.org/archive/marx/works/1857/grundrisse/ch03.htm#p153
33. *The World We Made* 34.
34. *The World We Made* 56.
35. The term *natural* is of course being used consciously here to indicate the problematic worldview of capitalism as self-regulating in ways that erase its history as a system created by human beings.

36. The text is never explicit about where exactly in the Global West the story takes place. It could be anywhere in the "developed" English-speaking world: the U.K., Canada, the U.S., and so on. Wherever it is, there is a sense of calm pastoralism about it, with urban gardens and few people. It is the very invocation of what William Cronon has identified as the sacredness equated with wilderness, resulting from the fact that modern environmentalism is the offspring of Romanticism, and as such, it is very often equated with "some of the deepest core values of the culture that created and idealized it." See William Cronon, "The Trouble with Wilderness; or, Getting Back to the Wrong Nature," *Uncommon Ground: Rethinking the Human Place in Nature*, ed. William Cronon (New York: W. W. Norton & Co., 1995) 69–90.
37. In a 2011 CBC report titled "Privatization of Canada's Electrical Grid Accelerating," Pete Evans concludes: "Bottom line. Ultimately, Canada's power system needs upgrading. And with governments tightening their belts for the new age of austerity in the wake of the stimulus money spent to pull the economy out of recession, it's unlikely the country will turn back from privatization, experts say. 'Canada is in a bit of a mess in trying to update its existing grid, which was based on this public utility model,' Thomas says. 'You can't go back to the old publicly owned utility model at this point.' Peter Evans, "Privatization of Canada's electrical grid accelerating," *CBC News* (March 30, 2011) http://www.cbc.ca/news/business/privatization-of-canada-s-electrical-grid-accelerating-1.1016930
38. *The World We Made* 5.
39. In "Ecological Ethics in the Context of Climate Change: Feminist and Indigenous critique of modernity," Ruth Irwin explains that "the concept 'world-view' itself privileges a solipsist orientation and we need to re-imagine ourselves as part of the world-scape"(111).
40. Some ideas in this paper have also been explored in the introduction to *Petrocultures: Oil, Politics, Cultures*, eds. Sheena Wilson, Imre Szeman, and Adam Carlson (Montreal and Kingston: McGill-Queen's UP, 2017).
41. In the chapter "Slumdog Billionaires" readers learn that life is "still hard" but "overall, life in such areas [of the globe] has improved" (221).

42. *The World We Made* 164.
43. *The World We Made* 217.
44. *The World We Made* 219.
45. *Cruel Optimism* 4.
46. *The World We Made* 37.
47. Stacy Alaimo and Susan Hekman, "Introduction: Emerging Models of Materiality in Feminist Theory." *Material Feminisms* (Indianapolis: Indiana UP, 2008) 13. See also Nancy Tuana, "Viscous Porosity: Witnessing Katrina," *Material Feminisms,* 188–213.
48. My previous work discusses in detail the discourses of the pro-oil right in Canada, including Ezra Levant's *Ethical Oil*: *The Case for Canada's Oil Sands* (2010) and the associated media campaign that the book inspired. See Sheena Wilson, "Gendering Oil: Tracing Western Petro-Sexual Relations through Colonialist and Capitalist Petro-Discourses," *Oil Culture*, eds. Ross Barrett and Daniel Worden (Minneapolis: U of Minnesota P, 2014) 244–263.
49. *The World We Made* 112.
50. Maria Mies and Vandana Shiva, *Ecofeminism* (London: Zed Books, 1993) 293–294.
51. Mies and Shiva, *Ecofeminism* 14.
52. Robert R.M. Verchick, for example, points out that many of the "most visible and effective environmental justice organizations are led by and consist mainly of women.... Thus, while 'environmental justice' describes an environmental movement and a civil rights movement, it also describes a women's movement... a feminist movement." Robert R. M. Verchick, "Feminist Theory and Environmental Justice," *New Perspectives on Environmental Justice: Gender, Sexuality, and Activism*, ed. Rachel Stein (New Brunswick: Rutgers UP, 2004) 63.
53. Silvia Federici, *Caliban and the Witch: Women, the Body and Primitive Accumulation* (Chico: AK Press, 2004).
54. Donna Haraway, "Anthropocene, Capitalocene, Plantationocene, Chthulucene: Making Kin," *Environmental Humanities* 6 (2015) 162.
55. For a compelling engagement with the scope and realities of species extinction, see Heather Ackroyd's and Dan Harvey's exhibit "Seeing

Red… Overdrawn," an installation that asked onlookers to trace over in red and black the common and scientific names of thousands of species at high risk of extinction on a massive poster. http://www.conflictedseeds.com/seeing-red-overdrawn/

56. Andreas Malm's case study of the transition from water to steam power illustrates that, depending on the industry, and despite coal's eventual dominance, steam power was not always more "efficient." Instead, coal's eventual primacy was more closely related to its mobility and ability to exploit urban labor. See Malm's *Fossil Capital: The Rise of Steam Power and the Roots of Global Warming* (New York: Verso, 2016).
57. See in particular Malm's "Scarcity, Progress, the Nature of the Human Species? Theories of the Rise of Steam," *Fossil Capital* 20–36.
58. Keller Easterling, *Extrastatecraft: The Power of Infrastructure Space* (New York: Verso, 2014).
59. Ladelle McWhorter, "Guilt as Management Technology: A Call to Heideggerian Reflection," *Heidegger and the Earth: Essays in Environmental Philosophy*, ed. Ladelle McWhorter et al. (Toronto: U of Toronto P, 2009) 9.
60. McWhorter, "Guilt as Management Technology" 14.
61. *The World We Made* 91, 101, 136, 179, 192.
62. *The World We Made* 267.
63. Haraway, "Anthropocene, Capitalocene, Plantationocene, Chthulucene."
64. Mél Hogan, "The Archive as Dumpster," *Pivot* 4.1 (2015) 31.
65. The UN Refugee Agency, "UNHCR, the Environment, and Climate Change," *unhcr.org* (October 2015) http://www.unhcr.org/540854f49
66. Zygmunt Bauman, *Wasted Lives: Modernity and its Outcasts* (Cambridge: Polity, 2004).
67. Glen Coulthard summarizes at least three of the weaknesses of Marxist theories of primitive accumulation in the conclusion of his book *Red Skin, White Masks : Rejecting the Colonial Politics of Recognition* (Minneapolis: U of Minnesota P, 2014): (1) its temporal rigidity (given the ongoing realities of colonialism); (2) its "normative developmentalist character" that deems primitive accumulation necessary for capitalist alternative to settler-colonialism; and (3) its inability to recognize the ways that

primitive accumulation *naturalizes* the hierarchies that produce life (151–152). In short, he rejects any definition of settler-colonialism that acknowledges only its coercive, violent, repressive nature, while refusing to acknowledge its productive aspects.

Petrofiction and Political Economy in the Age of Late Fossil Capital

Amy Riddle

From the title to the last scenes of Helon Habila's novel *Oil on Water* (2010), oil presents itself as mood, environment, and atmosphere. As the narrator Rufus makes his way into the Niger Delta, the atmosphere is heavy with "the suspended stench of dead matter… dead birds draped over tree branches, their outstretched wings black and slick with oil," and grass "suffocated by a film of oil, each blade covered with blotches like the liver spots on a smoker's hands."[1] Oil coats the atmosphere in *Oil on Water* to the point that different things — smells, birds, grass — become expressions of the same thing. Thus by the middle of the novel, even prisoners are covered in oil as a punishment, in what the novel calls a "brutal anointing."[2] In the last scene of the novel, "gallons of oil floating on the water" are imagined "tight like a hangman's noose around the neck of whatever life-form lay underneath."[3] By contrast, in *Cities of Salt* (1984) by Abdelrahman Munif — the novel that, in a review, inspired Amitav Ghosh to coin the term petrofiction — petroleum works behind the scenes in very significant ways, but is never physically present.[4] Why the abundance of physical descriptions of oil in the more contemporary novel?

That the novels represent oil in such different ways is of course largely due to their differing geographical and historical situations — in particular the uneven environmental crisis created by capital's increasing need for oil. The years between 1980 and 2008 mark a period of increasing globalization where the explosion of Chinese exports and "globally mobile capital" carrying production technology

to new locations, requires "massive consumption of fossil energy."[5] *Oil on Water* was written during the end of this period of late fossil capital, also a period of emissions explosion. Yet Ghosh's famous claim that there is as yet no great oil novel is not due to what we might term a lack of environmental consciousness but rather because in Ghosh's account, the idea of oil is "inconceivable."[6] The supra-objective qualities of oil as both fuel and plastic, earth and air, subject and system, distinguish it from earlier commodities in literature, like coffee, spices, or sugar.[7] Which is to say that the physical presence and absence of oil in these novels is also connected to the different forms of wealth oil stands in for and makes possible: wealth in the value form itself, as an abstraction, may not be directly representable in literature — it is after all not a measurable thing but a historically specific set of social relations — but the ways in which we see the value form as it bears on social relations in literature dealing with oil gives us a way to mediate the fictions themselves. *Cities of Salt*, written in a third-person collective narrative, makes explicit these relations around oil in its commodity form, while something very different happens in *Oil on Water*, where oil itself appears as a hostile object, a distorted form of natural wealth, or an expression of nature as such.

Cities of Salt was first published in Arabic in 1984 and then appeared in English translation in 1987. Munif, an ex-oil engineer and economist, thought of oil not in terms of environmental degradation but as a lost opportunity for the independence and development of the Arab world.[8] In the novel, when U.S. oil companies discover that the land occupied by Bedouins of a small oasis community in a fictional kingdom of the Arabian Gulf is sitting atop a large deposit of oil, the Bedouins are forcibly removed from their land and must work for the oil company in the coastal refinery center of Harran in order to survive. The pace of the narrative is slow at the beginning of the novel, allowing characters like Miteb al-Hathal the time to ponder the "bonds" of nature, family, and community.[9] These are the sources of wealth before the implementation of the imported social formation, sources which oil appears to replace. The people eventually

understand oil as a potential source of wealth, but wealth that is only ever realized via the accumulation of its money and commodity form by the Americans, the emir, and several designing individuals. For the workers receiving a wage, oil wealth remains obscure.

Oil on Water, published in 2010, follows the scattered memories of journalist, Rufus, as he attempts to make sense of his experiences locating the wife of a British oil executive who has been kidnapped by militants claiming to fight for the restoration of the Niger Delta. The story does not revolve around those working in the formal economy as in *Cities of Salt*, but around those forced into warlike and criminal activity in the informal economy, as either militants surviving off of the kidnapping of foreign oil workers or those involved in what is known in Nigeria as "bunkering" or illicit oil theft from the oil company's pipelines. The setting is one of an environmental apocalypse — a place where the capacities from natural wealth have been exhausted. There is a clear historical shift between the novels: in *Oil on Water*, we see a world of informal and criminalized economies, horrors of environmental destruction and capital's increasingly acute demand for raw materials. The work of those who do participate in the formal economy of *Oil on Water*'s Niger Delta is precarious and dependent on the whims of a racialized global order where domestic workers feign stupidity and journalists must chase the stories of white foreigners to get headlines. The economic and physical landscapes are mutually expressive, littered with disastrous social suffering and material waste. The shoddy infrastructure left by multinational companies is scattered about the landscape, depicting a much deeper crisis than we saw in *Cities of Salt*. Oil is extracted erratically and without the slightest concern for social or environmental costs. Workers are forced to survive entirely through participation in the informal economy, making inevitable the heedless extraction and ceaseless violence and leading to catastrophic spills.

While *Cities of Salt* depicts the transition from a traditional social formation to a colonial-capitalist way of life, *Oil on Water* shows us the end result of this social form. The former emphasizes

wasted possibility, while the latter describes the exhaustion shared across physical and social landscapes embedded in the emergent petroeconomy. Additionally, oil impacts social relations in these two novels in very different ways. In *Cities of Salt*, the source of conflict is not oil but the foreign social formation that organizes oil wealth in a particular way. In *Oil on Water* on the other hand, material nature seems to be exhausted because of the presence of oil itself. The novel asks the reader to think ecologically: oil is nature, humans are nature, and human creation is nature. We are reminded at one point in the novel that oil is as natural as light: narrator Rufus, using the oil imagery of "refining" through "sieves," notices that, "whenever a single ray [of light] found its way through the million leaves and branches and fell on our skin or on the dead leaves below, it looked so pure and startling, as if it had been refined through a thousand sieves."[10] But this small figurative moment, likening oil to a resource as natural as light, is never contrasted in the novel by a clear representation of how oil as wealth, in commodity form, shapes social relations.

This absent representation of oil as a commodity, in *Oil on Water*, makes the source of degradation indiscernible, as the particular ecological voice of the novel obscures the distinction between oil as wealth in the value form and oil as material or natural wealth. The narrative plays with the representation of oil paraphernalia, often depicting it as part of a natural landscape, as though "sprouting," or, in the case of the image of crisscrossing pipelines, as "tree roots surfacing far away from the parent tree."[11] Such re-naturalization of oil makes it at times appear to be an unstoppable sinister force of nature. Just how this same oil is related to the socio-ecological horror depicted in the novel is never clear because instead of appearing as wealth in the commodity form, it appears as an exaggerated, caricatured form of natural or material wealth. One version of this implication, for instance, turns the destruction of the Niger Delta into a natural cycle. That the commodity form is conflated with nature in its depiction in literature is part of its invisibility. Though oil coats nearly everything in *Oil on Water*, it is strangely invisible in its merging with everything else.

Literary Form and the Economy of Energy

How may this naturalization of oil manifest the "energy unconscious" that is part of the cultural logic of late fossil capital? Patricia Yeager insists that critics understand the ways that "energy invisibilities may constitute different kinds of erasures."[12] It may seem strange to argue that certain forms of petrofiction have an intensified version of "energy unconscious," yet in *Oil on Water* and petrofiction written in neonaturalistic forms, there is a kind of erasure of social relations that makes oil illegible. Andreas Malm defines a "fossil economy" as one of "self sustaining growth predicated on the growing consumption of fossil fuels."[13] Fossil capital in particular is defined as both a relation and a process — "a triangular relation between capital, labor and a certain segment of extra-human nature, in which the exploitation of labor by capital is impelled by the consumption of this particular accessory," and "an endless flow of successive valorizations of value, at every stage claiming a larger body of fossil energy to burn."[14] Commodity production, waged or forced labor, and carbon emissions are necessary elements of fossil capital. This economy appears to be driven by invisible inner forces in its self-sustainability, yet depends on what Jeff Diamanti calls the "subsumption of literally unimaginable quantities of non-human energy" entering into production, distribution, and consumption processes.[15] These "invisible inner forces" cannot be understood outside of the social relations and processes that maintain them. Seeing oil as nature could mean seeing its possibility — its use in fueling something other than capital. Conflating it with a naturalized version of the commodity form renders oil and the relations and processes of fossil capital imperceptible. Thus the problem of oil's political economy is part and parcel of the problem it poses to the literary history that takes it on. This, I am arguing, is tied to the challenges oil poses to the project of environmental representation, on one hand, and its impact on economic value on the other.

Writing from within the tradition of German value critique, Claus

Peter Ortlieb isolates the irreconcilability of material wealth and wealth in the value form or what in his title he names "A Contradiction between Matter and Form."[16] Writing in response to Michael Heinrich's insistence that capitalism knows no bounds — Heinrich's insistence, more specifically, that the economic crisis of the 1970s was not the beginning of a terminal crisis — Ortlieb ties the finitude of human and natural resources to the limits of capitalist accumulation.[17] In Ortlieb's account, capital must increase the sheer mass of commodities produced in order just to maintain, much less increase, the total mass of surplus value. But this increase in the mass of commodities produced obeys merely the blind drive for the accumulation of surplus value on the level of the individual capitalist enterprise. In turn this generates the contradictory result in which the *global* production of the mass of surplus value must tend to decrease since the same mass will have to spread out over more and more commodities — with no hope that their value (hence surplus value) will ever be realized through their sale. A second feature of the same contradiction is that material wealth appears superfluous to capital at the same time that it is essential: for capital must also continuously produce material wealth (or "use values" in this sense) as the only possible bearer of value. Yet capital cannot take the existence of any material limits or finitude, since the drive for the "self-valorization of value" cannot ever by its very logic reach an end point. Ortlieb's formulation puts the *sources* of surplus value at inverse relation to the *accumulation* of surplus value: "if the destruction of material wealth serves the valorization of value, then material wealth will be destroyed."[18] This recalls Marx's central claim about of "progress" under capitalism, namely that it is premised on "undermining the original sources of all wealth — the soil and the worker."[19] The pressure of capital to ceaselessly increase relative surplus value through technological improvements in production and the resulting fall in the value of labor power requires an ever-accelerating consumption of limited natural resources.[20]

What I have been suggesting so far, however, is that the discrepancy

between material wealth and the value form of wealth is as much a literary problem as it is a historical one. My argument so far has been that the historical modulation of these two forms of wealth takes place in sociocultural relations embedded in industrial production, which is to say in the cultural fields that negotiate environmental and economic wealth. "Petrofiction" is generally understood as a category of literature that indicates a thematic of oil in the content of the work. In light of Ortlieb's argument concerning the crucial distinction between material wealth and wealth in the value form, and the tendency with which the two are often conflated in environmental discourse, it is fundamental to analyze the ways in which acclaimed petrofiction may or may not be making this distinction and the resulting possibilities for the representation of conscious human action. As the depiction of the effects of petrol on the environment is often an essential characteristic of contemporary petrofiction, how are these depictions linked to the representation of oil as commodity and oil as material or natural wealth?

Petrofiction: A Category Mistake?

Implicit in my treatment of "petrofiction" in the age of late fossil capital is a reconceptualization of what the modifier "petro" does to the literary history of resource aesthetics. Let us begin, however, with the critical treatment of the term "petrofiction" itself. We have heard of "petrodollars" and "petrocapitalism," with "petro" generally specifying and defining the second term. But "petrofiction" is a combination of a material thing (petrol) and a social object (fiction), and the "petro" part of the word does not define or specify "fiction." Instead the term "petrofiction" seems to indicate that a thematic of petrol, drawn from the content of the work, is awkwardly projected as the form of the literature, which has lead to certain problems of interpretation. Peter Theroux, translator of Abdelrahman Munif's novel *Cities of Salt* — the novel that inspired Amitav Ghosh to coin the term petrofiction — says he felt that "*Cities of Salt* was no more about oil than the Godfather was about olive oil." He says he felt "let

down" by readings that emphasize oil as opposed to the story itself.[21] Theroux's statement indicates the need for critics to distinguish between petrofiction as literary theme and literary genre, in order to better understand how oil is used in the narrative. Interpretations of petrofiction as *theme,* that is, in analyzing how oil is depicted in the content of the story, could discern character and setting relations in the work *proximate to* oil. Interpretations of petrofiction as formal *genre or mode* are more complicit with drawing oil from the content of the story into the organizing form of the novel, which problematically makes the narrative appear resource determined, and thereby obscures the depiction of socionatural relations.

This naturalistic form is not uncommon in works often labeled as "petrofiction," as I have shown here in the case of *Oil on Water*. Though Upton Sinclair's work came well before the idea of "petrofiction," one might label it an early example of "resource determination" due to its awkward personification of oil capital at the end of the 1927 novel *Oil!* The novel ends with the "black and cruel" demon that must be "chained."[22] Oil in the novel serves as the object of the author's moral and political agenda of denouncing bourgeois rapacity and greed, which ultimately reverts to bourgeois apologetics. The bourgeoisie's unchecked immoral behavior is where the narrative locates much of the evil of capital, and the material excesses that oil brings exacerbate this behavior. I locate a more contemporary example of "resource determination" in the practice exhibited in Patrick Chamoiseau's *Texaco* (1992) of dividing the novel's timeline, as if it were a sequence of various forms of purely material substances, with the title of the novel itself leaving us squarely, if ironically, under the aegis of oil capital. Chamoiseau's redefinition of the slum as "urban mangrove," where the soil appears "strangely free, definitively free," is already problematic because the novel presents it from the very beginning as separate from and awkwardly immune to social processes.[23] This distancing makes it difficult for the narrative to analyze the relations that lead to socio-ecological destruction, as class consciousness appears to be replaced by ecological consciousness in the novel. Utopian moments

depicting slums as nature, assume that the symbolic resistance or infrapolitics of planting roots in polluted soil, noxious with oil fumes, can flower without significant, and not merely symbolic, socio-ecological interventions. Thus in one petrofiction we see oil's toxicity exerted as a contradiction in the commodity form it materializes — it has turned the very soil from which it came into a hazard — which already runs counter to the "natural" state of the commodity, which is paradoxically to appear without the friction of ecological or social toxicity.

The commodity form in its economic and social manifestation presents itself as natural, in a semblance of objectivity in the commodity. In *History and Class Consciousness* Georg Lukács writes that under capitalism "[e]conomic reality has the appearance of a world governed by the eternal laws of nature, laws to which [one] has to adjust [one's] activities."[24] Petrofiction in particular may be prone to interpretations of socioeconomic reality as nature (that is, ahistorically determined and not in relation to social processes) because when petrol as commodity is confused with petrol as material, the narrative weighs down in description of the material and natural world. When looking at petrofiction then, it is necessary to note the ways in which social relations may be stifled by the object in reified narrative form, effectively confusing certain social forms as natural (that is, determined by nature itself). In petrofiction that aims to depict the ecological effects of oil specifically, capitalism can project itself as an ecological force. Jason W. Moore convincingly argues in his work on what, borrowing from Andreas Malm, he calls "the Capitalocene" that capitalism is indeed a force of nature, as social and ecological processes are not separate but moving dialectically, in as he terms it, the "double internality."[25] But this dialectical movement can only be depicted in literature if character and environmental *relations* are established between subjects and objects. When the commodity form is represented as Nature, the social relations that the commodity form acts on disappear. The literary result is much like naturalism, as defined by Lukács, where characters have no connection with

the objects described, making the subjects no different than mere objects. I will return to this topic with more detail at the conclusion of this paper. But first, a closer look at *Oil on Water* and *Cities of Salt* as examples of two very different "ecocentric" forms of the novel and the resulting depictions of oil as differing forms of wealth.

Oil on Water and Voices without Quotation Marks

What stands out about the novel *Oil on Water* is its attempt at producing an ecological voice, the goal of which seems to be the decentering of human narration in order to give more weight to the ecological object. In her review of the novel, Jennifer Wenzel observes that "the land and water seem to speak directly in their own voice without quotation marks."[26] Tree branches, roots, seaweed, and the flight formations of birds resemble language, letters, or communication. Descriptions intertwine human and nonhuman nature showing their inclusiveness — the boatman is "as unobtrusive, as natural, as the grass and the trees outside."[27] In one scene, the journalists come upon a scene of post-violence carnage and then describe it by juxtaposing both trees "cut in half, dripping vital sap" and a body with a torn stomach and a "trail of blood that… disappeared into the grass."[28] Material objects are also given lifelike or animistic qualities, particularly in the imagery used to describe abandoned drilling installations: oil paraphernalia is naturalized as "sprouting," and "growing gas flares and pipelines."[29] In another passage pipelines resemble roots, veins, and writing: "the oil scorched earth, and the ever-present pipelines crisscrossing the landscape, sometimes like tree roots surfacing far away from the parent tree, sometimes like diseased veins on the back of an old shriveled hand, and sometimes in squiggles like ominous writing on the wall."[30] The similes here compare the pipelines to entities that transport and feed living beings (veins and roots) and meaning (writing). But the image is "ominous" as is the foggy setting of the entire novel giving it a tone of doom. This sense of doom is particularly haunting in the image where Rufus sees a human arm "severed at the elbow bobbing" in the water.[31] Even the dead limb

here seems to have "an ecological voice," with "its fingers opening and closing, beckoning… sometimes with its middle finger extended."[32]

The nonhuman world appears much more alive and active than the human world in *Oil on Water*. Rufus's narration contrasts significantly with the depictions of "ecological voice" in the novel. He appears trapped in his human understanding of world and is never quite able to understand the communication of either human or nonhuman voices. Though it is never stated in the novel, one can gather that his mentor, the once great journalist Zaq, represents the defeated hopefulness of the previous generation that saw a partial decolonial movement of Nigeria in 1960 and the expectations that oil wealth would eventually trickle down after new oil fields were discovered in 1973. Rufus eventually absorbs Zaq's cynical disillusionment, which is only occasionally interrupted by moments of often drunken idealism. After their first meeting, Rufus has to carry Zaq's intoxicated, passed-out, and ill body with him for long distances until he wakes up, symbolically staggering and carrying the crushing weight of the disillusionment of the previous generation. Zaq remains ill throughout the novel, and Rufus is never quite able to shake the influence of the disillusionment of his mentor. This failure of human understanding of the ecological is inherent in the narrator's failures, in the foggy memory he describes in the first paragraph, as well as in the unapologetic inability of the novel to capture its ecological object — it can only guess, observe, and describe. Furthermore, that the novel gets narrated from the point of view of a journalist whose aim is to "observe" and "witness" makes the form of the novel descriptive, as if an objective description of the material object gives more weight to the ecological object, making the narrative slightly less fallible in its attempted distance from human consciousness.[33] The result is an awkward depoliticization/naturalization of oil and the description of environmental apocalypse. Yet, this seems to be a conscious move on the part of the novel, as Rufus is at one point scolded by a prisoner he is interviewing for not being able to "see the larger picture."[34] The story should not just be about the recovery of the white woman, and yet

Rufus is never quite able to see this in his attempt to find a good story.

Ultimately, like Rufus, most characters are unable to understand the ecological voice. These characters appear to perceive reality through static binaries, much like oil on water — two entities refusing to merge. The kind of thinking that separates alive and dead, male and female, west and east, white and black also separates humanity and nature. Nature here includes oil. The assumption that oil as nature is passive and separate allows its indiscriminate use. Oil, the dead, the east, the female, the black, and nature are generally assumed to be passive and separate by Rufus and other dominant characters in a clearly unecological view. Yet, when the male, the white, and the human make these kinds of false assumptions, it comes back at them negatively, as everything is connected ecologically. This is most apparent through the ways in which men treat women. The Niger Delta at times appears to be telling its own story of suffering through its female characters often serving as an allegory for the way in which the land is treated: Boma, Rufus's sister, is burned and disfigured by an oil fire as is the Niger Delta, the military sergeant's daughter is raped as Chief Ibiram's land is taken without consent, and the British woman's husband abandons her for a foreigner as chiefs abandon the land for foreign oil money. That the novel more directly relates female characters to the land is not an essentializing feminization of nature but a critique of the ways in which both nature and women are statically perceived as passive, trivialized and valued for beauty only.[35] At one point in the novel Rufus overhears a scene of domestic violence: "there was the loud sound of a slap, the crying stopped, the shouting stopped. Peace reigned."[36] The irony implicit in the notion that peace follows violence, is most likely also a reference to the particular path of violent resistance the militants use while claiming to want the restoration of the Niger Delta. Their activities such as kidnapping and blowing up pipelines for ransom only end in more sabotage and suffering. There are many faulty claims to truth in the novel, one being from the professor: "This land belongs to us. That is the truth."[37] The ecological voice and details in the novel prove

otherwise. The assumption that the passive needs violent protection contributes to the cycle of violence that shows no end in the novel.

The ecological voice of the novel aims to make these connections, but the human characters themselves fail to do so. The exception is the island people of an animistic cult who survive and are able to heal in part because of the ecological consciousness that they embody through their rituals and daily practices — the cult refuses oil money, worships natural processes and aims to heal what has been scarred. But there is no sense that this healing is meant to lead to the restoration of the ecosystem. The priest of the animistic cult says, "we believe the sun rising brings renewal… whatever goes wrong in the night has a chance for redemption after a cycle."[38] This cyclical view of ecological processes is what distinguishes the novel from typical environmental apocalyptic novels, in that it refuses the didactic ploy, aiming to change the consciousness of the reader with the shock of the doom to come. But this means that instead, the novel is depicting a situation in which the end of the cycle has already come, as it has come to the Niger Delta, and that there is nothing left to do but heal and survive.

Depictions of the specific relations between the colonial subject and oil are missing in the novel. The novel's attempt to emphasize an environmental presence in the narrative has the effect of absorbing social processes into the ecological object, thereby stifling the depiction of relations between the subject and object. In giving Nature what appears to be complete agency, The Force of Nature appears to act on passive objects. The attempt to represent the ecological object in the novel instead renders everything passive. In opposition to dualism, and in what appears to be a purging of social processes, the novel presents a version of monism whereby the relations and connections of organisms to physical surroundings — notably the aim of ecological study — are lost.

One reading of the novel takes the contradictions of the racialized, patriarchal, neocolonial order as evidence of its flawed understanding of nature. At the end of *Oil on Water* Rufus wonders if it is fate that

wanted Isabelle, the kidnapped British woman, to see firsthand the human and nonhuman carcasses that were the result of her husband's work as oil engineer. But, in wondering how her life has changed after barely surviving the kidnapping, he concludes that she was most likely not able to recognize the Niger Delta's attempt to communicate with her — that her experience would be "nothing but a memory, an anecdote for the dinner table."[39] Isabelle's indifference to the socio-ecological apocalypse may be a challenge to the Western reader, who despite having more weight in the global order and being the biggest consumers of petroleum, care little for the waste that is disposed of far away. Despite Isabelle's direct experience as a witness to the socio-ecological destruction, she remains indifferent. Yet in spite of the recognition of this problem in the novel, the ways in which oil as a commodity supports this racialized, neocolonial order is missing.

In "Narrate or Describe?" Lukács interrogates literary naturalism and what he calls the "novel of disillusion," in which "the final victory of capitalist inhumanity is always anticipated."[40] The disillusioned tone of the narration radiates from every turn in *Oil on Water*. Though Rufus feels hopeful at the end of the novel, he has been naïve and wrong many times throughout the narrative, and indeed the last word of the novel is "descent," perhaps indicating the way in which the cycle is moving.[41] Possible ways out of the impasse appear defeated before they are even hinted at. If the title *Oil on Water* presents a metaphorical image of static dualism, its reference to nature further naturalizes such a dualism. But, as with most hints and symbols in the novel, the reader can too easily fall into the pathetic fallacy, reading into nature what is not intended to be interpreted by the human who inevitably falls into the trap, never fully able to decenter his or her consciousness. Lukács says of the "novel of disillusion" that the "inflated metaphor, arbitrary detail, chance similarity [and] accidental meeting," are "supposed to provide direct expression of important social relationships.[42] But because the characters have no clear relation to the objects described, social significance is actually obscured, making it near impossible to extract any kind of meaningful

interpretation of the novel. In *Oil on Water* this is essentially related to the naturalized representation of oil. If social forces do not surface dialectically in unity with the ecological forces, how can the reader discern with certainty that the degradation and violence in the novel are not also natural? The narrative's placement of humanity and oil in nature without establishing ecological relations leads to the idea that subjects are doomed more by nature than any kind of social form. If everything is seen as part of nature, then the absolute destruction of the Niger Delta in the novel becomes a problematic if not arbitrary idea because it becomes difficult to locate the relations that entail such devastation.

It could be argued that the novel is simply an expression of eco-social devastation in its depiction of a moment and location where there does not actually appear to be any agency whatsoever. In the Niger Delta over 550 oil spills have occurred in the last ten years, compared to the ten that have occurred across the whole of Europe in the last forty-five years.[43] But, instead of focusing on agency here, I ask if the emphasis that the novel places on the ecological is a feature of an expiring cultural logic of late fossil capital.

It is true that oil is nature before it becomes a commodity. But under capital we actually never experience oil as nature — it can only be experienced as commodity, and it is its naturalized commodity state that prevents us from seeing it as nature. Oil as a naturalized demonic substance in the narrative puts the colonial subject and the object (oil) in opposition, as the subject becomes isolated from the object when it loses its relation with the object. If social processes are isolated in literature, then ecological processes are also isolated and no movement is possible.

Cities of Salt: The Collective Third-Person Narrative Voice

How could oil as a commodity then appear in literature? The answer is that it does *not,* nor does it need to appear as such. An ironic problem that I am proposing is central to the cultural logic of late fossil capital is that the more oil is *described* in a work, the more it disappears.

This naturalization of oil indicates a particular kind of "energy unconscious" — that which erases or contributes to the depiction of literally fossilized social relations. I hope to show in the following analysis of *Cities of Salt* the contrast between its ecological form and the ecological voice of *Oil on Water* and how this is related to differing depictions of oil.

Going back to the invisibility of oil as a material substance in *Cities of Salt*, oil does not appear physically but instead manifests itself in the minds of the characters in different ways, mostly as some kind of wealth or gold to come. This is because its particular material form as a commodity is not of importance to the Bedouin. What is important are the social powers it is given and the depiction of its effect on eco-social relations. Indeed oil exists alongside a web of other commodities in the novel. The irrationality of the commodity system is shown through a web of things that have social power without actually being useful to people. The sketchy "doctor" that sees a business opportunity in Harran, Dr. Subhi, claims his needle can fix all sorts of problems — virility in particular — and its purported powers draw even the most loyal customers away from the traditional treatments of Mufaddi, Harran's traditional healer. The Americans easily keep the emir distracted from his people by presenting him with objects to make him feel powerful, but he is unable to understand any of these object's potential uses due to his insatiable desire to accumulate more. On the contrary the objects weaken and confuse him with desires: "The emir grasped the telescope as a mother grasps a suckling infant," but he completely loses sight of his people under these new colonializing circumstances.[44] His obsession with the telescope further distorts and fragments his vision, proving his inability to see or understand the whole picture.

We see the power of oil as a commodity in the novel not though its ability to fuel production and development, but in its ability to generate wealth and luxuries — and then only for the American side of Harran. Oil's social powers as a commodity appear infinite — it displaces people, invents work for a wage, creates racial inequalities,

complicates family and gender relations, and even rearranges people's relationships with nature. But never does oil itself appear in the novel as an object of natural powers — its influence is conditioned by its social uses. Oil depicted through a constellation of social relations shows the conditioning powers of those relations. In Ortlieb's summation of the crucial significance of pointing to the dissimilitude of material wealth and value, he makes the assertion that "conscious human action" must bring a postcapitalist form of the social into being, before the blind compulsion of the value form finally leads to the merger of terminal capitalist crisis and what may well be a terminal *ecological* crisis that threatens to destroy all sources of material wealth.[45] That *Cities of Salt* represents oil as a commodity and not as nature allows for the subject-object relations that permit movement in the narrative. This movement recalls Malm's definition of fossil capital mentioned earlier, as both a relation and a process. Without this movement there could be no "conscious human action" depicted in the novel, as the conflation of material wealth (here oil as nature) and wealth in the value form (oil as commodity) naturalize oil's powers without recognizing the social forces behind this influence.

Socionatural relations in *Cities of Salt* fluctuate and change under different social formations — from traditional precapital relations where people own the means of production and survive off the land, to their displacement in Harran, where they become mostly alienated from nature as workers surviving off wages. Under both social forms ecological and social forces are presented dialectically. The third person collective narrative begins with the consciousness of Miteb al Hathal, and remains with him longer than any other character. But the narrative eventually leaves Miteb, entering the stories of numerous characters, to the point that John Updike accuses Munif in his review of *Cities of Salt* of having not even written a narrative recognizable as a novel.[46] And yet this third-person collective narrative, more than other forms, works with the interconnection that ecological thinking necessarily entails — ecology being the science that studies the relations of organisms to one another and to their surroundings.

The narrative weaves in and out of interdependent characters, plants, and animals, highlighting both social and ecological relations and common destinations.

In *Cities of Salt* subjects do not appear as objects of their environment. The novel makes the subject-object relationship to the characters' environment particularly apparent at moments when characters come to consciousness of the nature of their exploitation and the rupture of socionatural relations. The commodity-based social formation organizes eco-social relations, but eco-social relations, though not with the same intensity, also impact the new social formation. The first victims of the oasis community, once the Americans have found oil and forced the people off their land are the "wailing" trees.[47] After the community is displaced, they become workers in the coastal city of Harran. They are distraught by their inability to counter the sense of racial inferiority created by their segregated working and living conditions. It is once they leave the city for the desert, that they begin to find ways to meaningfully counter their confused feelings of inferiority. The turn towards empowering social processes is here caused and strengthened by the workers' connection to their natural environment. The rains that bring plants and animals also have the effect of creating the nostalgia that reminds them of their previous relations. The workers start to engage in guerrilla tactics of resistance — playing practical jokes on the Americans by letting loose rats and lizards in their tents and the strategic placement of a big dead black snake in the American camp, which results in several Americans leaving. The culmination of this moment of empowerment is the offering of a boxful of lizards meant to publicly frighten and humiliate the Americans at the ceremony marking the completion of the pipeline. The Arab workers clap longer than the others in mockery of the show.

This parallel between the flowering of the desert and of social consciousness continues to drive workers to a greater unification as they bring their partially repaired socio-ecological relations back to the city, culminating in their outrage at the dismissal of workers

and the emir's refusal to investigate the murder of traditional healer Mufaddi, who had refused any complicity with the imported social formation. The formal insistence of collective third person turns the slow growth of class consciousness into a kind of vantage from which to assess the impact of oil as a social relation. Oil gets mediated differently across its stages of development — it's discovery results in general suspicion, curiosity, and desire in the community — it's extraction leads to fear, alienation and displacement — the refinement process in Harran objectifies them into workers, but during the building of the pipeline — oil's transportation, the workers recover their subjectivity.

Miteb and Mufaddi are important characters as they frame the novel — the novel starts in the consciousness of Miteb, his ghost appearing and disappearing throughout, and ends with the ghost of Mufaddi. Both are marked by their refusal to adapt to the new economy brought by the Americans, as well as for their particularly strong connection to their environment. Both have female counterparts (not wives or family-based) in Umm Khosh and Khazna, in that when one is affected, the other follows either in strength or weakness. In strength — as Umm Khosh becomes sane near Miteb, and Khazna's cures become more effective with the presence of Mufaddhi — or in weakness — as Umm Khosh reverts to her madness and dies with the disappearance of Miteb, and Khazna becomes blind with the death of Mufaddi. Both Mufaddi and Akoub the truck driver also have human and extra-human counterparts in Amna's fawn and Akoub's truck. Akoub the truck driver's truck breaks down along with him as his health deteriorates, as does his dog whose leg becomes infected at the same moment as his does. Additionally, tied-up camels suffer with the first prisoners in the first jail, here among many other moments in the narrative in which changes in the social and material environment are depicted as effecting both human and nonhuman nature.

The most striking example of this interconnectedness is the extent to which Mufaddi's death effects his entire environment: his name in Arabic means "the final arbiter" and the emir's refusal to investigate

the cause of his murder is the ultimate motivation for the unification of the workers at the end of the novel. The pain caused by his murder brings voice to the suffering workers and finally relief, as Mufaddi's child patient also finds his voice after being unable to talk, when he witnesses the pain of the irons on another — his pretended treatment — and he begins to "bellow" and is cured.[48] Mufaddi's ghost appears at the height of the marches, and is seen by every single participant; his death proving the extent of his connection to his environment as it reacts in chaos: adults tremble and become thirsty, babies cry, dogs howl, a gazelle jumps into the ocean, and large birds fall prey to hungry dogs.[49] Additionally, Amna's fawn, Mufaddi's animal counterpart, also suffering under house arrest, presumably dies at the moment of his death.[50]

Despite the many individual differences of characters, the narrative viewpoint is collective, from "the people," and often in connection, through simile, with nature or natural processes, turning the subjects and objects of the setting into an embedded whole. When Um Khosh begins to lose her sanity due to the disappearance of her son, her sadness is said to "[leave] a deep impression in the people's hearts and minds, much as rushing water does in hillsides."[51] When Miteb fully refuses the Americans and their claims, the narrative voice at first reflects society's frustration with his refusal: "He seemed obstinate and imbecilic. He had forgotten his age and dignity."[52] When the collective narrative of *Cities of Salt* directly expresses an opinion, it is often an opinion held in general by the community. There is no illusion of transparency as there would be in the case of a more conventional third person omniscient narrative. Instead, in the third-person collective, ideologies are laid bare and rendered fluid. Transformation happens collectively, often influenced by those characters lying just outside the collective norms. The people eventually realize that they were wrong about Miteb, and his ghost haunts them for the rest of the novel. The narrator's comments are not intended to capture "reality" but rather the dynamic of collective opinion, while at the same time remaining attentive to those just

outside this realm. The dynamic narrative shows the people as initially incapable of imagining future problems or of any critical awareness, much less preventing the oncoming crisis. Unable at first even to recognize their own situation, they nevertheless eventually transition into awareness and the capacity of organizing and fighting back.

Munif, himself formerly an oil engineer with a PhD in oil economics, moves between fiction and nonfiction in the novel, detailing the racist, segregated labor practices and Jim crow-type laws that clearly evoke the historical situation associated with Aramco (or the Arabia American Oil Company) in Dhahran, Saudi Arabia in the '40s and '50s. In the novel, the workers come to understand the nature of their exploitation and revolt, as in fact the workers did in Dhahran, Saudi Arabia, particularly in 1956. Echoing one of the first slogans actually used to exhort workers to unite in Dhahran in 1945 against Aramco, Munif's workers also shout "we are all one," and the novel concludes with "the masses of people mov[ing] as one man."[53] By 1956 in Dhahran, however, the protests had been stopped by a royal decree outlawing strikes. Those who didn't comply with the decree ended up in jails or disappeared. Additionally, poor migrants were kept on hand as a reserve work force, making local worker's demands largely futile. Oil historian Robert Vitalis says that after the royal decree, Aramco's policy planning staff came out with a statement claiming that the workers were more content now and that they even had new TVs courtesy of the company.[54]

Though Amitav Ghosh admires Munif's interaction with oil in *Cities of Salt*, he calls the novel's ending, in which the workers enact some success in "becoming politically active," "an escapist fantasy" and "pure wish fulfillment."[55] Whether true or not, such a putative exaggeration of the success of the striking workers when considered as a utopian moment within a realist fictional narrative provides a strong contrast to utopian moments from other works categorized and acclaimed as petrofiction. The ending, though not as optimistic as Ghosh implies, leaves breathing room for the possibilities that socio-ecological relations entail. Munif moves into the realm of the

magical at the end of the novel as Fawaz and Mugbel (Miteb's sons) are seen "flying through the air like birds" along with the ever-present specters of Mufaddi and Miteb.[56] The aim of the narrative here is clearly not to describe objective social facts or coincide with empirical reality but to realistically portray social forces and connections as they are seen by the third-person collective. That Miteb's sons are flying highlights the transcendence of material description in order to capture driving social forces that are at play in this moment.[57] That ghosts are present connects the historical process to a momentum, though the destination of this momentum is not as "wishful" as Ghosh would have it. The novel ends with small concessions given from an unreliable source (the emir), predicted future sacrifices as Ibn Naffeh says "you should ask whose blood is next," and the clear tone of uncertainty, as he "laughs sadly" and says, "Hope for the best"[58] The point is not that the momentum is hopeful, but that *momentum exists* in the form of the novel. What appears solid (like salt) may not be so. This momentum would not be possible without subject-object relations.

Though the discovery of oil completely changes the lives of the Bedouins, oil itself (as material wealth) is not presented as the catalyst for displacement or the source of suffering or an organizing historical force. It is instead the distinct commodity-based social formation that organizes eco-social relations, allowing for a representation of the relations organized around oil under the value form. When Ibn Naffeh says, "The Americans… are the root of the problem," there is some dramatic irony here, as the reader can easily discern that it is not the Americans themselves that are the problem, as the entire novel carefully depicts not a history determined by a nation or an inert natural material but the process of the disintegration of relations, from the divorce of the means of production, to working for a wage, to segregation, to iron posts replacing trees, to the reification of women's bodies, to the introduction of luxury goods, to land grabs, and so on.[59] The title could be pointing to a future collapse (salt easily disintegrates), yet it is not clear by the end of the novel how

this collapse may come about. What is clear is that the collapse is not coming from some determined social or ecological process. Both social and ecological driving forces arise organically in the novel and point to an uncertain ending that allows dynamic socio-ecological forces to gain or lose momentum. This also allows for the representation of oil as material wealth (oil as possibility) and oil as commodity (oil as tragedy) to operate simultaneously in dialectical and historical tension.

Conclusion

What happens when we rethink Georg Lukács's realism/naturalism distinction in the context of neonaturalist and neorealist narratives about oil in the age of late fossil capital? Naturalism, heavily influenced by Darwin's theory of evolution at the time of its first appearance as a distinct narrative style, tends towards fatalistic notions of environmental determination of social behavior. Lukács charges naturalism with reducing "driving social forces" to mechanical, natural laws of society, as would a scientist observing unmediated facts or as social data available to the novelist as experimentalist trying to discover the "natural laws" of society. In "Narrate or Describe?" Lukács explains that the distinction between realism and naturalism is based on the narrative standpoint: the reified observer of *naturalism* observes and describes a scene whereas the narrative of a *realist* work participates as it narrates the "vicissitudes of human beings," in part by transcending mere observation and description.[60] In *realism*, this transcendence involves the depiction of setting as something inseparable from its relation to the characters — and vice versa. We have already seen examples of this in *Cities of Salt*. However, in naturalism, as it is understood by Lukács, the characters have no connection with the objects described.[61] The subject and object are represented as isolated from each other. Such mutual isolation becomes, at its logical extreme, a total separation, not just of character and setting, but the severing of reality as such into two independent spheres, as is the traditional depiction

of nature *and* man, nature as entirely foreign to the social. And as we have seen in more contemporary literature, this can take the seemingly paradoxical form (as it relates to literary naturalism) in which the ecological object *completely absorbs* the social object. In both cases there are only abstract relations, established between subject and object, which in a sense amounts to the complete absence of relations. In Lukács's account of realism, however, "description of the environment is never 'pure' description but is almost always transformed into action."[62] In realism the depiction of environment accords it a dramatic role in the story as a whole, as characters and setting or environment never cease to interpenetrate each other. The two never cease to constitute an underlying *absolute* unity in relation to which their separation is always *relative*. Characters and setting are in continual and singular process — one which manifests itself in both their apparent separation as well as in those moments in which their absolute unity shines through the surface of what only *appears* to be their mutual isolation.

In naturalist observation, the narration "ignores the motive forces of social development and their unremitting influence on even the superficial phenomena of life."[63] There is a great leveling between characters and setting, as everything is described as existing on the same plane, as objects moving in accordance with a putative "natural law" that disguises what is in fact a more total reification of social relations. In naturalism, "[o]bservation is a process with its own logic and its own mode of accentuation. The important and unimportant are described with equal attention… deprived of all human significance."[64] The reified narrative style in naturalism is likened to the "static pictures of still lives connected only through the relation of objects arrayed one beside the other according to their own inner logic, never following one from the other, certainly never one out of the other."[65] Instead of documenting the dynamic process of the deterioration of relations or hinting at possible relations, there is static defeat. This defeat is the result of the depiction of so-called "subjects" (human characters) as if already absorbed by — and thereby

appearing to lack any real relation at all to so-called "objects" (oil, the natural environment, landscape, setting, and so on). Having been severed, in a necessarily false surface relation, from what has now become their true but concealed dialectical unity, subjects themselves appear to be mere objects.

Clearly, there are no "pure specimens" of either narration or description.[66] The point here is not to label works of literature as either one or the other but to notice different strengths and combinations in order to gauge the relationship with reality that is being depicted.[67] We cannot say that Rufus is simply describing "social facts," as did Zola's third person naturalistic description. But the problems that Lukács found in Zola's naturalism are very similar to problems we find in *Oil on Water* and other works of "petrofiction." This is notably related to the novel's particular kind of ecologically informed imagination, resulting in effects that may appear to differ from the standard naturalist formula critiqued by Lukács: in the moments where ecological processes are depicted, the narration *participates* by moving the typical idea of a pristine, rural, and asocial nature out of this static category and placing it in process with the social. In "petrofiction" this means that oil as commodity is not naturalized but also appears specifically as commodity bearing on the social relations that in essence *are* the domain of novelistic representation. Still, at bottom the novel nevertheless exemplifies reified observation, since in precisely those moments when social processes are depicted as rooted in indifferent ecological material, these social relations themselves simply disappear. When social processes are not portrayed as developing *in relation to* ecological processes but rather as *entirely subsumed* within ecological processes, then historical time appears to merge with naturalized, nonhuman time — a time of natural decay and a purely material, asocial death — and the historical time of the social appears to come to a standstill.

Notes

1. Helon Habila, *Oil on Water* (New York: Norton, 2010) 9–10.
2. Habila, *Oil on Water* 60.
3. *Oil on Water* 238.
4. See Amitav Ghosh, "Petrofiction: The Oil Encounter and the Novel," *Incendiary Circumstances* (Boston: Houghton Mifflin Company, 2005 [1992]) 138–151.
5. Andreas Malm, *Fossil Capital* (London: Verso, 2016) 333–334.
6. Ghosh, "Petrofiction" 140.
7. "Crucially, Ghosh does not consider the possibilities of a logic of oil that puts it in the shade, in his eyes, when compared with the creative commodity par excellence, spice (although even here, in the realm of commodities of colonization, he might have made space for the vast histories on sugar and coffee)." Peter Hitchcock, "Oil in an American Imaginary," *New Formations* 69 (2010) 81.
8. Peter Theroux, "Abdelrahman Munif and the Uses of Oil," *Words Without Borders: The Online Magazine for International Literature* (October, 2012).
9. Abdelrahman Munif, *Cities of Salt*, trans. Peter Theroux (New York: Vintage International, 1987) 49.
10. *Oil on Water* 140.
11. *Oil on Water* 9, 193.
12. Patricia Yeager, "Editor's Column: Literature in the Ages of Wood, Tallow, Coal, Whale-Oil, Gasoline, Atomic Power and Other Energy Sources," *PMLA* 126:2 (2011) 309.
13. Malm, *Fossil Capital* 11.
14. *Fossil Capital* 290.
15. Jeff Diamanti, "Three Theses on Energy and Capital," *Reviews in Cultural Theory*, 6.3: *Energy Humanities* (2016) 14.
16. Claus Peter Ortlieb, "A Contradiction between Matter and Form: On the Significance of the Production of Relative Surplus Value in the Dynamic of Terminal Crisis," *Marxism and the Critique of Value*, eds. Neil Larsen, Mathias Nilges, Joshua Robinson, and Nicholas Brown (Chicago: MCM' Publishing, 2014 [2008]).

17. Ortlieb, "A Contradiction between Matter and Form" 83.
18. "A Contradiction between Matter and Form" 112.
19. Karl Marx, *Capital: Volume I*, trans. Ben Fowkes (New York: Penguin, 1976) 638.
20. "A Contradiction between Matter and Form" 112.
21. Theroux, "Abdelrahman Munif and the Uses of Oil."
22. Upton Sinclair, *Oil!* (New York: Penguin, 1927) 548.
23. Patrick Chamoiseau, *Texaco*, trans. Rose-Myriam Rejouis (New York: Vintage International, 1992) 263, 319.
24. Georg Lukács, *History and Class Consciousness,* trans. Rodney Livingstone (Cambridge: MIT P, 1971) 31.
25. Jason W. Moore, *Capitalism in the Web of Life* (New York: Verso, 2015).
26. Jennifer Wenzel, "Behind the Headlines: Oil on Water," *American Book Review* 33.3 (March/April 2012) 14.
27. *Oil on Water* 178.
28. *Oil on Water* 76, 77.
29. *Oil on Water* 9, 43.
30. *Oil on Water* 193.
31. *Oil on Water* 38.
32. *Oil on Water* 38.
33. *Oil on Water* 60.
34. *Oil on Water* 163.
35. See Elmart Flatschart, "Crisis, Energy, and the Value Form of Gender: Towards a Gender-Sensitive Materialist Understanding of Society-Nature Relations" in this volume.
36. *Oil on Water* 111.
37. *Oil on Water* 232.
38. *Oil on Water* 90.
39. *Oil on Water* 239.
40. Georg Lukács, "Narrate or Describe?" *Writer and Critic and Other Essays*, Trans. Arthur Kahn (Lincoln: iUniverse 2005 [1936]) 146.
41. *Oil on Water* 239; Rufus says, "I turned and began my descent."
42. Lukács, "Narrate or Describe?" 116.
43. See Amnesty International, "Nigeria: Hundreds of oil spills continue to

blight Niger Delta," *Amnesty International* (March 19, 2015) https://www.amnesty.org/en/latest/news/2015/03/hundreds-of-oil-spills-continue-to-blight-niger-delta/.

44. *Cities of Salt* 421.
45. "A Contradiction between Matter and Form" 117.
46. John Updike, "Satan's Work and Silted Cisterns," *The New Yorker* (October 17, 1988).
47. *Cities of Salt* 106.
48. *Cities of Salt* 570.
49. *Cities of Salt* 579.
50. *Cities of Salt* 575.
51. *Cities of Salt* 53.
52. *Cities of Salt* 71.
53. *Cities of Salt* 613.
54. Robert Vitalis, *America's Kingdom: Mythmaking on the Saudi Oil Frontier* (Stanford: Stanford P, 2007) 187.
55. Ghosh 148.
56. *Cities of Salt* 615.
57. *Cities of Salt* 615.
58. *Cities of Salt* 627.
59. *Cities of Salt* 626.
60. "Narrate or Describe?" 111.
61. "Narrate or Describe?" 130–133.
62. "Narrate or Describe?" 118.
63. "Narrate or Describe?" 122.
64. "Narrate or Describe?" 131.
65. "Narrate or Describe?" 144.
66. "Narrate or Describe?" 116.
67. "Narrate or Describe?" 116.

The Political Energies of the Archaeomodern Tool

Amanda Boetzkes

In his provocative account of the relationship between representation and politics in *Representing Capital* (2011), Fredric Jameson observes the many figural flourishes by which Marx discloses a horrified awe of capitalism. Notably, these flourishes are occasioned by those moments in which the capitalist system becomes spontaneously animate in its confrontation with the collective power of labor. Where Jameson attributes an ontological status to these autonomous entities (capitalism and labor power respectively) under the rubric of "spirits" and "forces" as per Marx's historical moment, I would describe them as vital energies whose political vectors are charted by the historically specific scenes of production, reserve, clash, and/or discharge. For example, when the organization of factory machines springs to life, as though at the behest of "demonic power," or when collectivity "begets in most industries a rivalry and a stimulation of the 'animal spirits' which heightens the efficiency of each individual worker," Jameson reflects that "the choice between a 'good' description of capitalism (as constant revolutionizing and innovation) and a bad one (as exploitation and domination) is in fact a political choice and not a logical or scientific one: a choice that must be made in function of the current situation, and whether people can be *politically energized* by the negative — anger — or the positive — hope."[1]

In Jameson's characterization of Marx's literary forms, the work of politics and the work of machines share in an energic current, the ground from which the intentionalities of politics emerge. Not only was Marx keenly aware of the qualitative role of energy in the specific

character of capitalism (and not just its quantitative role in powering the perpetual growth of the system), he was also attuned to the way that energy charged his representation of it. More to the point, this energy possesses a coextensive political and aesthetic valence by which multiple political positions could be generated and shaped from within that very system. One might even say that the energic dimension of representation in Marx becomes the condition for a discursive ecology — a polyphony of criticisms, forces, collisions, oppositions, latencies, and possibilities that stand in resistance to capitalism's seamless absorption of labor.

This chapter shows how the energies of representation implicit in Marx's figurations allow us to rethink critical modes of existence within a political ecology. I consider how political energies have historically been registered as dissimulated forces that haunt the terms of representation but also shape the world to come. This tradition has a striking resonance with the recent preoccupation with an archaeo-modern perspective of the economy, in which political power can be gauged in its representation as a potential energy that inheres in petrified objects. I discuss the thematic of the petro-object through a discussion of several works that appeared in the 2015 Venice Biennale. Here, we see the specific formation of labor energies referenced only by manual tools discovered in posthumous environments — that is, in scenes of ruination in which assemblages of the workforce appear as prehistoric artifacts that have been buried and encrypted in the earth. I argue that this coextensive setting into history and setting into the earth of labor energies signals a paradigmatic shift in materialist thinking from economy to political ecology. However, as Bruno Latour points out, such a reorientation is demanding and not without its share of hauntings from modern conceptions of the political. Yet, following Latour, we may be able to shape such a turn by speaking and seeing political energies "crookedly," which is to say, by finding them running through new ontological formations. Inasmuch as political energies are generated by and directed within complex assemblages, these same assemblages disclose the potential to take

hold of the vectors of political conflicts. More precisely, in rethinking the ontological transections between technology, human labor, and earthly forces that produce such assemblages it becomes possible to chart their potential for redistributing our political capabilities and sensibilities.

The Monstrous Energies of Capital

Marx's varied representations of capitalism frequently revolve around its systemic depletion of energy. While his figurations of capital deal primarily with forms of consumption, these are not to be mistaken for the cultural vices of greed and pleasure in accumulation. Rather, the insights of Marx's figurations develop in *Capital* into an increasingly sophisticated consciousness of capital's insatiability for both human and nonhuman forms of energy. If the feudal landscape consisted of agricultural social relations that were relatively easy to map, the rapidly industrial landscape of the mid- to late nineteenth century took much more critical work. Thus he is at pains to find a modern form that would encompass the paradox of an expanding self-expending system. Such a contradictory energic model gets figured as monstrous, and thus Marx personifies the shift from mercantile capitalism, a basic exchange model, to its modern form as interest-bearing capital, as the emergence of an economic Moloch, a pagan god that demands the sacrifice of children and animals, and whose appetite is never sated. Marx writes,

> The complete *objectification, inversion* and *derangement* of capital as interest-bearing capital — in which, however, the inner nature of capitalist production, [its] derangement, merely appears in its most palpable form — is capital which yields "compound interest." It appears as a Moloch demanding the whole world as a sacrifice belonging to it of right, whose legitimate demands, arising from its very nature, are however never met and are always frustrated by a mysterious fate.[2]

Capital thus provides no plenitude whatsoever from its accumulation. Rather, its exchange is born of a sacrificial logic. In this reading, capital does not demand like a hell mouth that must be fed, but rather, proliferates through ever more exchanges to become an expanding system that depletes energy with every transaction. Like the Moloch, its appetite is for the world, and therefore it cannot be placated with a token portion of a society's wealth. Marx's point is that the demand for sacrifice is integral to the surplus value model of capital, so that the derangement of capital occurs in the world's circulation of wealth which takes place as its own self-consumption.

In this vein, Frederic Jameson argues that capitalism is both a self-organizing system and a dialectical totality (a unity of opposites) by which it can be understood as open and dynamic, but whose operation is nevertheless premised on a fundamental closure.[3] The system must expand and absorb in order to exist; but at the same time its requirement to perpetually enlarge — to find energy sources and absorb them into exchange — is the condition of its closure. It cannot stabilize or else it will begin to die.[4] Once the system is engaged, moreover, it precludes all economic alternatives or criticisms, which simply become sources of strength and resilience. The lynchpin of this system, however, is the unity of capitalist production and unemployment.[5] Unemployment is the essential state of depletion on which capitalist production functions and expands, since the strategic control of labor as a form of energy management (whether to keep stockpiled, or to deploy for maximum yield) guarantees the possibility of exploitation at the level of production, which can then be claimed as profit through exchange. Thus, while interest-bearing capital is a system that consumes expansively and uncategorically, it nevertheless demands a sacrifice in its particularity, as the lives of the unemployed given as tribute. The sources of energy that feed the depleting system change over historical epochs, yet unemployment remains capitalism's universal demand. Thus, the difference between the phases of capitalism, and the specificity of its globalization, are differences in the forms of unemployment reserves.

Where Marx was keenly attuned to the fact that labor was not just the functioning machinery of the system but a source of energy in its own right, Jameson mobilizes his figuration of capitalism to account for the status of labor in the contemporary economy. He therefore notes the global scale of populations who are held in standing reserves of energy precisely through the imprisonment of unemployment. The larger the reserve of unemployed people, the cheaper labor becomes, and the more demand for the world's resources increases, the more wealth remains in circulation gaining value without being used in the interests of individual livelihoods. This configuration sets the terms for leeching human energies in order to power exchange for its own sake, while impoverishment becomes naturalized through the ideologies perpetuated in events such as war, terrorism, massive refugee migrations, and environmental disasters. The global supremacy of capitalism has been powered by failed nation states, ethnic genocides, terrorism, and environmental crises that guarantee its supremacy as though through a process of traumatic bonding. On this point, Jameson follows Aaron Benanav's emphasis on the relationship between surplus populations and the production of surplus value.[6] However, where Benanav argues that, concomitantly with the growth of the system, capital accumulation produces surplus populations redundant to the needs of capital, Jameson attenuates this claim to suggest that Marx's key insight is that unemployment is structurally central to the dynamic of accumulation and expansion which constitutes the very nature of capitalism as such. Thus, surplus populations are not mere by-products of the system but are rather the sacrificial lives that it claims as its very energy source. Following Althusser, Jameson draws the conclusion that capitalist accumulation and unemployment are borne out coextensively through an axis of exploitation and domination.[7]

Representation as Derangement of Labor Energies

When Jameson argues that the representation of capitalism finds itself making a political choice to view it positively as constant

revolutionizing or negatively as exploitative, and that these choices are energically charged (positively by hope or negatively by anger), he locates the possibility of rearticulating the mechanisms of that system through precisely these political energies. That is to say, the seemingly magical process of deranging capital into interest-bearing capital can be undertaken as a representational procedure by which labor is inverted from its positive energies to its negative ones. A consciousness of the labor substructure thus occurs through the energic derangement of representing capital. Moreover, such derangements of representation are ways of tracking shifts in forms and modes of political resistance, in addition to the technical composition of what we might term the fossil-fueled exploitation of

Figure 1. Jean-François Millet, *Man with a Hoe*, 1860 – 1862, Oil on canvas, 81.9 × 100.3 cm (32 1/4 × 39 1/2 in.). The J. Paul Getty Museum, Los Angeles.

industrialized labor. From within capitalism's representation of itself to itself, derangements can occur that give rise to a new visibility.

This insight is crucial to theories of the social history of art. T.J. Clark's analysis of realist painting in the nineteenth century, for example, is attuned to the energic charges at play in the politics of representation. He notes such charges in Millet's politics, as he elaborated through his paintings of gleaners and other peasant laborers over the course of the mid–nineteenth century.[8] In his earlier paintings of the 1840s, Millets aggrandizes his peasants, drawing on Michelangelo's Sibyls or Raphael's Virgins as figural models. These figures incorporate the automaticity and brutality of their labor, mobilizing a "savage physiognomy." The combination of grandiosity and brutishness lends his paintings a "philosophic melancholy" in their "monotonous ugliness," in the words of Baudelaire.[9] In this regard, Millet's compositions and figurations open the representation of the peasantry from a poetic mythology of the noble poor to associations with the more dangerous and unruly *banlieue* peasant. As Clark points out, the factory workers of the Paris suburb were considered to have a recognizably degenerate physiognomy. More than this, the *banlieu* peasant was a dislocated and uncertain character of modern life; as people left rural France for work in the city, they relied on gleaning in the woodland of Barbizon, an intermediary zone between the agricultural communities and the urban factories that were also the sites of peasant uprising as gleaning rights became more stringently regulated and even forbidden.[10] The project of classicizing labor was not just a matter of elevating the figure of the peasant, but also of paring down the landscape, rendering it sublime and threatening, suggesting revolutionary power in simplified, ambiguous spaces. Labor power was not simply embodied through figuration, but in his paintings of the mid to the early 1860s, he articulated it as a latent threatening energy that pervaded the landscape (Figure 1). Clark explains:

> In 1850 Millet was still ready to draw that terror directly. In his later works he tended to suppress it: there were no more redskins in the forest, and no more twisting lines and contorted postures. But there was always violence, as an undertone to plain description: Death visited the woodcutter, grass smoked like pyres in the landscape behind the Man with a Hoe: an abandoned harrow, a flock of crows or a misshapen tree stood for more than themselves, an *abstract* menace which grew more sinister as Millet grew older.[11]

In other words, the political force of Millet's work arises in the very abstraction and dispersal of the proletariat, unformed and yet perceptible at the junctions between rural and urban landscapes, traditional and modern life in the mid-nineteenth century. Labor power itself was deranged into a suppressed and seething energy waiting to erupt into revolution. The subtlety of Clark's analysis comes from his assessment of how new formulations of both the labor classes and the unemployed asserted themselves into the visual field as a consciousness that could be abstracted from literal figuration. Moreover, precisely as an abstract disruption, such representations become politically charged, for in their staging of sites of labor but resistance to the existing relationship between figure and ground, worker and land, the paintings open the possibility of a new political form to come. The abstraction signals both an absorption of existing figurations of labor into the unmapped terrain of the Barbizon forest and at the same time, a potential energy which would be carried forth in a figuration that was as yet unrecognizable and therefore uncontainable. Millet therefore redistributed the aesthetic terms of the figure-ground relationship to posit the obsolescence of the rural proletariat and an anticipatory ethos that signaled a future revolutionary whose energy is derived from its emergence out of a feral topography. This return of the figure to its earthly ground in order to encrypt an existing political form, as a gesture toward its energic reinvigoration and in such a way as to alienate and invoke the reformulation of the visual field, is also at stake in the contemporary

era, which is witness to intensive procedures of deterritorialization due to global scale resource extractions and the restless flows of mobile surplus populations.

Petro-Objects and the Ruins of Global Politics

This dialectic of figuration and abstraction informs my reading of the political energies that charged the Arsenale art exhibition of the 2015 Venice Biennale, organized under the title *All the World's Futures*. Important here is the anachronism of *futures* in the aesthetic imaginary of the Biennale which is read against the historicity of land and labor in the nineteenth century. What Millet figured as a future contradiction is refigured as both the obsolescence of industrial labor and the revalencing of politics through an anticipatory figure inferred only by way of discarded manual tools that wait to be claimed in *All the World's Futures*. The exhibition's Marxist currents were articulated with particular force in the recurrent appearance of inert, broken, or appropriated tools and obsolete sites of manual labor.

The curator, Okwui Enwezor chose three intersecting "filters" by which to govern the thematics of the exhibition, with the goal of producing an aesthetic sense of the global political landscape: "Liveness: On epic duration," "Garden of Disorder," and "Capital: A Live Reading." The three filters convened a set of artworks that articulated the profound turmoil of world politics while foregrounding the representation of labor and exploitation. While the exhibition emphasized the "liveness" of political formations with a focus on mass movements such as protests, immigrants, refugees, and humanitarian catastrophes, the performances, documentary testimonies, and other time-based media were set into relief by the persistence of historical ruins. Thus, the curator opens his statement by quoting Walter Benjamin's famous ninth thesis from his "Theses on the Philosophy of History" about Paul Klee's *Angelus Novus*:

> A Klee painting named Angelus Novus shows an angel looking as though he is about to move away from something he is fixedly

> contemplating. His eyes are staring, his mouth is open, his wings are spread. This is how one pictures the angel of history. His face is turned toward the past. Where we perceive a chain of events, he sees one single catastrophe which keeps piling wreckage upon wreckage and hurls it in front of his feet. The angel would like to stay, awaken the dead, and make whole what has been smashed. But a storm is blowing from Paradise; it has got caught in his wings with such violence that the angel can no longer close them. The storm irresistibly propels him into the future to which his back is turned, while the pile of debris before him grows skyward. This storm is what we call progress.[12]

Like Benjamin's angel of history, Enwezor invites a sensitivity to the wreckage of contemporary politics — the debris of failed nation states, abandoned buildings, archaic tools, all of which appear in consonance with a consciousness of the unemployed and other disenfranchised populations.

Figure 2. Katrīna Neiburga and Andris Eglītis. *ARMPIT*, 2015 – ongoing. Mutimedia art installation. Still from the video. © artists, LCCA.

The most remarkable example of the exhibition's Benjaminian aesthetic was the Latvian pavilion, an installation by Katrina Neiburga and Andris Eglitis entitled *Armpit* (2015) (Figure 2). The installation was designed as a hybrid architectural structure, combining the style of an Eastern European woodshed (common in Latvia, whose prime

export has traditionally been lumber) and the private garage, which has become the site of appropriation by cooperatives that repurpose them as workshops. Built out of recovered wood, brick, and metal fragments, the makeshift space of the pavilion featured photographs and videos of a world of male laborers — lumberjacks or rural workers who, in their leisure time, or in periods of unemployment, take over garages to make a space for tinkering with electronics and other kinds of machinery. One corridor of the pavilion had a large workbench covered in old metal tools. The artists present garage culture in Russia and Eastern Europe characterized as an aesthetic ground, a "brutal techno-romanticism" that takes its inspiration from the Thoreau character in *Walden*, Alek Therien, who borrows an ax and fells some slender pine trees in order to build a hermit shack for himself. Yet, such spaces are predicated on labor that exceeds economic production.[13] Where Thoreau's *Walden*, and its meticulous inventory of basic supplies and acts of survival, offers a panacea to the suffocating drudgery of the work scene of the urban factory and its correlate poverty and sensory deprivation, *Armpit* recovers this aesthetic enrichment through the satisfaction of a labor without instrumental purpose or economic gain.

The curator of the pavilion, Kaspars Vanags, explains that the story of garage men inhabiting the periphery of Europe is a pastoral of the digital age. Yet, he calls their work a form of "self-exploitation as a leisure time activity… a time capsule where neoliberalism has enclosed the postindustrial proletariat."[14] He considers the terms of the pavilion's aesthetic:

> Here the rules adopted in the world of garages and lumberjacks are clearly felt. One can only guess what they might be… 1. The order of things must be at least natural, if not self-evident. 2. Functionality, with the exception of that associated with a woman, should not be beautiful. 3. Away with the decadent nonsense of metrosexuality — any woman knows that the hairy armpit of a man, albeit sweaty, is perfect for cuddling and feeling at home.[15]

Armpit presents an exclusively male world and yet even masculinity is laid bare as a subject formation in its obsolescence. The garage men combine a historical form of artisanship, with an equally long history of manual labor to make a new formation — a tinkerer who appropriates architectural structures in their demise and uses them for nonproductive labor. The wood fragments that make the scaffolding of the pavilion hark on the Latvian woodshed, and thereby suture the figure of the garageman with the tradition of artistic training in Latvia by which students would take over woodsheds as studios to train in plein air painting. Thus, the woodshed space sutures together the men's nonproductive manual work and the aesthetic sensibility for archaic spaces and tool-working.

Figure 3. herman de vries, sickles from *to be all ways to be*, Venice Biennale, 2015. Courtesy of the artist.

Where the Latvian pavilion vividly reproduced these spaces of excess labor, other works in the Biennale take up the political

trajectories of excess labor energy solely through the presence of the tools of manual labor in their nonfunctional state. herman de vries's installation, *to be all ways to be* in the Dutch Pavilion undertakes a deconstruction of nature and the agricultural landscape of the Netherlands (Figure 3). Each wall provided a grid of natural specimens — one wall a set of pigments derived from plant substances; another wall a set of samples of the plants themselves; on pedestals stood a selection of minerals. In the middle of the room was a large circle composed of 108 pounds of dried rose petals whose aroma filled the room. Right next to this, the artist laid out a selection of dozens of sickles and plans. In this way, de vries redistributes the historic episteme that connected nature, the peasant laborer, and agricultural production into a display of natural history by which botanical specimens and tools alike become artifacts in a common continuum. The manual tool becomes an archaeological entity; a fusion of geological matter and historical form excavated from the earth as though a new type of petroglyph: a petro-object.

Chinese artist Xu Bing likewise mobilized tools and construction debris in his monumental *Phoenix* (Figure 4). The work, actually a pair of two monumental phoenixes, originally commissioned for a set of office buildings in Beijing, is comprised of the remains of the urban development that took place when that city was preparing for the 2008 Olympics. Close inspection of the majestic forms yields metal panels, steel beams, chains, pipes, hard hats, saws, and other remnants of the construction sites. These ready-made components of the phoenixes were a tribute to the migrant workers enlisted to undertake the massive transformations to that city, as well as to the thousands of displaced people who were forcibly removed from their properties for the development projects. The work subtly preserves the evidence of this labor and exploitation, even as it revisits a grand national symbol of China's might. *Phoenix* gives full articulation to global capital itself: a new and beautiful Moloch that simply absorbs ever more elaborate forms of labor, leaving only the obscure material evidence of its energy source.

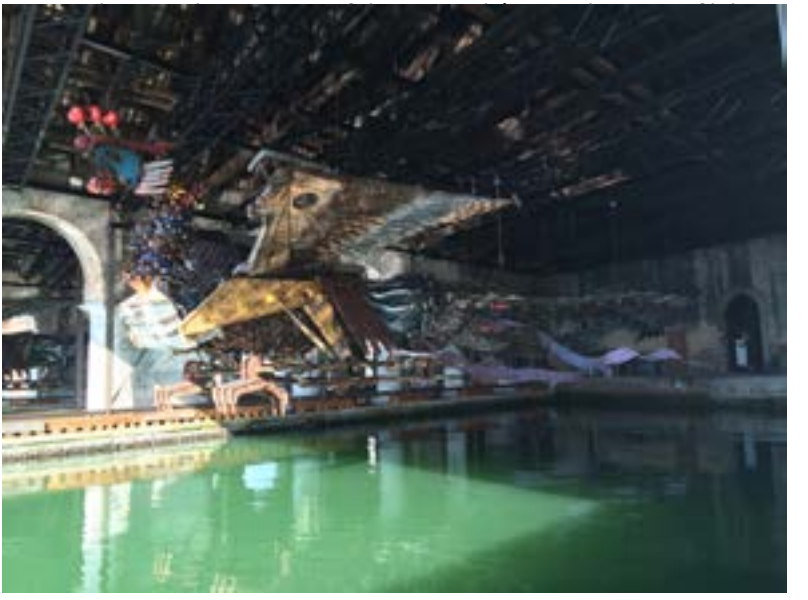

Figure 4. Xu Bing, *Phoenix*, 2015, construction site debris and materials, exhibited at the 56th Venice Biennale, Theme Exhibition, All World's Future, Venice, Italty, 2015. © Courtesy of Xu Bing Studio.

is clear: the era of manual labor and its energies has been buried and encrypted in the bedrock of the earth itself, a tactic of containment in the era of finance capital. Yet, the remnants of labor return as petro-objects, artifacts of that buried labor. Moreover, it is not coincidental that the tools of labor qua archaeological object appears in an age when extractive technologies provide the global economy's most lucrative resources (fracking for oil and natural gas as well as mining). The staging of an excavation of the remnants of another era of labor signals the rendering inert of labor and its burial as the wasted remains of modernity. Moreover, these excavations make apparent the containment of labor as potential energy. (I would go so far as to describe labor power as a petro-fuel in its own right.) In this sense, the return of manual tools as art encompasses the formation of the labor class in the global economy as both an archaic energy source, and one

that might be viewed alternatively as a displaced revolutionary power, here rendered as a sublime ethos in the manner Clark describes the energies of Millet's late paintings. The tools are laid out as neutral objects, but are available to be picked up once again. The archaeological aesthetic threaded through the Biennale galvanizes a consciousness of how prehistoric earthly energies, currently directed into the economy, threaten to change their valence and become revolutionary.

The Energies of Political Ecology

The Venice Biennale formulates a sense of the political landscape not simply by inferring a consciousness of the energies of labor that power the economy in petro-objects, but also by positioning these in "posthumous" environments and situations. (I take the term posthumous to refer both to the understanding of dead environments and the root of the word "humous", to mean of the soil or earth.) That is to say, the curator's recall of Benjamin's angel of history is more than just an invitation to consider the ruins of modernity, vainly and melancholically trying to make sense of them in the aftermath of change; it is to do so with a specifically ecological thrust. Thus, the Benjaminian foundation of the exhibition takes on a new relevance as an earthly politics, charged by the possibility of a revival and redistribution of the intimate relationship between land and labor.

An ecological turn can be deciphered in the latent political energies that reside within the artworks, waiting to be activated by the viewer. In this regard, the exhibition demonstrates what Bruno Latour identifies as a vacillation between a modern notion of economy and ecology.[16] In his *An Inquiry into Modes of Existence: An Anthropology of the Moderns*, Latour outlines the fallacies of the modern worldview, and its emphasis on science and politics. He takes issue with how these respective models produce facts and truth claims that orient the knowledge of "the moderns." Significantly, his analysis interprets "the moderns" anthropologically, which is to say, his deconstruction assumes a cultural distance by speculating on a worldview to come. Thus, he examines modern culture in hindsight, as a thing in the past,

or at the very least, in its passing. This rhetorical device complements his argument which insists on viewing the world "crookedly," which is to say, to understand the autonomy of ontological entities that are otherwise rendered invisible to the modern eye, but which are inferred in our very language. Where economy is a production of the modern paradigm that simply cannot account for the emergence of earthly disasters, including global warming and the disastrous positive feedback loops it creates planetwide, Latour advocates for a shift from economy to ecology, which would require an embrace of an entirely new and monstrous political sphere that includes such autonomous entities. His approach is deeply concerned with the speech acts that produce facts, and thus, as he puts it "the ancient division between words and things, language and being."[17] Ultimately, he seeks to galvanize language, which is otherwise deficient. Language, he says, has to be made capable of absorbing a pluralism of values. This absorption, though, would admit that words carry ontological weight, that they admit beings into existence, so that we regain the power to enter into contact with types of entities that had no place in modern theory, but which can find their place in a political ecology. He proposes a pluriverse as a new political sphere.

Latour introduces several "beings" in his anthropology, and he does so by making incisions into domains of knowledge, demonstrating how to give ontological weight to the beings that such knowledge produces, and then mapping their trajectories, conditions, and alterations to which they are subjected. Of particular relevance is his explanation of beings of technology, which he refers to with the graphic spelling, "[TEC]." Latour executes his own version of Heidegger's breakdown of technology into the fourfold causes, rejecting the modern penchant for associating technologies with inventions, means, or extensions. Instead, he approaches the concept through the essential qualities of technological beings, namely their capacity for shifting us through displacements in time, in space, and in the type of actor. Technological beings take us through but also implicate us in a global equipment that operates through an altered causal logic. He calls this the recoil

effect of technological beings. Humans are not the origin of action (we do not act on matter or manufacture through technology). Rather, humanity is the recoil of a technological detour. The history of technologies is a slow anthropogenesis, a co-extant becoming human and inhuman.[18] Latour therefore aims to free technological beings from any association with instrumentality and, in doing so, shift from the association of technologies with modernization, instead to suggest that when we encounter technological beings, we "ecologize" and are ecologized.

Latour's understanding of technology in the context of ecology is relevant insofar as it opens a way to understand shifts in the valence of political energies in and through technology. Insofar as Jameson notes that the political field is divided between the political energies of hope in capitalism's innovativeness and anger at its exploitative nature, Latour provides a way to view this dialectic as integrated into technological beings and to see ourselves as possessed by technology, within living assemblages of technological equipment. Such an assemblage is the ecological refiguration of Marx's Moloch. Instead of a monstrous self-consuming system, the economy might rather be viewed as an autonomous and heterogeneous technological being that, rather than consuming its own energy source, could be politically charged and redirected from that very source. That is to say, in as much as we are becoming ecological, and as much as we are ecologized (whether we like it or not) by capitalism, its forces and trajectories can be and (must be) taken hold of via an understanding of its energic systems. In this way, it becomes clear that new materialism emerges from historical materialism, and is strengthened by the acknowledgement of the latter's complex account of the intersections of economy, technology, labor power, and representation.

It is therefore possible to link the recurrence of petro-objects and their archaeological formulation to the capitalist assemblage of extractive technologies by which capitalism powers and consumes itself. Petro-objects represent labor as the prehistory of modern capital — the burial of labor is precisely the procedure by which to

render invisible the unemployed who fuel capitalism. Yet they are also provocations to exhume labor force, to see its energy as potential rather than as always already spent. A re-valencing of its energies might therefore be possible through a crooked interpretation of its machinery. We might, for example, see in Xu Bing's phoenixes a revolution of China's migrant workers in its dormancy rather than a show of that country's global economic might. Moreover, the work does not merely dazzle the viewer with yet another display of China's technological prowess, which traditionally displays itself as the sight of masses of people working together as a multitude, whether in factories, public assemblies, or the spectacular choreography of the Olympics. Instead, *Phoenix* charts a map for a reversal of the technological assemblage — each tool was wielded by a worker, who, in joining together with others could potentially take hold and redirect labor power. The work reads the image of the phoenix against the grain of a narrative of imperial resilience and instead subtly asserts a consciousness of labor power as a technological assemblage in and of itself.

Two sets of sculptures in the Arsenale section of the Biennale illustrate this point about the shifting of energies of the capitalist assemblage. Melvin Edwards encapsulates the artistic gesture of petrifying manual tools in order to revive buried histories of oppression. Known for his *Lynch Fragments* series, in which he addressed racial violence and the civil rights movements in the U.S., Edwards exhibited a sample of works that reference different phases of American activism from the 1960s, '70s, and beyond. His sculptures, such as *September Portion* (1991), and *Texas Tale* (1992) are composed of steel tools — shovels, pitchforks, hooks and chains — fused together into amalgams that suggest the manifold affordances of such objects, whether the instruments of specific forms of labor, the paraphernalia of enslavement, or the weapons of violent uprising (Figure 5). The fragmentary forms are thus invested with a generalized force in its petrified state, but nevertheless infer multiple avenues for the deployment of that force.

Figure 5. Melvin Edwards, *Texas Tale*, 1992. Courtesy of the artist.

Monica Bonvicini likewise created two sculptural amalgams for her *Latent Combustion* (2015) (Figure 6). Here, a grouping of chainsaws and leather straps were cast in concrete and covered in black liquid rubber, and then hung by chains from the ceiling. Though the chainsaws are perhaps among the most threatening and distinctly masculine of tools, nevertheless, the layout suggests an erotic overlay inspired as it is by the mise-en-scène of S&M sex clubs, so that the suspended grouping of tools is yielded to a libidinally charged probing of the objects' potential energies, rather than their direct deployment in the context of capitalist production or exploitation. The title of the

piece, *Latent Combustion,* implicitly draws the amalgam of tools into the domain of energic systems. Yet the implied combustion is not that of a broiling factory but rather of the expenditure of energies through which subjects constitute (or perhaps reconstitute) one another in practices that deploy tools that have been unexpectedly cathected by their uses in sexual scenarios. The restaging of dominance and submission through the specific roleplaying of power in the S&M encounter not only intimately connects the respective subject positions through the performative use of technological extensions, it does so in such a way as to reveal the potential affordances of those same tools. Thus, not only are the tools recontextualized from scenes of domination through labor to scenes of sexual roleplaying, they also become devices used to take control and redirect the valences through which power relations are forged. Thus, for both Edwards and Bonvicini, the historic tools of labor, though displayed in their latency, seemingly demand to be taken up in the service of energic potentials that would revalence the assemblages in which we are imbricated

Potential Energies and the Archaeomodern Tool

I link the staging of petro-objects at the Biennale to what Jacques Rancière describes as Walter Benjamin's "archaeomodern turn."[19] Insofar as the curator identifies Benjamin's visualization of modernity in ruins as a guiding trope, the petro-objects of the exhibition are connected to Benjamin's specific materialist history read through the debris of modernity. Benjamin applies his variations of Marxist dialectics specifically to the phantasmagoria of the arcades. Rancière examines Benjamin's dialectical turns that ensue from the specifically archaeological condition. Benjamin shifts the Marxist dream of emancipation to a deferral of that dream through its positioning in a prehistoric (archaeological) fantasy in which emancipation is both in a state of ruins and anticipated as a future to come. He then enacts an infinite regression of emancipation that sinks ever deeper into an archaeomodern phantasmagoria.[20] This spiraling movement takes place through linguistic, spatial, and figural turns. Rancière argues

Figure 6. Monica Bonvicini, *Latent Combustion*, 2015. Courtesy of Studio Bonvicini.

that the modern drive forward and postmodern fragmentation were always already dialectical accomplices and that Benjamin leverages the dialectic into a radicalized state of irretrievable meaninglessness. If Hegel characterized the modern condition as an opposition between the prose of modernity (the linguistic mode of economy, bureaucracy, science, and philosophy) and the failure of romanticism (symbolism as the mind trapped inside itself, unable to exteriorize and realize itself as representation), he equally leveraged from this opposition the possibility of a modern imagination with a figurative faculty: a form of reason that is captive within the exteriority of representation, sealed up in exteriority, a "thing of reason." From this, Rancière opposes two fantasies of reason: a "bad" one in which reason is simply anachronistic and anarchical, and a "good" one, in which reason is sealed in its prehistory, a lateness that is also an anticipation of interpretation, reading, deciphering.[21] Thus can we understand

Benjamin's archaeomodern turn as one in which the emancipation from the prose of science and philosophy takes place by locking up the dispersive power of meaning, to make a "sleeping meaning, waiting for its liberation but also anticipating it."[22]

In this vein, Rancière argues that Benjamin establishes a classic opposition between the factory, the Marxist substructure and presumed original scene of labor oppression, and the arcades, as the superstructure of bourgeois leisure, desire, and consumption. However, Benjamin reverses their position, so that the phantasmagoria of the passages become the originary scene of emancipation: the site where reason and the potential for emancipation are encrypted in a fragmentary state, where it sleeps but also, importantly, where it generates a dream of reason and awaits liberation. Not only has the superstructure become the substructure, but the arcades enact a perpetual deepening of the dispersal of reason. Instead of a demystification of the commodity and its scenes of display and discard, Benjamin finds us engaging more deeply with it, regarding it archaeologically in the sense that we follow it backward in time, discover the dialectical opposite of modernity in its prehistoricity, its "not-yet" and unfulfillment as a dream of the future to come.

> The archaeomodern turn presupposes a new turn — one turn *more*. The deeper the dream, the further the awakening, the more consistent is the evidence of the modern cogito, of the collective subject of modernity. Just as the sleep has become a dream, the dream becomes a phantasmagoria… So the logic of the archaeomodern might be a logic of the one-turn-more, a logic of the *regressio ad infinitum*, located at the core of the modern project.[23]

This infinite regression brings Benjamin's intervention to its full radicality. Yet, it is not without risk as well. Insofar as Benjamin sets the scene for the phantasmagoria as archeomodern return, it invokes a collective, heterogeneous subject position to undertake the

recovery and awakening of meaning. There is no presumption of who the revolutionary subject will be — not the bourgeoisie or the laborer — only a radical opening of liberatory subjects. Moreover, there is always the risk that Benjamin's turns of Marxist dialectics defect to a postmodern condition: an intensification of the phantasmagoria to the point of its reification as simulacrum. Yet, Rancière insists that Benjamin's ultimate contribution, the final turn of his archaeomodern spiral, is his insistence on a Messianic philosophy which takes the form of a counter-theology whereby the redemption of the object is predicated on the total foreclosure of its extant meaning into arbitrariness and indeterminacy. Hence, the impetus to disidentify with heritage or the ruling order takes the form of a catastrophic blast of the present into ruination. In this way, he reminds us that the phantasmagoria is also a *Lethe*, a river of the dead where:

> [M]eaning is produced as the presence of death-in-life and deciphered as the presence of life-in-death. By contrast, a detheologized Benjaminian approach would be tantamount to a 'postarchaeomodern' turn, the commodification of everything, the museumization of the shopping mall, a bourgeois dream that remains bound to the victor. Such a discipline would amount to nothing more than a history of the social imaginary as narration of economic processes and social relation — a materialist geography as antique shop or world fair.[24]

Herein lies the connection between Benjamin's phantasmagoria and the vitalism at the heart of Bruno Latour's political ecology. I am suggesting that between the petro-objects and their inference of vital assemblages, the Biennale invokes the emergence of as yet unknown political energies nested within the death and suffering of the capitalist economy, in its very wreckage. As such, it occasions an emancipatory dreaming that disassociates the petro-object from its originary modern contexture, and imagines it in operation in a different assemblage, politically charged through a crooked interpretation of its potential use or disuse.

Conclusion: The Heterogeneous Energies of the Petro-Object

Fredric Jameson argues that where it is often assumed that Marx conceived of the unemployed as a secondary feature of capitalism, in fact his figurations of capitalism demonstrate the centrality of structural unemployment, a condition that comes to the foreground as one of its core contradictions today. However, it takes the form of massive populations who have "dropped out of history": failed states, victims of famine and other natural disasters, ethnic genocides that are funded and fueled by First World countries, and other populations who are managed through NGOs and international philanthropy.[25] At the 2015 Venice Biennale, this reserve army of the unemployed is inferred through an archaeo-modern lens, in manual tools presented as petro-objects. Such a lens exposes the fact that this reserve labor force has been consumed by the self-sacrificing system — Marx's Moloch — subsequently buried and lost to history. Yet the curator produces a speculative environment for the recovery of such populations, in the inferences of the energies of their sacrificed labor. These energies become visible as an excavated geological force — tools discovered as though with no preconceived knowledge of their potential use. Such a neutralization of the tools of labor in a posthumous environment generates an alternative perspective of the global condition.

As Latour suggests, we might view technologies themselves as integral to a more expansive and autonomous assemblage of beings. Thus, we might view the energic field of petro-objects retroactively and proactively, not simply in terms of the encrypted labor energies they harbor, but the potential political energies that they channel forth. Though, as Rancière suggests, such a reading of capitalism's ruins take place in a *regresio ad infinitum*, so that the object is radically severed from its original installment in the technological equipment of modern labor. Yet, it is precisely the infinite deferral of an instrumental use of the petro-object that yields an opening to the heterogeneous energies of the concealed populations of the

unemployed. The petro-object may, then, be the lightening rod for the polyvalent energies of a political ecology that opens the way out of capitalism's self-expansion — a landscape of historical figurations that awaken the energies of labor from the crypt of a dying earth.

Notes

1. Fredric Jameson, *Representing Capital: A Reading of Volume 1* (London: Verso, 2011) 132, emphasis mine.
2. Karl Marx, "Addenda. Revenue and its Sources. Vulgar Political Economy," *Theories of Surplus Value, Capital Volume IV* (Moscow: Progress Publishers). https://www.marxists.org/archive/marx/works/1863/theories-surplus-value/.
3. Jameson, *Representing Capital* 145–146.
4. *Representing Capital* 146.
5. *Representing Capital* 147.
6. The Endnotes Collective, "Misery and Debt: On the Logic and History of Surplus Populations and Surplus Capital," *Endnotes* 2 (2010) 20–51.
7. Endnotes Collective, "Misery and Debt" 149–150.
8. T.J. Clark, *The Absolute Bourgeois: Artists and Politics in France 1848-1851* (Princeton, New Jersey: Princeton UP, 1982) 72–98.
9. Charles Baudelaire, in Clark, *The Absolute Bourgeois* 73.
10. *The Absolute Bourgeois* 79.
11. *The Absolute Bourgeois* 82.
12. Walter Benjamin, "Theses on the Philosophy of History," *Illuminations*, ed. Hannah Arendt, trans. Harry Zorn (London: Pimlico, 1999) 249.
13. Indeed, in *Archaeologies of the Future*, Fredric Jameson describes utopian space precisely as a workshop, "a garage space in which all kinds of machinery can be tinkered with and rebuilt." On one hand, he notes that these enclaves are aberrant by-products of social change, like an

eddy in a current of progress and therefore not integral to a practical politics, and yet their existence at all registers the existence of agitation in the midst of transitional periods. Fredric Jameson, *Archaeologies of the Future: The Desire Called Utopia and Other Science Fictions* (New York: Verso Books, 2005) 15.

14. Kaspers Vanags, *Armpit: Katrina Neiburgs and Andris Eglitis, Latvian Pavilion* (Venice: Biennale Arts, 2015).
15. Vanags, *Armpit*.
16. Bruno Latour, *An Inquiry into Modes of Existence: An Anthropology of the Moderns*, trans. Catherine Porter (Cambridge, MA: U of Harvard P, 2013) 8–9.
17. Latour *An Inquiry into Modes of Existence* 20–21.
18. *An Inquiry into Modes of Existence* 231–232.
19. Jacques Rancière, "The Archaeomodern Turn," *Walter Benjamin and the Demands of History*, ed. Michael P. Steinberg (Ithaca: Cornell University Press, 1996) 24–40.
20. Rancière "The Archaeomodern Turn" 24–40.
21. "The Archaeomodern Turn" 26.
22. "The Archaeomodern Turn" 27.
23. "The Archaeomodern Turn" 28.
24. "The Archaeomodern Turn"39.
25. *Representing Capital* 148–149.

Antiphysis/Antipraxis: Universal Exhaustion and the Tragedy of Materiality

Alberto Toscano

> If the question of the relation of nature and history is to be seriously posed, then it only offers any chance of solution if it is possible *to comprehend historical being in its most extreme historical determinacy, where it is most historical, as natural being, or if it were possible to comprehend nature as an historical being where it seems to rest most deeply in itself as nature*.[1]

Evoking the work of the French psychologist Alfred Binet on school children, Anson Rabinbach, in *The Human Motor* (1990), his masterful history of the energy-labor nexus, notes that "the critical distinction between fatigue and exhaustion was between the normal and the pathological, between the adequate 'speed of reparation,' which rest provided, and the lack of reparation in exhaustion." Exhaustion sets in when the "legitimate boundaries of fatigue" were transgressed. Or, in the cognate definition in Albert Deschamps's 1908 *Les Maladies de l'énergie*, exhaustion is "an accumulation of fatigues which were only incompletely restored."[2] It is thus possible to propose a preliminary distinction between fatigue and exhaustion by locating fatigue on the side of *production* and exhaustion on that of *reproduction*. Exhaustion occurs, therefore, when a limit or threshold has been crossed such that the reproduction of a certain bodily or relational state is no longer possible.

Though I will not abandon the horizon of individual or subjective

exhaustion entirely, in what follows I am concerned with thinking this "energetic" impasse of reproducibility in a more systemic vein, approaching the theme of exhaustion as a prism through which to connect contemporary debates on the consequences of climate change to theorizations of the multiple crises of social reproduction. I will approach exhaustion as a kind of limit concept that allows the exploration of the zones of indiscernibility between the philosophy of history and the philosophy of nature, an indiscernibility whose proper name might be materialism. The theoretical context for this inquiry is twofold. First, I want to address some pioneering recent work that endeavors to produce a historical materialist critique of the ambient discourse on the "Anthropocene," in particular the work of Andreas Malm (*Fossil Capital*) and Jason W. Moore (*Capitalism in the Web of Life*). By honing in on the leitmotif of exhaustion — and particularly Moore's distinction between its relative and absolute modalities — I want to explore how what Malm calls "theory in a warming world" strives to articulate the question of the relationship between the limits to capital and the limits to nature.[3] Second, as will hopefully become clear in my concluding considerations on Jean-Paul Sartre's *Critique of Dialectical Reason*, I want to place the question of exhaustion, and more specifically of the agency "behind" exhaustion, in the framework of an ongoing project to rethink *tragedy* as a political form.[4] In particular, Sartre's concept of "matter as inverted praxis," exemplified by his dialectical vignette on peasant labor and deforestation in China, will allow me to sketch the idea of a *tragedy of materiality*, which I hope can cut across the agential and ontological debates raised by the geological baptism of the Anthropocene, not least the debate about *who* this anthropos might be, and to what extent its actions require either a *dualist* or a *holist* take on the relationship between human Society and Nature (my tentative answer will be: neither).

It is my contention that the problem of "natural history" is at the heart of any reconstruction of a truly dialectical critical theory capable of testing its cognitive powers against a catastrophic present. The nature, which is also to say the necessity, in history has long been the

locus of tragedy, but the figure of tragic agency needs to be thoroughly revised in light of what recent theoretical concern with anthropogenic climate change foregrounds but fails to illuminate — the immanence of social praxis to material nature. By way of a historical corrective to the self-congratulatory notes sounded by talk of the Anthropocene — whose claims for novelty are often hard to detach from the conceptual boosterism that infects the critique of capitalism with the spirit of its target — I begin with a short and admittedly impressionistic history of exhaustion. Nineteenth-century concerns with the irrevocable depletion of nature, rich in material lessons, were also accompanied by speculative, cosmo-political efforts, wherein humanity was thought in terms both of its ends and its end. Attention to the contrasts and overlaps between exhaustion, degradation, and entropy as natural-historical ideologies may perhaps serve as an antidote to the rush to establish the Anthropocene as the keyword of our present. It can also provide us with a more nuanced sense of context for the emergence of a historical materialist theory of the relations between political economy and nature — namely in Marx's wrestling with debates on soil exhaustion — especially when that theory, creatively revised, is providing the richest counter to what may be the ultimate twist in the ideological work of naturalization: naturalizing humanity's transformation of nature. The paper then moves to a consideration of Moore's contribution to the thinking of the exhaustion of historical natures, foregrounding the interaction of logics of appropriation and exploitation, and thence to an exploration of how the very structure of the exploitation of labor power gives capitalist exhaustion its shape as the accelerating wastage of material natures. Notwithstanding the wealth of theoretical articulation and insight produced by the debates under review, I contend that they reach an impasse of sorts when they are translated into the metaphysical discourse of dualism or monism. Whence the perhaps unfashionable, concluding suggestion that we turn to Sartre's dialectical excavation of the tragic structure that haunts relations between praxis and matter as a possible model for incorporating a theory of action into our arguments about exhaustion.

Exhaustion, Degradation, Entropology

The expression "universal" or "general exhaustion" (*die allgemeine Erschöpfung* in German) is taken from a famously "prophetic" text of Friedrich Engels from 1887 which anticipated, with grim lucidity, the unraveling of World War I three decades thence:[5]

> Eight to ten millions of soldiers will massacre one another and in doing so devour the whole of Europe until they have stripped it barer than any swarm of locusts has ever done. The devastations of the Thirty Years' War compressed into three or four years, and spread over the whole Continent; famine, pestilence, general demoralisation both of the armies and of the mass of the people produced by acute distress… absolute impossibility of foreseeing how it will all end and who will come out of the struggle as victor; only one result is absolutely certain: general exhaustion and the establishment of the conditions for the ultimate victory of the working class.[6]

Prospected from within the ambit of Marxism's overall political epistemology of crisis, this *exhaustion* is figured as a prelude to proletarian victory, in which the horrific autophagic agony of bourgeois civilization shades into the birth pangs of socialist society. Spent, no longer able to reproduce itself, capitalism is exhausted in the sense of *irreparable*. *Exhaustion* is a revolutionary precursor. It is striking how much this model repeats another text on war and humanity's emancipation, from a hundred years before, namely Immanuel Kant's 1784 "Idea of Universal History on a Cosmopolitical Plan," which I quote here in Thomas De Quincey's translation:

> Nature accordingly avails herself of the spirit of enmity in Man, as existing even in the great national corporations of that animal, for the purpose of attaining through the inevitable antagonism of this spirit a state of rest and security: i.e. by wars, by the immoderate exhaustion of incessant preparations for war, and by the pressure of

> evil consequences.... [S]he drives nations to all sorts of experiments and expedients; and finally, after infinite devastations, ruin, and universal exhaustion of energy, to one which reason should have suggested without the cost of so sad an experience, — viz. to quit the barbarous condition of lawless power, and to enter into a federal league of nations.[7]

Collective will is born from an antagonism (unsociable sociability, class struggle, world war, and civil war) that requires the *exhaustion* of the energies fixed in the prior dispensation of powers, the crossing of a threshold of reproducibility. It is a concept in a philosophy of history (and in Kant's case of nature and natural purpose) — as signaled by its "inevitability." For Kant, nature's cosmopolitical plan is "the *inevitable* resource and mode of escape under that pressure of evil which nations reciprocally inflict." For Engels addressing the masters of war, this entails that "at the end of the tragedy [they] will be ruined and the victory of the proletariat will either have already been achieved or else *inevitable*."[8]

Yet Engels was also the thinker of another inevitability, another exhaustion: the exhaustion of (human) history in and by nature. Responding to widespread, contentious debates on the laws of thermodynamics and the thesis of a heat death of the universe (a theme revived in more recent times by Jean-François Lyotard in *The Inhuman* and Ray Brassier in *Nihil Unbound*), Engels, while strenuously rejecting the idea of a *universal* heat death — which he regarded as saturated with crypto-theological eschatologies of exhaustion — contemplated the... inevitable demise of humanity.[9] He did so in a lyrical passage that the Italian Marxist philologist and philosopher Sebastiano Timpanaro, advancing a pessimist and naturalist materialism equal parts Marx and Giacomo Leopardi, praised for showing that socialism need not require delusions of species immortality.[10] In the Introduction to his *Dialectics of Nature*, Engels writes:

> Millions of years may elapse, hundreds of thousands of generations be born and die, but inexorably the time will come when the declining warmth of the sun will no longer suffice to melt the ice thrusting itself forward from the poles; when the human race, crowding more and more about the equator, will finally no longer find even there enough heat for life; when gradually even the last trace of organic life will vanish; and the earth, an extinct frozen globe like the moon, will circle in deepest darkness and in an ever narrower orbit about the equally extinct sun, and at last fall into it.[11]

Engels also acknowledged his precursors, writing in *Anti-Dühring*: "As Kant introduced into natural science the ultimate destruction of the earth, so Fourier introduced into historical thought the ultimate extinction of humanity."[12] It is to Charles Fourier that the historians of science Christophe Bonneuil and Jean-Baptiste Fressoz, in their *The Shock of the Anthropocene*, have recently turned to show how — contrary to the weird self-congratulatory tendencies of contemporary commentators — nineteenth-century thought did not just entertain apocalyptic visions particular to the its industrial, imperial and financialized regimes of accumulation but was strikingly cognizant of anthropogenic climate and environmental change.[13] Ironically, from our present vantage, Fourier's concern was the *cooling* of the climate, a "malady of the earth" that he regarded as a product of social immobility and stagnation, of the delay of a transition to socialism. The material suffering of the planet was of a piece with human suffering, and, as he observed in his unpublished 1822 manuscript *De la détérioration matérielle de la planète*, "the prolongation of the social limbo causes a rapid progress in climactic vices," leading to forms of material and social exhaustion that bourgeois society is congenitally incapable of preventing.[14]

The preoccupation with social and material exhaustion, anthropogenic and otherwise, traverses the Victorian era, surfacing, for instance, in the anarchist geographer Piotr Kropotkin's work on the climactic sources of Eurasian desiccation (recently recovered by

Mike Davis), in Gabriel Tarde's science-fiction of "solar anaemia," in Antoine Augustin Cournot's warning to Léon Walras that the *laissez-faire* "curves of intensive and extensive utility" would lead to devastating deforestation and racial domination, or in Ruskin's delirious speculations on "The Storm-Cloud of the Nineteenth Century," wherein wind "figures the degradation of all existing structures."[15] "Ruskin," Thomas Richards tell us, "closes his lecture by meditating on that sunless entropic end: 'the Empire of England, on which formerly the sun never set, has become one on which he never rises.' Here the heat-death of the universe has become the heat-death of the Empire."[16] This recalls George Caffentzis's observation about capitalist apocalypticism: "Whenever the ongoing model of exploitation becomes untenable, capital has intimations of mortality *qua* the world's end."[17]

A striking index of the resilience of these overlapping nineteenth-century discourses of exhaustion and degradation can be found in the work of Claude Lévi-Strauss. As Patrick Wilcken recounts in his recent biography, Lévi-Strauss, having been invited by UNESCO in 1971 to reprise the critique of racial thought articulated in the 1952 *Race and History*, caused notable embarrassment to his hosts by evoking the warnings about cultural and racial dedifferentiation infamously voiced by Count Gobineau in that seminal tract of racist theory, *An Essay on the Inequality of Human Races*.[18] What is symptomatic in Lévi-Strauss's anthropological plea for the defense of cultural diversity is the extent to which it bears witness to the lamination in his thought of two nineteenth-century discourses of exhaustion, that of (cultural, racial, and biological) *degradation* — deployed both to bolster the efforts of criminological science[19] and to justify the genocidal tendencies of settler colonialism[20] — and the thermodynamic discourses of *entropy*. In the concluding pages of his melancholy masterpiece *Tristes Tropiques*, Lévi-Strauss, echoing the figure of species annihilation already rehearsed by Engels in the *Dialectics of Nature*, to reflect upon the task of the anthropologist, doubling the exhaustion of the very cultures he studies with the exhaustion of the

human race as such. The latter, far from a conserver of cultural and historical diversity, is depicted in all its tragic-ironic ambivalence: protection turns into destruction, the fixing of difference accelerates dedifferentiation.[21] Lévi-Strauss anticipates the invocation of inertia of his great opponent, Sartre, while trying to transcode entropy into a discourse about culture:

> [Man's] role is itself a machine, brought perhaps to a greater point of perfection than any other, whose activity hastens the disintegration of an initial order and precipitates a powerfully organized Matter towards a condition of inertia which grows ever greater and will one day prove definitive. From the day when he first learned how to breathe and how to keep himself alive, through the discovery of fire and right up to the invention of the atomic and thermonuclear devices of the present day, Man has never save only when he reproduces himself done other than cheerfully dismantle million upon million of structures and reduce their elements to a state in which they can no longer be reintegrated. No doubt he has built cities and brought the soil to fruition; but if we examine these activities closely we shall find that they also are inertia-producing machines, whose scale and speed of action are infinitely greater than the amount of organization implied in them.... Taken as a whole, therefore, civilization can be described as a prodigiously complicated mechanism: tempting as it would be to regard it as our universe's best hope of survival, its true function is to produce what physicists call entropy: inertia, that is to say.

Whence Lévi-Strauss's punning proposal to rechristen anthropology as *entropology*, the "discipline that devotes itself to the study of this process of disintegration in its most highly evolved forms."[22] The cosmic-cultural pessimism of the final pages of *Tristes Tropiques*, leavened or even redeemed by an aestheticized figure of "grace,"[23] is modulated somewhat in Lévi-Strauss's later speculations on how "just" societies could be considered in terms of entropy-transfers,

from society to culture; riffing on a Saint-Simonian dictum, he proposes that:

> A society is at once a machine and the work done by that machine. As a steam engine, it produces entropy, but if we look upon it as a mechanism, it produces order. This dual aspect — order and disorder — corresponds, in the language of anthropology, to two ways of looking at any civilisation: there is, on the one hand, culture, and on the other, society. By culture, we mean the relationships that the members of a given civilisation have with the external world, and by society, we mean more especially the relations men have with each other. Culture produces organisation: ploughing the land, building houses, manufacturing objects, etc.... [S]ociety... produces entropy, or disorder. "Government of men" corresponds to society and increasing entropy; "administration of things" corresponds to culture and the creation of an increasingly varied and complex order.[24]

Lévi-Strauss "entropological" musings on the exhaustion of cultural difference, and his tentative speculations on social justice as an energetic balancing-act, can be approached both as a speculative synthesis of many of the aforementioned strands of nineteenth-century thought (thus providing a somewhat different genealogy to structuralist anti-humanism than we are accustomed to) and as an important contrast to what we could, by way of approximation, term a dialectical tradition in the thinking of exhaustion. In what follows I explore this tradition, beginning with Marx's deployment of the language of exhaustion, through recent Marxist critiques of the dominant discourses of the Anthropocene, and concluding with the (tragic) place of material exhaustion in the account of historical praxis in the *Critique of Dialectical Reason* — the very target of Lévi-Strauss's *The Savage Mind*.

The Historical Nature of Exhaustion and the Exhaustion of Historical Natures

The most complex *social* figure of exhaustion emerging from the multifarious debates of the nineteenth century — with their abrupt shifts in register, from the energetic to the racial, the biological to the climactic, and so on — was arguably the one drawn by Marx from the soil exhaustion debates. Unlike the negative philosophies of history that could be distilled from ideologies of degeneration and entropy, Marx's metabolic thinking sought to reckon with the deeply destructive impact of bourgeois society's exploitation of human, animal, and material natures while having no truck with speculative philosophies of history anchored in various strains of civilizational pessimism, with all their dubious variations on the theme of the decline of the West. As proponents of the "metabolic rift" interpretation of ecological Marxism have argued, it was in his readings of the work of scientists like Justus von Leibig on soil chemistry or Carl Fraas on agrarian crises, readings which filled copious notebooks during the composition of *Capital*, that Marx developed a conception of the immanent relations between capitalist accumulation and natural exhaustion. In this conceptualization of socio-ecological exhaustion, Marx developed the insight of nature as an internal limit to (the reproduction of) capital and capital as an internal limit to (the reproduction of) nature.

In the first volume of *Capital*, Marx would write of how the capitalist mode of production

> collects the population together in great centres, and causes the urban population to achieve an ever-greater preponderance.... [It] disturbs the metabolic interaction between man and the earth, i.e., it prevents the return to the soil of its constituent elements consumed by man in the form of food and clothing; hence it hinders the operation of the eternal natural condition for the lasting fertility of the soil. Thus it destroys at the same time the physical health of the urban worker, and the intellectual life of the rural worker.[25]

This insight was joined by related ones, namely that the *time required for the reproduction of nature is generally too long for capital, and indeed is in contradiction with its turnover times*; that capital accumulation requires an *accelerating exhaustion of nature*; and that, most significantly, such exhaustion can only be prevented by *the social planning of this metabolism.* (Marx remarked upon the way in which contemporary accounts of environmental exhaustion, be it through deforestation, desiccation or soil exhaustion were haunted by an "unconscious socialist tendency.")[26]

The analogy and dialectic between the exhaustion of natural "resources" and the exhaustion — beyond fatigue, beyond reproduction — of the bodies of laborers is a critical juncture in *Das Kapital* itself. As Marx writes,

> Capital asks no questions about the length of life of labor-power. What interests it is purely and simply the maximum of labor-power that can be set in motion in a working day. It attains this objective by shortening the life of labor-power, *in the same way* as a greedy farmer snatches more produce from the soil by robbing it of its fertility.[27]

Labor may be conceived by Marx as a paradoxical "extinguishing fire," the productive consumption of fixed capital and raw materials, but it also a self-extinguishing which is at work under the accelerative imperatives of capital — an extinguishing or degradation of the actual, physiological bearers of concrete living labors, which goes hand in hand with the extinguishing or degradation of nature.[28] In this parallel, between the worker and the soil (or nature), as the sole ultimate sources of social wealth, Marx alerts us to the possibility, immanent to the imperatives of capital, of *an expanding crisis of reproduction*, in which the living sources of value come to be exhausted — a process which, as the entire chapter on the working day demonstrates, with its meticulous attention to the degradation of laboring bodies, diets, reproductive systems, and so on, is profoundly affected by class struggles, which are always (and I am tempted to

argue above all) struggles over reproduction.

While the theme and notion of exhaustion pervades the writing of Marx and Engels, circulating between the enervation of proletarian bodies, the depletion of natural processes, and the degradations of bourgeois civilization, and resonating with a vast array of contemporaneous literatures of exhaustion, it is not as such the object of sustained, direct theoretical treatment.

By way of rectification, I want to turn here to Jason W. Moore's *Capitalism in the Web of Life*, which includes an illuminating discussion of the distinction between relative and absolute exhaustion.[29] Some basic coordinates to Moore's complex and ambitious theoretical work are in order. *Capitalism in the Web of Life* is a critical intervention into the ecological Marxist debate, combining the historical methodology of world-systems theory and an ontological claim about the "double internality" of nature and capitalism in an insistent polemic against any dualism of nature and society (of which he also accuses "metabolic rift" ecological Marxism). It is not surprising then, in arguing against what he sees as the Cartesian prejudice of a Green Thought that would treat nature as an independent limit to social manipulation, that he himself would turn to the question of exhaustion. For Moore, capitalist accumulation, ever since its fifteenth century inception, has relied on a combination of exploitation (of paid labor in the immediate process of production) and appropriation (the dispossession and "free" use of unpaid work/energy, what Maria Mies had called, in *Patriarchy and Accumulation on a World Scale*, the capitalist basis, and invisible iceberg, of "women, nature and colonies").[30] Capitalism's increases in productivity and its constant struggles against the falling rate of profit have depended on successive assaults on commodity frontiers (from the silver mines of Potosí to the forests of Norway, from the coal fields of nineteenth-century England to contemporary oceans and aquifers). According to Moore, "capitalism must commodify life/work but depends upon the 'free ride' of uncommodified life/work to do so. Hence the centrality of the frontier."[31] Building on Rosa Luxemburg and David Harvey's theories of imperialism, while supplementing

them with an account of capitalism as the co-production of "historical natures," Moore argues that without these "free gifts," which is to say these violent thefts, the production of surplus value would have never gotten off the ground. This is why "the problem of exhaustion," according to Moore, "is a problem of how capital puts nature to work."[32]

The violent abstraction and appropriation, which is also to say the co-production of "Nature," is thus key to capitalism as a "world-ecology" in its own right. This is what Moore terms

> capital's *correspondence project*, through which capital seeks to remake reality in its own image, and according to its own rhythms. Agricultural landscapes become exhausted because capital must extract unpaid work faster than agro-ecological relations can reproduce themselves. Working classes become exhausted because capital must extract surplus labor as fast as possible. Particular capitalists might gain in the process, but over time, *capital as a whole suffers,* because the system-wide capitalization of reproduction costs proceeds apace. The share of unpaid work declines. The ecological surplus falls.[33]

Capital is what Moore calls a praxis of external nature, combining "productivity and plunder."[34] Surplus value generated from the exploitation of abstract labor within the circuit of capital thus depends on the appropriation of unpaid/work energy in a value relation with what is (relatively) outside that circuit. With time, however, each arrangement of this exploitation/appropriation dialectic is undone, as capital is forced to internalize ("capitalise," in Moore's vocabulary) the appropriated natures — say, to plant "sustainable" forests rather than to deforest at will. For the sake of historical and systemic understanding (as well as of political praxis) what is critical here is not primarily the finitude of resources that may be "wiped out," but the collapse of a particular relation of exploitation and appropriation, which can be, to use Moore's terminology, "maxed out." As he writes:

> It is not an *absolute* exhaustion of an abstract and historical nature that "causes"... crises of profitability. Rather, it is the exhaustion of specific complexes of socio-ecological relations that induce transitions from one systemic cycle to the next. Put simply, there is simultaneous exhaustion of the organizational structures and of the historical nature specific to the old accumulation regime.[35]

A "maxed out" historical nature "no longer delivers a rising stream of work/energy into — or in support of — the circuit of capital."[36] Relational, rather than absolute exhaustion, then, is not just relative to particular structures and conjunctures of work-energy, it is an *exhaustion of relations*.[37] The basic (value) relation that comes to be exhausted is the one that leads to a falling rate of profit through the increase in the ration of constant to variable capital (what Marx terms the organic composition of capital) within the valorization process. Successive capitalist strategies to produce, appropriate (and exhaust) "Cheap Nature," also understood as the "ecological surplus" — composed of what Moore calls the "Four Cheaps" (food, energy, raw materials, human living labor) — are all aimed at depressing the cost of circulating capital. But the returns are inevitably diminishing. As Moore notes, "These broadly entropic transitions highlight the self-consuming character of the capital relation, which tends to burn through its necessary biophysical conditions (included workers) and in so doing to jack up the organic composition of capital."[38] The double process of exploitation and appropriation must take place simultaneously "because life-activity within the circuit of capital is subject to relentless exhaustion" — as re-reading Marx's chapter on the working day or attending to the ethnography of factories on neoliberalism's contemporary frontiers readily attests.[39]

We are returned here, on a grand systemic and environmental scale, the scale of world-ecology, to the initial domain of the fatigue/exhaustion distinction in the nineteenth century, that of human labor (paid and unpaid, visible and invisible) and its conditions: "The dialectic of capitalization and appropriation turns, fundamentally, on

the relations through which humans are re/produced."[40] Now, though Moore argues that limits are co-produced by nature and capital, or rather by capitalism in the web of life, he is also arguing in the final analysis that relative exhaustion (of Cheap Nature) is palpably turning into a kind of absolute exhaustion — not just in the sense of the total exhaustion of certain natures, but as the exhaustion of the crucial strategy of accumulation itself, the dialectic of exploitation and appropriation, with the latter always needing to be "larger" and "faster" than the former to preempt crises of profitability. "Relative to capital as a whole, the opportunities for appropriation have never been fewer, while the demand for such appropriations has never been greater."[41] The historical-material relation of exhaustion, the relative turning into the absolute (or as absolute as we could hope, or fear), in the "end of cheap nature," resurrects after its own fashion the "pessoptimistic" philosophy of history we encountered at the beginning with Kant and Engels, exhaustion and antagonism as a prelude to a revolution that can only be planetary.

The Baleful Dialectic of Exhaustion and Acceleration

To the extent that "[e]very act of exploitation implies an even greater act of appropriation," the capitalist world ecology is defined at its core by a (negative) dialectic of exhaustion and acceleration.[42] Marx had already glimpsed this dynamic, a speculative (and financialized) logic, in his *Theories of Surplus Value*, again putting matters in terms of the twin degradation of human bodies and natural systems:

> Anticipation of the future — real anticipation — occurs in the production of wealth in relation to the worker and to the land. The future can indeed be anticipated and ruined in both cases by premature overexertion and exhaustion, and by the disturbance of the balance between expenditure and income. In capitalist production this happens to both the worker and the land.... What is shortened here exists as power and the life span of this power is shortened as a result of accelerated expenditure.[43]

That acceleration is an intrinsic trait of the social form of capitalism is a lesson easily garnered from much of Marx's work, but what is its specifically ecological dimension? In his *Time, Labor and Social Domination*, Moishe Postone has tried to specify it by remarking upon capital's tendency "to generate a constant acceleration in the growth of productivity."[44] But these increases in productivity only increase surplus value indirectly. Thus, "the ever-increasing levels of productivity generated by capital accumulation entail directly corresponding increases in the masses of products produced and of raw materials consumed in production," but these do not necessarily give rise to increases in surplus value — as we can see today when (a point also stressed by Moore) the accelerating consumption of natural resources gives diminishing returns in profit terms (requiring precarious supplementation by financial instruments). Following Marx's remarks on the metabolic rift that capital wreaks on soil fertility, a paradigm of capitalist exhaustion as such, Postone remarks upon the "accelerating destruction of the natural environment" as an intrinsic feature of capitalist accumulation.[45] Rightly, Postone indicates Marx's transcendence of critiques of capitalism from a productivist stance (where it is a fetter to productive forces requiring liberation) or ones that center on the domination of nature:

> The relation of humans and nature mediated by labor becomes a one-way process of consumption, rather than a cyclical interaction. It acquires the form of an accelerating transformation of qualitatively particular raw materials into "matter," into qualitatively homogeneous bearers of objectified time. The problem with capital accumulation, then, is not only that it is unbalanced and crisis-ridden, but also that its underlying form of growth is marked by runaway productivity that neither is controlled by the producers nor functions directly to their benefit.[46]

In his landmark book *Fossil Capital*, Andreas Malm has further specified this accelerating exhaustion of nature, exploring the consequences of

capital's structural indifference to natural boundaries (as opposed to intra-capitalist limits), its qualitative neglect and quantitative over-taxing of nature — a process that takes the form of a spiral, in which the "more biophysical resources [the capitalist] has withdrawn for profit-making, *the more he is able to withdraw in the following round*."[47] Referencing the work of his collaborator, the ecologist Alf Hornborg, Malm details how profit-driven accumulation determines the capacity to draw on increasingly greater quanta of energy and materials, showing how monetary accumulation determines an acceleration in the claims upon and dissipation of "other people's resources." The social relations within which capital accumulation and resource use are embedded, and in which human, animal, and material natures exist only relative to the measures and expediencies of accumulation, mean that dissipation is not castigated or checked, but positively rewarded. The more the capitalist successfully exploits and wastes, the more he will be able to continue to do so — capitalist growth has ecological crisis wired into its DNA.[48] This image of the spiral of accumulation and dissipation resonates with the one drawn by John Bellamy Foster and Brett Clark from William Stanley Jevons's *The Coal Question*, a key text in the nineteenth-century preoccupation with exhaustion. According to the Jevons paradox, far from diminishing resource usage, a more efficient and "economic" employment of matter and energy (in this instance, coal) serves to increase it. As Jevons noted: "If the quantity of coal used in a blast-furnace, for instance, be diminished in comparison with the yield, the profits of the trade will increase, new capital will be attracted, the price of pig-iron will fall, but the demand for it increase; and eventually the greater number of furnaces will more than make up for the diminished consumption of each."[49] (As Bellamy Foster and Clark observe, by contrast with Marx and Engels, the great marginalist economist did not turn this observation into a critique of capitalist model of growth and resource use, but rather into its tragic-heroic assumption; having posed the alternative [for the British Empire] as one of between the doomed pursuit of glory in the present and "longer continued mediocrity," Jevons opted for

the former.[50])

Notwithstanding their decisive methodological and theoretical disagreements, both Malm and Moore have raised the problem of the ideologies of species agency that govern the recent infatuation with the discourse of the Anthropocene, which both have rechristened the Capitalocene.[51] The problem of exhaustion is for both an occasion to revisit the question of agency — Moore opting for a broadly "monist" take on the "co-production" of historical natures by capitalism through the "web of life," Malm a "dualist" vision in which the impact of capital *on* nature is to be understood through the internal class antagonism sundering any putative "humanity" (as he pointedly writes "no other species can have its metabolism organized through such sharp internal divisions"[52]). By way of a philosophical coda, whose aim is to open a way of thinking exhaustion — the limits to capital and the limits of nature — in a manner diagonal to this dualist-monist divide, hopefully applying further dialectical torque to a debate already rich with insights about the contradictions and negativity attendant to the nature in and of social relations, I want to touch on Jean-Paul Sartre's idea of "matter as inverted praxis," as advanced in the first volume of his *Critique of Dialectical Reason*.

Deforestation and Tragic Form

Relying on René Grousset's 1942 *Histoire de la Chine*, Sartre depicts the scene of peasant deforestation as a paradigmatic instance of how "serial" human action is unified, as a "counter-finality," by matter, giving rise to a situation in which man becomes his own Other, his own enemy. It is in terms of this figure of *oneself as an enemy*, so critical to Hegel's account of the tragic, that I propose to interpret Sartre's *Critique* as, among other things, a *tragedy of materiality*. This is the very counter-finality of which Engels had spoken in *The Dialectics of Nature*, intimating the possibility of a "revenge of nature" against our daydreams of mastery: "Every victory, it is true, in the first place brings about the results we expected, but in the second and third places it has quite different, unforeseen effects which only too often

cancel the first."[53] Sartre begins from the position of what Moore would term "Cartesian dualism," though as the *Critique* advances, he twists it beyond all recognition.

Praxis, he writes, is "primarily an instrumentalization of material reality" giving the things it envelops a "pseudo-organic unity," one borrowed from the unity of the individual as a practical organism.[54] But matter's unity (and in a sense its agency) endures through *inertia*. In working upon matter, individually and serially, directly and indirectly, humankind produces a *practico-inert* reality, the world as a kind of "petrified backlash" of our own activity. Reified material objects reflect our praxis, but in its passivity. In an acerbic variation on the idea of the alienation of human capacities in the product of labor, Sartre writes of how "practice absorbed by its 'material' becomes a material caricature of the human."[55] In materializing itself, mediating itself through the inertias of matter, human action "enters into relation with the entire Universe," such that "infinitely many unforeseeable relations are established, through the mediation of social practice, between the matter which absorbs *praxis* and other materialised significations."[56] What the example of the praxis of peasant deforestation and the subsequent "tragedy" of flooding instantiate is a broader truth about the ontology of human action, namely that the "[i]nert *praxis* which imbibes matter transforms natural, meaningless forces into quasi-human practices, that is to say, into passivized actions."[57] I'd like to propose that such a concept of "passivized action" can go some way to cutting across or rearticulating the antinomies of agency in the Anthropocene (or Capitalocene), including as it does within it a kind of phenomenology of the genesis of our ideologies of action.

In Sartre's example, the Chinese peasants' historic conquest of the soil could not foresee the lack that would turn against them, the absence of trees. Deforestation, as a passivized practice whose explicit finality was not the removal of trees but the plenitude of harvests, took place in the wilds, in the "frontiers" (to return to that theme from Moore) that at the time represented the "historical limits of society."

The removal of obstacles was transmuted or inverted into the lack of protection, turning the human activity of deforestation into the production of a virtually unified enemy of the peasant, an enemy who, embodied in nature as his inverted praxis, is ultimately "himself." Sartre's summation could, with some tweaking (mainly in terms of the potential for foresight) be adapted to the so-called Anthropocene:

> Thus, the whole history of the terrible Chinese floods appears as an intentionally constructed mechanism. If some enemy of mankind had wanted to persecute the peasants of the Great Plain, he would have ordered mercenary troops to deforest the mountains systematically. The positive system of agriculture was transformed into an infernal machine. But the enemy who introduced the loess, the river, the gravity, the whole of hydrodynamics, into this destructive apparatus was the peasant himself. Yet, taken in the moment of its living development, his action does not include this rebound, either intentionally or in reality.[58]

All counter-finality, of which the flooding haunting traditional Chinese agriculture is but an example, is adumbrated for Sartre by "a kind of *disposition* of matter." In counter-finality, human action becomes a strange, reified destiny, serially produced, and collectively experienced. In counter-finality,

> human praxis has to become a fatality and to be absorbed by inertia, taking on both the strictness of physical causation and the obstinate precision of human labor. Destruction by Nature is imprecise: it leaves little islands, even whole archipelagos. Human destruction is systematic: a particular farmer proceeds on the basis of an approach to a limit which conditions his praxis — quite simply, the idea that every tree growing in his field should be destroyed.[59]

Thus humanity is unified in its own alienated antagonism against itself: "deforestation as the action of Others becomes everyone's

action as Other in matter.... Others are fused, as Others, in the passive synthesis of a false unity; and, conversely, the Oneness stamped on matter reveals itself as Other than Oneness. The peasant becomes his own material fatality; he produces the floods which destroy him."[60] Counter-finality creates a unity-in-potential-catastrophe which the previous uncoordinated actions of groups could never manifest, though it also launches fierce and unprecedented antagonisms. As Sartre remarks, Chinese deforestation "creates universal solidarity in the face of a single danger. But at the same time it aggravates antagonisms, because it represents a social future both for the peasants and for the land-owners. This future is both absurd, in that it comes to man from the nonhuman, and rational, in that it merely accentuates the essential features of the society."[61]

In exhaustion and catastrophe, the historical limits of human action become the very sources of political, or even species, unity, a unity of necessity beset by antagonisms — which Sartre encapsulates in the notion of *anti-physis*:

> This... relation of man to the non-human — where Nature becomes the negation of man precisely to the extent that man is made *anti-physis* and that the actions in exteriority of the atomised masses are united by the communal character of their results — does not as yet integrate materiality with the social, but makes mere Nature, as a brutal, exterior limitation of society, into the unity of men. What has happened is that, through the mediation of matter, men have realised and perfected a joint undertaking because of their radical separation. Nature, as an exterior constraint on society, at least in this particular form, constrains society as an interiority based on the objectification in exteriority of that society.... Nature, though transcended, reappears within society, as the totalising relation of all materiality to itself and of all workers to one another.[62]

This relation of inverted praxis goes beyond the holism of "double internality" posited by Moore, to reveal a process in which "we"

become our own enemy in the shape of a nature that bears the imprint of our praxis (in ways specific to its material disposition). Nature's externality, albeit painfully real (in the form here of recurrent flooding) is also an inner relation of society. Nature, seemingly transcended through mankind's work on matter, "transforms human praxis into *antipraxis*, that is to say, into a praxis without an author, transcending the given towards rigid ends, whose hidden meaning is counter-finality."[63] Nature is a historical limit of society, and of capital, only to the extent that society has externalized itself in it. It is in this, dialectical, sense, that we can begin thinking the relation between the limits of capital and the limits of nature in a manner neither endogenous nor exogenous, dualist nor holistic; in other words, that we can begin to think the Anthropocene, or rather the Capitalocene, as a geological and historical figure of alienated agency "where Nature," as Sartre writes, "becomes the negation of man precisely to the extent that man is made *anti-physis*," anti-nature.

Notes

1. Theodor W. Adorno, "The Idea of Natural History" (1932) *Telos* 60 (1984) 117.
2. Anson Rabinbach, *The Human Motor: Energy, Fatigue and the Origins of Modernity* (Berkeley: U of California P, 1992) 152, 163.
3. Andreas Malm, *The Progress of this Storm: Nature and Society in a Warming World* (London: Verso, 2017) 8.
4. For some iterations of this project, see my "Politics in a Tragic Key," *Radical Philosophy* 180 (July–August 2013) 25–34; "Taming the Furies: Badiou and Hegel on The Eumenides," *Badiou and Hegel: Infinity, Dialectics, Subjectivity*, ed. Antonio Calcagno and Jim Vernon (Lanham: Rowman & Littlefield/Lexington Books, 2015); "Transition et tragédie," *Période*, April 10, 2014, http://revueperiode.net/transition-et-tragedie/
5. See V.I. Lenin, "Prophetic Words," (*Pravda*, July 2, 1918) *Collected Works*, Vol. 27 (Moscow: Progress Publishers, 1972) 494–499, available at https://www.marxists.org/archive/lenin/works/1918/jun/29b.htm
6. Friedrich Engels, "Introduction [To Sigismund Borkheim's Pamphlet, *In Memory of the German Blood-and-Thunder Patriots*, 1806–1807]," Karl Marx and Friedrich Engels, *Collected Works*, Vol. 26 (London: Lawrence & Wishart, 1990) 451.
7. Translation from Thomas de Quincey, *The Collected Writings of Thomas de Quincey*, Vol. 9 (London: A. & C. Black, 1896) 428–444. De Quincey filters Kant through a thermodynamic vocabulary, as we can see by comparing his translation to the more accurate (if less evocative) translation by Nisbet, which renders the phrase *und selbst durchgängiger innerer Erschöpfung ihrer Kräfte* as "and even complete exhaustion of their powers." See Immanuel Kant, *Political Writings*, 2nd ed., ed. Hans Reiss, trans. H.S. Nisbet (Cambridge: Cambridge UP, 1991) 47.
8. Engels, "Introduction" 451; my emphasis.
9. For a thorough refutation of the widespread notion that Engels denied the second law of thermodynamics and an illuminating review of the nineteenth-century debates on the heat death of the universe, see John Bellamy Foster and Richard Burkett, *Marx and the Earth: An Anti-Critique*

(Leiden: Brill, 2016) 170–197.

10. If not of intelligence, which Engels deemed an… inevitable by-product of the combinatorial powers of matter. Here anthropological or species pessimism is combined with cosmological and cognitive optimism, of the kind manifested by the Russian scientist Lavrov, as cited by Engels, in this wonderful phrase: "Then the remains of the dead world become material for hastening the process of formation of the new world." Quoted in Foster and Burkett, *Marx and the Earth* 182.
11. Cited in Sebastiano Timpanaro, *On Materialism* (London: New Left Books, 1975) 98–99. Consider also this remark by Bukharin, from *Philosophical Arabesques*: "Engels… considered inevitable both the decline of humanity and its extinction, together with the ending of life on the earth as a planet. In other words, human history cannot be divorced in any way from the history of the earth as the base, *locus standi* and source of nourishment of society." Quoted in *Marx and the Earth* 197.
12. Cited in Timpanaro, *On Materialism* 98.
13. On the articulation between historical configurations of capital and variants of apocalypticism — as well as on the intimate nexus between the exploitation of labor and ideologies of energy, see George Caffentzis, "The Work/Energy Crisis and the Apocalypse" (1980), *In Letters of Blood and Fire: Work, Machines, and the Crisis of Capitalism* (Oakland: PM Press, 2013) 11–57.
14. René Scherer, *L'Écosophie de Charles Fourier* (Paris: Anthropos, 2001); Christophe Bonneuil and Jean-Baptiste Fressoz, *The Shock of the Anthropocene: The Earth, History and Us* (London: Verso, 2016); Jean-Baptiste Fressoz and Fabien Locher, "The Fragile Climate of Modernity: A Short History of Environmental Reflexivity," *Books & Ideas*, March 31, 2014, http://www.booksandideas.net/The-Fragile-Climate-of-Modernity.html
15. Mike Davis, "The Coming Desert: Kropotkin, Mars and the Pulse of Asia," *New Left Review* 97 (Jan–Feb 2016) 23–43; see Tarde's 1896 novel *Fragment d'histoire future*, translated into English, with a preface by H.G. Wells, as *Underground Man* (London: Duckworth & Co., 1905), and the brief discussion in my "Powers of Pacification: State and Empire

in Gabriel Tarde," *Economy & Society* 36.4 (2007) 597–613; on Cournot, resource exhaustion and deforestation, see Perry Anderson, "The Ends of History," *A Zone of Engagement* (London: Verso, 1992) 304–308.

16. Thomas Richards, *The Imperial Archive: Knowledge and the Fantasy of Empire* (London: Verso, 1993) 86–87. For a late imperial *détournement* of this image of exhaustion, consider the following, from E.M. Forster's 1952 essay "Art for Art's Sake": "How can man get into harmony with his surroundings when he is constantly altering them? The future of our race is, in this direction, more unpleasant than we care to admit, and it has sometimes seemed to me that its best chance lies through apathy, uninventiveness, and inertia. Universal exhaustion might promote that Change of Heart which is at present so briskly recommended from a thousand pulpits. Universal exhaustion would certainly be a new experience. The human race has never undergone it, and is still too perky to admit that it may be coming and might result in a sprouting of new growth through the decay." E.M. Forster, "Art for Art's Sake," *Two Cheers for Democracy* (London: E. Arnold, 1951) 89.
17. Caffentzis, "The Work/Energy Crisis and the Apocalypse" 14. Caffentzis's comment on the link between capital and entropy is also worth reproducing here: "The Second Law announces the apocalypse characteristic of a productivity-craving capital: heat death. Each cycle of work increases the unavailability of energy for work.... 'The world is living on its capital' and all around is the whisper of its impending silence" (14).
18. Patrick Wilcken, *Claude Lévi-Strauss: The Poet in the Laboratory* (London: Bloomsbury, 2010) 355.
19. See Daniel Pick, *Faces of Degeneration: A European Disorder, c. 1848–c.1918* (Cambridge: Cambridge UP, 1989).
20. Charles Darwin's chilling observation: "Wherever the European has trod, death seems to pursue the aboriginal." Quoted in Brewton Berry, "The Myth of the Vanishing Indian," *Phylon* 21.1 (1960) 53.
21. For a nuanced and sympathetic account of Lévi-Strauss's entropological plea for cultural diversity and his pessimistic analysis of Western modernity and humanism, see Emmanuel Terray, "Claude Lévi-Strauss's

World-View," *L'Homme* 193 (2010): i–xix.

22. Claude Lévi-Strauss, *Tristes Tropiques*, trans. John Russell (New York: Criterion, 1955) 397–398.
23. "Even if the rainbow of human cultures should go down for ever into the abyss which we are so insanely creating, there will still remain open to us provided we are alive and the world is in existence a precarious arch that points towards the inaccessible." Lévi-Strauss, *Tristes Tropiques* 398.
24. Georges Charbonnier, ed., *Conversations with Claude Lévi-Strauss*, trans. John and Doreen Weightman (London: Cape, 1969) 42.
25. Quoted in Kohei Saito, "Marx's Ecological Notebooks," *Monthly Review* 67.9 (Feb 2016) 26. The metabolic rift thesis extrapolates from Leibig's work on the way "in which soil nutrients are removed from the soil in the form of food and fibre and exported hundreds, sometimes thousands, of miles to the towns, where the nutrients end up as pollution, failing to return to the soil." See Foster and Burkett, *Marx and the Earth* 25.
26. Letter to Engels, March 25, 1868, quoted in Saito, "Marx's Ecological Notebooks" 35.
27. Karl Marx, *Capital: A Critique of Political Economy Vol I*, trans. Ben Fowkes (London: Penguin Books, 1976 [1867]) 376. My emphasis.
28. Fredric Jameson directs our attention to the relationship between the extinguishing fire of labor and the consumption and resurrection of the value embodied in fixed capital in his *Representing Capital: A Commentary on Volume 1* (London: Verso, 2011) 97–98: "labor already underway, specific and completing itself, becomes a veritable fire, which not only 'extinguishes' the previous characteristics of the raw materials (including that labor power itself), but also prepares the climax of the figure as such: for as paradoxical as it may seem for fire to extinguish (rather than to be itself extinguished), it does one thing whose name and verb unite the literal and the figurative (so to speak): it *consumes*. The consumption of its ingredients by the fire of labor is also the consumption by the capitalist labor process of its own capital (constant as well as variable); and now illustrates the paradox rehearsed over and over again elsewhere (particularly in the *Grundrisse*), that production is a consumption (just as from another standpoint consumption is a

production)." See my commentary on these passages in "The World is Already Without Us," *Social Text* 34.2 (2016) 107–122.

29. It is not capital or nature that is exhausted but "regionally specific relations of capitalization and appropriation." Jason W. Moore, *Capitalism in the Web of Life: Ecology and the Accumulation of Capital* (London: Verso, 2015) 123; "exhaustion is not a substantial property. It is a *relational* property of the specifically capitalist *oikeios*"; "*Exhaustion* happens when particular natures — crystallised in specific re/production complexes — can no longer deliver more and more work/energy" (124).
30. "The imperative faced by capital to expand the zone of unpaid work faster than the capitalization of the *oikeios* is the historical basis through which capitalist power lumped together the epoch-making appropriation of 'women, nature, and colonies.' Without women, nature, and colonies — a stylized list, to be sure — accumulation falters" (Moore, *Capitalism in the Web of Life* 240). Mies writes in *Patriarchy and Accumulation on a World Scale: Women in the International Division of Labor* (London: Zed Books, 1986) about "the contradictory process… by which, in the course of the last four or five centuries women, nature and colonies were externalized, declared to be outside civilized society, pushed down, and thus made invisible as the under-water part of an iceberg is invisible, yet constitute the base of the whole" (77).
31. *Capitalism in the Web of Life* 192.
32. *Capitalism in the Web of Life* 120.
33. *Capitalism in the Web of Life* 235.
34. *Capitalism in the Web of Life* 156.
35. *Capitalism in the Web of Life* 162.
36. *Capitalism in the Web of Life* 225.
37. "The normal course of capital accumulation tends to exhaust the establishing relations of re/production that inaugurate a great wave of accumulation" (*Capitalism in the Web of Life* 118).
38. *Capitalism in the Web of Life* 174. The term organic composition, referring to the ratio of constant to variable capital, is (ironically) borrowed from the writings of Leibig on soil fertility.
39. *Capitalism in the Web of Life* 193.

40. *Capitalism in the Web of Life* 221.
41. *Capitalism in the Web of Life* 165.
42. *Capitalism in the Web of Life* 214.
43. Quoted in *Marx and the Earth* 149.
44. Moishe Postone, *Time, Labor and Social Domination: A Re-interpretation of Marx's Critical Theory* (Cambridge: Cambridge UP, 1993) 311.
45. Postone, *Time, Labor and Social Domination* 311.
46. *Time, Labor and Social Domination* 312.
47. It could be argued that Moore's historical-philosophical and socio-ontological optimism lies in thinking that there is a tendential convergence between the limits to nature and the limits to capital, once we reconceive capitalism, via "double internality," as operating *in the web of life*. For an extreme — but not for that exceptional — counter to this consider the words of the neoclassical political economist Robert Solow: "If it is very easy to substitute other factors for natural resources, then there is in principle no 'problem.' The world can, in effect, get along without natural resources, so exhaustion is just an event, not a catastrophe" (quoted in *Marx and the Earth* 232–233n31).
48. Andreas Malm, *Fossil Capital: The Rise of Steam Power and the Roots of Global Warming* (London: Verso, 2016) 284.
49. Quoted in Brett Clark and John Bellamy Foster, "William Stanley Jevons and *The Coal Question*," *Organization & Environment* 14.1 (2001) 95.
50. Clark and Foster, "William Stanley Jevons and *The Coal Question*" 97.
51. Moore acknowledges Malm's initial coinage in his Introduction to *Anthropocene or Capitalocene?: Nature, History, and the Crisis of Capitalism*, ed. Jason W. Moore (Oakland: PM Press, 2016) 5.
52. Malm, *Fossil Capital* 280.
53. Cited in John Bellamy Foster, Brett Clark, and Richard York, *The Ecological Rift: Capitalism's War on the Earth* (New York: Monthly Review Press, 2010) 241.
54. Jean-Paul Sartre, *Critique of Dialectical Reason, vol. 1*, trans. Alan Sheridan-Smith, edited by Jonathan Rée (London: Verso, 2004) 161.
55. Sartre, *Critique of Dialectical Reason* 161.
56. *Critique of Dialectical Reason* 161.

57. *Critique of Dialectical Reason* 161.
58. *Critique of Dialectical Reason* 161.
59. *Critique of Dialectical Reason* 163.
60. *Critique of Dialectical Reason* 163.
61. *Critique of Dialectical Reason* 164.
62. *Critique of Dialectical Reason* 165. For a criticism of Sartre's inability to fully assume the negativity in nature and the historicity of matter beyond human subjectivity, see Richard James Blackburn, *The Vampire of Reason: An Essay in the Philosophy of History* (London: Verso, 1990) 16–18. For Blackburn, *Homo sapiens* "is persistently assailed by vampirish objects and agencies whose collective negativity can be designated as the predatory enemy of rationality, the vampire of reason" (22).
63. *Critique of Dialectical Reason* 166.

Fossilized Liberation: Energy, Freedom, and the "Development of the Productive Forces"

Matthew T. Huber

> ...the production quotas of socialism can be at least as environmentally destructive as the profit motive of capitalism. In a capitalist market it is assumed that people are naturally greedy, and this is taken into account in establishing the framework of rules within which the economy operates. Socialism assumes an inherent lack of greed and hence fails to guard against its potentially destructive consequences.[1]

This leveling logic — expressed by one of the United States foremost environmental analysts — suggests that socialism, or perhaps any economic formation, has the propensity to destroy the environment. It reflects common sense thinking that actually existing socialism in the Soviet Union had its own form of ecocide. Historical scholarship reveals that Stalin's commitment to the rapid collectivization of agriculture and large-scale industrialization had disastrous ecological consequences.[2] Environmentalists in general blame the Soviet Union's commitment to production quotas or economic development for its damaging relationship to the environment.

More erudite critiques place the blame squarely on Karl Marx, who claimed it was the capitalist development of the productive forces that would lay the basis for socialism. Marx's statements on this matter could appear quite teleological — most famously in the preface to the *Contribution to the Critique of Political Economy*: "No social order ever

perishes before all the productive forces for which there is room in it have developed; and new, higher relations of production never appear before the material conditions of their existence have matured in the womb of the old society itself."[3] Since socialism actually emerged in peasant societies like Russia and China, Stalin and Mao have been blamed for slavishly following Marx's dictum to develop the productive forces. To be sure, the ecological record of these regimes is terrible, involving massive pollution, deforestation, and destruction of lakes and river systems.[4]

Since the emergence of the modern environmental movement in the 1960s environmental or so-called green critiques of Marxism have focused on this fatal flaw. Writing in the *New Left Review* in 1974, Hans Enzenberger asserts, "the development of the productive forces is not a linear process to which political hopes can be attached.... The industrial process, insofar as it depends on these deformed productive forces, threatens its very existence and the existence of human society."[5] Ultimately, Marx's view was that the capitalist productive forces could lay the basis for *abundance* for all of humanity. More recently, Ted Benton has asserted this cannot be a dream of socialism. "Socialists can no longer hold out the promise of a future society of abundance. The future too belongs to the realm of necessity, and humankind is now faced with the problem of survival, not the hope of abundance."[6] If one thinks about the problematics of energy — and our reliance upon a finite and, thus, not abundant source of fossil fuels — Benton's logic appears to hold.

In this chapter, however, I argue that historicizing energy should force us to reevaluate this green critique of Marx's insistence on the development of the productive forces. While some might expect the association of fossil fuels — and consequently climate change — with the industrial development of the productive forces further damns any hopes we might attach to Marx's focus on the development of the productive forces, I argue that we must continue to see fossil fuel–based production as a *material basis* for the development of a better society beyond capital.

This argument proceeds in three sections. First, laying out a broad perspective on energy and the productive forces, I suggest a historical materialist sensibility must understand machines as freeing labor from the exploitation of *muscle power* which defined all precapitalist social formations. Second, in thinking beyond capitalism, I rethink Marx's ideas of "disposable time" and the "realm of freedom" through an understanding of the energy required in the "realm of necessity." Third, while twentieth-century socialism certainly has an atrocious environmental record, socialists need to reaffirm a commitment to the development of the productive forces — but, as David Schwartzman argues with his call for "solar communism," in the direction of solar and other renewable energy under different social relations of production.[7] This affirmation holds the possibility of creating "freedom" based on "disposable time" like Marx predicted. Fourth, I review much left thinking on energy which basically predicts two kinds of futures: (1) collapse due to peak oil or energy scarcity or (2) a "transition" to a low-energy society based on localized agriculture. I argue neither of these futures conforms to what Marx had in mind with a society beyond capital. I don't mean to say that either of these futures are not historically possible — they are — but neither follow from a labor or class based critique of energy necessary for building struggles based on the *possibility* of a different kind of future than the one bound to the material conditions of fossil fuels.

Energy and the Capitalist Development of the Productive Forces

> But life involves before everything else eating and drinking, a habitation, clothing and many other things. The first historical act is thus the production of the means to satisfy those needs, the production of material life itself.[8]

The production of material life is the basis of a historical materialist sensibility. How the materials needed for life were actually produced — whether it be agricultural labor or industrial manufacturing.

Understanding how material life is produced through history allows one to understand the conditions of possibility of what *can* be. Marxists, however, have not reflected enough on the fact that energy is central to "the production of material life itself."[9] There is no "life" without the sun absorbed by plants and many other organisms. Indeed, what I call the "dead ecologies" of fossil fuels are only plant life that subsisted off of past sunshine, or "buried sunshine."[10] Labor cannot be reproduced without energy (stored kinetic energy in the form of food), and in Marx's time, workers often worked alongside energized machines like steam engines.

There are two major energy transitions in history. First, the agricultural revolution allowed humans to concentrate in space the cultivation of edible foods and store this food for extended periods. Although this allowed for nonfood producing elites, for most of human history agriculture was mainly based on the muscle powered labor of human beings (often slaves) and animals. Fuel needs also required large swaths of territory to grow animal feed and forests for heating needs in what historian E.A. Wrigley calls an "organic economy."[11] The second major energy transition was the industrial revolution, which freed some domains of production from reliance on both land (territory for fuel) and labor (muscle). The shift to an industrial society that relies on *subterranean* stocks of energy has vastly increased the amount of energy that can be used. "1 million tons of coal provided as much heat as could have been obtained from 1 million acres of forested land."[12] For example, by 1820, Britain was already using the coal equivalent of a forest the size of the United Kingdom.[13] In addition to land, fossil fuels freed production from the labor, the muscle, of working animals and humans. By 1880, the world's steam engines equated the work of three billion human beings.[14] Today a compact car contains a 135 horsepower engine, or roughly the equivalent of 1,350 average strength humans. It is easy to take for granted how much of the material reproduction of our society depends on fossil fuel–powered machinery, or so-called "energy slaves."[15]

A key concept for understanding changing energy regimes

in Marxian theory is productive forces.[16] As Harvey suggests, the productive forces are most broadly defined as "the *power* to transform and appropriate nature through human labor."[17] His italicization of "power" is instructive as it indicates how important energy is to the concept. Coal-fired steam engines drastically increase society's power to produce textiles (when compared to "hand" methods) — which, in turn, create new geographies of "demand" for cotton, coal, and other raw materials needed to fuel these enlarged powers. Yet, the productive forces cannot be equated with "technologies" (or energies for that matter) or other material things. The instruments of labor must be situated within the social relations that make use of them as well as the knowledge systems, divisions of labor, and ideologies that produce them. As Derek Sayer argues,

> Under certain circumstances the productive powers of human labor may then come to appear simply as the intrinsic property of the material things in which these powers are objectified, independently of the social relations through which they alone acquire this property. But such an appearance is for Marx, exactly that: a fetishistic illusion and one he was much concerned to confute.[18]

Thus, it is important not to use energy and the technologies certain energy resources make possible as a determining force of history or political change. As I have argued elsewhere, this tendency is endemic in the case of oil. Much commentary claims oil is endowed with unique powers to "cause" war, poverty, wealth, suburbanization, corruption, and many other phenomena.[19] Yet, such discourses distract us from understanding the social relations and property regimes that harness oil for particular projects.

How can we think through the capitalist development of the productive forces in relation to energy? For Marx, the social relations of the capitalist mode of production — in particular, the competitive search for labor saving innovation and "relative surplus value" — leads capitalists toward "constantly revolutionizing the instruments

of production."[20] The most important mechanism in this process in Marx's time was the development of automatic machinery that could accomplish work without the force of labor itself. In terms of energy, this shift is clearly about replacing *muscular* power. Machinery, Marx said, "does away with the many-sided play of the muscles."[21] Although early machinery was often driven by human or animal muscle power, Marx explains, the productive capacities of machines call for a "mightier" force:

> An increase in the size of the machine and the number of its working tools calls for a more massive mechanism to drive it; and this mechanism, in order to overcome its own inertia, requires a mightier moving power than that of man, quite apart from the fact that man is a very imperfect instrument for producing uniform and continuous motion.[22]

Of course, in early periods of industrialism, that "mightier" force could be the powerful force of falling water driving a waterwheel. But, Marx explains that there are limits to water powered machinery:

> The flow of water could not be increased at will, it failed at certain seasons of the year, and above all it was essentially local.... Not till the invention of Watt's second and so-called double-acting steam-engine was a prime mover found which drew its own motive force from the consumption of coal and water, was entirely under man's control, was mobile and a means of locomotion, was urban and not — like the water-wheel — rural, permitted production be concentrated in towns instead of — like the water-wheels — being scattered over the countryside.[23]

Thus, the true breakthrough in the development of industrial machinery is the shift from muscle power or water power, to fossil fuel– (coal-) powered steam engines. Since coal was *mobile* — albeit quite expensive to haul — steam-powered factories could concentrate

in urban manufacturing districts (which, of course, is our nineteenth-century image of industrial capitalism). It also necessitated the spatial concentration of proletariat workers who could not only socialize, but also organize to combat the domination of capital.

It is important to understand that steam became preferable to workers not only because it is more productive, but also because it is easier to control and could replace workers when they agitated for better wages or conditions.[24] Rooted in the capitalist search for relative surplus value, this shift commenced a much wider and general historical process toward *automation* of tasks that used to be done by human hands or brains (today this is the sphere of algorithms that can replace human decision making). This includes manufacturing of course, but also transportation (from the steam-powered railway to oil-powered automobiles), agriculture (diesel-powered tractors replace horses and mules), and in some privileged geographies, everyday life is increasingly automated (electric-powered dishwashers obviate handwashing). This shift toward automation was almost always powered by fossil fuels and all the environmental problems they entail from the destruction of local landscapes to global climate change. Yet, we often don't consider the role of fossil fuels in "freeing" much of society from muscle-based labor. In brief, capitalism has led to the "automation of everything" and drastically reduced the amount of manual muscle work needed to reproduce society as a whole. So what does this mean for a future beyond capital?

Energy and the "Realm of Freedom"

Marx is quite clear that the capitalist development of the productive forces around large scale machinery and fossil fuels is an important step toward what he calls a "higher form of society." In one of the few passages in *Capital* where he speaks of such of a society, Marx argues:

> [The capitalist] is fanatically intent on the valorization of value; consequently, he ruthlessly forces the human race to produce for production's sake. In this way he spurs on the development of society's

> productive forces and the creation of those material conditions of production which alone can form the real basis of a higher form of society, a society in which the full and free development of every individual forms the ruling principle.[25]

The key phrase in this passage is "material conditions." For Marx, large-scale industry creates *conditions of possibility* not necessarily historical inevitabilities. Those material conditions need to be rethought in terms of energy. In short, the emergence of automatic, fossil fuel powered machinery creates the material conditions for a society where hard, muscle powered labor is not the foundation for the "production of material life."

Marx explains this in more detail in the famous passage of the *Grundrisse* referred to as the "Fragment on Machines."[26] For Marx, any society can be defined by the "surplus labor" over and above what is necessary for basic subsistence. For Marx, the "culmination" of capital's development in the production process is the "machine," but more specifically a machine, "set in motion by an automaton, a moving power that moves itself; this automaton consisting of numerous mechanical and intellectual organs, so that the workers themselves are cast merely as its conscious linkages."[27] As stated above, the only really versatile option to *drive* this automaton is fossil fuel or coal. "[I]t consumes coal, oil etc. (*matières instrumentales*), just as the worker consumes food, to keep up its perpetual motion."[28] Marx is also clear that we cannot fetishize machines or technologies in themselves. They are products of *social processes* of science and knowledge formation — what he calls the "general intellect" — that *appear* as attributes of capital, but, in a better society, could be appropriated by society as a whole.[29]

What Marx suggests is that capital, by its very nature, unwittingly creates surplus labor for society as a whole to appropriate.

> What capital adds is that it increases the surplus labour time of the

> mass by all the means of art and science, because its wealth consists directly in the appropriation of surplus labour time; since *value directly its purpose* [sic], not use value. It is thus, despite itself, instrumental in creating the means of social disposable time, in order to reduce labour time for the whole society to a diminishing minimum, and thus to free everyone's time for their own development.[30]

This kind of society would define wealth not as value measured by labor time, but as disposable time: time free from the exigencies of material necessities. In fact, the automation of production makes a value system based on living labor time increasingly irrelevant.

Amy Wendling has recently written on the intersection of machines, energy, and Marx's views of an emancipatory politics based on the "elimination of arduous labor."[31] She examined how Marx's writings on technology and machinery are confusing because his ruthless critique of the use of machinery under capitalism often creates what she calls "technophobic" assumptions about technology or machinery in general.[32] She situates this critique of industrial technology as part of a larger humanist illusion, or "a romantic longing for precapitalist forms of labor and political life."[33] In contrast, although Marx forcefully damns the immiseration of machine production under capitalism, under a communist society machines can become harnessed toward creating use values rather than value. Under such a society, "Real wealth, will be free to develop as the extension of needs other than material needs: especially the development of artistic, social, political, and scientific capacities of human societies."[34] Surplus labor — creating the potential for nonfood producing elites — has *always* been the basis of art and science in all class-based societies. What capitalism imparts are the material conditions that could allow that form of development to be extended to *all of society*. In energy terms, this means a society not organized around agricultural labor as the basis of the reproduction of material life.

Thus, for Marx, the "realm of necessity" is the basis of food,

clothing and other "needs" that must be produced for the reproduction of society. If machines do most of that production what is created is the "realm of freedom":

> Freedom, in this sphere, can consist only in this, that socialized man, the associated producers, govern the human metabolism with nature in a rational way, bringing it under their collective control instead of being dominated by it as a blind power; accomplishing it with the least expenditure of energy and in conditions most worthy and appropriate for their human nature.[35]

This is, of course, a complicated vision that Marx presents to us. Who are the "associated producers"? How can they "govern the human metabolism with nature in a rational way"? "Collective control" would still replicate a quite modernist nineteenth-century vision of *controlling* nature in the first place that many eco-critics have located as the core problem of our current ecological crisis.[36] It is clear that the actually existing historical attempts to make this "realm of freedom" a reality in the Soviet Union or China were not only ecologically destructive, but also based upon fossil fuel energies that are by definition unsustainable. They also interpreted ideas of "associated producers" and "collective control" in the most authoritarian statist forms possible. The question remains if history could allow for more democratic visions of "association" and "collectivity" in the "communist horizon."[37]

Since Wendling reminds us Marx was familiar with "energeticist" theories of thermodynamics at the time, it is instructive that he includes the "least expenditure of energy." But it is possible, perhaps even likely, that the translation of the word energy here refers not to amount of coal or oil burned, or even the amount of sunlight harnessed by solar panels. It is possible that Marx refers here to *human energy* — the least amount of muscle, sweat, brainpower, and emotional tolls that are wrapped up with human labor. This is why the "realm of freedom… can only flourish with the realm of necessity as its basis.

The reduction of the working day is its basic prerequisite."[38]

From an energy perspective, the productive forces based on fossil fuels have "relieved" society from the "necessity" of mass deployment of human labor and muscle. Of course, under a capitalist system oriented toward the accumulation of value, this "relief" comes in the form of unemployment as automation displaces workers from the labor process. More importantly for this essay, fossil fuels are an environmental and climate disaster. So, the question becomes how to interpret Marx's focus on the "development of the productive forces" when so much of that development has been fossil fuel based?

Solarizing the Productive Forces

If fossil fuels are viewed as "material conditions" for a better society it is clear that society cannot continue to be based around fossil fuels. Thus, as David Schwartzman has argued, we need to view a transition to communism as an *energy transition* to the use of the massive resource known as the sun.[39] While most discussion of a post–fossil fuel future focuses on scarcity and less energy use, it is worth remembering the *abundance* of solar energy. David Schwartzman puts it in stark terms, "one hour of solar flux to the earth supplies the same amount of energy as that consumed globally by society in one year."[40] The less radical, and decidedly not eco-socialist, Vaclav Smil states that "energy carried by solar radiation is several orders of magnitude larger than any conceivable global energy demand."[41] Of course, he goes on to warn "but so far, practical conversions into electricity (using photovoltaics) or large-scale industrial heat are quite negligible."[42] Thus, the problem is oriented around the "development of the productive forces." In other words, the development of the productive forces need not be seen as only "developing" toward "ecocide" and the dirty black ruins of Soviet-style industrialization, but as a longer process toward the development of an energy system based on the abundance provided from solar energy.

Historically speaking from an energy standpoint, this transition would be a kind of energy reversal. 99 percent of human history is

based on solar energy — specifically the photosynthesis needed for plant life and the food it provides. The use of fossil fuels (or buried sunshine) could be seen as a brief "bridge" to re-inaugurating an economy and society based on *direct sunlight* as the ultimate source of energy. What if "the development of the productive forces" was rethought in line with this project of a transition back to a solar economy? Unlike much eco-critique which rejects industrialism *tout court*, this kind of vision recognizes fossil fuels — like Marx recognized capitalism — as a critical precursor to a better society.

Again, it is important to not think about the "development of the productive forces" solely in terms of technological change. It will take new social relations as well. Fossil fuels are not only great sources of inanimate energy, they take advantage of natural conditions amenable to capitalist profitability and value — first, much of their "production," the millions of years of sunlight embedded in their formation, involves no labor and is *appropriated for free*. Second, the ecological costs of their extraction and combustion are "externalized" onto socio-ecological life, hydrology, and the atmosphere — again *for free*. Yet, solar, wind, and other renewable energies present a problem for capitalism — that is, a problem for capital which will not produce anything unless it is profitable. Once renewable energy infrastructures are built, it is conceivable that they could generate free energy that is difficult to commodify — the sun, wind, and falling water are in fact iconic examples of what Marx refers to as forces "provided by nature free of charge."[43] In the case of fossil fuels, "free" gifts of nature are profited on by capital; in a society beyond capital based on renewable energy, those free gifts could be harnessed for all of society.

This is not to say a transition to renewable energy could *not* occur under capitalism. There are plenty of ways to organize a "green" economy around the *private* production and profit — solar panels, batteries, transmission lines, windmills, and even small hydroelectric dams. All these materials could be furnished and profited upon by private capital. The key is to imagine a society in which the building of this infrastructure was organized in a way that distributed free

energy to the population — rather than finding ways to commodify it. Thus, the "development of the productive forces" can only bend toward "solar communism" on the basis of social and political struggle. David Schwartzman is clear, "Needless to add, [solar communism] will not happen automatically but only in the course of inspired and dedicated political struggle."[44]

In this view, it is obvious that fossil fuels are absolutely indispensable *material conditions* to a solar economy. The key technologies we know of today such as batteries are inconceivable without the socio-technical systems made possible by fossil fuels. Moreover, Schwartzman instructs, "A transition to solar-powered civilization will require using fossil fuel, the dominant energy source now available, for the creation of an alternative infrastructure."[45] He suggests the preference is oil and gas (since coal is so much more carbon intensive) and perhaps 40 percent of remaining reserves might be necessary energy and materials to build solar infrastructure. But, after a while, "The critical factor that leads to exponential growth of this renewable energy supply is the feedback of energy from the growing renewable capacity back into the physical economy to create more of itself."[46] Indeed, it is critical to understand energy transitions historically — new energy regimes emerge out of the material conditions of the previous. "Each stage of history has been energy-parasitic on the previous: pre-industrial (low-efficiency solar, i.e., photosynthesis), then industrial (fossil fuels, nuclear fission); and now in the twenty-first century, the challenge of transition to post-industrial high-efficiency solar feeding off the remaining reserves of fossil fuel energy."[47]

Fossil fuels need to be viewed as a geological gift that comes with an expiration date. Their incredible energy density and productive power have allowed for a society to be erected on the basis of labor-saving technologies and automatic machinery. The social relations of that society have excluded the large majority of people from the benefits of industrialized life. The centuries of fossil fuel–based society give us the opportunity — a material basis — to construct a society *also* based

on automatic machinery, but fueled by the abundant and renewable resource of the sun. Yet, the expiration date is based not only in the finiteness of fossil fuels themselves, but also in the planetary consequences of their continued extraction and combustion. The final section will explore how, rather than seeing them as a "gift," much environmental politics today is constructed in opposition to fossil fuels.

The Politics of Negation and the "Post-Carbon Society"

When considering the embeddedness of fossil fuels in modern industrial society, most thinkers come up with only two possible futures for a "post-carbon society." First, they posit the depletion of that fossil fuel stock and the unavoidable collapse of industrial civilization. This is the majority vision of the vast array of "peak oil" literature that exploded over the last fifteen years.[48] One of the key concepts in peak oil thought is the "die off" which will ensue when we lack the energy to provision basic food and other supplies to the seven billion humans on the planet. James Howard Kunstler, for instance, has made a living writing fiction and nonfiction predicting or imagining an apocalyptic post–peak oil world marked by violence, scarcity, and the return to an agrarian society.[49]

The reason why peak oil thinkers envision collapse as unavoidable is because they insist that there are no technical alternatives to fossil fuels. Richard Heinberg, a leading thinker in the peak-oil movement, argues that the capacities of renewable energy will necessarily limit our energy future: "[C]an we transition to these renewable energy sources and continue using energy the way we do today? And can we maintain our growth-based consumer economy? The answer to both questions is, probably not."[50] Thus, from the outset they contest Marx's belief that large-scale industry could provide the material conditions for abundance and fulfilling all of society's needs. Indeed, Heinberg focuses on society's "faith in technology" as the culprit for what will usher in a collapse.[51] Yet, while we should absolutely have no faith in the capitalist use of technology — where it is capital

that needs "economic growth" — we should encourage a politics of faith in the harnessing of modern technology for human needs and societal emancipation. In *Capital*, Marx continually ridicules critics for the mistake of locating their criticism "not against the capitalist application of machinery, but against machinery itself." He plainly suggests in a maddeningly brief footnote, "The field of application for machinery would therefore be entirely different in a communist society from what it is in bourgeois society."[52] We don't think enough about the incredibly narrow ways in which capitalist society makes use of machinery and technology. Without the imperatives of accumulation, technologies could be harnessed toward wholly different ends.

Second, if collapse does not ensue, the *only* positive future of a post-carbon society is based on a politics of "negation." Since fossil fuel industrialism has so many horrific problems, the solution lies in constructing a society based on the rejection of industrialism altogether and the drastic reduction of energy consumption. Ultimately this requires limits and sacrifice. Richard Heinberg claims that "only self-limitation is the answer that counts."[53] Social theorist and peak oil acolyte John Urry also characterizes this as a "low carbon society" which — since nothing can replace fossil fuels — necessarily entails a "powered down future."[54] While Marx is accused of having a forward thinking teleology — namely, the misleading idea that he predicted socialism as automatic or inevitable — these thinkers offer a backwards teleology "reversing most of the systems that were set in motion during the twentieth century."[55] This negative politics of "reversal" means a move toward localized agriculture and the dismantling of industrial systems based on automatic machinery.

A nuanced account of the development of the productive forces laid out allows for three critiques of these visions of the future. First, Heinberg's politics of "self-limitation" only focuses on a homogenous "culture" of high energy use (mainly in the industrialized north). This of course ignores that most people in rich countries and around the world are *already* self-limited vis-à-vis poverty and marginalization.

This is likely why Heinberg's politics mainly appeals to white middle-class suburban dwellers all too aware of "our" perilous dependence on oil.[56] Second, this means that a politics of self-limitation is only really speaking to the rich and middle-class fractions of society, whereas a politics that focused on freedom and emancipation of the poor, un/underemployed and working classes would need to focus not on sacrifice, but a vision of *more energy* and material security. Rather than a politics of "less" and "self-limitation," Schwartzman and Schwartzman clearly understand that, "energy supplies must be increased to end energy poverty in the global South."[57] Moreover, there is probably *zero* chance a politics of sacrifice and self-limitation will succeed among high-energy consumers anyway. John Urry naively suggests we could somehow successfully promulgate "discourses and practices of what might be called 'low carbonness' or 'post-carbonness' or 'transitionness.' This too would involve enthusiasts, interests, media, technologies, advertisements and corporations to develop and promote 'low-carbonness.'"[58] Ads and corporations have engendered a society of wasteful mass energy consumption, so I guess we can trust them to indoctrinate us into trendy ideas of "low-carbonness"? A politics of "less" and "powering down" only appeals to a very small subset of affluent, highly educated consumers in the Global North (a large proportion of whom might be academics!).

Third, these discourses about the reversal of fossil fuel industrialization are silent (or perhaps unaware) on the labor implications of such a return to a localized agrarian society. Fossil fueled industrialization has led to the mass "depeasantatization" of the globe and the decline of muscle power as a core productive force in the material reproduction of societies.[59] For example, in the United States as recently as 1910 35 percent of the population worked directly in agriculture; now it is less than 2 percent.[60] Most in energy studies don't even think about labor and agriculture and what might be needed for "powering down." When critics of industrial agriculture do confront this issue they often have some quasi-romantic idea that a return to agricultural lifestyles is in line with a vision of ecological

harmony. Tony Weis, for instance — an otherwise indispensable critic of industrialized agriculture — maps out his vision of a "socially just and humane" society:

> Agricultural systems must be vastly more labour-intensive and biodiverse, and geared towards much less meat production.... There is no substitute for skillful and dense human labour, decentralized agricultural knowledge and careful, passionate stewardship.[61]

To be sure, we need to integrate ecological knowledge systems into the management of large-scale agricultural production in order to transition beyond the chemical-intensive and monoculture basis of capitalist agriculture. But, despite the popularity of urban gardens and small-scale agriculture, we cannot wax nostalgic about "passionate" agricultural labor. Because agricultural labor itself is often insufferable,[62] few societies in history have been able to avoid class-based power systems that attempt to force and coerce *others* to labor on behalf of elites. Most often agrarian societies are reproduced through exploitative systems of slavery and serfdom. A truly humane society must commit to relieving the masses from agricultural labor. While the left certainly needs to support peasant movements seeking to maintain their livelihoods and resist dispossession, we cannot act like their agricultural systems are much of a "material basis" for a society beyond industrial capitalism.

The key will be finding technologies beyond chemicals, fossil fuels, and machines that can maintain industrial agriculture's productivity without sacrificing the water, air, and ecologies around them. Solar- and wind-powered machines that can substitute for labor-intensive methods of crop rotation, natural pest management, seed saving, and other agro-ecological knowledge systems and practices must be cultivated. Animals must be reintegrated with crop-based production as sources of fertilizer and, indeed, labor (but we can save their labor with machines as well if possible!).

Conclusion

Historical materialism is nothing else if not a commitment to understanding the political possibilities that exist given certain material conditions. Fossil fuels and industrial machines have so inundated the materiality of modern society that it becomes difficult to imagine what might surpass them. Because of the horrors involved in the capitalist use of technology, the environmentalist left is often reactionary and committed to a negation of industrial technology in general. Like Wendling reminds us, this technophobia is often based on romantic yearnings for precapitalist social formations. From an energy perspective, these precapitalist societies relied on muscle power in ways that would be difficult, if not impossible, to replicate today. Instead of a politics of negation, Marxism is obligated to imagine what world might be possible on the basis of fossil fuel energy, since the only way to transition out of today's carbon society is to revolutionize the forces of production on which it is built. Yet, substantial thinking on energy often forecloses this possibility by only focusing on "powering down," "localization," "degrowth," and "self-limitation." In contrast, a Marxist perspective cannot mobilize mass political revolution among the poor and marginalized through a politics of "less." For Marx, freedom meant more. Not just more material stuff but more time freed from the constraints of tedious material labor.

Notes

1. Lester Brown, "Foreword," Murray Feshbach, and Alfred Friendly, *Ecocide in the USSR: Health and Nature Under Siege* (New York: Basic Books, 1992) xii–xiii.
2. Paul Josephson, Nicolai Dronin, Ruben Mnatsakanian, Aleh Cherp, Dmitry Efremenko, and Vladislav Larin, *An Environmental History of Russia* (New York: Cambridge University Press, 2013) 5.
3. Karl Marx, *A Contribution to the Critique of Political Economy* (Chicago: Charles H. Kerr an Co., 1904) 13.
4. Marx, *A Contribution to the Critique of Political Economy* 13. See also, Judith Shapiro, *Mao's War against Nature: Politics and the Environment in Revolutionary China* (New York: Cambridge UP, 2001).
5. Hans Magnus Enzenberger, "A Critique of Political Ecology," *New Left Review* 84 (March–April 1974): 22–23.
6. Ted Benton, "Introduction to Part I," *The Greening of Marxism*, ed. Ted Benton (New York: Guilford, 1996) 10.
7. David Schwartzman, "Solar communism," *Science and Society* 60.3 (1996) 307–331.
8. Karl Marx and Friedrich Engels, *The German Ideology* (New York: International Publishers, 1970) 48.
9. See Matthew T. Huber, *Lifeblood: Oil, Freedom and the Forces of Capital* (Minneapolis, MN: U of Minnesota P, 2013). Of course, the concept of energy is itself a historically specific abstraction particular to nineteenth-century thermodynamics (itself emerging from observing industrial machines). Yet, I would insist that it is a useful abstraction that allows us to think through the commonalities between things as varied as breakfast toast, a coal fired furnace, and the sun shining at midday.
10. Huber, *Lifeblood* 12. Jeffery Dukes, "Buried Sunshine: Human Consumption of Ancient Solar Energy," *Climate Change* 61.1 (2003) 31–44.
11. E.A. Wrigley, *Continuity, Chance and Change: The Character of the Industrial Revolution in England* (New York: Cambridge UP, 1988).
12. Wrigley, *Continuity, Chance and Change* 54–55.

13. Rolf Peter Sieferle, *The Subterranean Forest: Energy Systems and the Industrial Revolution* (Cambridge, UK: White Horse Press, [1982] 2001).
14. Andrew Nikiforuk, *The Energy of Slaves: Oil and the New Servitude* (Vancouver: Greystone, 2012) 22.
15. Nikiforuk, *The Energy of Slaves: Oil and the New Servitude* 22.
16. Joan Martinez-Alier, *Ecological Economics: Energy, Environment and Society* (Oxford: Blackwell, 1987) 5.
17. David Harvey, *The Limits to Capital* (Oxford: Blackwell, 1982) 101.
18. Derek Sayer, *The Violence of Abstraction: The Analytical Foundations of Historical Materialism* (Oxford: Blackwell, 1987) 28.
19. Huber, *Lifeblood* 1–6.
20. Karl Marx and Friedrich Engels, *The Communist Manifesto* (New York: Simon and Schuster) 62.
21. Karl Marx, *Capital: A Critique of Political Economy Vol. I*, trans. Ben Fowkes (London: Penguin Books, 1976 [1867]) 548.
22. Marx, *Capital Vol. I* 497.
23. *Capital Vol. I* 499.
24. Andreas Malm, "The Origins of Fossil Capital: From Water to Steam in the British Cotton Industry," *Historical Materialism* 21.1 (2013) 15–68.
25. *Capital Vol. I* 739.
26. Karl Marx, *Grundrisse*, trans. Martin Nicolaus (London: Penguin, 1973) 690–712.
27. Marx, *Grundrisse* 692
28. *Grundrisse* 693
29. *Grundrisse* 706
30. *Grundrisse* 708
31. Amy Wendling, *Karl Marx on Technology and Alienation* (New York: Palgrave Macmillan, 2009) 65.
32. Wendling, *Karl Marx on Technology and Alienation* 146–148
33. *Karl Marx on Technology and Alienation* 131
34. *Karl Marx on Technology and Alienation* 115
35. Karl Marx, *Capital, Vol. III*, trans. David Fernbach (London: Penguin, 1981) 959.
36. A recent prominent example is Naomi Klein, who locates the social belief

in "control" of nature as the fatal flaw of the modernist "worldview." *This Changes Everything: Capitalism Vs the Climate* (New York: Simon and Schuster, 2014) 23.

37. I like Jodi Dean's idea of "communism" as a "horizon" that always requires struggle to move toward. Jodi Dean, *The Communist Horizon* (London: Verso, 2012).
38. Marx, *Capital Vol. III* 959.
39. David Schwartzman and Peter Schwartzman, "A Rapid Solar Transition is Not Only Possible, it is Imperative!" Proceedings of the 5th International Conference on Appropriate Technology, 5th IACT Proceeding Papers, *Appropriate Technology*, http://www.appropriatetech.net/?q=content/5th-icat-proceedings-papers
40. David Schwartzman, "Ecosocialism or Ecocatastrophe," *Capitalism Nature Socialism* 20.1 (2009) 14.
41. Vaclav Smil, "21st Century Energy: Some Sobering Thoughts," *OECD Observer* (2006), http://www.oecdobserver.org/news/archivestory.php/aid/2083/21st_century_energy:_Some_sobering_thoughts.html
42. Smil, "21st Century Energy."
43. *Capital Vol. I* 751.
44. Schwartzman, "Ecosocialism or Ecocatastrophe" 32.
45. "Ecosocialism or Ecocatastrophe" 32.
46. Schwartzman and Schwartzman, "A Rapid Solar Transition" 110.
47. "Ecosocialism or Ecocatastrophe" 32.
48. Some of the most influential include: Richard Heinberg, *The Party's Over: Oil, War, and the Fate of Industrial Societies* (Gabiola Island, BC: New Society, 2003); James Howard Kunstler, *The Long Emergency: Surviving the End of Oil, Climate Change, and Other Converging Catastrophes of the Twenty-First Century* (New York: Atlantic Monthly Press, 2005); and Matthew Simmons, *Twilight in the Desert: The Coming Saudi Oil Shock and the World Economy* (Hoboken, NJ: Wiley, 2005).
49. James Howard Kunstler, *World Made by Hand* (New York: Grove Press, 2008).
50. Richard Heinberg, "Renewable Energy Will Not Support Economic Growth," *Resilience.org*, June, 5, 2015, http://www.resilience.org/

stories/2015-06-05/renewable-energy-will-not-support-economic-growth. Marx of course would not envision a post-capitalist society to "continue to use energy in the same way"; nor would it be equivalent to a "growth-based consumer society" (although I think, unlike de-growth perspectives, growth would have to be involved).

51. Heinberg, "Renewable Energy Will Not Support Economic Growth" 133.
52. *Capital Vol. I* 515, 569.
53. *Capital Vol. I* 137.
54. John Urry, *Societies Beyond Oil: Oil Dregs and Social Futures* (London: Zed, 2013) 203.
55. Urry, *Societies Beyond Oil* 219.
56. Matthew Schneider-Mayerson, *Peak Oil: Apocalyptic Environmentalism and Libertarian Political Culture* (Chicago, IL, U of Chicago P, 2015).
57. "A Rapid Solar Transition" 114.
58. *Societies Beyond Oil* 220.
59. Farshad A. Araghi, "Global Depeasantization, 1945-1990," *Sociological Quarterly* 36.2 (1995) 337–368.
60. Huber, *Lifeblood* 86.
61. Tony Weis, "The Accelerating Biophysical Contradictions of Industrial Capitalist Agriculture," *Journal of Agrarian Change* 10.3 (2010) 315–341.
62. This was exemplified by the United Farm Workers "Take Our Jobs" campaign which illustrated that few Americans are interested in the jobs, specifically arduous farm labor, migrants perform. See, http://www.ufw.org/toj_play/TOJNEW_12_JAL.html.

Technologies for an Ecological Transition: A Faustian Bargain?

Tomislav Medak

> Neither tales of progress nor of ruin tell us how to think about collaborative survival.[1]

Since around 1970 the world has been living beyond Earth's ecological limits. Humanity currently operates at over 1.6 times Earth's regenerative biocapacity. In 2016 the Earth Overshoot Day — the day in a year when humanity's demand for environmental resources for that year exceeds Earth's capacity to regenerate those resources in that year — arrived on August 8, five days earlier than in 2015.[2] However, not everybody has been living equally beyond our common means. If everybody lived the standard of an average U.S. or Gulf citizen, we would need four to six planets to sustain the human population.[3] As the effects of human-induced change to Earth's biophysical systems catalyze extreme weather patterns, floods, droughts, wildfires, accelerated species extinction, lower crop yields, and famines, the global poor are asked to soak up the cost of the change generated by the global rich. Without means to adapt and to mitigate the effects of climate change, regions of the world that were previously ravaged by imperial conquest, postcolonial instability, and now mounting environmental pressures are likely to see as many as two hundred million "climate refugees" by 2050.[4] Yet the costs of climate change are shared just as unequally within nations as across them. With structural adjustments and neoliberal restructuring, inequality and vulnerability are on also on the rise. Proletarianization has affected

large segments of the population in the developed Global North and the urban poor and the vulnerable countryside are now feeling the effects of climate change as food and energy prices reverberate against a rising tide of climate disasters.[5] Nowhere is that double impact more readily observable than in Europe, where the rising conservative forces have pitted the surplus workforce left in the wake of post-socialist global reordering against the migrants escaping the plight of war and environmental degradation.

The historical trajectory of anthropogenic environmental transformation is well established: the beginning of the industrial revolution and the discovery of fossil fuels allowed humans to tap into energy stocks much richer than anything hitherto available. By the 1800s industrial capitalism was rapidly transforming vast expanses of the world leading quickly to initial increases in atmospheric CO2 concentration levels, land transformation and transformation of metabolic cycles, only to enter a period of Great Acceleration after World War II resulting in the present day CO2 levels, depletion of soil, and biodiversity loss.[6]

Against this background of anthropogenic environmental change, in this text I intend to discuss the role of technologies in two contrasting ecological transition scenarios. First, I will analyze the limits that beset the strategies of green innovation and green growth, which provide a foundation for much of international climate change policy — and which I understand to fall into the long lineage of dominant techno-developmentalist doxa. In line with that doxa, these strategies place inordinate expectations on the process of innovation to help us out of the present planetary predicament. Second, I will indicate what are takeaways for a degrowth scenario from that analysis, cautioning against an all-too-facile cherry-picking of technology and exclusive focus on small-scale convivial technologies. I finish by proposing some elements of strategy that might after all be reasonable to adopt in a degrowth transition, where that transition is understood as a potentially turbulent and revolutionary process of transition to a mode of production, social organization, and metabolic

relation between humanity and environment that would no longer be premised on economic growth that both sustains the dynamic of capital's self-expansion and drives the ever larger extraction of Earth's natural resources.

Technologies and Environmental Crisis

Changes in the planetary and social environment have been in no small way enabled by the growing productivity of technologies. In the progressivist worldview that continues to dominate in the present, techno-science is regarded as the single most important factor in human development. Advances in health, lifespan, nutrition, housing, mobility, communication, education, and general material abundance are all cursorily attributed to scientific and technological development to the disregard of other transformative factors such as political struggles, social institutions, language, or play.

As Lewis Mumford contended half a century ago, the prevalent worldview of progress has an inbuilt bias that understands human evolution as the evolution of a uniquely tool-making and tool-wielding species.[7] On this view, informed by a mass of mechanical, fossil fuel–based inventions made in the nineteenth century, the human is understood primarily as *homo faber*. However, disregarding the fact that there are other animals that make and wield tools, this overlooks a truly unique human capacity of combining and amplifying tools with social and symbolic structures — foremost spoken language. And yet, that bias, which for the purposes of my analysis I call techno-developmentalism, has remained unperturbed by the fact that gains in productivity enabled by technology have presided over an unprecedented environmental crisis on planetary scale and, after a period of post–World War II contribution to prosperity built on the militancy of the labor, is now the driving factor of growing economic inequality.[8]

Technology is thus part of the problem. Yet, the techno-developmentalist common-sense, now returning greenwashed in the guise of green innovation and the green growth narrative, would

have us believe that technology is the only solution to the problem. Scenarios of decarbonization of the global economy, and the climate change policy decisions within the framework of the Paris Agreement that are based on them, hedge our future on an unprecedented acceleration in technological development. By leaving the structural interdependence of technological systems and carbon-based capitalist socio-metabolism unexamined, techno-fixes effectively gag discussion of systemic change as politically inoperable. This political trap is further compounded by another contemporary doxa — one that considers that technological development in the present is best left to the private enterprise. Climate change thus can only be tackled if markets can be persuaded to provide a technological solution — or it will not be tackled at all.

The Limits of Techno-Developmentalism

It is within these constraints of the ecological transition debate that the narratives of green innovation, green growth, and green capitalism hold appeal. They all start from the assumption that technological innovation, by creating green technologies that are carbon neutral, more efficient, resource saving, recyclable will lead the global economy out of the environmental predicament, occasion sustainable development, and thus make possible long-term green growth.

Yet, if, unlike our political decision makers, we are willing to consider the interdependence of the contemporary technological apparatus with the operation of contemporary capitalism — the fact that technologies help capitalism reproduce at a world scale and that capitalist accumulation in turn directs the development of technologies, this green vision of techno-developmentalism gradually assumes a somber hue. The interdependence implies that promises of green innovation run up against many structural limits and limitations that shape the present-day capitalist world system. In the following paragraphs, I'll first outline four sets of limits, as they also impose constraints on the broader ecological transition debate,

before returning to the concrete technologies under discussion and their palliative role in the policy debate.

A. Capitalism's Conjunctural Crisis

First, capitalism faces a conjunctural crisis that is not likely to be resolved by means of a green techno-developmentalist fix. Technologies in the present are not productive enough to help capitalism maintain constant levels of compound growth at the expanded scale of world economy. If we are to follow the analyses of the historians such as Robert Brenner, Wolfgang Streeck, or Gopal Balakrishnan, since the 1970s the global economic system has been experiencing drawn-out downturn.[9] Technological advances in fossil fuel extraction, computerization, and containerization have allowed capitalism to relocate production overseas, bring down the price of labor, and increase the productivity of capital. However, they have failed to catalyze the levels of growth and profit that were enabled by the general-purpose technologies of the immediate postwar period — primarily for reasons that the total volume of the economy has grown immensely. To maintain a healthy annual growth rate of 3 percent over a period of forty years means that the total volume of economic activity needs to increase by a 300 percent — three times the total value, three times the amount of goods and services, and roughly three times the energy and material throughput compared to forty years earlier.[10] There's little evidence that the green technologies, premised on reduction or stabilization of energy and material throughput, can do better to maintain that level of growth.

At the same time as new technologies of the 1960s and 1970s were failing to reproduce the growth levels of the post–World War II *trente glorieuses*, the effects of relocation of production from the advanced capitalist economies to Asia were of limited success to capital. Despite high rates of growth achieved in Asia over the last decades, low-wage economies are not rich enough to create levels of demand achieved in the West a couple of decades earlier. For several decades Western consumption was made possible by the expansion of private credit

and financialization. Yet, with the onset of Great Recession of 2008, providing credit finance to consumption — or production for that matter — no longer seems a feasible option for capital. At this moment it prefers to keep $13.4 trillion parked in the negative yielding bonds.[11] Instead of investing to achieve returns or sustain growth, now it is less unprofitable to pay the interest to trustworthy borrowers who will keep the money safe.

All this signals that the capitalist world-system might have entered a steady-state of stagnation. Capitalist expansion has reached its limits. Capitalism is shifting away from the growth-premised model and this is bound to lead to social turbulence and shakeup of the political order. Under conditions of no growth the system of economic competitionturns into a zero-sum game where gains in income and wealth entail direct impoverishment of some and accumulation of economic power for others. Extreme levels of inequality thus created can be maintained only by growing economic despotism, social policing, and political authoritarianism whose outlines we can see forming all too clearly on the horizon. If nothing, this might prove conducive for public advocacy of an alternative, degrowth transition, one that might prevent the social transformation ahead of us from spiraling, as Serge Latouche has cautioned, into barbarism.[12]

B. Uneven Development

Second, sustainable development premised on technological change might not be achievable due to limits imposed by uneven development. With asymmetries of wage and purchasing power between national economies diverging by orders of magnitude, global free trade facilitates an exchange between highly unequal economic areas. This allows more advanced economies to siphon off the products of labor and natural resources of less advanced economies at knockdown prices. What is seemingly a symmetric relation of trade, an exchange of goods for money, a magic of conversion of unequal physical units of labor and energy into equivalent symbolic units provides economies with a higher purchasing power with an easy way to extract resources

from and externalize environmental costs onto those with a smaller purchasing power.[13]

As Arghiri Emmanuel, the originator of unequal exchange theory, has contended, the underdeveloped economies are caught in a spiral. In the international economic exchange they are forced to sell products of labor and natural resources cheaply and buy commodity and capital goods dearly, and are thus locked in underdevelopment while trying to catch up.[14] The reason being that in developmental terms there are no technologies appropriate to their level of economic development other than the most productive and hence most expensive, which such economies cannot afford. In this way, they remain destined to use obsolete, less efficient, and environmentally damaging technologies.

Uneven development is thus reinforced by varying levels of technological productivity. Labor and resources are extracted with inferior and inefficient technologies. If more developed economies would internalize the cost of uneven development by bringing wages and technologies of the underdeveloped economies to the same standard as theirs, the economic expansion altogether would likely grind to a halt. The consequence is that the developmentalist dynamic, which pushes all societies to try catching up to the advanced capitalist nations, is purchased only at a price of unevenness, inefficient technologies and environmental injustice. Contrary to what green growth boosterism, pointing to a shiny example of Germany, would like us to believe, green capitalism in one country simply cannot work as it depends upon unevenness elsewhere. If green technologies should serve as a new frontier of economic expansion, they surely will not be equally available across varying levels of development.

C. Environmental Time-Bomb

Third, there are extensive debates regarding the environmental limits to techno-developmentalism. Capitalism's downturn can also be attributed in part to the fact that the four "cheap natures" — food, energy, raw materials, and human labor — are increasingly becoming more expensive to extract and secure. As Jason W. Moore

has argued, capitalism has been able to appropriate by extra-economic means — conquest, slavery, plunder, uneven development — large contributions to its value production that it has been able to keep off its accounts.[15] Colonialism, imperialism, and neocolonialism have thus provided an extra-economic fix to some of the inner contradictions and crises of maturing capitalism. In the process, they have transformed precapitalist regions around the world into an integrated capitalist world system and planetary world ecology that is now going through a fundamental phase shift. Exponentially expanding food production, fossil fuel exploration, and raw material extraction from rich soils, stocks, and reserves have allowed capitalism to keep the cost of material inputs and labor power low in spite of its ever-growing throughput. However, as the environmental stresses on human habitats are rising, stocks of conventional oil are past their peak and reserves of many important minerals are reaching their limits, these resources are becoming more expensive to extract and secure, creating downward pressure on capitalism's growth. While capitalism has always depended on technological advances and accumulation by dispossession to secure these low-cost inputs, their reduced global availability in the face of still-growing demand in the present calls for even more advanced technologies of extraction and mercantile neocolonialism that might environmentally and politically no longer be feasible.

Furthermore, viewed from the framework of bioeconomics, initially developed by Nicholas Georgescu-Roegen, all economic processes can be understood as entropic. The economic production transforms low-entropy inputs of human labor, fuel, and raw materials into high-entropy outputs of commodity, heat, and emissions — and as the inputs have a lower price than the products, the generation of economic value is premised on the dissipation of resources of energy and matter.[16] Given Earth's limited capacity of regeneration, this sets rigid biophysical limits on growth. There's a heated debate around the validity of Goergescu-Roegen's assumptions of a strong physical causation between growth and emissions. Improving carbon efficiency

against GDP growth in advanced economies seems to suggest that decoupling growth from CO_2 emissions could be achievable through extended use of renewables and improvements in energy efficiency. But that evidence is only of limited value considering that the total emissions are not abating in the context of globally integrated production flows, which combine both efficient and inefficient technologies and entangle the national energy consumption of advanced economies with the energy diet of the rest of the world. Even if the global economy were to reduce CO_2 emissions, with the continued growth that also produces non-recyclable waste the entropy would persist. Regardless of the principled argument whether decoupling is in sum total possible or not, the efforts to reduce carbon emissions and the efforts to reduce the extraction of raw materials and depletion of soils are too slow for the time-bomb that is ticking away. The decarbonization and dematerialization is an extremely daunting task for the short time window available to us before we enter the period of nonlinear environmental change.

D. Socio-Technological Contingencies

Last, there are specifically *socio-technological limits to techno-developmentalism.* Technological innovation is a complex process, requiring synergy of technologists, regulators, financiers, businesses, and institutions. On the technological side, technological systems depend for their operation on integration with other technological systems. In fact, if we follow the influential historian of technology Thomas P. Hughes, much of the technological innovation principally reacts to critical problems of existing technological systems and optimization of their operation.[17] In other words, innovation is path dependent and alternatives cannot be easily willed into existence. On the social side, technological innovation is driven by critical problems of capital, military, administration, and population politics — and supported by institutions, financiers, and governments to that end.

While this does support the hopes that the development of technologies can be steered toward reduction of energy and material

throughput, this also means that desirable technological systems cannot be easily decoupled from other technological systems on which they depend for operation. It is unlikely that innovation will unfold smoothly if it is disruptive to the operation of current energetically and materially intensive systems and social interests entrenched into those technologies. We are thus back to the political trap of trying to institute a shift in the existing social metabolism, while maintaining business as usual in a capitalist economy.

A Curious Case of Negative-Emission Technologies

I have outlined four limits to green techno-developmentalism: conjunctural, developmental, environmental, and socio-technological. They strongly indicate, contrary to what the green-growth narrative would like us to believe, that a green revolution through technological innovation cannot resolve the crisis of growth or the crisis of environment that the present-day capitalist system faces. In fact, if we examine more closely what climate change policy prefers technologically, we are confronted with clear evidence that decision makers are entering a moral hazard. They are placing their bets on the wondrous development of barely existing technologies in order to defer the politically costly measures of rapid decarbonization.

As Kevin Anderson and Glen Peters have forcefully argued in a recent *Science* opinion piece, the scenarios that inform policy decisions and form the basis for Paris Agreement voluntary pledges hide their continued commitment to high-carbon emissions behind a large-scale deployment of negative-emission technologies.[18] Negative-emission technologies are mitigation technologies that make it possible to capture CO2 created in the process of power generation or already existing in the atmosphere, and store it long term in deep geological layers, oceans, or mineral formations. The most common model of carbon capture and sequestration (CCS) used in transition scenarios is in combination with the power generation from biomass, which would produce clean renewable energy by burning the crops cultivated specifically for this purpose. If used in combination with fossil fuels

such as coal, the CCS would enable a reduction of carbon emissions by up to 90 percent. And if used for the sequestration of atmospheric CO_2, it would wondrously expand our total carbon emission budget and allow us to continue with the business as usual.

All this looks highly promising. And yet, power generation with biomass is still in its early testing phase with only two power plants in operation. In addition, using large quantities of biomass required for the energy transformation on a global scale would require enormous masses of arable land — two times the area of India — with several adverse effects on land use, food security, and biodiversity.

On the other hand, pilot projects of power generation with CCS in combination with fossil fuels instead have so far proven economically unfeasible.[19] Moreover, the capture of atmospheric of CO_2 has not progressed further than a pilot project and also entails strong, adverse effects on the environment.[20] So, even if proven deployable at a globally relevant scale, negative-emission technologies are likely decades away from full development and deployment. Yet, they form a cornerstone of decarbonization scenarios — according to IPCC by 2100 they might contribute as much as 55 percent of emission-cutting effort. This highly speculative techno-developmental fix helps decision makers to avoid radical, rapid, and costly mitigation measures which would have to happen now: increase of energy efficiency, reduction in fossil fuel use, and large-scale deployment of renewables. With the combined voluntary pledges made by the world's governments, we remain currently on track to a global temperature increase by at least 2.7 degrees Celsius, if not more.[21] So, should we continue to bet on negative-emission technologies and these fail to live up to expectations, we might find ourselves in a much more dire situation than if immediate yet costly measures are undertaken now.

The blind techno-optimist belief of transition scenarios does not stop there. A number of models of deep decarbonization used in IPCC assessments have been recently reviewed by Peter J. Loftus, Armond M. Cohen, Jane C. S. Long, and Jesse D. Jenkins.[22] It turns out that these scenarios almost universally make the assumption of efficiency gains

and large-scale deployment of various forms of power generation that surpass anything we have have seen over the previous four decades of technological development. Rates of annual change in energy efficiency assumed by the least ambitious group of models set average reductions for the next four decades (-1.5 to -1.8 percent per year) on par with the record yearly values and double the average for the last four decades (-0.8 percent per year), whereas the most ambitious set average efficiency gains four times that (-3.4 to 3.7 percent per year). Also levels of new installed capacity of — depending on the model — wind, ocean, solar, geothermal, CCS, biomass, nuclear, and hydroelectric power generation, assumed as main components of substitution of fossil fuels usually surpass by far what we have seen in the past.

All this leads to the conclusion that narratives of green growth, green innovation, and green capitalism ultimately depend on a number of techno-developmentalist assumptions that verge on political denial and bad faith. As I argued earlier, a number of conjunctural, environmental, developmental, and socio-technological limits indicate that humanity is living beyond the Earth's ecological limits. We cannot simply hope to geo-engineer our way out of the predicament. What is needed is not only a radical change in the petro-capitalist technological apparatus, but also a parallel transformation of the relations of production and social reproduction. Yes, we need to rapidly instill into our current technological base greater energy efficiency; we need to massively build out renewables; and we need to find new ways to reduce CO_2 emissions, but we also need a transition from capitalist economies to an organization of social life that is premised on lower and different throughput, able therefore to stay in line with the regenerative biocapacities of our environment. And this is where degrowth comes into picture — as both a critical reassessment and a practical redress of the techno-developmentalist vision.

Degrowth and Transitional Technologies

Degrowth as theory advocates a systemic change. But as practice, it is leading by example, proposing and devising a number of prefigurative and transformative concrete utopias that start from the present social metabolism. The more frugal, localized, and mutualist socioeconomic system that degrowth envisions calls for a restructuring of existing relations of production, modes of distribution, value accounting systems, and, relevant to us here, technologies. Autonomous, distributed, localized, energy saving, resource efficient, non-obsolescent, recyclable are just some of the qualities that degrowth seeks in technologies it deems either appropriate or appropriable.[23] Citizen energy co-ops, organic food production, passive house construction, micro-production, resource-sharing digital platforms, free software, distributed computer systems, open patent pools, and crypto-currencies are all part of that strategic vision.

While acknowledging the emancipatory import of the technologies that the degrowth narrative embraces, my earlier analysis of limits to techno-developmentalism calls for caution also when considering what technologies can be conducive to degrowth. Caution is warranted against laying hopes in this or any specific inventory of technologies and caution is warranted against lionizing the specifically convivial, small-scale, or distributed character of these technologies. Technologies are imbricated with their socioeconomic ambient milieu. Our technological systems have largely coevolved with the capitalist world system. The integration and functioning of that world system is only made possible by the existing technological apparatus. Globe-spanning and interlocking complex of computerization, containerization, and fossil fuel extraction is essential for its continued reproduction. In return, technological systems are built for the scale of material and energy flows and intensity of capital investments that the capitalist world system requires.

This has four significant implications. First, we cannot decouple technologies from the capitalist system of production, its scale

of throughput and its capital intensity, and assume that they will continue to function as they do now. Take the example of personal computer — a highly useful, distributed, and autonomous technology. Its present functionality is dependent on a large-scale system of manufacture and centralized communication networks. Almost 25 percent of all email traffic is operated through Google's datacenters. Substituting these networks with the existing solutions for collectively run, distributed infrastructures and platforms would likely entail a scale-down effect, with potential fragmentation to much lower scales and substantial loss of social utility.

Second, the economic contraction would entail a deintensification of flows and investments into existing large technological systems and infrastructure, forcing the transitional process to search for different ways of dealing with the problem of maintenance. In a scenario where elements of the present mode of production are gradually replaced by various repurposed and re-localized alternatives, this continues to pose a problem since not all infrastructures can be localized and maintained in a collectivized way. In addition, and particularly after decades of globalization and specialization of production, many parts of the world will still need to trade long distance to procure some essential goods they cannot source locally.

Third, the transitional process will be under pressure to innovate substitutions for technologies that will go defunct or become too expensive due to the growing cost of material input that go into them. However, critical problems of technological systems do not always get solved and that means that sometimes technological systems need to be phased out with a certain loss of social utility.

Fourth, the transitional process being transitional means that it will have to start in parallel with the conditions of the existing mode of production. Not even revolutions can transform a mode of production overnight — thus new patterns of production can be developed and experimented with only under the compromised conditions of two competing modes of production.[24] This circumstance sets the operative horizon wherein technologies conducive to degrowth

can be developed in the present — situated between two modes and dependent on the present technological base to create a future technological base.

These implications, however, do not entail that technologies that are autonomous, distributed, localized, energy saving, resource efficient, non-obsolescent, and recyclable do not matter for a transition into a degrowth society, but rather that their development and deployment have to go hand in hand with broader social, economical, and political upheaval and change, in the context of which such technologies could secure food, housing, energy, tools, and other basics needed for the virtuous reproduction of a transition to a more sustainable and equitable economy. We are moving into the zone where we cannot know what will actually work and what will fail. But the bottom line is that in the unlikely case a society decides to pursue a path of degrowth, the interdependence of technological systems and inability to secure operation of basic infrastructure might push it back onto a growth-oriented path.

Outline of a Degrowth-Oriented Technological Strategy

Technologies alone thus cannot drive the post-capitalist transition. Nonetheless, technologies will necessarily be a part of any transitional process and practice. We live in a technological world, and we will obviously continue to live in a technological world. Although I have insisted that we should not put all our eggs into the technology basket, it is reasonable to think strategically about how to repurpose and develop technologies that *might* prove useful and maintainable in and after the transition. So, what would a strategy of technological development conducive to a degrowth transition be?

Building on the work of Vasilis Kostakis and Michel Bauwens, who have developed a model of a networked collaborative economy that is situated between the existing capitalist commodity production and transitional co-operativist production, I propose a more general model extending beyond the information economy — a wishlist of sorts.[25] Its normative outline would include the following aspects:

(1) Process of technological development: Methodologically, the development should prioritize innovations that can be developed globally, but applied locally. Internationally coordinated research efforts should result in localized, smaller-scale production technologies that can be easily adapted and installed under varying economic and environmental circumstances around the world. Innovations should go into an open pool of patents governed by licenses that are free for any noncommercial application, while non-free for corporate use. Patent fees from commercial applications should help subsidize further research and development.

(2) Focus of technological development: The earlier discussion leads to a conclusion that there are two general types of technology that need to be prioritized. One is focused on the decarbonization of power generation, industry, and transportation while the other on the restructuring of our current production and consumption patterns. Increased energy efficiency and replacement of current power generation capacity should take precedence over a build out of new capacities because the reduction of energy available for use will create more rapid decarbonization and prevent the rebound effect. What concerns the production and consumption patterns, recycling, repair, maintenance, and social reproduction should take precedence over expansion of commodity production and internationalized trade.

(3) Governance of technological development: The agent of the development process should, on one side, be public research and industrial policy bodies, focusing in particular on the urgent goals of rapid and deep decarbonization. They should sensitize the public for this goal and they should be pressured by the public towards this goal. National and local governments, their infrastructural and communal services, should support — through procurement and technological infrastructure — a massive uptake of localizable and smaller-scale cooperative production methods — of renewable energy, organically grown food, sustainable housing, and so on. They should carve out a

> policy space where the trans-local trade is encouraged only for goods that cannot be produced locally. They should provide accounting models in alternative currencies that address the problem of unequal purchasing power and support localization of economy. On the other side, the agent of the technological development process should also be self-determining producer, technologist, and consumer communities who form multi-stakeholder associations and cooperatives, or form civil-public partnerships with public entities, pursuing the goals of globally collaborative development and localized deployment of new production technologies. Through localization of consumption these communities can drive the demand and contribute financing, while the cooperative model of organization can instill elements of economic democracy into the localized production.

By reducing the geographic scale and intensity of production on one hand and by scaling up and trans-localizing the work on research and innovation on the other, these measures are tailored to lower the dependence of both socio-metabolic processes and processes of technological innovation on the global systems of commodity production. However, the feasibility of these measures hinges on their insertion into the anti-systemic strategies that are able to self-organize production and/or can influence policy on various levels of the political system. They are particularly suited for a troubled (semi-)periphery, where social movements and organized labor have a degree of know-how, some financial means to pursue them, outreach to public decision-making process, and a historic chance to articulate an alternative trajectory of social development. They are not a silver bullet, but they are a potential fallback should the postcapitalist tomorrow dawn. If social and political movements fail to understand that technology conditions the transition and that a cautious reconfiguration of our technological systems should be a part of their strategic register, judging by the experience of real existing socialisms, the day after the transition will increasingly start to revert back to the day before.

Notes

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Anarchism and Unconventional Oil

Jonathan Parsons

On Transitions and Revolutions

"What can be done about it?" This question is often left hanging, explicitly or implicitly, in research related to the social, cultural, and political implications of fossil fuel. A sophisticated body of knowledge exists to understand the centrality of fossil fuel in contemporary life and the way our petroleum-based world has developed, and, since fossil fuel is by definition a nonrenewable resource, such research always already gestures to some future world beyond oil.[1] Take for instance the projection with which Columbia University historian Timothy Mitchell ends his landmark *Carbon Democracy*: "The possibility of more democratic futures," Mitchell concludes, "depends on the political tools with which we address the passing of the era of fossil fuel."[2] Mitchell does not speculate on what a more democratic future may look like or the political tools to achieve it, but he nonetheless suggests that the means of transitioning away from fossil fuel prefigures the post-carbon worlds that can emerge. In this sense, the transition to a post-carbon world is a moment of rupture, an opening up of a space in the social imaginary that offers an opportunity to rethink the economic, political, and cultural conventions that depend upon a fossil-fueled polis. My aim in this chapter is to reframe the immanent energy transition as not just an opportunity for, but categorically tied to, political transition.

The thread Mitchell leaves loose at the end of *Carbon Democracy* poses similar questions of political possibilities: the kinds of political

theories and practices that coincide with the end of fossil fuels will have embedded within them the potential for various post-carbon worlds that may emerge — some more or less desirable. I am not raising a question of crude speculation about an ideal world of solar panels or electromagnetic propulsion or perpetual energy machines; I am instead calling for a political realism critical of the energy blindspot in contemporary political theories and practices of and against fossil fuel energy; *namely, that every energy system is first and finally a social system, and that a transition from one to another implies a sociopolitical transition as much as it does a technical one*. Furthermore, I argue that this struggle is to be best understood as revolutionary, since to speak of the end of oil or to gesture to a post-carbon world is to speak of an overturning and reorganization of fundamental aspects of contemporary life, from the seemingly abstract level of geopolitics to the seemingly mundane level of the everyday.[3] The struggle over the energy future is a revolutionary one, and this revolution is necessarily as much about ways of thinking and living as it is about technology.

As with any revolutionary struggle, there are many competing interests and different ways of understanding the emergence of possible post-carbon worlds. Because of the nature of the conflict, some of the participants do not even necessarily think of themselves as being involved in a revolutionary struggle to begin with. Thus one part of the political challenge moving forward is translating the energy crisis into a revolutionary struggle for populations implicated in it.

Part of the task for understanding this revolutionary shift is to understand the counterrevolutionary tactics currently at work in the energy sector. The oil and gas industry responds to the proposition of the end of oil by attempting to expand production of unconventional fossil fuel reserves. Unconventional oil, as the term is used here, indicates the kinds of oil and gas resources that are increasingly being extracted in the absence of easier to extract conventional oil. Some of the best known sources of unconventional oil are shale oil and shale gas, sometimes extracted through hydraulic fracturing (fracking); oil sands, such as extra heavy crude and crude bitumen; as well as

biofuels, such as the large-scale production of certain plants for conversion to ethanol. The notion of extreme oil, indicating extraction processes that require much more effort or energy input compared to conventional oil, is also relevant when discussing unconventional oil, since this may allow us to think of Arctic oil or other difficult to access offshore oil as in some sense unconventional as well, even if such oil is extracted in the form of typical crude. The kinds of unconventional oil on which this chapter focuses are shale oil and oil-sands developments in the global West, along with the pipeline infrastructure necessary to transport unconventional oil. A notable counter response to this industry response, the widespread grassroots rebellion against unconventional oil, is, I will argue, best understood as a practice of anarchism. Viewed through theories of anarchism, this resistance can be understood as insurrectionary, because it combats the oil industry as an occupying force with a colonial infrastructure.

This chapter begins by setting the theoretical context of unconventional oil and anarchism, and then examines some specific instances of resistance to unconventional oil developments in the form of hydraulic fracturing and oil sands and its related pipeline infrastructure. I then show how the resistance to unconventional oil is usefully understood as an example of anarchism in action, and imagine what sorts of worlds this practice of anarchism prefigures. Thus, I am proposing a prefigurative, anarchist approach to the struggle for a post-carbon world. Such prefigured post-carbon worlds necessitate a fundamental reconfiguration of economic and social relations — a paradigm shift — and in this sense the resistance to unconventional oil heralds the revolutionary struggle over the end of oil. Nonetheless, I need to make clear from the outset that I am not setting out to describe the post-carbon revolution as a heroic narrative of overcoming. It is important to have a prefigurative politics, but not to mistake what those politics makes possible with the desire for an ideal future. My argument is that the current practices of resistance to unconventional oil do indicate the potential for a more democratic future, as Mitchell puts it, but also indicates the potential

for a protracted insurrectionary struggle that may only ever achieve a Pyrrhic victory.[4]

How to Think about the Rebels and Reactionaries

I am going to reframe the struggle against fossil fuel, and the climate change it generates, by isolating two factions motivating the politics of energy: Rebels, who wish to do away with the present economic system; and Reactionaries who wish to maintain it. Of course, the struggle for the end of oil is not especially new, arguably stemming from the 1960s and the emergence of the modern environmental movement, as well as from the so-called anti-globalization movement of the 1990s.[5] One aspect of the early environmental movement entailed nascent research about greenhouse gas emissions and climate change, which has come to something of a crescendo in the present day with increasingly dire warnings from climatologists and catastrophists that present a particular kind of challenge to the oil and gas industry.[6] The anti-globalization summit protests, perhaps best exemplified by the demonstrations against the 1999 World Trade Organization meetings in Seattle, critiqued the system of international trade and finance, of which oil is the most significant part.[7]

The environmental and anti-globalization movements are different from the sorts of struggles that organized labor participated in (and arguably lost) with the oil industry in the nineteenth and twentieth centuries because organized labor was not in the same sense attempting to bring an end to the oil and gas industry or the web of global trade and finance it supports. Organized labor was involved in a democratic struggle for rights and justice, something along the lines of a traditional class struggle. The similarity shared by the environmental and anti-globalization movements and the struggle of organized labor with the oil industry is that they were all defeated for much the same reason: there was no effective leverage to be used against the oil industry and its networks of global finance in order to achieve political demands, since disruption and sabotage of critical points in the production process and distribution network was difficult

by design.[8] For example, the environmental movement, which has waged a reasonably effective public relations campaign on the issue of climate change, does not have any straightforward way of making industry or governments acquiesce to demands. And even though the summit protests were at times successful in stopping global trade meetings from taking place, the anti-globalization movement has never significantly impacted the momentum or overall development of globalization and has never overtly seized or sabotaged the critical infrastructures of international trade.

As the present discussion is about a revolutionary shift away from oil, it is interesting to note that the oil industry has come to understand the recent boom in production of unconventional oil as the so-called shale gas revolution.[9] Since the extraction and use of unconventional oil does not seek to fundamentally change the organization of social, political, or cultural life, and is mostly designed to maintain the present oil-based system in spite of its inevitable demise, the production of shale gas and other kinds of unconventional oil really should be understood as a reactionary or counterrevolutionary strategy.[10] Conventional oil extraction takes place in locales that are often distant from population centers — something that essentially put the brakes on the mass political action of industrial democracies — while unconventional oil extracted by hydraulic fracturing, on the other hand, requires vast production areas with potentially hundreds or even thousands of well pads for a single play, and because of its expansive geography this industrial activity sometimes overlaps with residential areas. Other kinds of unconventional oil such as oil sands require the strip-mining of huge areas, such as in the Athabasca Oil Sands production area in Alberta, Canada. Both hydraulic fracturing and production of oil sands also require large quantities of water and extensive systems of tailings ponds to hold waste water.

Specific forms of contentious politics and resistance have emerged in response to the elaborate processes recently developed to produce and distribute unconventional oil. Those who are engaged in the rebellion against unconventional oil, and especially those resisting

hydraulic fracturing, have arguably been much more successful in the struggle against the oil industry than organized labor or the environmental movement ever was, evidenced by the many bans and moratoria on hydraulic fracturing in diverse regions of the globe in recent years. The development of Alberta's oil sands and the associated networks of existing and proposed pipelines have likewise faced significant grassroots resistance. A few examples of this resistance to unconventional oil, which will be elaborated in greater detail below, include Elsipogtog First Nation in New Brunswick, Canada, that successfully stopped hydraulic fracturing; the *collectifs* movement in France, that won an outright ban on hydraulic fracturing in the country; as well as resistance movements opposed to unconventional oil developments or pipelines in numerous other countries around the globe. Because the grassroots resistance to unconventional oil does not have the same relation to wage and labor demands as organized labor, it makes sense that they have been more successful in mitigating resource extraction. So how can we understand this grassroots rebellion against unconventional oil that has gained so much traction in recent years? And how do the practices of this rebellion, and the practices employed in an attempt to suppress it, indicate possibilities for a post-carbon world?

First of all, it needs to be said that the primary forces in the resistance to unconventional oil are not easily recognizable as typical political organizations: there is no central labor union directing or controlling the struggle; neither is there an international federation of anti-fracking activists that gathers for annual conferences to discuss strategy, nor is there a major environmental nongovernmental organization that might be considered the vanguard of the struggle. Theories of social movements sometimes view contentious politics in relation to these kinds of clearly defined political structures, and often such an approach makes good sense.[11] The lack of a defined center to control the actions of diverse communities involved in the struggle against unconventional oil, and the diffuse and distributed makeup of the movement itself, make it difficult to track using conventional

political tools of assessment. Thus, I turn to anarchism, as a theoretical and political practice, to understand the way resistance to unconventional oil has taken shape and will continue to operate.

As a tendency of thought and action, anarchism is determined to abolish various forms of domination and hierarchy. Accordingly, the term anarchy means "without rulers" or "without masters." Anarchism has a rich history and encompasses a number of distinct lines of thought, such as anarcho-syndicalism, anarcho-communism, queer anarchism, eco-anarchism, and insurrectionary anarchism, to name a few. Across the various schools, anarchism rejects the supposed leaders of the revolutionary struggle — whether they call themselves a vanguard or have a more clearly defined political organization. Mikhail Bakunin, one of the foundational figures of anarchism, suggested that "no scholar can teach the people or even define for himself how they will and must live on the morrow of the social revolution. That will be determined first by the situation of each people… not by guidance and explanations from above and not by any theories invented on the eve of the revolution."[12] Murray Bookchin, one of the better known thinkers of contemporary anarchism, echoes this same sentiment when reflecting on the atrocities of the Soviet Union and Bolshevik Marxism: "the treacheries and failures of the past half century have made it axiomatic that there *can be no separation of the revolutionary process from the revolutionary goal*."[13]

Classical anarchists like Bakunin differed from some classical Marxists in that they understood revolution as something that should not be encumbered by the control of vanguard parties or other kinds of traditional political organizations. Whereas some early Marxists, like V.I. Lenin, wanted to appropriate the state apparatus so that the dictatorship of the proletariat might transform the people in a progressive march toward communism, early anarchists wanted to bypass the statist phase of Marxism and immediately go about the business of letting people work out for themselves how to run their own lives. Anarchy, therefore, is something like democracy without the government, a situation in which people directly make decisions about

how society functions, and in the absence of such a directly democratic society, anarchist practice is to assume one's own freedom, rather than to look for its delegation. Accordingly, some basic principles common to various schools of anarchism are direct action, self-organization, voluntary association, mutual aid, and direct democracy. In this sense anarchism is perhaps best understood as a name for ways of living and of organizing society that have been around for a very long time.[14] These grassroots anarchistic principles and practices animate the resistance movement to unconventional oil and, thus, prefigure social relations for a post-carbon world. Bookchin's work especially, as I will discuss later, imagines the kinds of decentralized, ecologically oriented communities whose nascent form the resistance movement embodies.[15] Eco-anarchist and insurrectionary strains of anarchism likewise speak to the practices and motivations of the resistance to unconventional oil, but at the same time prefigure somewhat different post-carbon worlds than Bookchin, for example. This is likewise true for a number of other strains of anarchist thought and action. In this sense, viewing the resistance to unconventional oil through various expressions of anarchist thought gives shape to the revolutionary potential of the movement.

Of course, contemporary anarchism, just as with contemporary Marxism, has changed immensely since the split of these two socialist factions in the First International, and it must be said that there are as many affinities between today's anarchism and today's Marxism as there are clear differences. David Graeber makes an interesting distinction when he suggests that "Marxism has tended to be a theoretical or analytical discourse about revolutionary strategy," whereas "anarchism has tended to be an ethical discourse about revolutionary practice."[16] Simon Critchley's work on anarchism and ethics is further informative in this regard, as he focuses on ethics as a "binding factor" in anarchist political practice, as opposed to the "silence or hostility to ethics that one finds in Marx's work and in many Marxist (Gramsci is an obvious exception) and post-Marxist thinkers."[17] This distinction between Marxist theory and anarchist

practice speaks to the present subject of specific practices of the resistance to unconventional oil and more generally to the social, cultural, and political implications of fossil fuel. Here, in this discourse on anarchism and unconventional oil, I am not so much attempting to create a theory or a strategy to direct those involved in resistance or to offer some program for creating a world beyond oil — though such theorizing and imagining is certainly important and worthwhile in its own right. Instead, I have set out to learn from the ways people have already begun to plant the seeds of a new world in the shell of the old.

Resistance to Unconventional Oil

Resistance to unconventional oil is happening for a number of specific reasons. It is not just that there are more opportunities to sabotage and disrupt unconventional oil, or that unconventional oil developments are at times immediately present in residential areas, or that concerns about climate change are reaching a fevered pitch (though these are certainly important factors). Resistance to unconventional oil is following in the aftermath of the 2008 financial crisis that shook confidence in structures of traditional authority; in the aftermath of a revolutionary wave, sometimes called the Arab Spring that spawned uprisings in every corner of the globe; and against the backdrop of a volatile international order in which oil is an increasingly valuable strategic resource.[18] In an even more fundamental sense, the grievances spurring resistance to unconventional oil can be traced back to a pervasive political, social, and economic system that relies on cheap oil for endless growth.[19] Along with the characteristic inherent in its historical development, the rapaciousness of globalized neoliberal capitalism is epitomized by the extraction of unconventional oil, stripping away layer upon layer of earth for vast surface mines and detonating explosives deep underground to open up shale formations.

Grassroots mobilizations against fracking happen in most any place the industry sets up.[20] In France, which eventually banned hydraulic fracturing in response to massive popular opposition, the resistance

movement organized in what came to be called *collectifs* that were often initiated by rural farmers and concerned citizens from small villages.[21] A similar kind of bottom-up mobilization happened in the state of New York, which instituted a fracking ban in 2015.[22] Tactics employed by the movement in France and New York included rallies, petitions, and public relations–style campaigns, but also significant acts of civil disobedience and blockades targeting equipment and industrial sites.[23] There was no central organization coordinating events and actions, and the overall structure of the protest movements is best understood as autonomous cells linked together in a rhizomatic fashion around a common goal. Traditional political organizations like unions, environmental NGOs, and political parties came into the protest movements after the fact, and in this sense the resistance to fracking should be considered a properly grassroots, bottom-up movement.

In some countries that have seen significant resistance to hydraulic fracturing, confrontational flashpoints catalyzed the struggle and particular communities became symbolic centers for the movement. Ain Salah, Algeria was the scene of massive demonstrations as well as numerous sit-ins, blockades, and occupations of shale gas sites and corporate offices, including the local Halliburton offices. Some of the more dramatic instances of civil disobedience in Ain Salah were organized and carried out by the women of the community, who took a leading role in the anti-fracking movement.[24] In the communities of Balcombe, England, and Pungeşti, Romania, grassroots groups created protest camps in order to block industry access to proposed sites, and in both of these communities police crackdowns enflamed tensions and spurred on national anti-fracking campaigns.[25] The incarnations of the anti-fracking movement in Algeria, England, and Romania, as with the examples in France and New York, should be understood as bottom-up grassroots mobilizations, with traditional political organizations coming on the scene as the struggle developed rather than in leadership roles.

One further example of a community that became symbolic of

the anti-fracking movement is Elsipogtog First Nation, a Mi'kmaq reservation in the Canadian province of New Brunswick. The development, strategy, and tactics of the grassroots movement that emerged in Elsipogtog was documented in detail by independent journalist Miles Howe, who was embedded in the community and who wrote a book recounting the events leading up to a ban on hydraulic fracturing in New Brunswick.[26] It is important to point out that while the movement in Elsipogtog, and more broadly in New Brunswick, was certainly focused on the environmental and social consequences of hydraulic fracturing; a significant element was also the context of Indigenous rights and sovereignty. The resistance in Elsipogtog also happened against the backdrop of a Canada-wide Indigenous movement called Idle No More. However, it was not the Canadian government–sanctioned Indigenous band council or other First Nations organizations that took the lead in the resistance to fracking in Elsipogtog. Miles Howe shows that such mechanisms of "official" Indigenous governance associated with the Canadian Indian Act were actually a source of division and subversion within the movement.[27] Instead, it was everyday members of the community who mobilized and set up protest camps and blockades, sabotaged equipment, and generally harassed and obstructed the progress of the American company attempting to do seismic testing in the lands surrounding Elsipogtog.[28]

Resistance to the development of the oil sands shares many of the characteristics of resistance to hydraulic fracturing, but differs in some significant ways. Ground zero for oil sands production in the global West is in Alberta, Canada, in a vast region of interconnected strip mines known as the Athabasca Oil Sands. Although the Athabasca Oil Sands are colossal in scale, the extraction process generally takes place in areas that are distant from populated centers, and so the industry is out of view, so to speak, in a similar way that conventional oil is also out of view. One community on the frontlines of the fight against the oil sands is Fort Chipewyan, which has a predominantly Indigenous Cree and Dene population. Fort Chipewyan is downstream from the

oil sands production area on the Athabasca River and has reportedly experienced a spike in illnesses and high levels of heavy metals and other toxic substances in wildlife.[29] The community is a focal point for resistance to oil sands, and people from the community have organized numerous protests and other actions to raise awareness about the dangers of large-scale oil sands production.

However, while there are frontline communities like Fort Chipewyan involved in the struggle against oil sands, just as there are a number of notable frontline communities involved in the anti-fracking movement, what is distinct about the broader resistance to oil sands is that it is very often focused on the infrastructure to transport the oil rather than the site of extraction itself. For example, in recent years there has been significant resistance to the proposed Keystone XL pipeline, which would transport oil products from the Athabasca Oil Sands to the United States, as well as the Enbridge Northern Gateway pipeline, which would transport oil products from the oil sands to the Canadian Pacific coast for possible shipment overseas, and the Energy East pipeline, which would transport oil products to the Canadian Atlantic coast. Perhaps the best known recent example of resistance to pipelines was the Standing Rock protest camp opposed to the Dakota Access Pipeline project, though it should be noted that the purpose of this pipeline system is to transport shale oil and not oil sands products. Nonetheless, the grassroots and radical aspects of the Standing Rock protest camp, as well as its primarily Indigenous character, parallel the form and function of mobilizations opposed to pipeline projects generally. From the perspective of contentious politics, it is tactically sound that resistance to oil sands should target pipeline infrastructure rather than the site of extraction, since this provides the most leverage with respect to the possibility of disruption. Small groups of dedicated people can block or sabotage a pipeline, whereas it would be mostly impossible to disrupt a production area as large as the Athabasca Oil Sands.

In an article on resistance to oil sands pipelines, Henry Veltmeyer and Paul Bowles suggest that the pipelines have been an important

factor, in this sense, in the grassroots mobilization. Veltmeyer and Bowles traveled the proposed route of the Northern Gateway pipeline collecting data on the resistance movement. They note that along with diverse grassroots groups and communities, the resistance is also supported by "160 First Nations... 31 municipal governments, two regional districts, the Union of [British Columbia] Municipalities and six unions." However, they are also keen to point out that even though the resistance enjoys broad support from many such political organizations, "it draws its power from the mobilizing capacity of the Indigenous communities in the direct path of the pipeline project."[30] As was the case in the anti-fracking movement, it is the resistance on the ground, often in small rural communities (and not environmental NGOs or recognized political organizations) that is at the forefront of the anti–oil sands movement.

One such community involved in the resistance to oil sands pipelines is the Unist'ot'en Clan, an Indigenous group whose traditional territory is in British Columbia on the path of proposed Enbridge pipeline project. The Unist'ot'en created a resistance camp and have been blocking industry access to their territory at strategic bridges and chokepoints, insisting that any unauthorized use of their territory by industry will result in the seizure of equipment. The Unist'ot'en host summer action camps, inviting activists from across Canada and beyond to come into the territory to learn about the struggle and to assist in monitoring the backcountry.[31] As was the case in the example of anti-fracking resistance in Elsipogtog, the Indigenous resistance to pipelines has had to contend with internal differences and divisions stemming from the "officially" recognized Indian Act political structures of Canadian governance.[32] The Unist'ot'en, who do not rely on Indian Act political structures but instead draw legitimacy from treaty-based approaches to their sovereignty over the territory, are in this sense another example of grassroots resistance.

Other grassroots mobilizations against oil sands pipelines, in the eastern part of Canada, came to be called the Swamp Line 9 protest camp. This group, made up of Indigenous and non-Indigenous peoples,

carried out actions such as the occupation of an oil and gas facility in Hamilton, Ontario.[33] The police eventually raided the Line 9 camp, which lead to numerous arrests of activists who had locked themselves down or otherwise refused to disperse. There are also examples of grassroots resistance to the Keystone XL pipeline on the route south from the oil sands to the Gulf Coast of the United States. One such group, as Naomi Klein notes, is the coalition called the "Cowboy and Indian Alliance," made up of ranchers and Indigenous groups along the pipeline route in the United States.[34] Another notable example of this is the Texas-based direct action group Tar Sands Blockade, which carried out an eighty-six day blockade on the Keystone XL pipeline route.

I am cataloguing these various actions and groups, first of all, to show the diversity and distribution of the broader resistance movement that opposes unconventional oil and to show its grassroots anarchistic character. But what is also instructive is the way the grassroots resistance is rooted in specific geography. All of these various groups strategically target the infrastructure of unconventional oil — the point is not to debate the relative pros and cons of a particular development, but rather to resolutely and absolutely resist. For all of these diverse manifestations of the movement, resistance involves direct action, such as putting bodies and barricades in the way of proposed developments or sabotaging critical junctures. Although such resistance groups generally also make an appeal to the broader community and are presenting moral and technical arguments, for example through statements or literature expressing their point of view, the strategy is not necessarily to build mass popular support. Instead, the resistance to unconventional oil is at first an expression of a pragmatic politics — direct action — in that it is a disruptive force in a specific geography of struggle.

Major environmental NGOs and other formal political organizations are not in the same sense rooted in such specific geographies of struggle but are instead engaged in struggle on what might be considered a more abstract or discursive terrain. Thus, their

acts of resistance are much more symbolic and indirect, often aimed at raising public awareness or attempting to sway public opinion. A good way to understand this is through the resistance to the Keystone XL pipeline project, which has both site specific and discursive terrains of struggle. On the one hand, the opposition to the pipeline happens in grassroots, on-the-ground configurations as noted above. On the other hand, one event associated with Keystone XL that brought significant attention to the oil sands was a fourteen-day series of sit-ins in front of the White House in Washington, DC, organized by Bill McKibben's climate-change-oriented 350.org, during which hundreds of activists were arrested including a number of celebrities. To be clear, of course this action took place in a specific geographical terrain (that is, the front fence of the White House), but it was largely a symbolic gesture of defiance aimed at making an intervention in political discourse. As discussed above, unions, municipal governments, political parties, civil society organizations, and other such groups are involved in the struggle against unconventional oil, even as they may not be on the front lines and do not function as vanguards or in leadership roles, as it may sometimes appear. Public opinion does matter in the calculations of industry and governments, and so for controversial issues like unconventional oil, consent needs to be manufactured in various ways. The mainstream element of the movement, which is typically composed of recognizable political structures, functions to delegitimize unconventional oil in the court of public opinion. In this way, it might be generously understood as a broad support network for those engaged in more militant acts of resistance.[35]

Certainly this is a somewhat oversimplified account of the role of NGOs and other such organizations in contentious politics; however, unless resistance is willing to go beyond the law (and perhaps even beyond nonviolent civil disobedience), unless it is capable of transgression in the form of disruption and sabotage, it essentially carries no threat.[36] The reason industry and government are willing to talk to and bargain with more mainstream elements of the movement is not only because they are recognizable political structures, but

because the more militant element of the resistance *does* offer a clear threat. Moreover, it is precisely the distinction between the geographically specific direct action of the grassroots resistance and the mainstream, symbolic strategies of resistance common to political parties and NGOs that marks the shift to a revolutionary struggle over the end of oil (more on this in a moment). Klein, who was herself arrested at the White House sit-in, suggests that while the protest was certainly a significant flashpoint for the movement, it was still following on the heels of earlier grassroots direct actions throughout the United States and Canada.[37] Some of the activists involved in organizing the protests at the White House were also acutely aware of the need for the anti–oil sands movement to remain true to its grassroots character, even though they were affiliated with major environmental NGOs.[38] This is just to say that activists involved in moderate or mainstream organizations are often self-reflective of the role they play in the movement and are keenly aware of the importance of grassroots, on-the-ground resistance and direct action.[39]

Finally, the kinds of tactics and practices the oil industry, governments, and security forces use in combating resistance to unconventional oil use are largely PR-style campaigns attempting to sell various sorts of unconventional oil projects to the public and generate social license. These campaigns are sometimes carried out by marketing firms, think tanks, or governments, and that may function to delegitimize resistance. One pertinent analysis of such a strategy is described by Riley Dunlap and Aaron McCright, who chart the aspects and evolution of the discourse of climate change denial.[40] Dunlap and McCright note that although the claims of the climate change denial movement "differ and evolve over time (there's no warming, it's not caused by humans, it won't be harmful, and son on), the theme of 'no need for regulations' remains constant." Some of the key actors Dunlap and McCright identify as being involved in organized climate change denial includes the petroleum industry, conservative think tanks, front groups for particular public relations

campaigns, and also what they refer to as the echo chamber of the mass media. Interestingly, they also theorize the denial machine as a reactionary mechanism attempting to save industrial capitalism in spite of its own entropy:

> Viewed through a broader theoretical lens, climate change denial can be seen as part of a more sweeping effort to defend modern Western social order, which has been built by an industrial capitalism powered by fossil fuels. Since anthropogenic climate change is a major unintended consequence of fossil fuel use, simply acknowledging its reality poses a fundamental critique of the industrial capitalist economic system.[41]

Dunlop and McCright argue that contemporary Western civilization is built on the premise of oil being plentiful and readily available for transportation, agriculture, manufacturing, and generating electricity, and suggest that any threat or challenge to the oil industry, such as is offered by those opposing unconventional oil, is an existential threat to capitalism.

Along with such discursive strategies to delegitimize the resistance to unconventional oil and to obfuscate the issue of climate change, there are also somewhat more direct attempts at subversion of resistance movements, whether by infiltrators or by established political organizations, as in Elsipogtog when infiltrators and members of recognized political structures attempted to subvert resistance.[42] Resistance may also be deterred by legal means, such as injunctions against activists or by the introduction of specific legislation; some laws currently on the books in the U.S., the U.K., and Canada describe disruption of certain industrial projects or infrastructure as terrorism, such as the Canadian Bill C-51. Along with these methods of soft power, security forces may aggressively raid protest camps or blockades and make arrests. Security forces may also initiate confrontations or attempt to frame activists through dirty trick campaigns, such as when police tried to frame Wiebo

Ludwig, who was suspected (and eventually convicted) of sabotaging numerous gas wells and pipelines.[43] Risk management firms suggest that sabotage of facilities, equipment, and pipelines associated with unconventional oil is likely to increase if the resistance movement becomes further radicalized.[44] If the resistance to unconventional oil indeed progresses along this path, industry, governments, and security forces will likewise refine or intensify their strategy and tactics.

Practicing Anarchy

Once again, and to be emphatic, the various mobilizations against unconventional oil described here do not necessarily self-identify as anarchist and do not explicitly draw on theories of anarchism in the ways they organize or set about operating. However, because resistance to unconventional oil is best understood as grassroots, decentralized, and dispersed and because it characteristically exists outside the formal organizational structures often associated with contentious politics such as unions, NGOs, or political parties, it is generally reflective of anarchism in action. Of course, these various movements, impressive and inspiring as they are, do not provide on their own a definitive shape of the post-carbon world. They should instead be understood as prefigurative, offering a general outline of the kinds of strategies and tactics that may be expected as the struggle progresses and perhaps also offering a glimpse of the possible worlds that may emerge. I now turn to a reading of these movements through an anarchist lens in order to bring to the surface their revolutionary potential.

Of immediate note is the refusal by the resistance movement of recognized authority, whether that is the authority of governance and law that is discarded by acts of civil disobedience and sabotage, or the authority of recognized political structures, including those sometimes associated with contentious politics like environmental organizations or official Indigenous political structures. Bookchin suggests that this refusal of authority is typical of embryonic phases

of revolutionary movements and that such antiauthoritarianism effectively pulverizes the system to be overturned by "molecular action from below long before [it is] toppled by mass revolutionary action."[45] The refusal of authority is consistent with the grassroots, decentralized character of the global movement against unconventional oil, and each transgressive action also functions to show others how they may resist as well — a kind of propaganda by the deed.

Even though the movement is decentralized and geographically dispersed, its actions remain consistent and come together to form something like a united front that is opposed to a common foe. In this sense, the movement is akin to what Michael Hardt and Antonio Negri discuss as a distributed network operating with swarm intelligence:

> When a distributed network attacks, it swarms its enemy: innumerable independent forces seem to strike from all directions at a particular point and then disappear back into the environment. From an external perspective, the network attack is described as a swarm because it appears formless. Since the network has no center that dictates order, those who can only think in terms of traditional models may assume it has no organization whatsoever — they see mere spontaneity and anarchy. The network attack appears as something like a swarm of birds or insects in a horror film, a multitude of mindless assailants, unknown, uncertain, unseen, and unexpected. If one looks inside the network, however, one can see that it is indeed organized, rational and creative. It has swarm intelligence.[46]

This formulation of the tactic of distributed attack is immediately recognizable in the case of the global movement against unconventional oil and is likely why the movement has been somewhat successful to date. Oil and gas companies, and the governments supporting their efforts, have appeared wrong footed in the face of steadfast resistance, and more so because this diverse network of resistance activity has been able to sabotage and interrupt critical points of the production or distribution process. Resistance to unconventional oil is essentially

anarchistic in the way it acts without defined leadership or political structures that can be bargained with or brought to the table in any straightforward manner. Nonetheless, even as the movement has no coordinating center, it does have a kind of intelligence of action, attacking weaknesses in the production and distribution system, often in creative and unexpected ways.

This notion of organization without a clearly defined center, of common action in loose association without strict authority, relates to some of the conceptualizations that come up in various theoretical and speculative writings on anarchism of how an anarchist society might function.[47] In this sense, the movement opposed to unconventional oil acts as a mutual aid network of voluntary associations that is, at least in part, setting out to create the world it desires through the way it acts. And because environmental concerns are central to resistance, some of the anarchist writings focused on ecology and environmentalism are especially worth noting. Bookchin, a key figure in the development of the ecology and environmental movements, has written extensively on a concept he calls social ecology. A basic idea in the theory of social ecology is that the relationships of dominance and hierarchy between humans and the environment, evident in the wanton exploitation of natural resources and nonhuman animals, is a correlate of the relationships of dominance and hierarchy within human society. Put differently, because people exist in a society of dominance and subordination, a society with rulers and bosses, the logic of domination and hierarchy may then be extended as a way to understand our relationship to the nonhuman world.

What Bookchin sees as emerging out of or beyond this world of domination and hierarchy is an anarchist society, which is "a precondition for the practice of ecological principles."[48] He imagines this anarchist society as made up of numerous independent communities whose day-to-day operations will be based on principles of direct democracy, that will be mostly self-sufficient in terms of food and energy, and that will not exploit the nonhuman environment in the same way hierarchical society does.[49] Bookchin, writing in the

1960s, argued that social ecology needs to be understood as a new form of anarchistic social relations, and that such a way of life is directly related to the kinds of energy such communities will use, namely community-based solar, wind, tidal, and geothermal energy systems. Some of the characteristics of the various examples of resistance to unconventional oil indicate the emergence of something like this anarchist society Bookchin imagines. Those involved in the movement generally have an ecological understanding of the world, and the movement as a whole is the kind of loose affiliation of autonomous communities of resistance that can be understood as the seeds of a federation of anarchist communes. Furthermore, the movement is decentralized and has an antiauthoritarian and directly democratic character, in that various groups involved in the struggle make decisions on their own about how best to operate without necessarily needing formalized or regimented decision-making processes.

It is easy, however, to view the resistance to unconventional oil as the opening chapter of some heroic narrative that ends with an ideal world. Certainly, Bookchin's descriptions of communities based on principles of social ecology paints a beautiful and compelling picture, and the possibility of participatory direct democracy allowing everyday people to actually be involved in the decisions affecting their lives must tug on the heartstrings of even the most cynical and jaded radicals. However, Bookchin is aware that a directly democratic and ecologically oriented world may be desired but is in no way guaranteed. Because of the unsustainable and destructive way of life of contemporary neoliberal capitalism, it is as likely that, in Bookchin's words, "we will simply go under as a species."[50] Of course, there are many possible worlds in between idealized anarchist communes and total collapse, and so it is useful to consider other sorts of futures that are also prefigured by the rebellion against unconventional oil, even as they may not be as optimistic as Bookchin's social ecology. A few other strains of anarchist thought are helpful in this regard, and so I now turn to consider the resistance movement through a lens of eco-anarchism, and then through a lens of insurrectionary anarchism.

Eco-anarchists are those who outright refuse to consider any kind of glib idealized future in discussions of the ecological crisis and instead take an uncompromisingly stark view. Eco-anarchism is sometimes associated with the deep green resistance movement, with primitivism, and with anti-civilizational theory and practices. Some of the better known groups associated with eco-anarchism include EarthFirst! and the Animal Liberation Front, as well as many other underground groups. An important criticism offered by eco-anarchism to mainstream environmentalism (and, indeed, to other strains of anarchism as well) is that it tends to assume the maintenance of the contemporary way of life in the visions it presents for the future — for example, imagining that a world beyond fossil fuel could somehow look mostly the same as contemporary mass industrial civilization, only with wind turbines and solar panels instead of oil and gas. Moreover, eco-anarchism critiques mainstream environmentalism for potentially doing more harm than good, since it allows people to believe that merely recycling and using energy-efficient light bulbs is enough to avert ecological catastrophe. In this sense, eco-anarchists may view mainstream environmentalism as part of a reactionary mechanism, essentially propping up the very industrial system it pretends to oppose.[51] Civilization itself, which is to say the organization of human society based on cities, is a significant part of the problem for eco-anarchists, as the maintenance of such a civilized way of life requires ever greater use of resources and ever greater strain on the environment, which, if left unchecked, will doom our species and many other forms of life on the planet. Those who subscribe to various strains of eco-anarchism argue that civilization needs to be brought down through whatever means necessary — sabotage, disruption, and blockades, as well as *any* other methods available — regardless of whether a significant portion of the population agrees, and the sooner the better.[52]

Eco-anarchism relates to, and is indicated by, the resistance to unconventional oil in a few ways. First of all, the resistance to unconventional oil puts into practice many of the tactics common

to eco-anarchist direct action. Although the participants in the movements against unconventional oil may not necessarily have thought through various perspectives of eco-anarchism, they are nonetheless carrying out part of its program in that the end of oil is in some respects anti-civilizational, at least in the sense that there is no readily available way to replace the contemporary oil-based industrial society without also assuming the collapse of mass industrial civilization. Indeed, this is an intersection of the scholarship on the social, political, and cultural significance of oil and eco-anarchist perspectives. Given the massive overturning implied by the end of oil, one has to wonder whether so many people would currently be involved if the fundamentally revolutionary aspect of the resistance to unconventional oil was more apparent.. Without some technology unborn or some durable and easily transportable fuel source to replace oil, without some deus ex machina, the post-carbon revolution may be far more catastrophic and have far more dire consequences than those involved in the struggle over the end of oil may realize. Beyond the intention of individual instances of resistance, the political current made available in the struggle against and for energy is, in this sense, already revolutionary, and this is precisely why energy is the locus around which revolution is and will continue to unfold.

Even if the logical conclusion is that the current oil-based world must come to an end, whether it is brought down by revolutionary action or whether fossil fuel eventually runs out (even unconventional oil has limits), it will be unacceptable to a significant number of people. Perhaps this is part of the reason why those with an interest in maintaining the status quo, such as governments and captains of industry, have created legislation to criminalize resistance to unconventional oil and to label participants in the movement as terrorists, since from the point of view of the politicians and industrialists such resistance movements are genuinely terrifying. Any revolutionary action aimed at bringing an end to industrial civilization based on oil, whether the participants in that action fully understand what they are doing or not, will be met with reactionary

force. The kind of repression and subversion currently faced by the resistance to unconventional oil is telling, in this regard. As the age of oil comes to an end, increasingly stark options will be available to those wishing to retain power. The kinds of soft force currently mitigating resistance (such as swaying public opinion, infiltrating resistance groups, or co-opting the mainstream environmental movement) may give way to hard power in the form of direct repression by security forces. This potential for an increasingly authoritarian political order is likewise prefigured by the responses of police and private security in the current flashpoints of resistance to unconventional oil, and this eventuality may in fact be desirable to significant numbers of people when faced with alternatives that point to the end of mass industrial civilization without any attractive alternative. In this sense, the prefigurative anarchist politics of the resistance to unconventional oil, perhaps despite itself, is also pointing to what must be characterized as a reactionary future.

The resistance to unconventional oil can also be read through theories of insurrectionary anarchism, first of all, because of how it functions: in loosely affiliated cells without an apparent command structure or unified organizational center, and through distributed attacks against strategic but geographically distant targets. The notion of insurrection as a way to understand resistance to unconventional oil, thus, also compels an interpretation of the oil industry as an occupying force, one that generates a particular terrain of struggle along its network of pipelines, well pads, survey lines, tailings ponds, and port facilities. Just as the extraction of conventional oil generates a particular map and configuration of the terrain of struggle, unconventional oil generates a different map, one with chokepoints and strategic weaknesses which can be sabotaged or otherwise disrupted. In this sense, the practices of the anti-fracking and anti–oil sands movement have affinities to insurrectionary anarchism, and appear as insurrectionary moments. These insurrectionary moments may be fleeting and may fade away once a particular struggle has been won or lost, but they are, at the same time, gesturing toward

a much larger revolutionary transformation on the horizon, just as insurrectionists imagine the emergence of social revolution out of many insurrectionary moments. Indeed, analyzing the context of the current struggle, with as many and various incarnations throughout the world, indicates that a number of low-intensity insurrections are already taking place.

Some recent insurrectionary anarchist texts, and most famously *The Coming Insurrection* by the Invisible Committee, specifically talk about ecology and the end of oil, and also about the role of mainstream environmentalism, echoing some of the criticisms of eco-anarchism but with a characteristically insurrectionary anarchist twist:

> Everything about the environmentalist's discourse must be turned upside-down. Where they talk of "catastrophes" to label the present system's mismanagement of beings and things, we only see the catastrophe of its all too perfect operations.... Let the petroleum reserves run out earlier than expected; let the international flows that regulate the tempo of the metropolis be interrupted, let us suffer some great social disruption.... Either way, any loss of control would be preferable to all the crisis management they envision.[53]

The perspective on civilizational collapse offered here is admittedly bleak and potentially nihilistic. Nonetheless, it goes some way to illustrating the diversity of thinking on the end of oil and the consequences it may bring. For some insurrectionary anarchists, the kind of catastrophes that may occur with the end of oil or to do with climate change are not only desirable but should, if at all possible, be helped along. Industrial civilization and its associated institutions are certainly not something that can be reformed, since the functioning of the system is no more than the playing out of precisely what the system was designed to do, and so destruction and collapse is preferable since at least the possibility of even fleeting freedom might then exist.

In my view, insurrectionary anarchists are not offering a particularly attractive vision of the future when compared to, say,

the optimistic vision of Bookchin's social ecology. However, the possibility for such a dark future is arguably just as much embedded in the struggle over the end of oil. This is not only the case because the practices of the resistance to unconventional oil prefigure such a future, in the sense that it is already a series of insurrectionary moments, but because of the response by the oil industry and governments to the struggle over the end of oil. Even though thoughtful and well-intentioned people have been talking about the end of oil for decades, and even though the potential for catastrophe must be obvious to anyone who thinks critically about the situation, none of the very reasonable, incremental steps that could have been taken were ever implemented. Such a colossal failure of action on so many levels, and such intransigence on the part of those with vested interests, can only give credence to the arguments of those insurrectionists who today may sound like extremists. When the struggle over the end of oil becomes more pronounced and obvious in the lives of everyday people, it should not be surprising to see the proliferation of ideas like those of various schools of anarchism, no matter how extreme such ideas may sound today.

To the Barricades

Resistance to unconventional oil prefigures a world in which social and economic relations are based on principles of anarchism. The potential for this anarchistic world can be seen in the practices of the movement — in its grassroots, decentralized character and in the way it manifests the political will of everyday people around the world. Moreover, when looking at the specifics of some of the mobilizations discussed above, it is often the people most affected by and vulnerable to bad political deals who are leading the struggle, indicating a movement through which, as Paulo Freire suggests, the oppressed liberate themselves and their oppressors as well.[54] In the sense that it is a leaderless, bottom-up movement without a defined set of organizing principles or a manifesto, the resistance to unconventional oil is essentially anarchistic. The practices of self-organization and

voluntary association central to anarchism that are evident in various facets of the movement contribute to its democratic potential and point toward a directly democratic society, such as is described in Bookchin's writings on social ecology. The configuration of energy in such a society would likewise be democratic, decentralized, locally produced and would, thus, be intrinsically related to community life and a new set of social relations.

At the same time, it is important not to lionize the movement resisting unconventional oil as a precursor to some idealized world to be desired. Doing so is potentially symptomatic of what Lauren Berlant calls a cruel optimism in the face of overwhelming or impending crisis, a positive attachment that serves as the limit to one's flourishing.[55] Such optimism blinds us to the real consequences of the end of oil and the disastrous effects of climate change and environmental degradation. In a general sense it blinds us to the problem of neoliberal capitalism itself, with its many inequalities and inherent violence. The refusal of optimism central to eco-anarchism, seen in this light, is best understood as hardnosed realism and goes along with a general refusal of complacency seen in the resistance to unconventional oil, since eco-anarchists and those participating in the resistance alike refuse to believe that someone else will make the necessary changes and so cannot help but take action when faced with the stark reality of the situation.

The resistance to unconventional oil points to a revolutionary era, and yet there are reactionary forces comprised of some of the largest corporations and most powerful governments on earth who will try to crush the rebellion and try to make things unfold in profitable ways. Police raids and subversion campaigns used against the resistance movement today contain the seeds of future repression, and so the resistance to unconventional oil also indicates the potential for an authoritarian world if business as usual continues. If some of the more hopeful visions for future worlds that are prefigured by the movement against unconventional oil are not allowed to emerge, if the resistance is suppressed or if reasonable demands are not met, the

insurrectionary aspect of the resistance may proliferate and intensify.

One way or another the oil, conventional and unconventional alike, will stop flowing and the world based on the availability of cheap petroleum products will come to an end, along with the forms of social and economic relations conditioned by this type of energy. Looking at the resistance to unconventional oil as a practice of anarchism showcases some of the political tools available for the post carbon revolution and prefigures the possible worlds that may emerge. Now that we are not on the threshold of, but firmly in the fires of catastrophe, we might as well move from reaction to rebellion.

Notes

1. Imre Szeman, "How to Know about Oil: Energy Epistemologies and Political Futures," *Journal of Canadian Studies* 47.3 (2013) 145–68, and John Urry, *Societies Beyond Oil: Oil Dregs and Social Futures* (London: Zed, 2013).
2. Timothy Mitchell, *Carbon Democracy: Political Power in the Age of Oil* (London: Verso, 2011) 254.
3. Theda Skocpol, *States and Social Revolutions: A Comparative Analysis of France, Russia, and China* (New York: Cambridge UP, 1979) 5. Skocpol contrasts political revolutions, in which a regime change may happen in a given state, with social revolutions, in which a massive change takes place in the structure of a society.
4. A Pyrrhic victory is one in which a victory is achieved but at a cost so high that victory is meaningless. In this case, a victory by the forces resisting a fossil fuel-centric world could be considered Pyrrhic if the struggle takes so long that the land base and ecosystems necessary for human and nonhuman life have been degraded to the point of collapse. A number of other collapse and catastrophe scenarios could also be considered Pyrrhic, depending on the point of view one may have on acceptable standards of living in a post carbon world.

5. "So-called" because some of the radical left groups involved in the movement call for the removal of all restrictions on travel and residency, perhaps a much more authentic kind of globalization in its own right, as is suggested by David Graeber, *Fragments of an Anarchist Anthropology* (Chicago: Prickly Paradigm, 2004) 77–78.
6. Syukuro Manabe and Richard T. Wetherald, "Thermal Equilibrium of the Atmosphere with a Given Distribution of Relative Humidity," *Journal of Atmospheric Sciences* 24.2 (1967) 241–59; Michael Mann, *The Hockey Stick and the Climate Wars: Dispatches from the Front Lines* (New York: Columbia University Press, 2012); Christophe McGlade and Paul Ekins, "The Geographical Distribution of Fossil Fuels Unused when Limiting Global Warming to 2 C," *Nature* 51 (2015) 177–90.
7. Eddie Yuen, Daniel Burton-Rose, and George N. Katsiaficas, eds., *The Battle of Seattle: The New Challenge to Capitalist Globalization* (New York: Soft Skull, 2001).
8. Mitchell, *Carbon Democracy* 38–39.
9. Paul Stevens, "The 'Shale Gas Revolution': Developments and Changes," Briefing Paper, (London: Chatham House, 2012).
10. Corey Robin, *The Reactionary Mind: Conservatism from Edmund Burke to Sarah Palin* (New York: Oxford UP, 2011) 47–50, and Ryan Katz-Rosene, "The Rise of Reactionary Environmentalism in the Tar Sands," *A Line in the Tar Sands: Struggles for Environmental Justice*, eds. Toban Black, et al. (Oakland, CA: PM P, 2014) 45–54.
11. Sidney Tarrow, *Power in Movements: Social Movements and Contentious Politics*, 2nd ed. (New York: Cambridge UP, 1998).
12. Mikhail Bakunin, *Statism and Anarchy*, trans. Marshal S. Shatz (New York: Cambridge UP, 1990) 198–99.
13. Murray Bookchin, *Post-Scarcity Anarchism* (Berkeley, CA: Ramparts, 1971), 45, emphasis in original.
14. Graeber, *Fragments of an Anarchist Anthropology* 3.
15. Murray Bookchin, *Toward an Ecological Society* (Montreal: Black Rose, 1980).
16. Bookchin, *Toward an Ecological Society* 6.
17. Simon Critchley, *Infinitely Demanding: Ethics of Commitment, Politics of*

Resistance (New York: Verso, 2007) 125.

18. Nafeez Ahmed, *A User's Guide to the Crisis of Civilization: And How to Save It* (London: Pluto, 2010). Ahmed's complex systems analysis describes the interconnectedness of various economic, political, social, and cultural factors in creating the conditions for unrest, revolts, and revolutions.
19. David Harvey, *A Brief History of Neoliberalism* (Oxford: Oxford UP, 2005).
20. Naomi Klein, *This Changes Everything: Capitalism vs. The Climate* (Toronto: Knopf Canada, 2014) 348; Jonathan Wood, "The Global Anti-Fracking Movement: What It Wants, How It Operates and What's Next," *Control Risks* (2012); "Fracking: The Gathering Storm," *New Internationalist* (December 2013).
21. René Weile, "Beyond the Fracking Ban in France," *Journal of European Management and Public Affairs Studies* 1.2 (2014) 12.
22. Colin Kinniburgh, "From Zuccotti Park to Zurawlow: The Global Revolt Against Fracking," *Dissent* (Summer 2015) 44–45.
23. Wood, "The Global Anti-Fracking Movement" 10, and Weile, "Beyond the Fracking Ban in France" 12.
24. Kinniburgh, "From Zuccotti Park to Zurawlow" 47–49.
25. Martin Dale, James Bolam, and Sue Jameson, *Balcombe and Beyond: The U.K.'s Frack Free Movement* (London: Createspace, 2015), and Simon Devey et al., "Shale Gas U-Turns in Bulgaria and Romania: The Turbulent Politics of Energy and Protest," *Journal of European Management and Public Affairs Studies* 1.2 (2014) 53.
26. Miles Howe, *Debriefing Elsipogtog: The Anatomy of a Struggle* (Black Point: Fernwood, 2015) 94.
27. Howe, *Debriefing Elsipogtog* 86–96, and Mary Ellen Turpel-Lafond, "Through our Eyes — Who Leads?" *The Winter We Danced: Voices from the Past, the Future, and the Idle No More Movement* (Winnipeg: ARP, 2014) 335–341. Turpel-Lafond discusses the composition of the Idle No More movement as essentially grassroots and not in any sense led by the officially recognized Indian Act political structure. She suggests, as does Howe, that the Indian Act structures and leadership were a source of subversion rather than of liberation. Similar ideas are expressed by, among others, Patrick Wolfe in his analysis of ongoing settler-colonial

relations, who highlights the way supposedly autonomous Indigenous political structures may be better understood as neocolonial mechanisms of control (Patrick Wolfe, "Settler Colonialism and the Elimination of the Native," *Journal of Genocide Research* 8:4 [2006] 387–409).

28. *Debriefing Elsipogtog* 117, 137–138.
29. Klein, *This Changes Everything* 326–327.
30. Henry Veltmeyer and Paul Bowles, "Extractivist Resistance: The Case of the Enbridge Oil Pipeline Project in Northern British Columbia," *The Extractive Industries and Society* 1.1 (2014) 66.
31. Sâkihitowin Awâsis, "Pipelines and Resistance across Turtle Island," *A Line in the Tar Sands: Struggles for Environmental Justice*, eds. Toban Black et al. (Oakland, CA: PM P, 2014) 260.
32. Sâkihitowin Awâsis, "Pipelines and Resistance across Turtle Island" 258–259.
33. Martin Lukacs, "Canada's Eastward Pipelines: A Corporate Export Swindle, Confronted by Cross-Country Resistance," in *A Line in the Tar Sands: Struggles for Environmental Justice*, eds. Toban Black et al. (Oakland, CA: PM P, 2014) 80–82.
34. *This Changes Everything* 302.
35. A less generous view is that the mainstream elements are actually a major hurdle, as they may delegitimize particular practices of resistance and direct action, and in some sense function as a self-policing mechanism for the movement.
36. Peter Gelderloos, *How Nonviolence Protects the State* (Cambridge: South End, 2007); Stephen D'Arcy, *Languages of the Unheard: Why Militant Protest is Good for Democracy* (Toronto: Between the Lines, 2013); Ward Churchill, *Pacifism as Pathology: Reflections on the Role of Armed Struggle in North America* (Winnipeg: Arbeiter Ring, 1998).
37. *This Changes Everything* 139–140.
38. Joshua Kahn Russell et al., "Lessons from Direct Action at the White House to Stop the Keystone XL Pipeline," *A Line in the Tar Sands: Struggles for Environmental Justice*, eds. Toban Black et al. (Oakland: PM P, 2014) 166–168.
39. For an analysis of the interaction and cross-pollination of mainstream

and more radically oriented environmental activism, see Ruth Reitan and Shannon Gibson, "Climate Change or Social Change? Environmental and Leftist Praxis and Participatory Action Research," *Globalizations* 9:3 (2012) 395–410.

40. Riley Dunlap and Aaron McCright, "Organized Climate Change Denial," *Oxford Handbook of Climate Change and Society* (Oxford: Oxford UP, 2011) 144–160. It makes sense that this overall trend be understood as "organized denial," as Dunlap and McCright put it, even as the discourse may evolve or adapt to shifting public opinion to acknowledge that climate change is real, since the purpose of obfuscating the climate change discourse, just as initially denying the climate change discourse, is the same: to maintain the petroleum-centric status quo.
41. Dunlap and McCright, "Organized Climate Change Denial" 145.
42. *Debriefing Elsipogtog* 86–96.
43. Andrew Nikiforuk, *Saboteurs: Wiebo Ludwig's War Against Big Oil* (Vancouver: Greystone, 2002) 210–12, 58–65.
44. "The Global Anti-Fracking Movement" 12–13.
45. Bookchin, *Post-Scarcity Anarchism* 49.
46. Michael Hardt and Antonio Negri, *Multitude: War and Democracy in the Age of Empire* (New York: Penguin, 2004) 91. Earlier, I noted that there are perhaps more affinities between contemporary Marxism and contemporary anarchism than there are clear differences. Hardt and Negri are an interesting example of this, since they self-identify as autonomist communists, perhaps closer to the anarcho-communist or insurrectionist strains of anarchism. See Michael Hardt and Antonio Negri, *Empire* (Cambridge: Harvard UP, 2000) 350; David Bates, "Situating Hardt and Negri," *Libertarian Socialism: Politics in Red and Black*, eds. Alex Prichard et al. (London: Palgrave, 2012) 275–293.
47. For speculative writing on anarchism, see Hans Widmer, *Bolo'bolo* (Zurich: Panorama City Verlag, 1983).
48. *Post-Scarcity Anarchism* 76.
49. The name Bookchin uses for the organizations and practices of these kinds of anarchist communities is libertarian municipalism. See Murray Bookchin, *The Murray Bookchin Reader*, ed. Janet Biehl (London: Cassell,

1997) 173–196.

50. *Toward an Ecological Society* 70–71.
51. Derrick Jensen and Stephanie McMillan, *As the World Burns: 50 Simple Things You Can Do to Stay in Denial* (New York: Seven Stories, 2007).
52. Aric McBay, "Decisive Ecological Warfare," *Deep Green Resistance: Strategy to Save the Planet*, eds. Aric McBay, Lierre Keith, and Derrick Jensen (New York: Seven Stories, 2011) 425–474; Derrick Jensen, *Endgame Vol. 1: The Problem of Civilization* (New York: Seven Stories, 2006) 251–268; John Zerzan, ed., *Against Civilization: Readings and Reflections* (Port Townsend, WA: Feral, 2005).
53. The Invisible Committee, *The Coming Insurrection* (Los Angeles: Semiotext(e), 2008) 25–26.
54. Paulo Freire, *Pedagogy of the Oppressed*, trans. Myra Bergman Ramos (New York: Continuum, 2005) 44.
55. Lauren Berlant, *Cruel Optimism* (Durham: Duke UP, 2011) 3.

Oil Drums: Indigenous Labour and Visions of Compensation in the Tar Sands Zone

Warren Cariou

Where I come from, oil extraction is often understood as an arena of labor, in which marginalized people can use their skill, strength and intellect to prove their value and legitimacy, not only to their own people but also to colonial society. Work, in other words, holds a symbolic value within the community. For each laborer, work is always embedded with narratives about who you are and who you want to become. This conception of colonial industry as a kind of proving-ground for Indigenous laborers has a long history in Canada, one that is manifested in generations of my own family. Some of my Métis ancestors were voyageurs, traveling the rivers and portages of the West in the employ of the Hudson's Bay Company and the Northwest Company, transporting supplies in one direction and luxury goods (mostly furs) in the other. They were powerful men, legendary figures in some cases, and I remember the pride in my dad's voice when he used to tell us about them. He recited stories about their endurance, their resistance to physical discomfort, their uncanny ability to read dangerous rapids and to slip their cargo safely past submerged rocks and snags. Their work took on a heroic dimension for me when I was growing up, and I saw it echoed in the lives of the Cree and Métis lumberjacks and sawmill workers who lived in our town. The voyageurs also reminded me of my Uncle Leo, who had begun working as a roughneck on Alberta's oil rigs in the sixties and eventually worked his way up to become the tool push of an offshore drilling rig. Uncle Leo traveled the world for his job, working in Africa

and South America and off the coast of Newfoundland. One time when he was working in the Amazon, he brought us a stuffed piranha that my dad kept on the bookshelf beside the TV. Whenever my friends visited, we passed that rigid, grinning beast between us, running our fingers over its jagged teeth. I remember I was holding that gift piranha on my lap, gazing into its lacquered maw, when I announced to my family that I wanted to be an oil worker some day.

That dream didn't come true, largely because of my incompetence as a manual laborer, but I begin with this story because I think it highlights the symbolic and aspirational nature of labor, especially in Indigenous contexts. Many of my Cree and Métis friends had relatives who worked in the forestry, mining and oil industries, and we were proud to be associated with these people. To us, they were the latter-day voyageurs, having proven their value in the hostile arena of colonial labor, having gained the approval of bosses and maybe even of the community at large. By succeeding as workers, these men (and they were virtually all men, this labor situation being deeply gendered) not only provided economic resources for their families, they also combated prevailing stereotypes of Indigenous people as shiftless or lacking in ambition, and they acted as role models for younger members of their communities.[1] The youth could look up to these workers and see a path toward a kind of independence and self-esteem that was all too rare at that time. In the context of stultifying governmental control, genocidal assimilation policies, economic dependency, and the general exclusion of Indigenous people from the realms of power and wealth, these Indigenous laborers could indeed be understood as heroes of a sort. Seen from a different perspective, one might say that their labor was ideological as well as physical. Their work resonated in the dreams of others, for better or for worse.

My uncle lost his job when the inevitable downturn came to the oil industry in the 1980s. I suppose that was another way in which he was like the voyageurs and the many other Native workers of the fur trade, who saw their livelihoods disappear as animal pelts lost their value in colonial markets. Outsiders often identify unemployment

as a serious social problem in Indigenous communities, but these commentators usually don't understand the cultural and colonial contexts of Indigenous labor. The lack of meaningful occupation for Indigenous people *is* certainly a problem in some communities, but what is labeled by the government as "unemployment" is largely a result of colonialism itself, created by a combination of restrictive government and corporate policies, loss of access to traditional territories, and the brutal cycle of capitalist expansion and collapse. When the bottom falls out of the fur economy, when the oil downturn hits, when the forestry industry retrenches, Indigenous laborers are often among the first to lose their jobs, their status, and perhaps also some of the pride they had gained when it seemed they were welcome in the settler-colonial realm of work.[2] Of course all laborers are subject to market-based precarity, but for Indigenous workers there are other factors of marginalization and discrimination that make their situation even more tenuous, especially when the industries in question are ones that cause significant damage to Indigenous traditional lands.

Nonetheless, governments and corporations continue to use the rhetoric of what I'll call *neoliberal reconciliation* when discussing the putative benefits of extractive megaprojects in Indigenous territory. By neoliberal reconciliation, I mean the supposition that the state or non-Native society in general can fix the damage created by colonialism by encouraging capitalist development within Indigenous communities.[3] In neoliberal reconciliation, the capitalist labor market is understood as the *means* of reconciliation, perhaps even the medium of it. Saskatchewan Premier Brad Wall exemplified this notion in a 2013 speech where he referenced the uranium mining company Cameco, saying that "the best program for First Nations Métis people in Saskatchewan is not a program at all — it's Cameco."[4] The implication of this statement is that Indigenous people's many social and health disadvantages — undeniably caused by violent colonial interventions over a period of many generations — can best be addressed not by compensation from the state, but by providing

them with the opportunity for jobs in extractive industries. In a sense, Wall is suggesting that a job *is* the compensation, or at least the best form of compensation, for Indigenous people who have been subjected to the colonial violence.

Wall's prescription for alleviating social and health problems in Indigenous communities is essentially: *more capitalism.* At the same time, this prescription involves an implicit or explicit minimizing of the role of government programs in addressing these problems. There is a sense that, where government intervention has failed Indigenous people, corporate intervention can make up for that failure. This can be read as an evasion of government responsibility for the ongoing disaster that colonialism has created in Indigenous communities. And yet in Canadian society at large, there seems to be little criticism of this notion of neoliberal reconciliation that suggests that mines, dams, and oil megaprojects — despite their obvious negative environmental and other effects — are nonetheless good for Indigenous people because they create jobs. This rhetoric has become so pervasive that when a government enables the incursion of a multinational corporation into Indigenous territory, it can actually be spun as an act of generosity, a gesture toward reconciliation.

I don't want to lose sight of the fact that for many Indigenous community members, having a meaningful job can make a difference in their self-esteem, their independence, and the future prospects of their families. What needs to be examined, though, is what constitutes a "meaningful" job within Indigenous worldviews, and whether extractive capitalism is suitable for creating such jobs. Certainly, extractive industries offer the possibility of relatively high levels of pay, even by the standards of non-Native middle class expectations. For Indigenous workers, this can be seen as a rare opportunity. The exclusion of Indigenous people from well-paying, safe, and stable work has a long and undistinguished history, and one that continues today in many places. As Tracy Friedel and Alison Taylor point out,

> the commonplace notion of Native people as being economically unproductive, or as seemingly suited to "unskilled" work, has deep

> roots in Canada, and has served to legitimate appropriation of Native land and economic resources, in keeping with the notion of *terra nullius*.[5]

Stereotypes of Indigenous laziness or unsuitability for work have often created a kind of self-fulfilling prophecy in which Indigenous people have been strategically denied access to the best and most sought-after jobs. So when an industry declares that it is welcoming Indigenous laborers and wants to help train them so that they have a chance to advance beyond entry-level positions, it seems like a positive development.

This has happened on a significant scale in the bitumen mining operations of the Athabasca region in Alberta, where multinational oil companies — encouraged by governments and likely by the potential for positive public relations — have in some cases made it a priority to hire Indigenous workers and to create business partnerships with nearby Indigenous communities. This has led to a situation in which some Indigenous people have been given access to the kind of high-paying employment opportunities that most Canadians, let alone Indigenous Canadians, only dream of. Annual pay of well over $100,000 per year has been common for skilled laborers in tar sands mining and processing operations for at least a decade, while the median income for Indigenous people is less than a quarter of that.[6] In a 2003 "educational" video intended for Alberta high school students, *The Amazing Athabasca Oil Sands,* Alberta's Minister of Economic Development says that he is especially proud of the government's success in encouraging this climate of labor opportunity for Indigenous people in the Athabasca region because

> it gives them not only careers and jobs and hope for the future but it lets them share in the resources that are in many cases in their tribal lands.... It is really helping Aboriginals share in the wealth, create opportunities for the future, and have jobs that are meaningful for them and their families.[7]

This depiction of employment opportunities as a means of "shar[ing] the wealth" with Indigenous people is a common trope in government and corporate discourse about tar sands development. What is usually not addressed is why the putative holders of this wealth would *want* to share it with Indigenous people this time — unlike in the rest of colonial history — and what strings might be attached to this supposedly magnanimous action of sharing. The fact that these oil resources are "in many cases in their tribal lands" brings up an interesting question for Indigenous people: who is being asked to share with whom? Though this Indigenous employment strategy is being presented as a generous act of neoliberal reconciliation, it is possible that the companies need the Indigenous people more than the other way around.

However, the relationship of Indigenous community members to the oil companies in the Athabasca region is not one of empowerment. Any talk of employment or business "partnerships" between communities and industry is complicated by the fact that there is an enormous power imbalance between the two — and, as Friedel and Taylor argue in their excellent article on this subject, "partnership discourse holds out that development of the oil sands is inevitable and that the fruits of cooperation are self-evident."[8] In light of this rhetoric of inevitability, a prospect of "sharing" can seem more like coercion than like genuine partnership. While conducting the interviews for my film *Land of Oil and Water,* I routinely encountered a sentiment among Indigenous people of the region that there was nothing they could do to stop oil development in their territories, and so the most they could hope for was to make the best of a very difficult situation. I suspect that this logic of inevitability is a major part of the ideology that encourages Indigenous people to accept work in the tar sands. Such a choice can be understood as strategic and temporary acquiescence to a power structure, rather than as empowerment or any real movement toward reconciliation.

In addition, there is a longer economic and colonial history at work here, which indicates the ways in which neoliberal reconciliation

fits into the cycles of capitalism and the assimilationist logic of colonialism. In the *Amazing Athabasca Oil Sands* video cited above, there is also an interview with Ft. McKay First Nation Chief Jim Boucher, a noted proponent of Indigenous business partnerships with oil companies. But while Boucher expresses pride in the economic development that he attributes to his community's negotiations and business dealings with the tar sands industry, he positions this activity as a kind of necessary evil that has been precipitated by a community crisis — one created by the collapse of the previous capital market that his people had long become accustomed to working in:

> With the decline in fur demand around the planet, it had a very drastic effect on the area in the sense that we were left without an economy. So we had to change, and that change was brought about with regards with [*sic*] some discussion in the community saying we need to embrace a new type of economy.[9]

The idea of being "left without an economy" might seem somewhat hyperbolic, but given the fact that tar sands development was devastating the Ft. McKay First Nation's land base at the same time as the fur economy was disintegrating, it might not be an overstatement. In any case, the chief's invocation of economic erasure after the decline in global demand for fur indicates the profound sense of crisis and vulnerability that can come to an Indigenous community when it has tied its economy to a capital market that then collapses. Boucher's analysis points out that the people of the Ft. McKay First Nation were already engaged in a form of extractive capitalism — the fur trade — and when that industry became unviable, the community felt it had little choice but to "embrace a new type of economy." Thus, what government and business portray as an action of neoliberal reconciliation ("shar[ing] the wealth," as the Alberta Minister said) is really for the Indigenous community a situation of utter desperation. What is not mentioned — or perhaps not even considered — is what will happen to the community when the "new type of economy" also

inevitably collapses in the future.

The operation of neoliberal reconciliation discourse can be compared to Naomi Klein's idea of the shock doctrine, in which neoliberal forces foment or prey upon economic crises in order to gain an excuse to step in and take control over entire economies. Klein describes the ideology of economic erasure — such as Chief Boucher's idea of being "without an economy" — as a crucial starting point for neoliberal economic experimentation in devastated economies. This crisis situation opens the way for new neoliberal ideologies to be implanted into the infrastructure and presumably into the psyches of the community members. Klein writes, "shocked societies often give up things they would otherwise fiercely protect."[10] This statement resonates strongly with the experience of Indigenous people in the Athabasca region, who have suffered enormous shocks not only to their economy but also to their culture, their language, and their land. Given the generations-long assault that Indigenous cultures have suffered in the history of colonialism, it is no wonder that they might be considered ideal candidates for the implantation of neoliberal ideologies. There is one important difference between the shock doctrine and neoliberal reconciliation, however. Instead of spinning these economic prescriptions as examples of hardline austerity and "tough medicine" in the way that shock doctrine economists have done, the proponents of neoliberal reconciliation spin their (fundamentally very similar) interventions as paternalistic generosity.

But if the companies are so much more powerful than the Indigenous communities, then why does the oil industry even need Indigenous workers at all? One might imagine that it would be much less complicated for the oil companies to simply ignore the Indigenous communities in their vicinity — much in the way that extractive industries have done in the past. I would argue that in the contemporary situation, the oil industry *does* in fact need Indigenous people, but it doesn't need them as laborers. Instead, it needs them as symbols, and as possible allies, in the ongoing quest to maintain

social acceptance of tar sands mining practices — the very practices that are radically altering the surrounding Indigenous territory and interfering with Indigenous cultural practices on the land. Hiring Indigenous people is the simplest way of utilizing them for this purpose. For the companies, the potential public-relations bonus of having Indigenous employees can be understood as a secondary kind of surplus value, beyond the one that their labor produces. This ideological form of surplus value pays its dividends when the company deploys the Indigenous laborer as a symbol, either through advertising or through public performances of neoliberal reconciliation that celebrate Indigenous employment programs.

Tracy Friedel writes about this process of deployment in her article "(Not so) Crude Images and Text," which shows how oil company public relations campaigns use images of Indigenous people to create an aura of "corporate social responsibility" through the now widely-known practice of "greenwashing."[11] Because Indigenous people are associated with environmental sensibilities and strong commitments to the well-being of the land, Friedel argues, images of them can be used to lend an appearance of responsible environmental practices, even when the reality is starkly different. Furthermore, when Indigenous people are known to live in the immediate vicinity of the oil extraction activities — as in the tar sands mines — their appearance in company advertisements can give an impression that they accept and even condone these developments. She analyzes the ways in which oil companies advertise their Indigenous employment programs, arguing that these are often aimed more at a non-Native public than at Indigenous people themselves. The rhetoric of some of these ads is rife with the ideology of neoliberal reconciliation. For example, she cites a Nexen advertisement that claims:

> Our Aboriginal Partnership Strategy is designed to create mutually beneficial relationships with Aboriginal people, where they are encouraged to participate in our industry activities and share in the economic benefits of energy development near their communities.[12]

The rhetoric of "sharing" here is virtually identical to the previously-quoted Alberta Economic Development Minister's statement about "helping Aboriginals share in the wealth," and Friedel links this performance of magnanimity to the ideology of Whiteness in Canada. Indeed, her analysis helps to show how the colonial discourse of "White civility" — which Daniel Coleman examines brilliantly in his book of that title — is still kept alive in the rhetoric of neoliberal reconciliation today.[13]

Friedel also discusses a Syncrude print advertisement from 2004 that presents a fascinating and disturbing image of Indigeneity in the context of extractive industry. This ad, which appeared in *Windspeaker,* a national magazine with a large Indigenous readership, presents a composite image of three versions of Indigeneity by placing parts of three portraits side by side.[14] On the left side is what appears to be a historical photograph of a Plains Chief wearing a war bonnet, and the text below reads "Remember where we have been." The center part of the composite face is a color image of a light-brown-skinned Indigenous person, probably a man, with the accompanying text, "See where we are." Finally, on the right side is an image that appears to be displayed on a computer screen, of a lighter-skinned Indigenous person of indeterminate gender wearing a white hard hat, with the text "Imagine where we are going." The narrative of so-called progress here is unmistakable, with the Chief being consigned to the past and the hardhat-clad, lighter-skinned person being a vision of the Indigenous future. Indeed this image might be compared to the infamous "before and after" photographs of the Cree boy Thomas Moore taken in 1897 at the Regina Indian Industrial School.[15] Like the photos of Moore, which were proudly published in the Department of Indian Affairs 1904 Annual Report, this ad is a representation of Indigenous transformation and indoctrination, directed toward an aspirational goal. Friedel comments:

> The old man's headdress, denoting chieftainship, becomes the young person's white hard hat, denoting a capitalistic sign of leadership.

> Through staging Native, the stereotype of the sombre spiritual and environmental steward is brought to bear on oil sands development even as he is in the process of disappearing.[16]

Thus, while this advertisement purports to represent an image of an idealized Indigenous future, it can actually be seen as an invocation of that most transparent trope of colonial wish-fulfillment, the stereotype of the dying Indian. The racial ideology of the Nineteenth Century seems to be still with us, only now it is clothed in the garb of industrial labor.

Nonetheless, for Indigenous workers who have been excluded from many of the opportunities that most Canadians take for granted, the idea of sharing in the wealth that is enjoyed by non-Native society could still be enticing. Having a permanent, well-paying job could mean more than economic stability; it could mean self-esteem and community engagement and all of the other things that made me proud of the Indigenous workers in my community when I was growing up. Perhaps this is what Alberta's Economic Development Minister is referring to when he describes tar sands labor as "jobs that are meaningful for them and their families." However, there is a marked semantic emptiness in his use of the word "meaningful." There is no elaboration on what meaningful employment might be for an Indigenous person, in general or in comparison to another laborer. The implication seems to be that a meaningful job is simply one that pays a lot, no matter what the laborer's actual experience of the work is, or what the business's ultimate effects might be upon the community's land, water and social fabric.

Many Indigenous workers have taken up these opportunities to work in the tar sands operations, but they often do so with a sense of ambivalence because of the environmental and cultural effects that tar sands mining has become known for. What does it mean to be an Indigenous laborer in the tar sands when the environmental impacts of the industry would seem to be antithetical to traditional Indigenous world views? In my film *Land of Oil and Water,* Fort

Chipewyan resident Lionel Lepine describes his past experience as an Indigenous oil worker and then adds a comment about his fellow community members who have remained on the job, saying "they don't understand that they're assisting with the destruction of our way of life." This statement highlights the fact that for Indigenous people, choosing such work is a cultural question, bound up in the fundamental clash of values that is at the heart of every encounter between Indigenous communities and extractive capitalism. In the past, Indigenous people were mostly locked out of the petroleum workforce, but now that they have been (at least partially) welcomed, that clash of values has sometimes become a personal struggle about the meaning of Indigenous identity in the modern world.

Each Native person who makes the choice to work for the oil companies will have their own complex set of reasons for that decision, and I think it is important to avoid making easy value judgments about this. While it is difficult to see how this kind of work could be conducive to the building of cultural pride and self-worth for Indigenous workers, the fact is that there are few other employment prospects available to Indigenous people in the region, and traditional ways of life have been rendered largely unviable by the massive environmental damage that has already been inflicted. Personally I feel empathy for the workers who have made the choice to work in these devastating conditions. They are offered high pay for their labor, but in many ways they have been trapped in a system where the very prospect of work has become a minefield of coercion and co-optation.

In such a situation, I am struck by the calculus of cost and benefit that each worker must make when deciding whether or not to work in the tar sands. What price does an Indigenous person pay when she or he takes a job in an extractive industry? What price does the community pay, and what does the land itself pay? On the other hand, are the wages, the putative benefits to self-esteem and the economic spin-off effects sufficient to compensate for the things that are lost or given up when such an industry takes hold in a community? *Is it worth*

it? This idea of compensation is at the heart of such a decision, since the damages created by tar sands extraction are obvious to anyone who lives in their vicinity, and the remaining question is whether or not one might receive enough other benefits to still make the choice worthwhile.

Figure 1. Anonymous, *Indigenous Oil Worker* (c.2008)

In this context of identity-based choices, I would like to discuss an image that is reminiscent of the Syncrude advertisement discussed above, but that I think encapsulates something more of the identity-dilemma that Indigenous workers in the tar sands must face (Figure 1). This anonymous line drawing was posted on the bulletin board of the Fort McKay First Nation when I visited the community in 2008 to record interviews for *Land of Oil and Water*.[17] At that time, the price of oil had reached a historic high, and many younger members of the First Nation and the neighboring Métis Nation were either working for the nearby tar sands companies or seeking employment in the industry. To me, this drawing represents an attempt to work through or symbolize the cultural tensions of being an Indigenous oil worker. The world of the image is bifurcated, with all the trappings of industrial petro-modernity on the top half, while on the bottom there are symbolic representations of traditional — and pointedly *past* — modes of Indigenous life. The muscular, hardhat-clad laborer at the top of the image crouches down to touch what seems to be his own reflection in a puddle of liquid that extends beneath his own feet. He also gazes down into the reflection, in a gesture reminiscent of the Narcissus trope that has been so common in Western art — but unlike many images of Narcissus, this man doesn't seem to be falling into a solipsistic paralysis of self-regard. His posture, like that of the reflection, is more open and upright, more directed toward the viewer. This is an image of power and pride, refracted through two very different worlds. The reflected figure wears traditional braids and feathers, and carries a tomahawk or war club instead of the oil worker's wrench. As a whole, then, this image can be read as a symbol of the worker as warrior. Its message for an Indigenous laborer might be paraphrased as, "you can still be a warrior, still be authentically Indigenous, while working for an oil company."

The warrior has long been a figure of the utmost respect in Indigenous communities across Turtle Island, and this remains true today. The warrior is not an inherently martial or violent figure, but rather a person who adheres to traditional values in a disciplined way.

Warriors may have distinct ceremonial and other roles in different Indigenous cultures and communities, but their general task of protecting the community remains constant. Warrior Societies among the Mohawk, the Anishinaabe, and other nations have gained national prominence for their work to defend their communities from outside threats (most often threats initiated by corporate or government interests). Within contemporary Indigenous sovereignty movements, the figure of the warrior has also been an important pedagogical and political rallying point, as exemplified in Taiaiake Alfred's *Wasase,* where he encourages his Indigenous readers to model their lives after the warrior-attributes of generosity, humility, discipline, honesty and incorruptibility.[18]

On the face of it, it would seem that these attributes have little to do with the ideals or qualifications for doing wage labor in the petroleum industry, but what they do share, and what this image explicitly links, is an aura of pride and authenticity. The role of the warrior is also predominantly gendered male, which matches the demographics of the tar sands workforce.[19] Thus the oil-worker-as-warrior motif can be seen as doing significant ideological work to persuade Indigenous people that there is no cultural double-bind involved in choosing to work in the tar sands industry. It suggests that the best way to embody pride in one's heritage and to take care of one's community is to join in the project of neoliberal reconciliation — to exchange the tipis for oil derricks, and the tomahawk for a wrench.

As it was during my childhood, the prospect of gaining pride in oneself through labor is still a powerful motivator, especially for Indigenous people who have so often been denied any sense of self-esteem in their dealings with colonial culture. However, this drawing undercuts that promise of Indigenous pride by simultaneously enacting an allegory of deracination. One of these characters is sublimated to the other. The worker's Indigenous warrior-identity is only visible in the reflection; there is no outward sign of Indigeneity in his appearance or dress. So it seems that his connection to his Indigenous heritage may remain only at the level of fantasy, a

shimmering projection on the uncertain surface of the liquid he is kneeling in. And what exactly is that liquid, the medium of his vision? The puddle looks remarkably like the tar sands tailings ponds that surround the Ft. McKay First Nation, where glistening mats of petroleum float on the waste water.[20] If we accept this possibility, then this image can be understood as a particular kind of symbol: the Indigenous laborer viewing himself in oil, as if gazing into the scrying glass of modernity. What he sees is an image of the past, of a Nativeness that is locked away from the modern world and rendered merely a phantasm. The oil has become a medium of projection, a tenuous way of connecting to a lost authenticity, while the landscape has been emptied of everything except oil derricks.

This raises a question for Indigenous people in the Athabasca region, as well as for all of us who benefit directly and indirectly from the bitumen extraction industry: how do we compensate for the loss of the land, and the threat to the Indigenous cultures that are so closely connected to it? One answer would be that money can compensate, at least partly. "Compensation," after all, is another word for "wages." Perhaps for some Indigenous tar sands workers, the wages are sufficient to make up for the losses. Maybe the oil companies' investments in local recreation facilities and partnerships with Indigenous businesses constitute another element of compensation. Perhaps the self-esteem that comes from having a "good" job can also compensate, but if it comes at a price of identity-loss and separation from culture, then it is only a chimera. The rhetoric of neoliberal reconciliation is a primary medium of such chimerical thinking, because it supposes that turning Indigenous people into industrial laborers will solve the problems that colonialism has wrought. Instead, what is being offered to these workers is a fantasy of consequence-free wealth (which is, of course, the governing fantasy of capitalism in general), and what is being sold to the broader Canadian public is the notion that economic imperialism in Indigenous communities can somehow make up for the violent colonial history that all settler Canadians benefit from.

As part of Canada's recent Truth and Reconciliation process, survivors of the Indian Residential Schools have received compensation in the form of monetary settlements, but many survivors have indicated that no amount of money can make up for the loss of their languages, their ways of life, their connections to family and to the land. Any compensation in the form of capital is bound to be insufficient to account for such fundamental and even unquantifiable losses — and I suspect that many Indigenous people might say the same thing about the damage being sustained in the Athabasca region. In *Land of Oil and Water,* Cree leader Steve Courtoreille compares the environmental and cultural devastation caused by the tar sands to the damage inflicted by Canada's Indian Residential Schools policy, saying "twenty, thirty years down the road, is the government going to make another apology to the Native people… for the damage they've done to us?" His reference to the federal government's 2008 apology for the Residential Schools program, which had recently been announced at the time of the interview, makes me wonder whether any real progress has been made toward the Canadian government's stated goal of fostering reconciliation with its Indigenous people.

Recently, the logic of compensation in the tar sands has reached a new level of strangeness. Compelled by Department of Fisheries and Oceans regulations, bitumen mining companies have begun to create what they call "compensation lakes" out of exhausted tar sands mines. These human-made lakes are mandated to replace fish habitat that has been destroyed during the mining process, but the companies have chosen to emphasize the idea that Indigenous communities are the intended beneficiaries of these projects.[21] One of these compensation lakes being built at Imperial Oil's Kearl mine site is the subject of a video on the company's website, in which an environmental adviser explains that local Indigenous people have been asked "what they'd like to see in the lake, for fish species, what kind of vegetation they'd like to see on the lake shore, and also what depth the lake should be."[22] The spokesman goes on to offer an idyllic prediction of the future value of this lake for Indigenous people, saying "in due time, the local

Aboriginal population will be able to come here and use the lake as they wish." Similarly, Canadian Natural Resources Limited has created another compensation lake that they have endowed with a Cree name, Wapán Sákahikan. On their website the company also stresses that Indigenous people were consulted on the fish species to be stocked in the lake. "One of the central goals," the website text explains, "was to develop a lake that could be used as a gathering place for Aboriginal people to continue to practice their traditional lifestyle."[23]

The ironies of this activity probably don't need to be explained in detail, but the complicated knot of ideology at work here merits some final observations. To me, nothing says neoliberal reconciliation more poignantly than a reconditioned bitumen mine being offered as a gift to Indigenous people — the people from whom the land had been stolen in the first place. The idea that Indigenous communities could be "given back" their land only after it has literally been put through the grinder of industrial processing is both deeply sad and fundamentally absurd. Indeed this rhetorical move might be seen as the ultimate neoliberal reconciliatory gesture. This is recycled generosity, performed largely for the sake of a non-Indigenous audience that is expected to applaud such apparently charitable treatment of Indigenous people and their land. I am left wondering what, exactly, is being compensated *for* in the construction and elaborate gifting of these lakes. Are they an attempt to make compensation for the destruction of nature itself? Perhaps this performance can be understood as a grand staging and deflection of neoliberal guilt, as an act of compensation in the psychological sense, a defense mechanism in which a person (and corporations are of course officially persons) avoids doing one thing by fervently doing another. The idea of providing a newly-built lake for Indigenous people to "practice their traditional lifestyle" while the industry has in every other way worked to eradicate those traditional practices is a powerful example of the misplaced priorities that unfortunately exemplify both the colonial and the corporate approaches to Indigenous people over many generations.

Notes

1. My analysis in this paper focuses mainly on representations of Indigenous men and masculinity within the Alberta oil industry because my personal experience and my primary materials fall largely within that realm. However, there remains a need for a specific analysis of the role of gender in Indigenous participation in the industry, especially focusing on Indigenous women's labor. The academic study of Indigenous labor in general was for a long time dominated by a focus on Indigenous men in the fur trade and its aftermath. See Ron G. Bourgeault, "The Indian, the Métis, and the Fur Trade: Class, Sexism, and Racism in the Transition from 'Communism' to 'Capitalism,'" *Studies in Political Economy* 12 (1983) 45–80, and Arthur Ray, *Indians in the Fur Trade: Their Role as Trappers, Hunters, and Middlemen in the Lands Southwest of Hudson Bay, 1660-1870*, 2nd ed. (Toronto: U of Toronto P, 1998). Recent feminist scholarship (such as Mary Jane McCallum's *Indigenous Women, Work, and History 1940–1980* [Winnipeg: University of Manitoba Press, 2014] and Robin Brownlie and Valerie J. Korinek's *Finding a Way to the Heart: Feminist Writing on Aboriginal Women's History* [Winnipeg: University of Manitoba Press, 2012]) has begun to address this gap in the study of Indigenous women's labor, but at this point there is no major study of Indigenous women's work in the petroleum industry.
2. For example, Friedel and Taylor note that after the financial crisis of 2008 and the subsequent drop in the price of oil, "employment rate declines in Alberta were more than twice as large for Aboriginal people as they were for non-Aboriginal people over this period." Tracy L. Friedel and Alison Taylor, "Analyzing Policy Discourse in the Context of Northern Alberta's Oil Sands," in *Aboriginal Policy Studies*, 1.3 (2011) 32.
3. Lessie Jo Frazier also uses the term "neoliberal reconciliation" to describe the Chilean context in her chapter, "The Economy of Reconciliation," where she reveals the state's economic interests in creating a culture or an appearance of reconciliation. Lessie Jo Frazier, *Salt in the Sand: Memory, Violence and the Nation State in Chile, 1890 to the Present* (Chapel Hill: Duke UP, 2007) 197. In *Neoliberal Indigenous Policy*, Elizabeth

Strakosch does not use the term, but her analysis is very relevant to the idea, and it has been a significant influence on my thinking. Strakosch examines the relationship between neoliberalism and reconciliation discourse in Australia from the late 1990s to the present, a situation that is strikingly similar to Canada's. She contends, "Where the socio-economic differences were previously seen as arising from political issues, including insufficient inclusion, in neoliberal logics it is the socio-economic differences which create and exhaust political difference between Indigenous and other Australians." Elizabeth Strakosch, *Neoliberal Indigenous Policy: Settler Colonialism and the 'Post-Welfare' State* (London: Palgrave McMillan, 2015) 88.

4. "Transcript: Brad Wall's Controversial Address." *Prince Albert Herald* (28 March 2013).
5. Friedel and Taylor, "Digging" 31.
6. Statistics Canada reports, "The median total income of the Aboriginal population aged 25 to 54 in 2005 was just over $22,000." For First Nations people living on reserve, the median income was slightly more than $14,000. Statistics Canada, "Income," *Aboriginal Statistics at a Glance,* 89-645-X (2010) http://www.statcan.gc.ca/pub/89-645-x/2010001/income-revenu-eng.htm.
7. Quoted in Andrew Hodgkins, "Manufacturing (*Il*)literacy in Alberta's Classrooms: The Case of an Oil-Dependent State," *Journal for Critical Education Policy Studies* 8.1 (2010) 278.
8. "Digging" 40.
9. Quoted in Hodgkins, "Manufacturing" 278.
10. Naomi Klein, *The Shock Doctrine: The Rise of Disaster Capitalism* (Toronto: Vintage, 2008) 17.
11. Tracy L. Friedel, "(Not so) Crude Images and Text: Staging Native in 'Big Oil' Advertising," *Visual Studies* 23.3 (2008) 239. The more recently coined term "redwashing" is another useful descriptor of this activity. Melanie Yazzie describes redwashing as a situation in which Indigenous people, or representations of them, are co-opted and used to support ideologies that are not in the best interest of Indigenous communities. See Melanie K. Yazzie, "Solidarity with Palestine from Diné Bikéyah,"

American Quarterly 67.4 (December 2015) 1007–1015.

12. Quoted in Friedel, "(Not so) crude" 241.
13. Friedel's article appears in the same year as Coleman's book, so it is unlikely that there is a direct influence, but the two studies are complementary in their findings. See Daniel Coleman, *White Civility: The Literary Project of English Canada* (Toronto: U of Toronto P, 2008).
14. "(Not so) Crude" 243.
15. See Chapter 1 of John Milloy's *A National Crime* for detailed contextualization and analysis of these photographs. John Milloy, *A National Crime: The Canadian Government and the Residential School System, 1879–1986* (Winnipeg: U of Manitoba P, 1999).
16. "(Not so) Crude" 246.
17. I have made significant efforts to identify the artist, but I have not been successful thus far. The image appears to be a photocopy of an original pen drawing, so it is possible that numerous copies exist. The drawing may not originate in the tar sands region (since, for example, the oil derricks depicted in the background are not a feature of bitumen extraction), but its placement in the Fort McKay Band Office makes it inevitably a commentary on the situation there at that time.
18. Taiaiake Alfred, *Wasase: Indigenous Pathways of Action and Freedom* (Toronto: U of Toronto P, 2005) 88–89.
19. Gender statistics for the tar sands industry alone are difficult to find, but a 2009 article (Kemp) claims that women make up only 11 percent of the Shell's Albian Sands workforce. A 2008 Alberta Department of Employment, Immigration and Industry report, *Industry Profiles: Mining and Oil and Gas Extraction Industry,* indicates that women make up 25.4 percent of the workforce in the province's mining, oil, and gas sectors combined. Alix Kemp, "Why Women Could Save the Oil Sands," in *Alberta Venture*, December 24, 2012.
20. My article "Tarhands: A Messy Manifesto" contains photographs of these tailings ponds. Figure 12 of the article is particularly reminiscent of this drawing. See Warren Cariou, "Tarhands: A Messy Manifesto," *Imaginations: Journal of Cross-Cultural Image Studies* 3.2 (Sept. 2012) 17–34.
21. I fully support the idea that the companies should be required to reclaim

the land to the highest standards when their mining operations cease. What I am objecting to here is the companies' decision to represent this required activity as a magnanimous expression of generosity toward Indigenous people.

22. Imperial Oil, "Compensation Lake — Kearl," 2011, Youtube, https://www.youtube.com/watch?v=3trluv8E1pI.
23. Canadian National Resources Limited, "On the Horizon: CNRL Report to Stakeholders," (2010) https://www.cnrl.com/upload/media_element/306/03/on-the-horizon-2010.pdf.

The Oil Bodies: Workers of Fort McMurray

Dominique Perron (Trans. by Wafa Gaiech)[1]

I wish to begin my story in Calgary, Alberta at the airport. It's November 12th, 2015 and the time is 11:30 pm. It's boarding time. In his song "Orly," Belgian singer-songwriter Jacques Brel reminds us *"la vie ne fait pas de cadeau!"* (life is not a free ride), and I find that it is precisely at airports that this ontological injustice is most easily noticeable. What would he have said about the passengers *I was* looking at, as they board at Gate 19 for a night flight to Toronto — a flight that is the least expensive (given the time), the most uncomfortable, and the most grueling? And what would Karl Marx have thought of them, which is to say, how does Marxism take up the figure of labor in today's energy sector? At the very least, he who would have noticed that the high-speed and high-tech evolution of the twenty -first century does not entirely confirm class struggle as he had analyzed it, as much as it brutally confirms a radical social distancing, given that superior classes ultimately enjoy a range of privileges, while inferior classes remain in a position of subordination. On the plane, class difference is built into the very architecture of space, the infrastructure of work that makes the plane possible, and the energy system that ties both to rhythms of the oil markets.

Taking a flight — regardless of the airline or destination chosen — is first and foremost an opportunity to determine one's class and showcase it in full view of everyone. It's all in the name: first class, business class, economy class. Each boarding call clearly denotes the order in which the different occupants would get to their seats and make themselves more or less comfortable. By priority, those traveling

first and business class will have the privilege to neatly stow their carry-on luggage before the hustle and bustle would begin. They will comfortably sit in their spacious seats or lay supine as if at home in their beds; indeed, the one seat occupies the space of three (if not four) seats in economy class. Once these "high-flying" people take *their place* — in the most literal sense of the word — the ones traveling coach class are *put in their place.* They march past the business class passengers, already well seated, immersed in their magazines, bound up in their phones — eyes staring at the screen, headphones on — which spares them all audiovisual contact with the flock moving painfully past them. Overloaded with handbags, backpacks, shoulder bags, small suitcases, and with coats and parkas, boarders get unexpectedly caught in the angles of seats. One stumbles, slowing the flow of third-class fellows who are actually looking forward to leaving those alien passengers before them. In fact, this "first world's" deafness and blindness are nothing but the confirmation of the desire to suffer such an existence for the shortest time possible.

I have talked about the high society, and here beauty is linked literally with the fore and aft of class division. I am in Calgary, flying to Toronto. At such a late hour, there are just a few tourists and yet, the aircraft is full: full of what *one* might call the oil personnel making business in the Alberta oil industry; though in reality, it is a heterogeneous and disparate group. First, I see *the oilmen*: businessmen, managers, lawyers, professionals, engineers, and highly specialized technicians. They are the business class and this is visible through their sporty and casual elegance, well-tailored clothes, flexible and in-shape bodies (thanks to regular workouts). Their freshly radiant faces, nicely cut hair, and their soft-skinned hands (even for the oldest among them) say much about their rising affluence. Bodies comfortable in their seats, enjoying expansive full-bodied movements, they *own* the space made for them, for their comfort.

Yet, the oil personnel are not exclusively made up of oilmen. It also includes oil workers and laborers — specialized or not — who

make their living from oil sands extraction areas in Northern Alberta. They work in huge construction sites that are variably far from one another, flanked by camps and mainly known under the name of Fort McMurray. An area in Alberta that brings to mind the Gulag labor camps or the myth of El Dorado (depending on one's imagination), Fort Mac is as much a place as it is a state of exception at the heart of North America. I will get back to this point. But for now, let me take a moment to study these oil workers who perform not only the toughest, physically exhausting tasks in oil sands development, but also the most unpleasant and certainly the least prestigious ones. All the various oil industry trades can be found in that place: mechanics, welders, truck drivers, conveyors, laborers, carpenters, machinists, scaffolders, and so on. Their tasks vary from the most specialized ones to those that require no specific experience or diplomas, as evidenced by the recruitment ads appearing on internet job sites. These ads, while they display lucrative hourly wages, are usually followed by warnings and remarks on the burden of the tasks. Nevertheless, the ads posted through government hiring centers (especially) do not miss the opportunity to highlight the high standard of living.

I would like to take a closer look at these workers. In the cluttered chaos of third class, everybody fights to hang on to luggage handles, to put their baggage — which sometimes exceeds the size allowed by airline regulation, hoping to find space companies — in the storage compartments above their seats, only to finally (and usually) find such compartments already packed to capacity. Impatient crowds create clogging down the narrow passageways. The traffic — which has been intermittent — has now stalled. The stewardesses can barely conceal their impatience. And finally, after a series of furious blows dealt on the recalcitrant bags and the resilient suitcases, the storage compartments are closed and each one of the oil workers, who make up the vast majority of the passengers of this economy class, has the chance to take their seat.

This last operation is no easier than that of luggage storing: it is now that one can study at length these workers' bodies, which are different

from those of the first class. It is now that one can fully observe these oil workers, who truly perform an active physical labor within the field of bitumen extraction, and whose strong limbs provide the material foundations of the oil industry and of modern society. The study of working bodies has already been conducted by renowned sociologists — particularly by Pierre Bourdieu — but its unique traits are still worthy of emphasis. In fact, it is important to highlight that these bodies are fed in a very specific way, so that they can respond to the harsh work in Fort McMurray, where physical work takes normally twelve hours a day. Camp cafeterias provide choices that primarily reflect the social background of the workers. Additionally, they reflect the tremendous caloric needs that the laborers must supply their bodies with, in order to succeed in their jobs. A recent documentary made by Radio Canada showed francophone workers in Fort McMurray amazed by the Wednesday menu offered by a cafeteria in Athabasca camp; steaks were served without limit. Knowing the high price range of steaks in Eastern Canada, their amazement is justified. Plus, it is very likely that these steaks would be served with a side of mashed potatoes and ultra-boiled vegetables, with bread and butter, unlimited desserts, fruits and greens available buffet style. These bodies must be well-nourished in order to fuel their work.

As they are now about to sit in the increasingly narrowed seats of Air Canada's economy class — or rather as they struggle to do it — it becomes clear that some of these bodies are overweight, bordering on obesity. Here, we are far from the malnourished figures of minor characters that Zola depicted in *Germinal*. Certainly, many of these men are rather tall. Yet, their height, rather than expressing the strength or athleticism of trained and disciplined bodies, betrays instead the constant and repetitive use of the same actions, put in the service of completing heavy tasks that might break arms and backs. Their bodies speak of the surplus of fast food consumed to immediately satisfy their physical needs, delivered straightaway the benefit of satiety, an energy boost, and immediate comfort — especially when one is exhausted by work. This existence offers no choice between living

one's life and earning one's living. Coffee, hamburger, chips, fries, soft drinks, chocolate are what constitute these oil workers' daily diet. In short, they opt for whatever makes them feel good. Actually, it might very well be that alcohol consumption, although officially forbidden in camps, but heavily trafficked anyway, upsets the physical exertion of their work, and helps create the overweight condition of these unhealthy bodies. And there's also the cigarettes that inscribe themselves on furrowed and swollen faces — marks deepened by the wind, the sun, the cold, and, often, a lack of sleep.

While physical labor constitutes the bedrock of the modern energy system, it is not the all-inclusive and exhaustive physical labor we associate with other energy sources, like early-twentieth-century coal. This is a techno-scientific mode of production where workers work not on natural resources directly, but on the heavy machinery necessary for advanced extraction. The great mass of machinery represents a century of intellectual and physical labour combined into what Marx called dead labor. And here the weight of dead labor weighs heavy on the body of well fed, but malnourished workers in the oil patch.

On the night of the flight, all the bodies making up the economy class exhibited deformed hands and damaged joints, burdened limbs, enormous thighs, and bloated bellies. And these bodies now have to fit into seats whose sizes are inversely proportional to their urgent need for rest and comfort during this late-night flight over a seemingly endless Canada. The fact that they could even fit their limbs and torsos in such tight seats with stiff backs, and fasten their safety belts, is a miracle. This ultimate discomfort, bodies taut to the machine, will last between three to six hours (depending on final destinations: Toronto, Montréal, Saint-Jean, Halifax, and St. John's) endured in the utter silence of an exhaustion verging on a bitter resignation which, nevertheless, knows itself incapable of changing the "natural" order of things.

There are no conversations, small talk, or friendly exclamations, and certainly no protests — which are after all useless, if not

potentially compromising, for that, as we know it, airline companies no longer tolerate ill tempers or aggressive behaviors, especially from these third-class passengers, who can be so easily replaced. None of these men who are rather frustrated by their tiredness dare run the risk of entering the ban list among Canadian airlines. This also makes up one of the reasons why these usually heavy drinkers had showed up somewhat sober at the boarding gate, with coffee as their sole, paradoxical tranquilizer, which in itself constitutes another ordeal for them as they are really in need for the numbness that alcohol provokes.

Such are the oil bodies heading east to their temporary homes: young but already looking old, swollen, and prematurely worn, strong but already ruined by their painful work conditions. Their backs are threatened by arthritis, and their bodies broken into the rhythms of the rising organic composition of capital.

Sociology and Class

In recent years, there has been a growing interest in "studying" the workers of Fort McMurray, their work camps, the conditions of their job, their lavish wages (from the perspective of Eastern Canadians), their life alternating between Northern Alberta and the rest of Canada. Francophone and Anglophone, they are all aspiring to finally find a stable job, as unemployment has been increasing in the Maritimes, Ontario, and Québec. Many reports have surrounded their lifestyle: the threats of alcoholism, the drugs usually consumed by the youngest, the prostitution that has become an industry, pornography, casinos, and the multiple temptations to earning immediate revenue, for men living far from their families, from their home environment, deprived of any clear sense of belonging.[2]

Some people gather in a kind of heartwarming brotherhood to organize meetings aimed at resisting those dangerous temptations. For instance, men make pacts with one another not to set foot in a bar and keep in touch daily with their families, so that they might bring home a worthy paycheck. Indeed, money can quickly slip through the

numb fingers of oil workers. Their distance from their spouses often leads to separation, divorce, and family breakdowns.[3] To avoid such problems, some seek to bring their family to the north, even to Fort McMurray, but they soon discover something that the government's employment ads have subtly alluded to: the high cost of living in Alberta.[4] In fact, the high cost of rent and the housing market simply risk canceling out the benefits of the oil workers' high wages, in the same fashion their jobs deprive them of enjoying the youth of their bodies — their proletarian bodies — and squander their economic benefits over medium to long term, as their health and quality of life are put at risk.[5]

From a certain perspective, the Albertan oil workers who constitute the third class on many levels seem to be coming directly from the nineteenth century, like mutants slightly different than Zola's laborers or those of the British industrial revolution. One could say that their life conditions and their purchasing power have greatly improved since then, which is true. One could say that access to those that the wealthier classes enjoy — health, education, and housing is proximate to the wealthiest class, for instance. And one could also say that there is no comparison with these workers and with what Karl Marx said of the heteronomous proletariat who were locked in their dominated class position, enslaved in a world exploiting nature, for the much greater benefit of social and environmental exploitation, and, thus, dispossessed of what *they* produce.[6] But, if that perspective does not seems linear, it does not contradict the Marxist assertion: "make their own history, but they do not make it as they please."[7] Moreover, in this situation both oil workers and nature are exploited.

Despite appearances, today's oil worker is still locked into a process of self- and environmental exploitation, rather than self- and environmental emancipation as neoliberals insist. It is precisely this idea of class struggle — or rather the absence of struggle — that dominates the image of the workers of Fort McMurray, and on the plane this absence is crystallized into form of passivity. They are obediently strapped to their seats, on their return trip bordering on

torture. I get a vision that calls upon the reconsideration of some of Marx's ideas on the possibility to change things and to shake up the order of social classes, in a context just as capitalist, productivist, and heteronomous as that of twenty-first century Alberta.

The oil bodies of this real and symbolic third class show all the symptoms of what sociologist Denis Duclos has called a phenomenon of "autophagy," through which individuals' and markets' sustainability depends on consuming what they produce in order to survive in a neoliberal economy. On the question of markets, Duclos underscores the corporate takeovers of businesses by others that are bigger, more powerful, and with more capital, such as one can observe, particularly in Canada, by growing concentration of capital through a reduced number of multinational oil exploiters. This gradually becomes like a constant, telescoped take-down of the smallest by the biggest, thus making firms' concurrence disappear for a certain time, only to see it reappear on a new level. Capital's metabolic relation to other capitals, however, is written across the psychological and physical forms that constitute the labor force as well. In individuals, the process has something even more dramatic, as it is evinced by the observation of the working body that gets increasingly worn down with stress; precarity; pressures to perform; the fear of weakening; increased competition for job vacancies; wage cuts; and budget cuts in practically all sectors of the economy.

It is precisely with regard to the subject of pensions that Duclos emphasizes the mechanics of autophagy, which defines the state of our social and economic systems. It is clear that pensions, administrated by huge investment cartels, are implicated in the general financialization of capital and are thus vulnerable to the same global volatility as oil. Very few businesses are shielded from volatility in the energy sector, which means very few businesses, mutual funds, or pensions are shielded from the economic and environmental force of hydrocarbons. The energy sector thus cuts across all physical and economic sides of the present.

In this respect, the list of industries that fit this description is

long. One can mention hydrocarbon, oil, coal, petrochemicals, mines, the pharmaceutical industry, the production of weapons, computer surveillance, genetically modified agriculture, and so on. The results from these activities increasingly undermine natural and social heritage, and easily outrage the polis. The flow of information on this subject circulates with abundance and ease. Yet, the crux is that it is by this exact harm to the biosphere and to human rights that the high investment revenues will be fed. This will provide (in theory, for the crisis still threatens) a modest old age insurance to millions of workers, or at least to those fortunate enough to be exploited, to have their minds disturbed by work-related stress, and to have their bodies consumed to meet the requirements of a job that is never guaranteed. One of the most terrible particularities of autophagy is that it cannot be stopped, or modified is such a totalizing (*totalisant*) system as the one we experience in that first part of the twenty-first century, where very few individuals can protect themselves from the threats of recessions, austerity measures, and increasingly frequent crises that have become, in recent years, anything but exceptional, a prelude to a kind of general collapse whose end cannot be seen — at least in the West.

There are two things to underline in the above breakdown. First, getting worn out and knocked down by one's job over time may effectively be a privilege in the present context of cyclical crisis, which promotes the permanent anxiety of workers in all sectors and establishes precarity as a norm. This very condition of exploitation as a privilege is a paradoxical and tragic situation that seems to have become generalized. Second, the more or less clear consciousness of being subject to a general and individual autophagy makes very little difference in finding concrete possibilities of escaping this despotic condition which is carefully maintained by neoliberals' dominant discourses. In fact, there is still no sign that the economy would ever alleviate the increasing sense of insecurity.

It is nevertheless thus very likely that these airborne workers imagine their relative position to the labor market as fortunate, rather

than fragile and frayed like those coal miners embedded in Blake's Dark Satanic Mills. After all, their wages are good despite salary expenditures, and they seem to have found a good job that is likely to last (though we can now see the truth about that) — given that since 2008, unemployment has melted like snow in the sun over all of Canada including Québec.

The previously mentioned Radio Canada documentary focuses on the workers of Fort McMurray, presenting a number of laborers who, during the financial breakdown of 2008, not only lost their jobs in paper mills, in forestry, in mining, and in manufacturing industries, but also witnessed a significant loss in their pensions. This loss gives a true meaning to the decades of hard labor melted into the thin air of oil pricing. Some of the workers who were interviewed stood in front of the camera calculating — without any protest — the minimum number of additional years of work in Fort McMurray they have to fulfill in order to recover the sums lost: seven, eight, nine years. They took all of this in, without protesting.

I am writing this text in late January 2015. The price of oil has lost more than 60 percent of its value over the past six months, thus creating an economic and fiscal crisis and rushing Alberta into deficit and recession for the second time in less than seven years. It is quite possible that a good number of the workers of Fort McMurray who took that flight on November 12, 2014, have lost their jobs or feel that their jobs are being threatened by the crisis. Hit hard by the dramatic drop in crude oil prices, the oil companies established in Northern Alberta attempt to scale down their operations, cancel their development projects, and downsize their workforce as soon as possible. The first ones to be dismissed are actually those who are easier to replace — those who can readily be substituted, who have nothing but the strength of their body to offer in exchange for a salary. This again is a scenario akin to that of the industrial revolution of nineteen century.

Boom and Bust

Historically, since Alberta has started developing its oil industry — both in conventional fields and in oil sands — it has been doing so at the rate of the boom and bust cycle. This cycle marks the social and economic history of the province. Its movements, while predictable, seem to provoke an invariably renewed astonishment on the part of provincial and federal governments, as if they were all affected by a collective amnesia, helpless in reaction to this rather frequent phenomenon.[8]

It is on these notoriously volatile oil prices (especially in recent years) that Albertan society bases its economic, social, and fiscal balance, which in turn affects a national scale. The impact of the precariousness of Canada's energy markets tremendously impacts not only the most vulnerable workers of the oil industry but also those whose jobs are more or less directly related to the goods and services of that industry.

The idea of diversifying the economy — calling into question the oil sector's exposure to high risk — reliance on taking risks — was occasionally welcomed by Alberta's and Canada's leaders, but the oil lobby has made this response unthinkable. This inability to develop another possible economic and social plan can be viewed as a typically Canadian habitus of sticking to the simplistic solution of the direct exploitation of so-called "natural resources." It can also be described as a kind of cognitive deficit in imagining a world that would encourage innovative solutions in response to these successive, yet predictable crises. In addition, one should not forget to mention Canada's paradoxical conservative-neoliberal thinking which deems itself rational, while it's basing its whole operational structure on a line of thought that goes against all economic logic. In fact, as the climate change crisis can no longer be denied, it is very likely that world markets will simply lose interest in Northern Alberta's oil sands. Yet, there seems to be a refusal to acknowledge that in the short or medium term, lower demand for this type of heavy oil will affect the

economy. Unexpectedly, the signs of this denial have become evident through the many discourses on global environmental change — another irrefutable phenomenon which often places Canada under the international spotlight. If the world economy loses interest in tar sands, it will be because it produces the most expensive oil in the world, and not because of the environmental reasons. Yet, oil poses more than an environmental challenge to capitalism: as an energy source it gives capital its physical, social, geographical power over laboring bodies. For Marx, fossil fuels are far more than one among many possible inputs to the system of capitalism: rather, they are the defining input. From this vantage, a market-driven transition to a wholly new source appears to be very unlikely.

Three aspects make Alberta, in particular, function as an autophagic society: (1) The volatility of oil prices, over which Canada has neither influence nor authority, (2) the increased uncertainty around Canada's oil future, and (3) the highly selective prosperity that oil exploitation confers on Canadian citizens whenever prices rise. One might dare to say that the province is condemned to consume its own territory, its own resources. It is doomed to attract and then dismiss its Canadian workers as well as its foreign workers. Buoyed by its booms, especially those of 2005–2008, it gains huge amounts of money, only to be then defeated by the successive busts. Thus, unlike Norway, which consistently demonstrates that it knows how to manage its surpluses and thus become one of the richest oil-producing countries in the world, Alberta has notoriously proved itself incapable of making any lasting benefit from its huge fiscal surpluses, which could have protected it from the harmful oil price fluctuations. Massive economic injections brought by Alberta's oil are quite like the junk food that satisfies the bodies of Fort McMurray's oil workers: after an immediate feeling of well-being, nothing remains, nothing but an auto-destructive system forced to feed on itself in order to reproduce itself. Caught in such a vicious circle, this system will sooner or later collapse. It will reach a point of physical, social, economic, and environmental exhaustion.

These observations do not necessarily amount to a moral condemnation, but are rather the result of an analysis of Alberta's recent history and its inevitable dependence on paradigms that presently influence the development of oil markets and environmental data. In respect to labor in the tar sands, Alberta's situation presents a case of complex alienation that seems difficult to overcome. What conditions would allow Albertan society and the most precarious among these workers to break with the current order of things? What would it take them to revolt and bring an end to the vicious circle of autophagy in which both of Alberta's energy and social production are caught? How can Marxist thinking help imagine a post-oil scenario and help liberate individuals from their confinement within classes and from their constant fear of losing their jobs? What would force an autophagic society to change the way it works?

The Privilege of Exploitation

As I have noted previously, the workers of Fort McMurray probably count themselves fortunate to have this job that exhausts their bodies as well as their health. Indeed, the conception of privilege is completely relative. Privilege gets shaped in the mind of a given subject (a researcher in social sciences, for instance) in an autonomous way that allows one to perceive one's own privileges (that we will call bourgeois) according to the notion of "normality." The risk of unemployment and job insecurity exposes the fantasy of a labor-based privilege into a fiction told by the same ideologues that prevent either political or technical transition away from a fossil-fueled capitalism. Compared to what he might have held as a job elsewhere, or rather to joblessness, the worker of Fort McMurray is pleased to have at least been able to recover his pension savings; he is happy that he has one thing in common with the oil market professionals, even if it is on a more modest scale.

In a way, it is paradoxically the structural instability of the neoliberal system and capitalism — its uncertainties and the continued financial crises that have continued to shake it despite the scandalous

inequalities it produces — that ensures its functioning (no matter how chaotic) and aligns Albertan society with its principles. The paradox is that the more capitalism abandons individuals — precisely because of increasing production gains and over-productivity — the more individuals cling to it. There seems to be no other real perceptible options left, especially for those who are aware of their limited qualifications.

Meanwhile, the neoliberal discourse skillfully echoed by the media successfully maintains the illusion that no one is excluded, that all forms of consumption are possible for everyone, that all the services offered are accessible to everyone, and that all it takes to achieve this lifestyle is a small individual effort. Indeed, this is the case for a significant range of Canada's and (mainly) Alberta's proletariat. It is not as if the workers of Fort McMurray were excluded from the salary system or from consumption opportunities: it is rather their inclusion that is at stake. In fact, their inclusion is *almost close to the norm* of a working middle class that enjoys some comfort — yet, a comfort easily threatened — like that of the airlines' economy class. One can certainly take a flight, but the seating area is tight. And so far, things are not that bad. There is no reason to make a revolution.

As such, while my analysis relies on the use of the term *alienation* to describe the condition of Alberta's socio-economy (generally) and that of Fort McMurray workers (specifically), we also realize that the need for liberation from the system cannot occur unless the intolerable would have exceeded a certain level. Thus, as long as it is not understood in terms of a constraining autophagy, Alberta's uncertain situation can undergo no change. This is mainly due to the firm belief in the evolution of economic cycles and in the certain rise of oil prices once again. This emanates from a logical fallacy of balancing supply and demand that denies the possibility that, one day, there might be no global demand for the oil extracted from tar sands, as the threats associated with climate change will become more prominent over time. Investment will probably be made in other types of hydrocarbons, and hopefully, safer and environmentally

acceptable energy sources will be developed. However, this is still an unthinkable scenario that most Albertans find difficult to consider. This is due to the fact that the majority of Canadian citizens cannot grasp the social contradictions of the neoliberal discourse, indeed it is a difficult lesson that unemployment — exposed in the past few years as a structural feature of capitalism — might be overcome through solutions other than oil sands exploitation. Such a conception of the labor market prevails even in Québec where the promotion of social democracy has allowed for publically addressing the topic of social and environmental justice.

In addition, it is important to draw attention to the fact that for the past forty years, Alberta's social discourse has successfully promoted an ethics of individualism among its citizens, which was drawn from the American model. Even if individualism were to be associated with the notion of community — in the narrow sense of the term — it would nevertheless discard the principle of class solidarity. As such, individualism results in perceiving any hindrance to success or to the improvement of certain living conditions only as a contingent event that could be overcome through *individual* will and perseverance. In this realm, the notion of boundary is not perceived as the product of a system. While for the postmodern sociologist this way of conceptualizing things is superficial and lacks pertinence, it is, nevertheless, this very way of thinking that shapes Alberta's social ideology, regardless of the contrasting scenarios brought by reality.

Thus, the Albertan geodestiny gets presented as a unique opportunity allowing for a guaranteed economic benefit — a myth that runs counter to what reality has shown. Alberta's current economic picture is ideologically perceived as acceptable and it could be added that the "opportunity" held by Fort McMurray workers is much envied in the rest of Canada's provinces where there is nothing as such to offer. This might be true, for even in this period of price plunges in the global oil market, the unemployment rate in Alberta is still much lower than in other provinces. However, one should not forget that it is the dominance of the neoliberal discourse promoting

individualism that actually serves to legitimize the Albertan condition, and that rules out all possibility of thinking the current situation in terms of collectivity and class struggle. As such, there is nothing in Alberta's social and economic dysfunctions that cannot be explained in the idiom of individual struggle, luck, or ability to seize opportunities. According to this way of thinking, those who are left behind have no one to blame but themselves. This emphasis on individual responsibility in practically any given situation is what makes the Albertan socioeconomic spectrum unconceivable in terms of "collective alienation" and renders the very concept of class rule inexistent. In the Albertan oil realm, there is no such thing as class hierarchy. There are rather *individuals* seeking their *own* benefits.

Thus, until now, and despite the growing concern caused by the uncontrollable shifts in oil prices, the alienation found at the core of Alberta's socio-economy is still not thought of in terms of collective or even individual autophagy. In a sense, the province produces third-class oil that still takes its place in the market — however tight and controversial it may be — and thus relies on an unforeseeable future to maintain the economy in this way. The deformed bodies of the third class still have the energy to take their seats, still have the patience to wait for their retirement pension, and still hope that their hard work will pay off. All of this is tolerable, and it is exactly this sense of tolerance and failure to imagine things differently that postpones any possible revolution.

A Marxist account of Albertan society and its vision of exploiting non-renewable energy will undoubtedly result in a clash with the discourse of neoliberal individualism, with the linear principles of an economy always governed by a deceptive rule of supply and demand, and with axioms advocating the permeability of class hierarchy — thus making of class struggle a minor topic. More importantly, one will need to look in depth at the robust conceptual framework that makes of Alberta's and Canada's situation a local case study that cannot apply as tightly to the rest of the world — especially when it comes to considering climate change and economic uncertainty in

energy markets. There will be work to do, but it sadly cannot begin until the system would have completely exhausted its capacity of self-reproduction. There is no doubt that facing such a crucial scenario will have a dramatic impact on both the collective and individual level. But for the time being, no one seems to be compelled to revolt. And so we will have to wait.

In the meantime, however, this Calgary-Toronto night flight will bring the exhausted bodies of the oil patch back to central and eastern Canada. After a few days off work spent with family, after some partying (or no partying at all), the third-class oil workers will go back to Fort McMurray, where bitumen waits for the exploited and the exhausted. The oil prices will rise again, and as Albertans say, *they will need our oil, and we will have to sell it to them.* And once again, Alberta's fortune, as well as its workers, will be renewed, as far as the eye can see.

Postscript: After the Fire

The previous sections were written in February 2015. While I was proofing my essay, a fire started. On May 5, 2016, the town of Fort McMurray was engulfed in flames by the worst forest fire on record. 90 percent of some areas of the city were destroyed. The whole population of the town (80,000 people) had to be evacuated in one of the biggest operations of population displacement in Canada's history. This disaster comes as one in a series of shocks to the social democrat–led Albertan government — the New Democratic Party took power in May 2015 much to the surprise of Canada and Alberta itself — the province has been facing a crippling deficit caused by the extremely low price of oil. The price per barrel plummeted to $26 (CDN) in February 2016. At the time of writing, it precariously hovers around $40 (CDN) a barrel. Needless to say, this free fall of the oil price brought a previously unknown unemployment rate of 10 percent to the province as a whole and, perhaps, a higher rate in Fort McMurray. Chances are that the oil workers of that Calgary flight in January 2015 had already lost the privilege of being exploited many

months ago, and now their hope of recovering their pension has gone up in smoke. Their story now belongs with the obscure socioeconomic precarity of the Maritimes, of central Canada, of Québec, and, above all, Newfoundland, which suffers the most from the Alberta oil crisis. While Alberta is on its knees, Newfoundland has been struck down.

With a $10 billion dollar deficit, Alberta now has to face the unthinkable: more than a quarter of its oil production capacity is stalled, with some facilities and plants even now directly threatened by the fire. The 80,000 refugees are scattered all around the province in a poignant diaspora of the absolutely unlucky. The core of oil workers are now without work, homes, and, in some cases, even vehicles. Absolutely nobody knows when they can go back to Fort McMurray, or what exactly they would be returning to, as 1600 homes have been destroyed. The privilege of being exploited is gone with the fire, and Alberta's future has the same opacity as the orange smoke that rises incessantly from the ashes of its oil-boom town. Specialists estimate the total cost of the disaster at $10 billion — the current amount of the Alberta deficit. Other specialists, economists, oil analysts, and political scientists are inordinately cautious in their evaluation of the situation: it seems that the catastrophe has surpassed their capacity to conceptualize the event itself, since their only previous worry was lower oil prices. Some of the usual commentators even somberly hint that rebuilding Fort McMurray as it was before could prove impossible. Those sober comments, remarkably devoid of the optimistic jingoism that characterized Albertan discourses during the Calgary flood of 2013, are haunted by the *nondit*, the unsayable: that the fire of Fort McMurray was in all probability caused by climate change; the climate change caused by fossil fuels, which are produced largely by Fort McMurray, in an improbable but astonishing autophagic circle, fire devouring fire, fire punishing fire. But, at the beginning of May 2016, such an association is the object of a tacit censorship within a massive state of cognitive dissonance that is the current condition of Alberta. Also tacit, but censured, is the corresponding thought: a kind of monstrous poetic justice has befallen the province that is seen as

responsible for the most CO_2 emissions in Canada.

This idea of an appalling punishment is with me as I watch the first group of refugees from the vast windows of the Taylor Library at University of Calgary. They have been flown in by the Albertan government and will now to have a place to sleep and to eat for a little while on the university campus. Service Canada has set up a special office on the second floor of the library that allows the refugees a fast-tracked unemployment insurance application and debit cards issued by the provincial government to cover immediate needs. Some refugees, with whom I spoke, deemed this speedy help insufficient in light of the uncertainties that lay ahead of them and their families for the coming months and up-coming year. There are currently 1000 refugees living on the university campus, and circulating on the ground. They are easily recognizable, whether they walk alone or in small groups. I immediately know who they are, as I myself come from the working class: some are burly, more or less young men, wearing black T-shirts, dark sweatpants or baggie pants, half-laced converse shoes, tattooed, and above all with the obligatory baseball cap that marks these displaced people as markedly *out of place* on a university campus. Some are rather scrawny men, pony-tailed, with bearded faces ravaged by the harshness of life protruding from their hoodies. An obvious mark of these men's class is the cigarette pack visible on their shoulder tight under the sleeve of their T-shirt and their quiet air of people who have seen enough not to be surprised by anything anymore. The exhausted women, many with their even more silent and exhausted children in tow, huge shopping bags in hand, advance slowly. Many are slightly overweight, hair undone, wearing tight T-shirts and capri pants, all in dark colors, which contrast with their bright flip-flops. Calm and poised, they patiently wait their turn, speaking slowly and in low voices. Despite the activities taking place, the dinner room occupied by the crowd of evacuees and their families is eerily silent. In contrast, on the other side of the campus the food court still full of students offers the usual chicken coop clamor.

This displaced, exceedingly *out of place*, new batch of bodies from

the oil of Fort McMurray exhibit the gait and the voice of resignation, even of tranquil fatalism, as they already have begun to suspect that government help will be limited, that they are there for a long haul, and that, two weeks from now, they will still be in the same precarious and unsecure position, but that they will then no longer be of interest to the good people currently so eager to help them. Collective charity likes clear situations and quick solutions: like Christmas turkeys and emergency parcels. Politicians do not like to be reminded of unsolvable and complex problems that continue to linger. All everybody wants is that these bodies from oil go *back to their places* as soon as possible in order to keep the big machine of Fort McMurray running.

There is no sign of revolt among this group of refugees wandering around the campus. Very probably there won't be any: as is the case with those other bodies from oil uncomfortably strapped into their Air Canada seats, revolt is pointless. The object against which one revolts has no face, no identity, no structure, and no response. From their exhausted position, the neoliberalism and the totalizing global capitalism that devours bodies, land, and resources, and disowns the life and the mind of the workers is just too massive an abstraction too heavy to digest or comprehend for any of the wearied people of Fort McMurray.

Notes

1. This chapter was originally composed in French and subsequently translated into English. The original language title was « Les corps du pétrole : les travailleurs de Fort McMurray».
2. See "Fort McMoney, au cœur de l'industrie petroliere," *ici.radio-canada.ca*, http://ici.radio-canada.ca/nouvelle/640485/fortmcmoney-industrie-petroliere-jeu-documentaire, November 19, 2013; and, *Nos hommes à Fort McMurray*, Film, Ça Tourne Productions, 2015.
3. Sandra Conrad, "Coming Apart in Alberta," *Alberta Views* 11.3 (April 2008): 32-37.
4. This is due to the authorities' desire to avoid facing many social demands presented to an already insufficient structure.
5. Looking into the etymology of the word "proletariat," one finds that this term used to describe the laborer who has nothing but his body to offer in order to feed his children's bodies.
6. The irony here is that the Fort Mc Murray oil workers *literally* exploit nature
7. Karl Marx, "The Eighteenth Brumaire of Louis Bonaparte," *Marxists.org*, n.d., https://www.marxists.org/archive/marx/works/1852/18th-brumaire/.
8. The variations of crude oil prices sometimes happen at a sudden rate.

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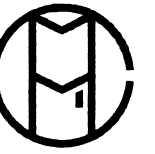

Materialism and the Critique of Energy brings together twenty-one theorists working in a range of traditions to conceive of a twenty-first century materialism critical of the economic, political, cultural, and environmental impacts of large-scale energy development on collective life. The book reconceives of the inseparable histories of fossil fuels and capital in order to narrate the historical development of the fossil regime, interpret its cultural formations, and develop politics suited to both resist and revolutionize energy-hungry capitalism.

Examples of the new fields of critical research included in the book range from Marxist-feminism and an energy-critique analysis, test cases for a critique of "electroculture," an analysis of the figurative use of energies in both political struggle and the work of machines, and the intersection of Indigenous labor and the history of extractivism. Materialism and the Critique of Energy lays the foundation for future study at the intersection of history, culture, new materialism, and energy humanities.