

MINERAL

AN ARCHAEOLOGY OF THE FOSSIL ECONOMY

RITEs



BOB JOHNSON

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Mineral Rites

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Fossil Economy

Bob Johnson



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Preface

A Postcard from the Birthplace of Oil

To begin, a postcard from Titusville.

This hand-colored postcard arrives to us from another time. It takes us back to the birthplace of oil, to Titusville, Pennsylvania, ca. 1859. The picture it portrays is of an undocumented oil fire that occurred forty or fifty years after the nation's first oil strike in the western Alleghenies, and its message is an odd one: "Will you accept this little card in place of a regular New Year's one. . . . I thot [sic] you might enjoy the scene from near my own house."¹

That warm invitation to an industrial disaster, dispatched to a friend sitting in the midst of a cold Michigan winter, presents us with an interpretive dilemma. It contains none of the holiday cheer we expect to ring in the new year—to deliver us into a new season, a new future. No sleigh bells, no garland, no blessings—just this rousing oil fire, its carcinogenic smoke cloud rising, and a warm season's greeting on the back of the card.



A postcard from Titusville. *Reproduction from eBay*

What do we make of this invitation?

The aesthetics of this “oilscape” are not ours. Its mood—or what we might call, after Raymond Williams, its *structure of feeling*—comes from a time before climate change, before the current malaise, that is, before the full impact of industrialization had recolored the world in grey hues.² Its uncanny dialectic of turbulence and calm—of toxicity and leisure—is hard to process. For, on the one hand, we have this billowing cloud of carcinogenic smoke and waste rising boisterously from the center of the picture. It supplies, for all intents and purposes, the main event. On the other hand, the photographer has chosen a queer bourgeois formality and innocence to frame the picture. The sky is not industrial grey but rather hand-colored in pink pastels and robin’s-egg blue, and the foreground showcases a curious innocence of young children squatting at rest in the grass. One young boy reclines in a white suit coat and boater hat as he leans affectionately toward the shoulder of a friend. Another perches on a tree stump in black britches and white knee socks, his shoulders hunched in resignation to the occasion. Knickers, bowties, and derbies, boys lazing on the grass—this is an odd framework for an industrial disaster.



A burning oil tank with children posing in foreground. *Reproduction from eBay*

The message given to us resists the neat political and symbolic boxes we have for making sense of the waste and worry that an oil fire signifies. It refuses to be stuffed into a neat paradigm of melancholy or shame, challenging us instead to embrace a Victorian confidence, a different way of being in oil. Far removed from the scene are the smog of Los Angeles, yesterday's shrimpers collecting compensation payments along the Gulf Coast, and the Larsen Ice Shelf collapsing into the Weddell Sea. These episodes in climate change are part of a future that has not yet been written into the landscape or entered into the historical record. Such worry is put off for another day. These leaky clouds still look like progress.

Context is everything.

The Fossil Economy

The 1859 oil strike that occurred in Titusville, Pennsylvania, marked the nation's first oil boom. It was the original event that set us on the path to becoming a modern petroculture, even if the West had already gone down the rabbit hole of modernization and global warming in its earlier embrace of coal. Petroleum in the West, however, begins here. Titusville was preceded only by the contemporaneous boom in Azerbaijani Baku a decade earlier on the other side of the world. Oil had a history before Titusville, but it was a marginal one. Iroquois Americans harvested petroleum from the region's Oil Creek for use as a tonic and grease. Non-native locals also harvested oil to prepare medicinal emetics, and elsewhere across the preindustrial world, crude oil located near the surface was applied to pipes and ships for waterproofing and, in a few instances, used as a quickening agent to create firestorms in war.³ But until Titusville, oil was only a marginal part of the ecosystem, a quiet resource, a historical bystander rather than participant. It had yet to join coal in the world's coming jubilee.

Tapping into the Petrolia reserve changed all of that. From 1859 forward, these subterranean forces became terrestrial, and the ecology of modern life become increasingly primeval. Crude oil, this residue of fossilized history, of "compressed time," as Jennifer Wenzel puts it, was pumped out of the ground with great speed and rapidly integrated into a transatlantic, and ultimately global, marketplace of commodities that already included colonial consumer goods like sugar, tea, and cotton.⁴ For the next fifty years, petroleum from fields across the globe, such as Petrolia, Baku, Pico Canyon in California, and North Sumatra's Telaga Tunggal, lit up the transatlantic and transpacific

worlds, bullying aside the world's whale oil industry and providing the kerosene for light used in kitchens and bedrooms, factory and office interiors, and bustling urban street corners. Petroleum accelerated and altered the pathways into which coal had already steered us within the fossil economy.

But at the turn of the century, when this picture was taken, possibly when lightning struck an oil tanker in 1894, petroleum was still of a different order. It was a commodity, yes. It was an energy source, sure. And it was the developing world's preferred illuminant, used for lighting up homes and offices. But it was not yet a source of *power* or *work*. The combustion engine was still in its prototype, and no one could have anticipated a raucous mineral economy characterized by 2-ton personal vehicles hurling tens of millions of people across ribbon-like highways or 220,000-ton cargo ships transferring resources and goods in a global system of oceanic highways. Nor could we have anticipated the accumulated costs of these new mineral dependencies, what Bill McKibben has designated to be "the end of nature" that came from unchaining carbon from its underground moorings.⁵ At the turn of the century, when this picture was taken, it was easy to think of oil as a form of light, of lux, of enlightenment, and the scope of its environmental consequences (although not its economic impact) as localized and containable.

This postcard from Titusville reminds us, in other words, that not so long ago we could still gather the nation's middle class around an oil fire with a certain degree of innocence—that it was not so far back in our history that the romantic world of Jane Austen, with its foreground of green meadows, picnic blankets, and thick trees and its background of ugly colonial subsidies of slave labor and wage slavery, had ceded to this hyped up and spastic one of combusted carbon, with its new liberties, new costs, and new enslavements. We are only a few generations gone.

The words of historian Jean-François Mouhot are of some value here: "We have arrived at the present situation (mostly) in good faith, with the conviction that modernity would bring the masses freedom from toil, and without any chance of knowing the climatic consequences of our burning of fossil fuels."⁶ Carbon's most aggressive boosters, from the predatory John D. Rockefeller to the equally destructive Koch brothers, have known better and operated with a systematic cognizance against nature and humanity, but the rest of us might find some reprieve in knowing that the average consumer has until recently participated in carbon's jubilee with an unmeasured innocence.

The Deep Ecology of the Modern Soul

There is, in other words, a lesson to be learned here.

This postcard invites us into forgiveness—to absolve ourselves from having gotten ourselves into this predicament. It gives us permission to move forward with renewed conviction out of carbon’s moment and away from the unanticipated consequences of the choices that brought us here.

Even so, this curious postcard points us to a second lesson. It challenges us to confront what has for too long been a distractedness in attending to the externalities of our lives. Suit coats and black ties, cameras and awkward smiles, GDPs and declarations of progress, our world’s insistence on optimism and an enduring bourgeois insistence on form have for too long worked to silence these clouds that sit so portentously in the background to our lives. Most of us will never travel, dressed in our Sunday best, to the coal mines, oil platforms, and boiler rooms of the world to see what lies beneath the Western standard of living, but we know, deep down, that the logic of the fossil economy ties pleasure to pain, comfort to suffering, and present health to future injury.

This memory from Titusville gives us, that is, a glimpse into the deep ecology of the modern soul and a premonition of the impending collapse of fossil capitalism.

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Introduction

The Mineral Moment

This book is an archaeology of the present. It unearths a buried set of stories about the origins of modern life that center on the pivotal, if sublimated, role that fossil fuels have played in the growth of capitalism and in fueling our affective attachments to modernity. It recovers, in this respect, a genealogy of the modern self, one oriented to a postcarbon future, by demonstrating how our bodies, minds, identity, nature, reason, and faith are energized by, given life by, an infrastructure of carbon flows where we are fleshed out in everyday mineral rites, fossilized rituals, that imbue our sinews with muscle memory, provide material for our imagination and senses, and shape our expectations about being fully human in the twenty-first century. In short, this book proposes an alternative history of modernity that returns our attention to the dialectic of materiality and consciousness, body and affect, that has taken shape under the terms of fossil combustion during the past two hundred years—or, to push the matter further, under the terms of “fossil capitalism” during that time.¹

Genealogy, we know, is grey, meticulous, and heterogeneous—defiant of origins, possessive of its singularity.² Thus each chapter of this book comes at this project from its own uncanny perspective, narrowing in on an artifact, trope, or ritual in the social life of fossil fuels: a chunk of coal recovered from the *Titanic*, a day spent in a hot yoga studio, a postcard sent from the nation’s first oil boom. From that particularity, each chapter maps out, piece by piece, chunk by chunk, the ontological depths of the fossil economy so as to raise to the surface, to make visible, the material, sensory, and emotional substrata through which carbon enters into our lives—into our labor and

play, our bodies and consciousness, albeit in ways stratified by class, race, religion, gender, and nation.

The title of this book, *Mineral Rites*, refers to the various rituals—from the morning shower to online shopping, from freeway commuting to breathing near a petroleum refinery—by which we naturalize these energies, taking them into our bodies in ways we recognize and ways we don't. The subtitle of this book, *An Archaeology of the Fossil Economy*, nods to the type of genealogical work that runs methodologically through it.

The main argument is that modern lives—male and female, white and black, rich and poor, American and Bangladeshi, Christian and Muslim—are conditioned by a global infrastructure of carbon flows that saturate our habits, thoughts, and practices but that tend to be socially barricaded behind No Trespassing signs and cordoned off, symbolically and psychically, from fantasies of the American Dream and its global permutations. Integral to that argument is the assumption that this embodiment of fossil fuels, including our affective attachments to them, is a highly stratified affair, one that cuts along differential axes of power.

At the center of this argument thus stands a paradox first developed in my previous book, *Carbon Nation*. That paradox runs something like this. Fossil fuels are the source of health and opportunity, fertility and reproduction, in the modern world, and they prop up the rich emancipatory qualities that many of us, especially in the upper and middle classes, expect from modern life in the West (including easy mobility, materialism, economic growth, and a diversified palate). But they are also and simultaneously the fuel for widespread social injury and limited horizons, for impotence and decline—a prime mover of fear, neurosis, and terror for those living downwind of power and for those of us staring into an unknowable future.

To be more precise about this, fossil fuels are, on the one hand, the leverage of modern life, the fulcrum on which modern populations pivot. To understand fossil fuels in this sense means understanding that they are not simply “fuel” for our personal vehicles, furnaces, and air conditioners—a source of heat and propulsion—but also a material supplement, an excess of the organic, that grants to modern economies a larger and deeper degree of resource flexibility with which to meet humanity's basic Malthusian needs. We think we know fossil fuels, but we tend to size them up insufficiently. The term *fuel* appears as an impoverished signifier; *energy* a term that merely nails jelly to the wall. Fossil fuels are more than what our language permits

us to see, and thus we need a proper *energy heuristic* to tease out the hidden material functions they perform behind the scenes to birth us into a second nature.

There are at least five functions, or modalities, through which we embody fossil fuels and incorporate them into our daily routine and environment. These include:

- *Ambient energy*: carbon generates the habitat and habitus of home through lighting, heating, and air conditioning (i.e., HVAC systems), remaking the setting and mood of modern life as well as the impression of security in it.
- *Congeaed energy*: carbon creates today's hardened and vertical material environment by expanding the heat supply for blast furnaces, gifting us a tough, soaring, and sprawling world of steel, glass, and concrete, playing a critical role in housing and infrastructure.
- *Polymerized energy*: carbon regains modernity's textures by serving as the fuel stock for a synthesized and pliant world of fiberglass, nylon, polyester, PVC (polyvinyl chloride), and Lycra, plasticizing the world and expanding its fiber supply for the purposes of clothing, furnishings, architecture, and consumer goods.
- *Embodied energy*: carbon reinvents the rules of species reproduction, elevating carrying capacity (i.e., population) and remaking the bioenergetics of food security by both taking us outside of nature's nitrogen and phosphate cycles (e.g., artificial fertilizer and phosphate mining) and providing the background refrigeration and propulsion needed to fatten granaries in a complex global food system.
- *Propulsive energy*: carbon reinvents labor (i.e., work, force, mobility) by supplying mechanical energy in motors, engines, and turbines that propel us beyond the somatic economy of the human body, permitting us to escape an austere preindustrial economy of slaves, servants, serfs, yeoman, hunters, and artisans, driving and accelerating industry, transport, and even leisure.

In these diversified roles, fossil fuels perform an *eco-logical* magic. They flex our resource base, gifting us with a more generous set of options for taking what we need from nature. In effect, they emancipate us from the past, from the older biological constraints of forest growth, soil fertility, draft horses, and slaves that had previously imposed hard limits on reproducing

the essentials of life (fuel, clothing, food, and shelter). By permitting us to move beyond the forest—to circumvent the earth's nitrogen cycle and soil constraints and to escalate our labor productivity beyond the capacity of physical bodies—fossilized carbon rapidly became the foundation for more than a century of optimism about the future. Today, fossil fuels support a global carrying capacity that rises skyward toward ten billion people, looks back on two hundred years of rambunctious growth in global GDP (gross domestic product), and squints hopefully forward, albeit with some trepidation, to a future that does not end in preindustrial austerity or system collapse.

The world's demographic horizons, its potential for life, and the possibilities of its politics all derive from this zombie-like reactivation of fossilized life brought up from underground.

On the other hand, these mineral fuels operate simultaneously as the agents of unrepaired harm, inequality, and evasion. The fossil unconscious—this repressed underside of the fossil economy—is populated by terrors, neuroses, and pain. To speak excitedly, and blithely, as many of us do in the West and the developed core, in tropes of emancipation, opportunity, and progress, is misguided. Such rhetoric reflects a strong bourgeois bias and an unrepentant presentism that naturalizes the vantage point of comfort and endorses a cultural form of fossil imperialism. Such a perspective, long promoted by industry boosters, state actors, and the many beneficiaries of the fossil economy, supposes that these energies have been the main driver of an Enlightenment project originating in the West that produces social mobility, physical emancipation, and material comforts delivered through science, engineering, and vision.

Yet, as we now know, this highly selective representation of the world we live in produces major blindspots and distortions. Opposite, under, and inside of this privileged way of being in fossil fuels are the other partially concealed, and marginalized, experiences of injured peoples, spiraling penury, and broken ecosystems. The fossil unconscious is a register of this misshapen world that buckles under the strains of radical resource extraction and unequal colonial and quasi-colonial practices.

That underside, moreover, is not simply a repository of past and present pain. It is also future-oriented. Combusting our way into modernity has produced not only a Janus-faced landscape of mobility and immobility but also a new environmental stage for us to perform on, a destabilized climate that

veers away from the relatively predictable patterns under which *Homo sapiens* as a species flourished during the Holocene. We live in a new planetary context, even if we are still learning about that context. Extreme heat waves, polar vortices, and the normalizing of drought: these are the barely repressed symptoms of a high-energy world that is producing system failure on a planetary scale—and transferring worry to the future. To steal a phrase from the literary theorist Rob Nixon, we are watching our future be degraded through a type of “slow violence” that does not register in the old ways.³

This is risky because reproducing modernity, even in its plans B and C, presumes climate and water conditions more or less akin to those that allowed for the expansion of agriculture and the creation of a global hydrological infrastructure over the past ten thousand years. The weirding of the earth, or as Bill McKibben suggests, this new “Eaarth,” is no longer promising that sort of predictability.⁴ Fear today lies in the nonlinear. The fragile hybrid crops of the Green Revolution, the resurgence of organic agriculture, the promise of GMOs (genetically modified organisms), and even the lingering practices of hunting and gathering may not weather the unfamiliarity of extreme climate volatility.

And so to our energy heuristic we must add a sixth term to capture this id-like other, a term to name the destructive impulse, the death drive, internal to modernity. We might call it simply *entropic energy* in recognition of the fact that carbon’s combustion works simultaneously to accelerate disorder: to degrade nature’s complexity through emissions and waste (i.e., CO, CO₂, and garbage piles of disposables) and to arm us with the fossilized weaponry and other industrial-grade technologies that shake up social systems, disrupt life patterns, and degrade the ecosystems that *Homo sapiens* depend on to thrive as a species.

Entropic energy (this palpable register of a repressed fossil unconscious) points us back, that is, to the damages and leakage of modernity, to its externalities and its waste products. It thus returns our attention to the heavy-duty scrubbing we have done to keep that leakage off stage and out of our minds, realerting us to modernity’s internal entropy, to the presence of injury, so that we might accept the ambivalence of the world we have created and thus better anticipate our prospects going forward.⁵

We have today some hard thinking to do. It might be true that we humans have a wide latitude in our capacity to construct our demographic horizons and to adapt to material conditions, but even so, demographics—this

art of feeding, fueling, sheltering and clothing people—will provide a bottom line that matters. It will have the final say.

But for now, we trade the future for the present, social excess for social justice, whisking away objections with balloons and confetti. Despite some very good science and a capacity for good sense, we just can't seem but to urge ourselves onward to invest in the project of modernity and to believe that it is simply not finished, that it just requires more fuel. Yet we know that this is the same thing as making peace with our children's downward mobility, ensuring they will live and give birth amid radical worry and stress.

What has made this paradox palatable up until now is that the fossil economy has done real work. It has underwritten two centuries of middle-class expansion and the increased material security of many people at home and abroad. In North America, for instance, combusting carbon, under the terms of fossil capitalism, has been a genuinely good deal for those of us who climbed out of an austere yeoman economy and into a degree of relative privilege and security. Homes that are 2,600 square feet in size (American average), with central heating and climate control, a 26.4-minute commute (American average) without one having to break a sweat, a secure, diversified, and excessive food supply (2,000–3,000 calories, American adult male average) transported through a global infrastructure of calorie production. Such pleasure and privilege are in historical terms not something to laugh off.⁶

Moreover, the mineral economy has operated to reinforce self-interest by performing a certain magic on its beneficiaries. That has been true whether we look at privilege and comfort under fossil communism in the Soviet Union, under fossil fascism in Germany, or under fossil capitalism in the West and now globe at large. Each of these permutations of the fossil economy has managed to cordon off the experience of pain from its main pleasure centers by exiling its externalities, if not always successfully, to far-off places—to Russia's remote Magnitogorsk at the edge of the Ural Mountains, to the water-tight stokehold of the modern steam liner deep below the promenade, or to a depressed Appalachian hollow where disability and economic morbidity are written off as someone else's troubles. We have made sure, that is, that the pain points of the fossil economy have always been cut off socially and psychologically from the joy centers of its marquee geographies, whether the petro mansions of Russia's oil-igarchs or the segregated pastoral communities of the postwar American suburbs.

But what does it mean to sever the moral ligaments of the world we live in? And what does it mean to leverage life today on tomorrow's suffering?

This book seeks an answer to those questions by examining our mineral rites, by picking them up, looking under them, and circling around them so that we can get a more accurate feel for the eroticism they produce and the socioecological costs they reproduce. It focuses particularly on the experience of fossil capitalism in the West, as its rise is today's main storyline. It need not be read in sequence, as each essay is an autonomous meditation on our fossilized lives, although the chapters move forward with some accumulated momentum.

Each of these chapters comes at this project in a unique way by denaturalizing the subject of modernity, taking apart our ways of knowing and being under fossil capital, and subjecting them to scrutiny. Stylistically, they eschew chronology and linear narrative and forego an exclusive reliance on sometimes sterile academic forms to propose a phenomenology of writing that better registers the barrage of life thrown at us each day and that invites us into a bricolage aptitude more suitable to survival under modernity.

The first chapter, "Mineral Rites: The Embodiment of Fossil Fuels," examines how the middle-class self is choreographed by an infrastructure of carbon. To dramatize that point, it turns to the strange and hyperbolic ritual of contemporary hot yoga, using that high-energy site of fossil consumption as a hyperbole for the modern condition at large. It demonstrates how the bourgeois self takes its form in such privileged sites of combustion through an erotic interplay of body, consciousness, and fossilized energy inputs. In so doing, it gives us a portrait of the class dialectic that ties modern self-realization and satisfaction to a sublimated infrastructure of energy flows that generate, as its waste, the derealization, the disability, the labored breathing, and the ecological disarray of modernity's other.

Chapter 2, "Carbon's Social History: A Chunk of Coal from the 1912 RMS *Titanic*," explores the social life of fossil fuels. It returns us to fossil capitalism's purest, most Platonic achievement—the *Titanic*. Centered on a chunk of coal recovered from that luxury steam liner, the chapter takes us back through the commodity chain that drove this monument of fossil capitalism to see how an infrastructure of high-grade coal fueled the *Titanic*'s starkly stratified world of pleasure and risk—of Turkish steam baths and sweaty stokeholds, of hungry Welsh miners and engorged elite passengers, all dialectically bound to one another in this microcosm of fossil capital.

Chapter 3, “Energy Slaves: The Technological Imaginary of the Fossil Economy,” unpacks the fossil imaginary, or to be more precise, it unmasks the technofundamentalist dispositions of modernity that lead us to believe that fossil fuels (and the machines they empower) have emancipated us from nature, from labor, and even from history. Focused on the curious (and quickly forgotten) corporate unveiling of a black robotic slave in 1930 by the Westinghouse Corporation, it traces out the trope of technological servitude from its early appearance in the West’s language of mechanical slaves during the Industrial Revolution through today’s political debates over the role of “energy slaves” in climate change.

Chapter 4, “Fossilized Mobility: A Phenomenology of the Modern Road (with Lewis and Clark),” denaturalizes modernity’s background culture of time and space by recovering the phenomenology of the modern road and modern mobility. To achieve that, it takes us on a tour across the continent with the archetypal trekkers Lewis and Clark, who recorded in great detail what it meant and felt like, in social and sensory terms, to move one’s body across time and space without prehistoric carbon, without the combustion engine, the diesel engine, the railway, or the commercial jet. This chapter thus interrogates our second nature by making visible the strangeness, including the unknown risks and dangers, of today’s uninterrogated culture of automobility.

Chapter 5, “*Coal TV: The Hyperreal Mineral Frontier*,” steps into today’s hyperreal media environment to explore the difficulty of seeing fossil fuels, and our dependencies on them, accurately in the context of systematic media distortions. Focused on a reality television show, *Coal TV*, that followed the lives of hard-rock coal miners in a small and otherwise sleepy town in West Virginia, this chapter shows how today’s media culture has worked to naturalize fossil capitalism and to minimize the costs of our energy dependencies by accommodating them to comfortable liberal, and now neoliberal, tropes of agency and emancipation.

Chapter 6, “Carbon Culture: How to Read a Novel in Light of Climate Change,” returns us to the energy unconscious that sits just beneath the surface of our culture. It applies to our literature the energy heuristic I have outlined and reflects on how fossil fuels drive our cultural texts below the register of plot, showing up as the ambient energy, propulsive energy, congealed energy, polymerized energy, embodied energy, and entropic energy that supply the elemental ground to our fiction. In doing so, it explains how

we can begin to reskill ourselves for reading and writing in light of climate change by becoming attentive to the modalities by which a fossil infrastructure asserts itself both materially and ideationally in our cultural life.

In the Epilogue, this book offers a reflection on the question of temporality in light of fossil-induced climate change by deconstructing three of today's big metanarratives, the Anthropocene, Big History, and the Capitalocene, asking if there might be more productive strategies for writing the history of the now so that it better fits within today's prevailing structures of feeling that can mobilize us to action.

Terms and Definitions

Several key terms knit these essays together, and it is thus worth taking stock of them.

The first term—*fossil economy*—is developed in my previous book *Carbon Nation*, and it is a term that appears periodically in the work of other scholars, perhaps most notably that of human ecologist Andreas Malm.⁷ I utilize this term as shorthand for saying that we have lived, since the mid-nineteenth century, under a different set of ecological and economic assumptions than we did for the previous 200,000 or even 2.5 million years of human history, and that we can thus mark a relatively sharp break between what we call the modern and the premodern worlds (and what we categorize as the industrial and preindustrial experiences). For ecological anthropologists and energy historians, this claim will appear to be old wine in a new bottle. Leslie White, William Catton, E. A. Wrigley, Rolfe Sieferle, Kenneth Pomeranz, John R. McNeill, and Edmund Burke have all argued previously, albeit in different ways and to different ends, that fossil fuels mark the break between the then and the now.⁸ They each explain how new energy flows from below the soil altered the ecological calculus by which we could advance the world's carrying capacity and by which we could engineer radical growth in labor productivity and global GDP. That is, it refers us back to the moment when economics was the world's dismal science—and to when it was realigned to today's boosterism.

For my purposes, this term, *fossil economy* (which refers to a mode of production that emerged two hundred years ago and gradually expanded from a handful of textile mills in the West to the globe at large, affecting over that time pretty much everyone in one way or another), allows us to frame the world we live in as being of a single piece, a synchronic slice in the human

experience. It is a way of defining the modern moment, its origins, its substance, and its finality.

This terminology warrants a curious caveat. Fossil fuels are, of course, not technically minerals. They are organic matter composed of plants and animals, snails and ferns from the long past that became fossilized (or mineral-like) under geological pressure in the absence of oxygen. To be a purist about it, they are thus properly classed with other organic life forms, past and present, that contain carbon, and thus distinct from iron, copper, gold, silver, aluminum, and uranium—these truly inorganic elements that science designates as the real minerals. But the world is socially constructed, and reality doesn't get made in the purity of the glove box. Things, as we know, get messy outside of the laboratory. Coal, oil, and natural gas have long been classified not as organic matter but as minerals in legal, economic, and political discourse, if not in the natural sciences. That is to say, over the course of time, we have decided that oil and coal have less in common with a hungry badger or a blooming petunia than they do with aluminum and iron. Hence, drilling and mining on federal lands were first clarified under an act we call the Mineral Leasing Act of 1920, which lumped fossil fuels into the category of the mineral and promoted their development alongside other inorganic resources like phosphate and sodium. Consequently, we use the term *mineral rights* to designate property regimes in the fossil economy, and hence, the title to this book, *Mineral Rites*.

A second term, *fossil capitalism*, serves a specific purpose in this book. That term derives from Malm's *Fossil Capital: The Rise of Steam Power and the Roots of Global Warming*, which contends that the fossil economy is by origin and subsequent developments a distinct form of capitalism. The fossil economy started, Malm tells us, amid the drive and ethos of industrializing capital in the entrepreneurial textile mills of England, and it served in that context not as the solution to material obstacles nor as an answer to bottlenecks in technological inefficiencies but rather, and quite self-consciously, as the technology by which aspiring capital could increase its control over labor. Malm reminds us, in other words, that the complex of coal and steam was coaxed into life by certain historical actors and for certain class-based reasons.⁹

That argument is compelling for two reasons. First, Malm explains that mechanization in the textile mills occurred not in the absence of cheaper forms of labor, as we might expect, but rather amid a surplus of labor. Mill

owners began to use mechanical energy, whether supplied by water or coal, he says, to circumvent their reliance on the working poor, whose output was not rationalized and who systematically pilfered from the profits of the mills to supplement their meager income. Second, he tells us that coal and steam, as opposed to waterpower, introduced specific managerial advantages for industrial capital. In particular, it gave investors the ability to relocate factories away from a handful of interior waterways, where waterpower was sited, and to capitalize on a different class of workers in cities and towns who were not yet organized. The effect was quite deliberate: steam manufacturing allowed capital the mobility to undercut the strength of men's spinners' unions and to do an end-run around workers' control. It gave capital a more pliant labor force, and it enabled a rationalization of its inputs and output from the top. It allowed modernity's first class to take shape.¹⁰

This arresting meme—fossil capitalism—captures the dominant strain in the West's experience with fossil fuels and in the globe's current experience with them, and it gives us something to swing at. But it too requires a brief caveat because the argument both exercises a sort of originalism, or birtherism, that colonizes the fossil economy's subsequent history and a certain presentism that draws too neat a line from today's impasse to fossil capital's origins. By casting off fossil communism in Eastern Europe and fossil fascism in Germany, Italy, and elsewhere as side notes deserving of only a short paragraph, this argument casually throws off much of the history of the twentieth century. It renders big events like World War II a historical oddity and the Berlin Wall a minor event, while it writes the collapse of communism into its DNA and treats the history of fascism as a thing of the past. These too were fueled by, and they were about, the political command of carbon. The wild success and current victory of fossil capitalism over its competitors does not make fossil capitalism the only, or even always main, storyline, even if it appears that way in hindsight. But even with that caveat, Malm's intervention meets the cut of the pragmatists' razor.

A third term used throughout these essays is *fossil unconscious*. I put forward that term to refer us to the raw underside of the fossil economy, to the alter ego of fossil capitalism, as a way to take us back into our world's infrastructure, into production, and into that barely concealed world of toxic seepage and collective human casualties that has always been part and parcel of the mineral order. The fossil unconscious is thus two things at once. It is first and foremost a material thing, rooted in radical ecological degrada-

tion and the stratified experiences of those who live at the end of carbon's commodity chains. But it is also a psychic matter, a mental maneuver that represses the presence of infrastructure, production, and their human and environmental costs. The fossil unconscious thus refers us back, in this second sense, to those old phrases that were once meant to capture the social dialectic of industrialization's pleasure and pain, phrases like "how the other half lives," "the other America," or "the other side of the tracks"—although, to be sure, it adds to these old concerns a new ecological dimension that refers us also to climate change. The fossil unconscious traces back, that is, to our economy's sacrifice zones, its spaces of economic morbidity, its demented ecologies, and its generation of blocked desires. Its repressive element, which is both psychic and social, encourages us to look away from the alleys, favelas, and underpasses of the fossil economy and away from the crisis that is in front of us. The fossil unconscious is modernity's destructive and antisocial impulse; it is the substance of the modern world's id and a register of that entropic energy that thrusts us forward.

These terms are all reaching toward something. They are reaching toward a temporality of the present, toward a way of slicing history into a meaningful synchronic piece, so that we might get a better look at it and be able to figure out when it was that this "we" began and why this particular version of "we" has gotten us into so much trouble.

Interventions and Threads

By way of closing, let me state up front and more directly a few of the main interventions of these essays.

First, and most obviously, is their focus on how fossil capitalism orchestrates human nature (e.g., bodies, minds, and souls) and nonhuman nature (e.g., soils, forests, and waterways). These essays show how that orchestration occurs through a deep and mostly uninterrogated culture of *mineral rites*, which is, in turn, organized by a transactional marketplace fueled by carbon. To that end, the essays in this book each take inventory of fossil capital's presence, immanence, multiplicity, its little scattered referents, evident everywhere but named only in the breach, to bring it out of the shadow and into the light. They reveal fossil capital to be more than background, more than second nature—to be a historical event and thing of agency, mobilized, reaffirmed, concretized, and validated day in and day out through a praxis of petroleum and through a way of being in bitumen. By returning us

to the world's coal fields, its polyvinyl chloride factories, its hot yoga studios, its dining rooms, its automobile interiors, and its oil refineries, from Los Angeles to Beijing, the following essays give us a feel for how today's fossil economy, organized by capital and engorged by cheap energy, aligns us to capital's blueprint for life, people, and planet.

A second and corollary concern of these essays is the ethics of life under fossil capital. Today, we know that empathy, a core disposition of any ethical system, is in short supply, relegated to the sidelines of history's main event, assumed to be marginal to modernity's real movement. That leaves us with some need to reinstate the centrality of human relationships—of community and solidarity—in our historiography so as to point us toward healing and suturing. To that end, these essays offer a disruptive optics focused on capital's knotted skein of circulations, including all of those seemingly agnostic market operations that twist and distort living today into the systematic abuse of subaltern bodies and the planet's ecologies. The simplest point to be made in this respect is that fossil capital today systematically pits producers against consumers while erasing (i.e., burying inside a global system of impersonal circulations of wealth, labor, and commodities) their solidarity with, and obligations to, one another. These essays provide some counterbalance to that estrangement by walking us back through the world's commodity chains and through their correlating chains of signifiers. By doing so, they highlight the bittersweet and confusing entanglements of living in a world where freedom, health, and mobility generate disability, immobility, and morbidity somewhere else, for someone else, in ways stratified by class, race, gender, and region. If today fossil capital cries out that these relationships are already accounted for by the mechanism of the dollar exchange, these essays suggest that they aren't—and that we all, deep down, really know better.

A third concern of these essays is the importance of politics under fossil capital—in particular, the importance of understanding that a class of architects stand directly and indirectly, wittingly and unwittingly, behind this project. The following essays call attention to the fact that a small circle of financial actors, which we proverbially call the 1%, combined with a panoply of entangled state actors, play an outsized role in directing modernity's project.¹¹ Throughout these essays, we catch these cyclopean giants restructuring the rules of the game that we are all playing as they reorganize transatlantic shipping lines for the *Titanic's* maiden voyage, open and close dirty

strip mines and oil refineries on the periphery, trade stocks behind the enameled brick of the Chicago Board of Trade, and peddle their wares at state fairs and in today's 24/7 hyperreal media—all in order to ensure that drilling remains pleasurable for many, enriching for the few, and unsustainable for all. The fact is that in the twenty-first century a mere ninety private and state-owned companies, in a world climbing to ten billion human actors, account for as much as 63% of the emissions that drive climate change.¹² We are thus not all equal in this mess—and that fact must be kept in sight if our politics are to matter, if we are to swing in the right direction—and if we are to understand why some of us cling to this sinking ship, while others secretly, and not so secretly, welcome the breach in the hull.

A fourth concern of this book is Enlightenment's iron cage—or to be more specific, modernity's faith (and we are talking about fossil capital's version of modernity) in the sufficiency of science as epistemology and technology as theocracy. This too is a legacy fueled by carbon—and it has, over the last two hundred years, cut across the fossil economy's many different permutations. But what we know today in hindsight is that tapping coal and steam—which closely correlated with an unabated acceleration in economic growth and technological change—had a long-lasting ideological impact beyond its obvious material impact. Because machinery and science gave us greater control over nature's energy and work, and because they corresponded with rising GDPs, they came to appear over time to the world's major players as proof of their project—as evidence of its righteousness and rectitude—even as coal and steam supplied, at the same time, those same actors with the physical engines needed to expand their empires. Today, the cornerstones of that Enlightenment project are still standing. They remain the West's preferred knowledge regime, with science and technology still operating, only partly contested, as the privileged “measure of man.”¹³ (Any doubters might turn, for instance, to today's focus on STEM—science, technology, engineering, and math—as exhibit A.) But that barometer broke some time ago, and its mercury leaks as toxically as the story it has told. None of us, of course, wants to throw the baby out with the bathwater, but these essays suggest that we need to put this discourse squarely back into history, into its proper place in our lives.

Finally, the essays in this book strike a different, even uncanny, register of the human experience under fossil capital. They do that by breathing life back into modernity's ontological empire, by resuscitating a repressed body—

its layers of sense, affect, emotion, touch, sentiment—that otherwise gets buried in the world’s official business and all but disappears from its historiographical record. That is, the following essays touch down here and there on the elusive and yet bone-deep domain of infrapolitics where modern bodies are charged by carbon, where they feel the warmth of its heat, the chill of its absence in the blood, the eroticism of its automobility, wind in the hair, sun through the window, and the drip of its sweat deep down in the boiler rooms and back alleys of the world. Such attention to *affect*—to a feel for the world—is reinforced stylistically in these essays by a parallel challenge to the depersonalized rhetoric of academic writing. These essays challenge, at least periodically, what can be too-precious of a commitment to the fiction of detachment that while vital to our labor and profession can at times become a hindrance to communication, understanding, and audience. In this respect, they invite into the text a measure of play, encouraging readers to enjoy the apertures of our reason and the excess and supplementarity of life a little more than is tolerated in academic writing, so as to remind us that the language and history we have today, themselves products of modernity and appendages of fossil capitalism, are not up to the existential and ontological task at hand. These essays suppose, that is, that there might be some agency in contesting the disciplinary protocols that shrink our portraits of modern life down to what can feel all too often like an exhausted, dull, and disciplining affair.

And so . . .

We are not in a place to dither. The moment has reached its crisis. The chips are in, and we all find ourselves, despite our differences and similarities, somehow losing the long game, even if some of us are winning the short one. We are trapped, for better or worse, into using the fossil takeoff to lift us into a postcarbon future. As critic Matthew Huber writes, we have reached an impasse and are stuck with what we’ve got, with learning to leverage the capacities of fossil energy to generate a more sustainable and just future.¹⁴

No one doubts that power and privilege, economic and military might, will matter in the future, that they will determine where shrinking harvests go, which dykes get repaired, and where unpredictable fresh water supplies flow to. We know that the coming heat will not strike all of us equally. But even so none of us will be cordoned off from this species-level threat. Our children and grandchildren will increasingly sweat and worry whoever they are. Without some quick and preconceived plan for adaptation, it is quite

possible, perhaps it is most likely, that we will all shift outside of the Holocene's comfort zone and watch the world's promise of democracy shake and rattle, the world's prospects for upward mobility shrink, and new feudal moats pop up around wealth and privilege.

That uncertainty is ours to share, and thus rethinking our rituals is the task of everyone. We can still hope for a future without moats, with longevity, with compassion, and with equity. But there is no invisible hand to get us there.

One

Mineral Rites

The Embodiment
of Fossil Fuels

Breathe in the warm swell of coal.
Empty your mind of chatter.
Recline into child's pose.
Let the quiet textures of petroleum caress your body.
Congratulate yourself for being here.
This is your hour, your truth.

Our erotic attachments to fossil fuels are ultra deep, to repurpose a phrase used by critics of deep-water drilling. They are rooted in minutia, in the intimate quotidian rituals of the home, workplace, streets, and stores, and such unlikely spaces as the boudoir, the lavatory, and the yoga studio. Fossil fuels compose time and space in the modern world and they leave an imprint on our emotional, aesthetic, and sensory lives. They are both interior and exterior to us. Our relationship to carbon neither begins nor ends, that is, with the pleasures of the gas-fueled automobile and the transoceanic flight, nor is it limited to the sexualized imagery of vehicular mobility and the luminance of the modern city. Such things shape the eros of modern life, especially for the world's middling and aspiring middle classes, but they are only the most transparent manifestations of a much deeper phenomenology of carbon that cuts through our lives in socially stratified ways.

So what is meant by the embodiment, or the eroticism, of fossil fuels? What might it mean to adduce a phenomenology of the present?

Fossil fuels are embodied in the sense that the modern soul is disciplined by and substantiated by, that is, given its essence within, an infrastructure of mineral energy flows (e.g., propulsive energies, ambient energies, con-



Origins. Coal in the hands of a miner. © *Siberia Video and Photo/Shutterstock*

gealed energies, etc.) that assert themselves on the flesh, the psyche, and the horizon of life. This soul, to the extent we can speak of it, Michel Foucault reminds us, is a prisoner of the body—an effect, or an instrument, of disciplinary relations that are imprinted mostly below the register of consciousness but that nonetheless lift up that body, preparing it for flight, press down on that body, burdening it with the world's heft, and endow it, albeit in unequal ways, with a good part of its potential for self-realization. Put a bit differently, the embodiment of fossil fuels describes how today's mineral rites—the body's immersion, or saturation, in the materiality and praxis of modernity's rituals—condition life and being under fossil capitalism.¹

The Eroticism of Fossil Fuels: Part 1

From the first step into the morning shower, a saturate heat breaks through the fog of consciousness. That heat, a fossil heat, conditions the modern body to carbon. These little charges of combustion that warm up the world—and the refined chains of hydrocarbons that texture it—can appear hyperbolic and superfluous at times, and they can be acutely missed in their absence, but throughout the developed world, such carbon inputs

serve as the precondition to modernity's standard of living for the world's upper and middling classes and to the sensual attachments that such a standard of living implies. The textures of the clothing we wear during the day, the food choices we make at breakfast, the tempo and tone of the evening commute, the objects we play and exercise with in childhood and adulthood, and the quality of our sleep have something to do with the extraction, the refinement, and the combustion of carbon.

We might take for illustration one hyperbolic example—the Western middle-class practice of hot yoga. Carbon's cultural work is put on spectacular display in this carbon rite that not only appropriates and repurposes East Indian culture but that appropriates and repurposes subaltern peoples and mineral ecologies around the globe. Here in the yoga studio, whether Bikram yoga, CorePower, or the local mom-and-pop variation, we have a metonym, metaphor, and exaggeration of the modern condition. Hot yoga's wild excess of steam heat, its long stretch of vinyl-wood flooring, its sheen of plate glass walls and mirrors, and its textures of spandex, polyester, and PVC mats immerse the modern body (in this case, the bourgeois body) in a festival of tactile and visual sensations that trace back to the pleasures of combusted and refined carbons. In the hot yoga studio, as in modernity's many other material rituals, the body is acclimated to the surfeit of coal's heat, conditioned to the touch of congealed oil and natural gas, and joined to a subterranean infrastructure of carbon that delivers these little sensations to the skin, ear, and eye.

It is a peculiar moment we inhabit when even the search for the self delivers us back to the coal mine, the oil well, and the boiler room.

Ambient Energy: The Body's Saturation in a Fossil Heat

To understand this structure of embodiment, we can examine its core modalities.

First, this structure of embodiment derives from the body's saturation in a surfeit of mineral heat that carries us beyond the organic forest.

This surplus heat, a fossil heat rather than a traditional organic heat, serves as the precondition of modern life. It arises from the large, controlled burn that has been going on in boiler rooms throughout the West and elsewhere for nearly two hundred years. Today we combust in fossil fuels, in the United States alone, the sustainable growth equivalent of twenty-one billion acres of forest annually, or more than double the sustainable output of the

entire world's global reserves.² Whereas heat in the premodern world had purchase—it was often scarce, limited, hard earned, and frequently visible to the eye—heat today is simply ubiquitous, assumed, and thus invisible. It is ambient. According to philosopher Dennis Skocz we are daily conditioned to this surfeit heat that our bodies absorb unconsciously and that appears without origin: modernity's "warmth and comfort," he writes, "are not perceived as the effect of anything. They simply are experienced phenomena without a history or an anchor in anything outside themselves."³ That heat calms the body when we step into a hot shower, generates the savoriness of soup on a kitchen stove, and provides the security of entering a warm home. It teaches us, he says, "that climate is not an issue and is controllable."⁴

The hot yoga studio makes this ambient energy visible while erasing its source. Steam rises from ventilators to provide a sensory contrast to the cool waterless air of a desert climate, and hot blasts, exceeding 104 degrees Fahrenheit, invite the body into a ritualistic sweating that is grotesque, therapeutic, and perfectly modern. In the yoga studio, this heat is elevated to totem.

Congeaed Energy: The Body and Its Exosomatic Environment

Second, fossil fuels are embodied through what Victor Hugo once called the "consustantial flexibility of a man and an edifice."⁵

The body, phenomenologists tell us, is co-penetrated by its material environment: in our case, by an architecture of congealed carbon—energy transmuted into glass, cement, and steel.⁶ Today modern eyes, ears, and fingertips anticipate a material environment that differs dramatically from the world of wood and stone that the body once navigated, grated against, and enjoyed. Our bodies carry within them the rough memory of knees hitting cement, eyes lingering on the smooth curve of steel arches, and light refracted through plate glass. In this not-so-new world order, walls of steel and a terra firma of concrete are energy incarnate.⁷

The yoga studio, like the rest of our lives, takes part in this symphony, or, depending on the environment, discordance, of congealed carbons. Mirrored walls reflect the body back to itself while a sheen of sheet glass, open steel rafters, and recessed lighting provide alternately quiet and dramatic invitations to the modern eye. An aura of naturalness surrounds this house for the soul, but there is virtually nothing here in the yoga studio that does not depend on mineral heat for its fabrication.

Coal and enlightenment go hand in hand in this space.

Polymerized Energy: The Body and Carbon's Intimate Fabrics

Third, we embody carbon through the intimate fabrics we wear on our bodies and drape in our homes as accoutrements of the self.

Through polymerization—wherein monomers coaxed from hydrocarbons are strung out into chains of polymers and heated into resins—we acquire the elasticity of modern life that we know as spandex, polyester, polyvinyl chloride, and other synthetics.⁸ This carbon that makes contact with the flesh, that drapes down our walls, and that is assembled like idols around our bodies, finds its way consciously and subconsciously into the poetics of daily life, as memories, nerves, and muscles become “encumbered” with these commonplace facts.⁹

This other embodiment of fossil fuels is physical and intimate in the yoga studio. It embraces the lissome stretch of spandex across the thigh, the forgiving cushion of high-density foam, and the damp touch of polyester wicking away sweat from an overheated body. The tree of life might stand boldly at the entrance to the yoga studio, giving to this space the aura of the unprocessed, but we too are polymerized here, bound in body and mind to these manufactured chains of carbon.

Propulsive Energy: The Body Served by Carbon

Finally, our embodiment of fossil fuels derives from the unspoken leisure that carbon affords the modern body as it performs disembodied labor behind our walls and in the other hidden spaces of our lives. This vast kinetic work subsidy shapes all our lives, although in different ways, depending on our social positioning.

In the modern world, mineral heat is commuted into labor—minute by minute—without remark, with each American burning sufficient carbon throughout the day to generate the labor power of nine horses, or what scholars have calculated to be eighty-nine human bodies.¹⁰ And although that work is not always visible to the eye, this infrastructure of empowerment by carbon leaves its bold signature on the nature of our leisure, productivity, and psyche.¹¹

At the close of yoga practice, I anticipate a shower that was not drawn by hand—not by my hand or any other—and I am entitled to a heat not borne of wood or delivered by foot. Electric pumps move heavy rivers of

water (8.3 pounds a gallon/25 gallons a shower) across mountains to deliver little streams to my feet; natural gas lines imbue me with kinetic energy and ready heat at the flick of a switch; and oil pipelines condition me to a universe of horsepower that emancipates me whenever I prefer not to walk, lift, pound, or swing without help.

The body might take center stage in the hot yoga studio, but that body rarely arrives on its own and never leaves without accruing to itself a heavy attachment to kinetic carbons that generate and circulate a staggeringly modern quantity of water, people, goods, resources, and heat. While we crave to leave behind the hustle of a fossil-fueled world when we enter the sacred space of the yoga studio, here too the body is moved by carbon.

Sweet Savasana

But for now—sweet *savasana*.

I take a final drink from a polyurethane water bottle, strip off a pair of nylon-blend Prana pants, and turn the plastic handle of this plastic basin to release the steam of a warm shower. Behind the wall, copper pipelines hiss with gas, electric water pumps churn silently, and a hot burst of water rains down in a cool evening desert. This warm cataract that gushes over my body leaves only the faintest trace of the fracking of California, the drilling of North Dakota, and the strip mining of Wyoming that gives me pleasure.

I needed this. Soaked in coal and oil, I am now fully and finally in my body.

The Eroticism of Fossil Fuels: Part 2

Breath is not universal in the modern world. It takes us back through the stratifications of power and prerogative. To breathe deliberately is a privilege. This breathing in the yoga studio is only half of the story. The fossil unconscious lurks not far below. The entropic energy of fossil capitalism issues forth.

On one side of the spectrum sits this calm breathing of the hot yoga studio where carbon is harmonized and the body tuned to its combustion. Here the potential for self-actualization and health is played out. But like every other fulfillment that carbon enables—the weekend drive, the trans-oceanic flight, the organic apple from Peru, or central heating in the home—a labored breathing, a spectral doubling, takes place somewhere else, whether across the tracks in the city, in a remote Appalachian strip mine, in the blight of the global industrial corridor, or in an unwritten future.

If breath is our metaphor for life, if it signals to us the body circulating in health, then this other breathing is also ours to claim. We have a moral stake in this wheezing on the other side of the tracks even if carbon's infrastructure renders it remote and other.

Ambient Energies: The Body's Saturation in a Residue of Mineral Heat

To flesh out this other embodiment of carbon we might revisit these modalities as they appear to other bodies in other geographies in the form of entropic energy.

First, this mineral heat, which produces life and comfort in one place, produces as its alter ego an unwelcomed heat, a residue, that falls outside of the engineer's control. These eleven and a half tons of coal (or tons of coal equivalent) that are stoked into modernity's furnace annually for each American generate a residuum that expands like a gas, and literally as a gas, to affect our collective health in less salutary ways.¹² The hot yoga studio that commands that fire and brings it to bear down on us in therapeutic manner creates a certain disorder and collateral damage elsewhere.

It is a peculiar hearth that we draw our life from.

July 28, 2014. Navajo Reservation, Four Corners.

The air over the Navajo Nation is thick in some parts with the residue of burned carbon.¹³ The quality of breathing here depends on where you stand. But, as of today, the Environmental Protection Agency (EPA) has decided to enforce emissions regulations that might help to protect the lungs of local workers and neighbors (from mercury, sulfur dioxide, and nitrogen oxide) and to reduce the smog that hangs over the Grand Canyon.¹⁴

This sovereign nation in the heart of the American Southwest is home to the third and fourth most polluting coal plants in the region, the Navajo Generating Station and the Four Corners Power Plant, and it is surrounded by five other massive coal plants privately or publicly owned, each sitting, like opportunists, just on the edges of the reservation.¹⁵ The reservation's Kayenta Mine (an open pit mine in the Black Mesa region owned by the global giant Peabody Energy, recently infamous for its coal slurry pipeline) and the nearby El Segundo and San Juan Mines (also large privately owned strip mines) have come to define the landscape of this region just as surely as its open ranges and rain-carved mesas. Coal mining here means that more

than four hundred acres of reservation land are stripped clean each year of their original ecology. And while coal mining and power generation leave their visible footprint on reservation life, there is also the invisible mineral legacy of five hundred abandoned uranium mines that continue to seep radioactive gasses into the lungs of nearby Diné men and women.¹⁶ In the words of the Navajo Nation's Department of Justice, the reservation functions as an "energy colony" of the modern United States and corporate capital, a place where the externalities of a mass market in cheap heat and electricity are off-loaded into the lungs and bodies of the nation's less privileged citizens.¹⁷ Not-in-my-back-yard politics for those of us living in the Sunbelt means in the backyard of the Diné.

The Navajo reservation, as well as its immediate environs, has long served as an epicenter of Southwestern energy production. The reservation's economy has been dominated since midcentury by coal and uranium mining (making up 50% of the tribe's receipts), and the electric-generating plants that sit on or just off the reservation have played a critical role since that time in the rise of the region's high-tech sector and the culture of the Sunbelt that has grown up with it, as historian Andrew Needham has argued. In fact, the scope of this busy energy intersection's influence is remarkable. Until divestment in 2014, even the Los Angeles Department of Water and Power, located 546 miles away across harsh deserts and mountains, had a firm hand in the ownership of electricity generated here.¹⁸ Which is to say that despite the reservation's seeming remoteness, the Diné people's lives are bound up in a material infrastructure of bourgeois comfort that stretches back into the Black Mesa mines of northern Arizona, into eastern Kentucky's rich mountain ecologies, and into various other subaltern ecologies around the world.

Fossil capital expresses itself differently here than it does in the hot yoga studio. The poverty rate is stuck at a stunning 42% for families who live on the reservation, despite the profitable quantity of exports of coal and electricity delivered offsite. Thirty percent of Diné homes (or a figure that is worse than the impoverished Himalayan nation of Nepal) lack running water and electricity, despite the fact that locals look up at high-power transmission lines that move such resources to middle- and working-class families off the reservation.¹⁹ Moreover, the material dialectic and cultural logic that connects the hot yoga studio to reservation life is evident in the patterns of environmental health on the reservation. Although air quality on most of

Navajo land typically falls within acceptable limits because of its vast size and high winds, the air gets thicker—and filled with pulmonary pollutants like nitrous oxides, sulfur dioxides, and, of course, radon—for families that live near strip mines, uranium mines, and these two-thousand-megawatt power plants that have a poor history of emissions and waste control. Aerial contamination in this high desert is, in fact, so palpable that Grand Canyon tourists complain that the reservation's smog is ruining their family pictures and astronauts once claimed, back in the 1960s, that they could see from outer space a plume of emissions rising from the reservation's Four Corner's Power Plant. Perhaps worse for local lungs is the stark contrast between the clean air of the hot yoga studio and the indoor air pollution that affects a third of the reservation. Although official World Bank statistics claim that the United States is now 100% electrified, 30% of Diné homes lack electricity (and running water), and thus many engage in the dirty business of combusting wood or coal inside homes that leave respiratory pollutants deposited onsite in Diné families' lungs rather than offsite in someone else's.²⁰ Breathing on the reservation can thus be hard in metaphorical, and sometimes literal, terms.

The Navajo reservation cannot be written off as an exception to modernity. It is, as Needham tells us, among the most modern of geographies in the United States.²¹ It is the other half of a dialectic of therapy and injury generated by a fossil heat that draws systemic suffering on the reservation into close quarters with the deep breathing of the modern yoga studio.

Congealed Energies: The Embodiment of Carbon's Discordant Environment

Second, this “energy deepening” that produces the exosomatic environment of modern life—symbolized by the mirrored walls and clean steel lines of the hot yoga studio—also produces as its alter ego a shadow world of hard-breathing, wheezing bodies, of inhospitable concrete, and of contaminated industrialized ecologies across fossil capital's other sacrifice zones.²² Once that wheezing was heard nearby in Sheffield and Pittsburgh, where emissions from heavy metal, cement, and glass production were part of a working-class life that included heightened cardiovascular diseases, cardio-pulmonary diseases, lung cancer, brain cancer, ovarian cancer, and a host of other long-term health risks from heavy aerial contaminants, but today that same wheezing can be heard along a shifting geography of precarity that

binds the health of the world's peoples to one another across state lines, continents, and oceans.

December 21, 2015. Hebei Province.

Beijing is on red alert for the second time this month. This municipality, which is surrounded by the industrial province of Hebei, home to a good chunk of the world's steel production, is four days into a particularly harsh winter inversion that has, like a tight lid on a pot, trapped carbon emissions over the city. The air pollutant PM_{2.5}, particulate matter thinner than a string of hair, circulates here at seven times the recommended maximum exposure. That toxic dust gets sucked into the lungs of industry workers and local residents, causing a host of respiratory problems, especially for the very young and old. The air here is, residents claim, "like a toxic gas," and it can hurt to talk after long-term exposure.²³ Beijing's municipal government has consequently shut down 2,100 factories, confiscated personal barbecues, and warned the city's residents to stay inside near air filters unless it is absolutely necessary that they leave their homes.²⁴ What the quality of breathing will be tomorrow in this city depends largely on what the wind chooses to do.

Hebei Province is among the world's dirtiest provinces in terms of air quality, and it is home to modernity's heavy industries, including steel, glass, and cement. China produces today nearly 50% of the world's steel (in addition to 50% of its cement and 20% of its glass exports), and Hebei province plays a very large part in that manufacturing.²⁵ The air here is thus not really a local problem, or at least not only a local problem. It is a global one, as under late capitalism, the world's smokestacks have been reassigned spatially so as to transfer risk and wealth with an almost Platonic perfection.

In contrast to practitioners in the hot yoga studio, where the point is to breathe deliberately, to take in the environment and lose something of oneself to the world, those living in the global industrial corridor find it healthier to put up a protective barrier against their environment. The images, in fact, are stunning. Across Beijing and Hebei Province, children and parents, laborers and office workers, are found in the streets, in hallways, and on buses wearing air-filtering masks, geared up for what looks like, and is in fact, a chemical attack. Residents here band together not only to pray and meditate but to purchase indoor air filters to strain out particulate matter that they know is the corporeal cost of progress. If 4.2 million people died prema-

turely in 2016 from ambient outdoor air pollution around the world, that burden is not equally shared.²⁶ Bodies that congregate around the world's mines and heavy industries are sacrificed to steel, glass, and cement production; the costs to the unborn and to the young include reduced cognitive development, an increased rate of autism, smaller head circumference, and elevated anxiety and depression in addition to the expected increases in cancers and pulmonary diseases.²⁷ A nineteenth-century smog still hangs over this twenty-first-century life.

Beijing, Suzhou, New Delhi, and frequently in places surprisingly close to home—there is systemic injury built into the world's walls of steel and plate glass.²⁸ These sobering spaces that are chained to the yoga studio remind us that we have never left behind the age of steel and concrete and that a savage industrialism has only been ramped up and relocated to someone else's ecology. But we had, until recently, breathed a little easier thinking things had changed.

Polymerized Energies: The Erotic Residue of Carbon's Textures

Third, the tactile pleasures we get from carbon's intimate objects—the stretch of spandex and Lycra and the soft cushion of a polyvinyl chloride yoga mat—signify the athleticism, freedom, and health of the mineral moment, but this lissome stretching, this signature agility of the modern, also draws us closer to the fracking field and to the world's petrochemical corridor.²⁹ The plasticity we gain from living among foam rubbers, synthetic floorings, polyester textiles, and olefin carpets ties us, that is, to a barricaded, restricted, and off-limits world of hydrocarbon refineries where disability and anxiety are the counterpoint to the health of the yoga studio.

August 1, 2014. Kaohsiung, Taiwan.

Today, a petrochemical pipeline exploded in the city of Kaohsiung, killing 28 people and injuring 268. The explosion left a 6.5-foot trench cutting across 3.7 miles of city streets. It also left 23,600 households without gas supplies and more than half of those families without running water. According to residents, the pipeline explosion “sounded like a bomb,” and one older resident initially thought that mainland China had decided to shell the city. In the days leading up to the explosion residents had been complaining that an unseen but noxious gas, propylene, a chemical ingredient derived from the catalytic cracking of natural gas and used as a feedstock for food

additives, drugs, and, among other things, the synthetic straps and blocks of the hot yoga studio, had been leaking fumes from one of the city's buried pipelines. That gas turned out to be explosive when it hit the sewer system, and the resulting violence brought the underground geography of petrochemical refining a little closer to the quiet reflection of the polymerized yoga studio.³⁰

Kaohsiung City is the core industrial zone of Taiwan, and Taiwan has since the 1980s pivoted on the petrochemical industry.³¹ Plastics, chemicals, and oil are three of the island's top ten exports, and hydrocarbon cracking, the process of turning oil and natural gas into chemical compounds and chains of polymers for synthetic fibers, mats, carpets, and pipes, is a busy business not only here but across the global chemical corridor.³² Kaohsiung City, like the rest of the world's petrochemical geographies, has consequently been what environmental scientists call a "hot spot" for its toxic discharges into water, soil, and air.³³ For instance, recent inspections at the now-defunct Renwu polyvinyl chloride facility of the world's second largest PVC manufacturer, the Formosa Plastics Group, revealed that the groundwater and soil contain exceptionally high levels of carcinogens from plastic production like benzene, chloroform, vinyl chloride, and dichloromethane along with unpronounceable ones like 1,1,2-trichloroethane, 1,1-dichloroethylene, tetrachloroethylene, and trichloroethylene.³⁴ Further downstream Taiwanese bodies host wildly high loads of the endocrine disrupter BPA, or bisphenol A, from the waste stream of another plastics manufacturing plant in the Linyuan industrial zone.³⁵ These wastes, like most other petrochemical releases here and elsewhere, are part and parcel of our synthetic world, and they are closely associated with a range of disorders, including nervous system dysfunction, liver cancer, kidney and heart failure, and reproductive problems. But there is nothing unique to Kaohsiung or Taiwan's largest petrochemical producer. BASF, Dow Chemical, ExxonMobil Chemical, Illiopolis, Illinois, Point Comfort, Texas—the story is nearly the same.³⁶

Modernity's elasticity has its trademarks. Made in Taiwan, made in Bangladesh, and made in the USA. These little signifiers on our water bottles and quick-dry towels tie us into a global ecology of hydrocarbon refining that offloads injury into other bodies and other soils. Ethylene vinyl acetate foam blocks, Lycra yoga pants, plastic water bottles, polyvinyl chloride mats—the things that make the yoga studio a space of emancipation link health to a panoply of unfamiliar petrochemical compounds that stack up as among the

world's most important and hazardous trade goods. Today, this polymerized world is so universal that it sheds a residue of microplastics day and night (from laundering beads to synthetic fabrics like yoga towels and pants) in such high quantities that scientists find emancipated plastic fibers in every water sample on the planet.³⁷

The external costs of today's flexibility are not simply an error of faulty regulation; they are not simply a moral error in our ability to care about other people: these little doses of toxic waste are a founding part of economic growth under the terms of fossil capital. They are part of a mineral moment that makes wheezing and worrying about the lungs of children as modern as the calm deep breath of meditation in the yoga studio.

Propulsive Energies: The Laboring Body under Carbon

Fourth, the movement we derive from combustion, modernity's labor subsidy, is also a premise of the hot yoga studio, even if the human body, rather than the mechanical one, is on display here. This hour of quiet meditation in the middle of the day is made possible for North Americans by a hidden endowment of labor that is equivalent to dozens of human bodies working day and night. This nearly invisible labor force we depend on derives from charges of combustion that allow bodies to circulate without exertion in three-thousand-pound Priuses, water to be pumped interstate across mountains and deserts to bathe the practicing body in humidity, and plate glass walls and steel beams, foam blocks and elastic fabrics, to be shipped across oceans to generate the mood for quiet self-reflection. The automobile, the container ship, and the water pump—the road, the flight path, and the shipping lane—these are embedded in the hot yoga studio, making the textures, the placement, the aesthetics, and the leisure of this space possible, even if for each mile of the road, for each lift of the escalator, and for each pump of the aqueduct that work demands a little sacrifice from some other remote environment and from the people who live in it.

September 11, 2005. Lake Charles, Louisiana.

Residents living near the Pelican Refining Company in this state got a strong inhalation of air laced with BTEX (benzene, toluene, ethylbenzene, and xylene) and hydrogen sulfide today. At low concentrations, the smell of the hydrogen sulfide would have stunk like rotten eggs. At higher concentrations that same gas would have entered the lungs, numbed the nervous sys-

tem, and rendered itself undetectable to the recipient. Breathing downwind from this refinery, one of the Gulf Coast's asphalt manufacturing facilities, meant nausea and headaches for local residents, and over the long term, it meant the body's chronic exposure to abnormally high emissions of the unwelcome volatile organic compounds familiar to oil refining, including the cancerous quartet, benzene, toluene, ethylbenzene, and xylene.³⁸ Mechanical labor and its product, carbon mobility, require processing the world's oil and natural gas, and that can be a hot, leaky, and unhealthy business.

Four of the world's largest oil refineries sit near here as part of a petroleum and natural gas infrastructure that runs for four hundred miles along the northern Gulf of Mexico from Baton Rouge, Louisiana, to Houston, Texas. Not surprisingly, the most contaminated zones are peopled predominately by low-income African Americans and low-income whites. It is here that, among other things, sour crude (with its high impurities of sulfur) from the Gulf, from Mexico, from Venezuela, and from Alberta's tar sands is converted into gasoline, diesel fuel, jet fuel, naphtha, and a host of other fuels and chemical products. The United States remains today the "refiner to the world" and this region is at the center of it all.³⁹ American asphalt—the key to the road—is one of the many products that comes out of this leaky corridor where nearly 50% of the petroleum that reaches the United States is refined.⁴⁰

As the anthropologist Michael Watts explains, there is a chronic leakage, a systemic atmospheric, aquatic, and terrestrial contamination, that is integral to modern work and mobility.⁴¹ Most of that leakage goes undocumented, but periodically it comes to the surface. What is remarkable in the example at hand is that in the twenty-first century, in the presumably developed world, in the world's third largest producer of petroleum, neighborhoods breathed deeply in for years as a refining company, answering to dictates coming from the nation's financial energy center, Houston, operated with no environmental budget, no environmental regulation plan, and no employee tasked with conforming to state and federal regulations. The costs went undocumented for years. They included unwelcome emissions whenever sour crude was off-loaded at cargo docks, further seepage into the ambient air whenever that oil was stored in tanks without an operating roofing system, and chronic leakage into neighborhoods whenever the refinery operated without appropriate scrubbers or flares. It would be comical, if it weren't depressing, that the only plan in Lake Charles was to doctor the

books and to direct endangered employees to trot off to Walmart to purchase flare guns to shoot at the facility's smokestacks whenever the plant's faulty flares went out.⁴²

The air around the Lake Charles refinery complex is just a small symbol of the chronic leakage, legal and illegal, that goes into the air, soil, and water from oil and gas processing across the world's energy frontier. That leakage (symbolized more grandiosely by the Macondo blowout that affected as much as sixty-two thousand square miles of this region's gulf coast) occurs when fossil fuels are pulled out of the ground, whether in Inez, Kentucky, in the Niger Delta, or in the forests of Amazonia; it occurs when oil is transported and refined, whether by ship, rail, or truck, and it finds its personal expression in the CO₂ that pulses out of the automobile on the way to the yoga studio, heating up the planet just a little more each mile.

If the hot yoga studio defines itself as a place of repair and healing, this shadow world is a place of injury—a modernized “wasteland,” to quote one critic, where subaltern peoples engage in “toxic marches” for the sake of their children and where the oily footprint of one state includes as much as sixteen thousand pounds of petroleum waste products annually for each person, with that waste dumped disproportionately into communities of high unemployment, high illiteracy, and ill health.⁴³ Carbon's mineral rites emancipate the privileged body in one place, but they degrade these subaltern bodies elsewhere.

Savasana: Corpse Pose

But life persists. And so to end, a final belly breath.

We relax a second time into *savasana*, or corpse pose, this ritual of death in life, where we register the entanglements between breathing and cessation and pause somewhere between activity and stasis, health and injury. As we subside this final time into oblivion, unwinding through the tensions of the day, we have the opportunity to give up the modern self, to wake up renewed and reborn with a new awareness and with fewer attachments to the material world in hand. We take together a final collective breath and bow to the god that is within us.

Namaste.

Notes

Preface

1. Miss Edith Carpenter, "Burning Oil Tank, Titusville, Pa," duplicate postcard, 1915, in author's possession.
2. Williams, *The Long Revolution*, xv.
3. Black, *Crude Oil*, 5–11.
4. Wenzel, introduction, 8.
5. McKibben, *End of Nature*, 40–80.
6. Mouhot, "Past Connections and Present Similarities in Slave Ownership and Fossil Fuel Usage," 329–30.

Introduction. The Mineral Moment

1. For a definition of "fossil capitalism," see chap. 13 in Malm, *Fossil Capital*.
2. Foucault, "Nietzsche, Genealogy, History," 76.
3. For a definition of "slow violence," see chap. 1 in Nixon, *Slow Violence and the Environmentalism of the Poor*.
4. McKibben, *Eaarth*, 2.
5. Michael Watts has documented the type of structural leakage that occurs in sites of oil extraction. See, for example, "A Tale of Two Gulfs," 444.
6. Mark Perry, "New US Homes Today Are 1,000 Square Feet Larger than in 1973 and Living Space per Person Has Nearly Doubled," American Enterprise Institute, June 5, 2016, www.aei.org/publication/new-us-homes-today-are-1000-square-feet-larger-than-in-1973-and-living-space-per-person-has-nearly-doubled; Christopher Ingraham, "The American Commute Is Worse Today Than It's Ever Been," *Washington Post*, February 22, 2017, www.washingtonpost.com/news/wonk/wp/2017/02/22/the-american-commute-is-worse-today-than-its-ever-been/?utm_term=.5055803d855a; Office of Disease Prevention and Health Promotion, "Estimated Calorie Needs Per Day," *Dietary Guidelines, 2015–2020*, <https://health.gov/dietaryguidelines/2015/guidelines/appendix-2>.
7. Malm defines the "fossil economy" as "an economy of self-sustaining growth predicated on the growing consumption of fossil fuels, and therefore generating a sustained growth in emissions of carbon dioxide" (11–13, 319–20).
8. White, "Energy and the Evolution of Culture," 335–56; Sieferle, *The Subterranean Forest*; Wrigley, *Continuity, Chance, and Change*; Pomeranz, *The Great Divergence*; Catton, *Overshoot*; McNeill, *Something New under the Sun*.
9. See Malm, chaps. 1 and 9.
10. *Ibid.*, 1–19, 194–222.
11. A number of scholars have sketched out a detailed, and eye-opening, portrait of some of the major players and developments in the history of fossil capitalism in the United

States, including Andrews, *Killing for Coal*, Jones, *Routes of Power*, LeCain, *Mass Destruction*, and Needham, *Power Lines*.

12. Heede, “Tracing Anthropogenic Carbon Dioxide and Methane Emissions to Fossil Fuel and Cement Producers.” See also the Carbon Majors website (<http://carbonmajors.org>) for recent information on the major contributors to climate-changing emissions.

13. Adas, *Machines as the Measure of Man*.

14. Huber, *Lifeflood*, 155–70.

Chapter 1. Mineral Rites

1. Foucault, *Discipline and Punish*, 25–28.

2. The US Energy Information Administration (EIA) estimates the 2010 global energy consumption at 524 quadrillion BTU, of which approximately 84% was made up of fossil fuels, or the equivalent of approximately 16 billion tons of coal. In the preindustrial world, an acre of forest could sustainably produce about .73 tons of coal equivalent, and thus we might grossly think of our fossil fuel consumption as something like the equivalent of 21.7 billion acres of forest lands (“International Energy Outlook 2013,” 1, [www.eia.gov/outlooks/ieo/pdf/0484\(2013\).pdf](http://www.eia.gov/outlooks/ieo/pdf/0484(2013).pdf)). For an estimate of the energy yield of a premodern forest, see Vaclav Smil, quoted in Pomeranz, *The Great Divergence*, 308–9.

3. Skocz, “Husserl’s Coal-Fired Phenomenology,” 18.

4. *Ibid.*, 20.

5. Quoted in Bachelard, *The Poetics of Space*, 91.

6. *Ibid.*, 3–37.

7. Johnson, *Carbon Nation*, 21–26.

8. Matthew Huber offers a portrait of how the work of cracking hydrocarbons into various fuels and products produced what he calls the “fractionated lives” of the post–WWII period in which the American standard of living became deeply rooted in oil and its products, which, he suggests, played a material role in propping up an entrepreneurial ethos of freedom and mobility that aligns symbolically with the flexibility of a plasticized world (*Lifeflood*, 302–7).

9. Bachelard, 57.

10. Nikiforuk, *The Energy of Slaves*, 71.

11. Johnson, 14–21.

12. EIA, “How Much Energy Does a Person Use in a Year?,” June 12, 2018, www.eia.gov/tools/faqs/faq.cfm?id=85&t=1. The figure three hundred million BTUs per capita computes to approximately 10.8 tons of coal equivalent.

13. Needham’s *Power Lines* develops in great detail this relationship between the Navajo and the making of the American Southwest. It exemplifies neatly the dialectic between class privilege and subaltern injury, economic growth and its externalities. See chapters 4 and 5, 123–84.

14. EPA, “EPA Cuts Emissions at Navajo Generating Station,” July 28, 2014, <http://yosemite.epa.gov/opa/admpress.nsf/doc6618525a9efb85257359003fb69d/e26806c557e820e485257d2300664dfa!OpenDocument>.

15. See Jordan Schneider, Travis Madsen, and Julian Boggs, *America’s Dirtiest Power Plants: Their Oversized Contribution to Global Warming and What We Can Do about It*, Envi-

ronment America Research and Policy Center, September 2013, table A2, 28, <https://environmentamericacenter.org/sites/environment/files/reports/Dirty%20Power%20Plants.pdf>, and EIA, “Energy Mapping System,” <https://www.eia.gov/state/maps.cfm>.

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41. Watts, “Oil Frontiers,” 190.
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Chapter 2. Carbon’s Social History

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2. Szeman, “How to Know about Oil,” 146.
3. This argument is developed in Burke, “The Big Story,” and Johnson, *Carbon Nation*.
4. De Kerbrech, *Down amongst the Black Gang*, 32–33, 67
5. Hutchings and De Kerbrech, *RMS Titanic Manual*.
6. *Ibid.*, 73–74.
7. Morgan, *Rebirth of a Nation*, 125; Smith, 160–61.
8. Quoted in LeMenager, *Living Oil*, 3.
9. This is taken from the broader portrait of the Welsh coal industry given by Chris William in *Capitalism, Community, and Conflict*. Conditions, of course, varied to an extent from place to place.
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11. “Perils of the Pit,” *Weekly Mail* (Cardiff, Wales), June 27, 1908, 8; “At Lancaster’s Six Bells,” *Cardiff Times*, July 27, 1907, 7; “Fatal Fall of Roof,” *Evening Express* (Cardiff, Wales), September 29, 1909, 2.
12. “Miners and the L.R.C.,” *Evening Express* (Cardiff, Wales), May 15, 1908, 3.
13. “Masters and Workmen,” *Evening Press* (Cardiff, Wales), December 16, 1902, 3.
14. For accounts of the riots, see Smith, 162–63, and “Coal Strike Riots,” *Cardiff Times and South Wales Weekly News*, November 12, 1910, 8.
15. Smith, 169–70.
16. “Statue Commemorates Six Bells Colliery Disaster,” BBC, June 28, 1910, http://news.bbc.co.uk/local/southeastwales/hi/people_and_places/history/newsid_8754000/8754198.stm.
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18. Clark and Clark, “The International Mercantile Marine Company,” 139–142.
19. Barczewski, *Titanic*, 257.
20. De Kerbrech, 41–42. The term *cannibalize* comes from Barczewski, 257. Beyond these sources, there is at least one apocryphal acquisition that makes claims on the voyage’s thrust. Not long ago a revolver from one of the Titanic’s bursars, a man named George Bull, was put up at public auction for £200,000; the story is that Bull and another agent had

traveled to Wallasey in Merseyside in advance of the *Titanic*'s voyage to purchase coal at gunpoint from local miners. We have only oral history to confirm that story, but the class hostility that it invokes—with middle-class guns pulled on striking miners—speaks to the implied structural violence that gave to the *Titanic*—and that still gives to the modern world—its dynamism.

21. De Kerbrech, 41.
22. *Ibid.*, 22–30.
23. *Ibid.* Also, the social architecture of the *Titanic*, including the location of the black gang's quarters, the firemen's passage, and so forth are laid out in Hutchings and De Kerbrech's *RMS Titanic Manual*.
24. Hutchings and De Kerbrech, 86.
25. De Kerbrech, 65–71.
26. Beesley, *The Loss of the SS Titanic*, 17. This book was originally published in 1912.
27. Brewster, *Gilded Lives, Fatal Voyage*, 77.
28. *Ibid.*, 5–121.
29. Scranton, *Proprietary Capitalism*, 198–99; Hall, *America's Successful Men of Affairs*, 256–57.
30. Brewster, 32–33.
31. *Ibid.*, 34, 58.
32. For a detailed description of the ship's facilities and its material culture, see Hutchings and De Kerbrech, and Gill, *Titanic*.
33. Barczewski, 258.
34. Brewster, 107–8. The *Titanica* exhibit at the Ulster Folk and Transport Museum refers to “electric baths” and “electric beds,” for example; see <https://nmni.com/titanic/On-Board/Activities-on-board/1st-Class-Turkish-Baths.aspx>.
35. Barczewski, 21.
36. A contemporaneous description of using this electrical equipment can be found in Onken and Baker, *Harper's How to Understand Electrical Work*, 232. Carolyn de la Pena has written the most comprehensive recent account of the discourses of health relating to electricity, mechanical devices, and the body in *The Body Electric*.
37. Gill, 140. For a sampling of its provisions, see Barczewski, 257–58.
38. Huber argues in *Lifeblood* that oil provided the material foundation for the expansion in the post-WWII period of American beliefs in the entrepreneurial life and bourgeois individualism. To an extent his argument is applicable to the period before the war; an embrace of entrepreneurship and individualism was evident in more restricted ways in the life patterns derived from coal veins.
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40. *Ibid.*
41. Brewster, 12.
42. Behe, *On Board the RMS Titanic*, 111; Gleicher, *The Rescue of the Third Class on the Titanic*, 41–44.
43. Gleicher, xii–xv.

44. Nick Barratt details the sequence of events in *Lost Voices from the Titanic*, 110–14.

45. *Ibid.*, 145–46.

46. De Kerbrech, 132–41; Barratt, 126–30.

47. De Kerbrech, 132–41.

48. Barratt, 142, 152.

49. Gleicher details the survival rates by class and ethnicity and argues that a number of decisions were made to maintain order based on ethnic and class assumptions of steerage men being “dangerous individuals” (41–44, 277–78). This assessment also fits with Steven Biel’s contention in *Down with the Old Canoe* that racial and class prejudices fundamentally structured how the disaster was represented in public memory (42).

50. Gleicher, 41–44, 277–78.

51. Helen Churchill Candee, “Sealed Orders,” *Collier’s Weekly*, May 4, 1912, 10–13.

52. Behe, 134, 391. See also Biel, who argues that gender and class myths of civility and danger have framed how this disaster was remembered after the fact as survivors struggled to make sense of acute trauma (16, 27, 29).

53. Barratt, 164.

Chapter 3. Energy Slaves

1. For a discussion of technofundamentalism, see Dinerstein, “Technology and Its Discontents,” 569. Andrew Hoffman offers a lucid interpretation of what he calls the “optimistic” path that we are hardwired to endorse in thinking through technology and climate change (*How Culture Shapes the Climate Change Debate*, 30).

2. Petrocultures Research Group, *After Oil*, 13.

3. The term is from the *San Antonio Light*, September 6, 1931. For additional accounts, see E. C. Taylor, “Machines That Are Almost Human: Mechanical Men,” *Buffalo (IA) Tribune*, April 19, 1931, 6, “Wonders of Electricity,” *Baldur (Manitoba) Gazette*, July 2, 1931, 8, “Armory Prepared for Progress Exposition Which Opens Monday,” *Syracuse (NY) Herald*, May 3, 1935, 3; “An Electric Flea Circus,” *Mail* (Adelaide, South Australia), January 3, 1931, 19, Schaut, *Robots of Westinghouse*, Cybernetic Zoo, www.cyberneticzoo.com, and Paleo Future, www.paleofuture.com.

4. On the anthropomorphizing of Westinghouse robots, see Toton, “From Mechanical Men to Cybernetic Skin Jobs,” 30–31, 54.

5. “An Electric Flea Circus,” 19.

6. “Higbie, “Why Do Robots Rebel?”

7. Taylor, 6; Toton, 69–74. See also Gregory Hampton’s *Imagining Slaves and Robots in Literature, Film, and Popular Culture* for a discussion of discursive parallels between antebellum representations of slavery and robotic narratives of servitude.

8. Pomeranz, *The Great Divergence*.

9. Kakoudaki, *Anatomy of a Robot*, 161.

10. For background, see Rabinbach, *The Human Motor*, 49–52.

11. Johnson, *Carbon Nation*, 42–46.

12. House of Commons, “Slaves,” 25.

13. *Ibid.*

14. *Ibid.*, 28.

15. de Vogüé, “Electricity at the Paris Exposition,” 193.
16. *Ibid.*
17. *Ibid.*, 195–97. E. A. Wrigley notes that economist Pierre Emile Levasseur also developed this analogy in the 1880s (*Continuity, Chance, Change*, 76).
18. Quoted in Dinerstein, 569.
19. Pennsylvania Joint Committee on Electrification, *Rural Electrification in Pennsylvania*, 4; *Power and the Land*, directed by Joris Ivens (Rural Electrification Administration, 1940), VHS.
20. Gainaday Company advertisement, *Good House Keeping*, February 1919, 152.
21. “About Reddy Kilowatt,” www.reddykilowatt.org/about.
22. US Census Bureau, “Lighting Equipment: Housing—General Characteristics,” 1940, table 8a, 24.
23. US Census Bureau, “Median Value of Assets for Households,” 2011, table 1, <https://www.census.gov/data/tables/2011/demo/wealth/wealth-asset-ownership.html>.
24. International Energy Agency, “World Energy Outlook 2017,” executive summary, 6, <https://iea.org/textbase/npsum/weo2017sum.pdf>.
25. Jackson, “Idle Slaves of the South,” 613–14, 655–57.
26. *Ibid.*, 613–14.
27. *Ibid.*, 655–57.
28. “Thirteen Slaves for a Nickel,” 552–53.
29. *Ibid.*
30. *Ibid.*
31. According to Toton, the concept of the robot as servant was tied to a gendered logic of marketing domestic help to middle-class housewives (39, 56–57).
32. Rabinbach, 64–96.
33. “Proceedings of the Committee on Dynamics Held at the Franklin Institute,” 6.
34. Smith, “Manpower Plus Horsepower,” 29–30.
35. Gilbert and Pogue, *Power*, 7.
36. Fuller, “U.S. Industrialization,” 57.
37. White, “Energy and the Evolution of Culture,” 335–40.
38. *Ibid.*
39. McNeill, *Something New under the Sun*, 11–12, 15–16.
40. See Pritchard, “Situating Routes of Power within the History of Technology,” 20, and Jones, “Response,” 28–30.
41. Nikiforuk, *The Energy of Slaves*, 65.
42. LeMenager, “Comments,” 12.
43. Rönnbäck, “Slave Ownership and Fossil Fuel Usage,” 6.
44. Degani, Hornborg, Strauss, and Love, “Theorizing Energy and Culture,” 74.
45. Nikiforuk, 65.
46. Mouhot, “Past Connections and Present Similarities in Slave Ownership and Fossil Fuel Usage,” 329–30.
47. Debeir, Deléage, and Hémery, *In the Servitude of Power*, 36, 60; Nikiforuk, 3. The emphasis is mine.

48. Nikiforuk, 4–6, 13–14.
49. Jones, 28–30.
50. Hornborg, “The Fossil Interlude,” 50.
51. Johnson, 3–40; Huber, *Lifeblood*.
52. de Jouvenel, “Utopia for Practical Purposes,” 442–43.
53. Pritchard, 5.

Chapter 4. Fossilized Mobility

1. Solnit, *Wanderlust*, 9; Kern, *The Culture of Time and Space*.

2. *Automobility* is a term developed in the writings of a number of automobile critics. Typically, it is used to define the culture of the automobile itself, but I have broadened it, with, I think, good reason, to mean the reliance on the various technologies of automobility from the railway and trolley to the automobile and airplane, each of which permits the body to move without labor. The risk here is that the unique cultures that attend each of these transportation technologies over time and space gets diminished some, but the advantage is that such a broadening highlights the immense cultural and material divide between this modern culture of movement and the one that preceded it. See Seiler, *Republic of Drivers*.

3. Associated Press, “Americans Drive 3.1 Trillion Miles in 2015, a New Record,” *Los Angeles Times*, February 22, 2016, www.latimes.com/business/autos/la-fi-hy-driving-record-miles-20160223-story.html; EIA, “Oil: Crude and Petroleum Products Explained,” November 28, 2016, www.eia.gov/energyexplained/index.cfm?page=oil_use. EIA, “Passenger Travel Accounts for Most of the World Transportation Energy Use,” November 19, 2015, www.eia.gov/todayinenergy/detail.php?id=23832. The figure of 60% derives from the addition of aviation, road travel, sea navigation, and railway (International Energy Agency, “Total Final Consumption by Sector,” *Key World Energy Statistics*, 39, <https://webstore.iea.org/key-world-energy-statistics-2017>).

4. More remarkable is the fact that these figures *underrepresent* the degree to which our expenditure of fossil fuels is tasked with the circulation of bodies, resources, and goods. Not included in that calculation is the energy needed to produce the infrastructure itself that makes all of this movement possible, including such things as the amount of energy spent on molting iron into steel for chassis and engines, on crushing, heating, and pulverizing rock to make concrete roads, and on providing the resource inputs to make asphalt pavement and plastic automotive interiors. Three tons of concrete alone are produced each year per person globally for things like road and bridge building, and the process of its manufacturing generates as much as 5% of the world’s emissions, making it arguably the dirtiest and most energy intensive of modernity’s industries (World Business Council for Sustainable Development, *The Cement Sustainability Initiative*, July 2002, 13, <http://web.archive.org/web/20070714085318/http://www.wbcds.org/DocRoot/1IBetslPgkEie83rTaoJ/cement-action-plan.pdf>).

5. Dwight D. Eisenhower to Chief Motor Transport Corps., November 3, 1919; William C. Greany, “Principal [sic] Facts Concerning the First Transcontinental Army Motor Transport Expedition, Washington to San Francisco, July 7 to September 6, 1919,” undated, www.eisenhower.archives.gov/research/online_documents/1919_convoy/principal_facts.pdf.

6. Greany.

7. Journals of Meriwether Lewis and William Clark, Clark, undated, ca. January 21, 1804. All subsequent citations to entries in the journals of Lewis and Clark refer to the University of Nebraska-Lincoln's digital archives of the Corps of Discovery Expedition, <https://lewisandclarkjournals.unl.edu/journals>.

8. Thomas Jefferson laid out the imperial rationale behind the Corps of Discovery in his confidential letter to Congress on January 18, 1803 (US House of Representatives, "President Thomas Jefferson's Confidential Message to Congress Concerning Relations with the Indians and Proposing an Expedition to Explore across the Continent to the Western Ocean," US National Archives and Records Administration, www.archives.gov/education/lessons/lewis-clark/images/jefferson-letter-04.gif).

9. Cronon, *Nature's Metropolis*, 63.

10. The term *derealization* comes from Margaret Morse and is quoted in Seiler, 139.

11. As examples, see the following entries: Lewis, September 17, 1804; Clark, April 7, 1806; Lewis, July 10, 1806; John Ordway, May 5, 1805.

12. Lewis, June 1, 1806; Lewis, June 1, 1805; Patrick Gass, October 17, 1805; Joseph Whitehouse, July 23, 1805.

13. Clark, June 23, 1805.

14. Lewis, April 24, 1805.

15. Lewis, undated, winter 1804–5.

16. Whitehouse, May 29, 1805; Whitehouse and Clark, October 18, 1805; Lewis, April 14, 1805; Clark, January 22, 1806; Clark, January 22, 1806.

17. Clark, October 30, 1805.

18. Clark, November 12, 1805.

19. See, for instance, Ordway, August 17, 1805; Clark, "Weather," September 1806, and Lewis, July 11, 1806.

20. Clark, December 29, 1805.

21. Kern, 123–24, 145.

22. See Scott's concept of legibility in *Seeing Like a State*, 2–3.

23. Lewis, September 5, 1803.

24. Ordway, May 4, 1805.

25. Ordway, July 11, 1805.

26. Clark, March 17, 1806.

27. Clark, July 12, 1804.

28. Whitehouse, February 22, 1805.

29. Clark, December 6, 1805.

30. Clark, July 1, 1804.

31. Clark, June 30, 1804.

32. Whitehouse, June 22, 1804.

33. Johnson, *Carbon Nation*, 56.

34. Today's biometric apparatuses like the Fitbit are not much better in representing these material facts, even if they inch us toward an understanding of the strangeness of the modern. For instance, I can track that my body moved over fifteen miles today by bike, that along the way I burned about 350 calories of fuel (i.e., energy), and that my work output for

that short and exhausting forty-five-minute period was approximately 145 watts, or one-fifth the capacity of a horse. With a little extrapolation, I can conclude that this middle-aged male body can muster up (for a short period of heavy exertion) about the same amount of work it takes to move a Subaru Outback about a quarter of a mile down a flat road at a good pace. Still, this is a pale dramatization.

35. Lewis, September 1, 1803.
36. Lewis, July 4, 1805; Ordway, August 16, 1804.
37. Clark, August 18, 1804.
38. See Seiler, chaps. 2 and 4.
39. Quoted in Seiler, 146, 140.
40. Baling invoices, codex C, winter 1804–5.
41. Clark, January 31, 1805.
42. Lewis, July 7, 1805.
43. Clark, January 1, 1805.
44. Lewis, June 8, 1806.
45. Clark, April 14, 1804.
46. Clark, October 21, 1805.
47. Clark, September 8, 1806; Clark, August 28, 1805.
48. Whitehouse, October 20, 1805.
49. Lewis, April 27, 1806.
50. Clark, October 21, 1805.
51. Ibid.
52. Clark, September 14, 1805; Whitehouse, September 14, 1805.
53. Clark, July 4, 1804.
54. White, *The Organic Machine*, 3–29.
55. Whitehouse, May 13, 1805.
56. Clark, May 24, 1804.
57. Ordway, September 30, 1804.
58. Lewis, June 2, 1805.
59. Seiler, 69–104; Huber, *Lifblood*, vii–xxii.

Chapter 5. Coal TV

1. Huber, *Lifblood*, xii.
2. EIA, *EIA Coal Data: A Reference*, February 1995, 17–18, https://books.google.com/books?id=c6fPzHx5UYEC&pg=PP4&source=gbs_selected_pages&sig=ACfU3U1KNzitICnSApoLMenSFv8TeSCs5g&hl=en#v=onepage&q&f=false; EIA, “How Much of U.S. Carbon Dioxide Emissions Are Associated with Electricity Generation?” www.eia.gov/tools/faqs/faq.cfm?id=77&t=11.
3. Celinda Lake, Daniel Gotoff, Kristel Pondel, Alex Dunn, and Christine Matthews, “Public Attitudes on Mountaintop Removal,” Lake Research Partners, Washington, DC, and Bellwether Research and Consulting, Alexandria, VA, 2011, www.lakeresearch.com/news/mtr/MTR%20Slides.pdf.
4. Nathan Joo, Matt Lee-Ashley, and Michael Madowitz, “Fact Sheet: Five Things You Should Know about Powder River Basin Coal Exports,” August 19, 2014, Center for Ameri-

can Progress, www.americanprogress.org/issues/green/report/2014/08/19/95820/fact-sheet-5-things-you-should-know-about-powder-river-basin-coal-exports.

5. Christopher Jones argues that we have a “petromyopia” in the energy humanities; this is a largely true but oversimplified claim. See his “Petromyopia.”

6. “Cobalt Coal Reopens Westchester Mine,” *Coal Age*, July 20, 2010, accessed February 12, 2017, www.coalage.com/coal-in-the-news/latest/cobalt-coal-re-opens-westchester-mine.

7. Spike TV, “Learn the Truth about Coal,” *Spike*, February 25, 2011, www.spike.com/articles/7n8hnx/coal-learn-the-truth-about-coal; Spike TV, “Spike TV Digs ‘Coal,’” October 14, 2010, www.spike.com/articles/qj5luw/coal-spike-tv-digs-coal; Mandi Bierly, “‘Deadliest Catch’ Producer Talks Upcoming Season and New Show ‘Coal,’” *Entertainment Weekly*, March 23, 2011, www.ew.com/article/2011/03/23/thom-beers-coal-deadliest-catch.

8. Epstein and Steinberg, “Life in the Bleep Cycle,” 91.

9. Ibid.; “‘Deadliest Catch’ and ‘Axe Men’ Creator Thom Beers Talks About His New Show, ‘COAL’.”

10. “‘Deadliest Catch’ and ‘Axe Men’ Creator Thom Beers Talks About His New Show, ‘COAL’.”

11. Dana Jennings, “Grab a Brew while They Face Death,” *New York Times*, March 24, 2011, www.nytimes.com/2011/03/27/arts/television/coal-on-spike-aims-to-attract-male-viewers.html?_r=0.

12. “‘Deadliest Catch’ and ‘Axe Men’ Creator Thom Beers Talks About His New Show, ‘COAL’.”

13. Associated Press, “Mine in TV Show ‘Coal’ Gets Fined for Endangering Miners,” April 8, 2011, www.foxnews.com/entertainment/2011/04/08/tv-coal-gets-fined-endangering-miners.html.

14. William Egginton proposes that viewers turn to reality television “to watch the human dramas that emerge around those who lose” (“The Best or Worst of Our Nature,” 179). While Egginton is speaking about reality contest shows, docudramas like Beers’s series likewise, I suggest, trades on a similar pursuit of pain.

15. Spike TV, “Spike TV Digs Down Deep for New Original Series,” January 5, 2011, www.prnewswire.com/news-releases/spike-tv-digs-down-deep-for-new-original-series-coal-112943774.html.

16. Bakhtin explains that the novel has a dialogic quality to it in which the reader enters vicariously into different characters’ lives and consciousnesses; see *The Dialogic Imagination*, 259–422.

17. Adorno, *The Stars Down to Earth*, 150.

18. The material was perceived to be so good that the scene was apparently restaged for dramatic effect after the initial “real” firing went unrecorded (Zack Harold, “‘Coal’ Puts on Best Fact,” *Charleston (WV) Gazette Mail*, March 30, 2011, www.wvgazette.com/News/201103290858).

19. See, for instance, the opening credits, episodes 4, 7, and 9.

20. In episode 4, we hear that “for Mike, keeping the mine afloat is about more than just business. I’m a bigtime family man and, ah, that’s why I’m doing this. . . . I’m doing it for the family. We got three kids and a wife that are counting on me. We are not a big corporation. Our necks are on the line.” We also learn that Mike relies on G & L Trucking and

that too is a “family business . . . Family man, good father, you see his son hanging with him . . . Those are the kind of people I want to do business with.”

21. See the *Coal* blog stream, wvbroadcasting.net, Coolbreeze, April 23, 2011, www.wvbroadcasting.net/viewtopic.php?f=3&t=18765.

22. Trip Gabriel, “50 Years into the War on Poverty, Hardship Hits Back,” *New York Times*, April 20, 2014, www.nytimes.com/2014/04/21/us/50-years-into-the-war-on-poverty-hardship-hits-back.html.

23. Lindsey Abrams, “How the Coal Industry Took over West Virginia,” *Salon*, March 3, 2014, www.salon.com/2014/03/31/how_the_coal_industry_took_over_west_virginia; Trip Gabriel, “West Virginia Coal Country Sees New Era as Donald Blankenship Is Indicted,” November 30, 2014, www.nytimes.com/2014/12/01/us/west-virginia-coal-country-sees-new-era-as-a-mine-boss-is-indicted.html?_r=0.

24. US Census Bureau, “Quick Facts: McDowell County, West Virginia,” www.census.gov/quickfacts/table/EDU635214/54047; “County Profile: McDowell County, West Virginia,” Institute for Health Metrics and Evaluation, www.healthdata.org/sites/default/files/files/county_profiles/US/2015/County_Report_McDowell_County_West_Virginia.pdf.

25. The Cobalt Mine was a nonunionized mine. Consequently, the difficult subjects of unionization, wages, and benefits were scrupulously left out of the series by the producers. Moreover, not long after the series was canceled in late 2011, the Cobalt miners decided to secure legal counsel and collective bargaining rights under the United Mine Workers Association, suggesting that things were not so, well, let us say, familial down in the pit. The paternal elders in the Cobalt family were running at the time (and on the side) a coal consulting business called New Tech Mining, Inc., that promised they could deliver to would-be investors a “100% union free workforce” as well as much coveted “confidentiality—internally and externally.” The Cobalt family might not be so friendly. Crowder’s company responded swiftly and brutally by laying off the unionized miners, closing the mine, and then reopening it shortly after with nonunionized labor supplied by a subcontractor. That episode in union busting was so transparent that Cobalt Coal was ordered by the National Labor Relations Board to rehire the workers and to compensate them with back pay. Unfortunately, the story ended when Cobalt did what all good union busters do: it simply closed down the mine; and left the twenty-three miners who were discriminated against with approximately five hundred thousand dollars lost in back pay. See Tom Roberts and Mike Crowder, “New Tech Mining, Inc.: Company Mining Abilities and Startup Support,” http://newtechmining.com/NEW%20TECH%20MINING,%20INC%20presentation_files/frame.htm, and Paul Nyden, “Coal Company from Spike TV Series Cited by NLRB,” *Charleston (WV) Gazette-Mail*, April 2, 2014, www.wvgazette.com/business/coal-company-from-spike-tv-series-cited-by-nlr/article_159920a4-5b8b-5561-be0e-116829cbc237.html.

26. Ben Jervey, “*Coal*, the Great New Reality TV Show That Totally Misleads You about Modern Mining,” *Good*, April 8, 2011, www.good.is/articles/coal-the-great-new-reality-show-that-doesn-t-actually-show-the-reality-of-modern-mining.

27. Halttunen, “Humanitarianism and the Pornography of Pain in Anglo-American Culture.”

28. Al Norton, “411mania Interviews: Thom Beers,” March 30, 2011, <http://411mania.com/movies/411mania-interviews-thom-beers>.

29. See Appadurai, introduction to *The Social Life of Things*.
30. Ibid. I have adopted here the language of Appadurai, although I have repurposed it to fit my discussion of the ecology and class politics of this fuel commodity.
31. Bierly.
32. Mandi Bierly, “Spike’s Reality Show ‘Coal’ Earns Violations for Coal Mine,” April 8, 2011, <http://www.ew.com/article/2011/04/08/spike-coal-mine-violations>; Marc Hoffstatter, “Learn 10 Things about Coal in This Episode Three Summary,” *Spike*, April 4, 2012, www.spike.com/articles/dxsjtf/coal-learn-10-things-about-coal-in-this-episode-3-summary.
33. Jervey.
34. EIA, “Major US Coal Mines, 2016,” www.eia.gov/coal/annual/pdf/table9.pdf.
35. EIA, “Coal Productivity by State and Mine Type, 2016 and 2015,” www.eia.gov/coal/annual/pdf/table21.pdf.
36. Katie Valentine, “Scientists Have Now Quantified Mountaintop Removal Mining’s Destruction of Appalachia,” *Think Progress*, February 11, 2016, <http://thinkprogress.org/climate/2016/02/11/3748303/mountaintop-removal-flattening-appalachia>.
37. Spike TV, “Learn the Truth about Coal.”
38. Hamilton, “Climate Change,” 4.
39. Beck, “Living in the World Risk Society.”
40. Simon Hefer, “Editorial: If We Take Away Risk, then Capitalism Is Finished,” *Telegraph* (London, UK), September 19, 2007, www.telegraph.co.uk/comment/3642776/If-we-take-away-risk-then-capitalism-is-finished.html.
41. Mankiw, *Principles of Economics*, 583.
42. Mark Layton, “Taking Risks to Create Value—It’s What Capitalism’s All About!,” International Risk Management Institute, Inc., September 2007, www.irmi.com/articles/expert-commentary/taking-risks-to-create-value-its-what-capitalisms-all-about.

Chapter 6. Carbon Culture

1. Petrocultures Research Group, *After Oil*, 41.
2. Macdonald, “Oil and World Literature,” 7.
3. Ghosh, “Petrofiction,” 29–34.
4. Macdonald, 31.
5. Wenzel, introduction, 11.
6. For example, see LeMenager, *Living Oil*, Worden and Barrett, *Oil Culture*, and the experimental essays in Szeman, Wenzel, and Yaeger’s *Fueling Culture*.
7. Hawthorne, “The Ambitious Guest,” 174–76.
8. Ibid., 175.
9. Sinclair, *The Jungle*, 69.
10. Ibid., 57, 60, 94.
11. EIA, “Estimated Primary Energy Consumption in US, Selected Years, 1635–1945,” www.eia.gov/totalenergy/data/annual/showtext.php?t=ptb1601.
12. Ellison, *Invisible Man*, 5–7.
13. Ibid.
14. Wallace, *Infinite Jest*, 3, 15.
15. Melville, “Paradise of Bachelors and Tartarus of Maids,” 221, 222, 227.

16. *Ibid.*, 220–21, 226.
17. Lawrence, “Tickets, Please,” 290–91.
18. *Ibid.*
19. Steinbeck, *Grapes of Wrath*, 35.
20. *Ibid.*, 33, 35.
21. Silko, *Ceremony*, 5, 6, 59.
22. *Ibid.*, 25, 236, 239, 240.
23. Ren Xiangkun Clean Coal Experts Convenor et al. “China’s Policies for Addressing Climate Change & Efforts to Develop CCUS Technology,” www.worldcoal.org/chinas-policies-addressing-climate-change-efforts-develop-ccus-technology; EIA, “US Primary Energy Consumption by Source and Sector, 2016, www.eia.gov/energyexplained.
24. Dickens, *Great Expectations*, 6, 19.
25. *Ibid.*, 10, 13, 33, 97.
26. Dreiser, *Sister Carrie*, 11–12.
27. *Ibid.*, 6, 11, 25, 31.
28. Di Donato, *Christ in Concrete*, 12, 69.
29. *Ibid.*, 4.
30. *Ibid.*, 66–67, 136.
31. McCarthy, *Blood Meridian*, 3, 37, 46.
32. *Ibid.*, 94, 131.
33. Huber, *Lifeblood*, chap. 3.
34. Barthes, *Mythologies*, 97–98.
35. Stowe, *Uncle Tom’s Cabin*, 293, 294, 300.
36. *Ibid.*, 94, 121.
37. Hardy, *Far from the Madding Crowd*, 10.
38. *Ibid.*, 115, 262.
39. Pynchon, *The Crying of Lot 49*, 1, 15, 24.
40. *Ibid.*, 24–25.
41. DeLillo, *Underworld*, 110, 388, 515, 625, 825.
42. *Ibid.*, 120, 121, 285, 809, 823.
43. McNeil, *Something New under the Sun*, 212.
44. Smil, “Nitrogen and Human Food Production,” 127.
45. Rølvaag, *Giants of the Earth*, 454.
46. *Ibid.*, 58, 126.
47. Norris, *The Pit*, 32, 33, 42, 107, 165.
48. *Ibid.*, 41, 47, 135, 194.
49. Cheever, *Bullet Park*, 21, 92, 101, 118, 233.
50. *Ibid.*, 226.
51. *Ibid.*, 62, 224, 227.
52. Saunders, *The Brief and Frightening Reign of Phil*, 6, 20.
53. *Ibid.*, 20, 21.
54. Davis, *Life in the Iron Mills, and Other Stories*, 11, 12.
55. *Ibid.*, 12, 24, 25, 31.
56. Toomer, *Cane*, 73.

57. *Ibid.*, 144, 151, 160.
58. Mailer, *The Naked and the Dead*, 20, 26, 210.
59. *Ibid.*, 30, 31, 35, 37, 277.
60. Carter, *The Infernal Desire Machines of Doctor Hoffman*, 15, 193, 224.
61. *Ibid.*, 16–17, 107, 206–10, 212.

Epilogue

1. McKibben, *Eaarth*; Kolbert, *The Sixth Extinction*.
2. See the discussion of standard time and private time in Kern, *The Culture of Time and Space*, chap. 1.
3. *Ibid.*
4. Hallegatte, Bangalore, et al. *Shock Waves*, 2.
5. World Health Organization, “Climate Change and Health: Fact Sheet,” June 2016, www.who.int/mediacentre/factsheets/fs266/en.
6. Brian Kahn, “Antarctica CO₂ Hit 400 PPM for First Time in Four Million Years,” Climate Central, June 15, 2016, www.climatecentral.org/news/antarctica-co2-400-ppm-million-years-20451.
7. “Meet the Human Ancestor Who Walked Earth 4 Million Years Ago,” *Independent* (London, UK), October 1, 2009, www.independent.co.uk/news/science/meet-the-human-ancestor-who-walked-earth-4-million-years-ago-1796386.html.
8. See the Big History Project at www.bighistoryproject.com/about and Christian, *Maps of Time*, 511.
9. Christian, 1.
10. McNeill, foreword, xv.
11. Christian, 11.
12. Christian, 100.
13. Callison, *How Climate Change Comes to Matter*.
14. McNeill and Engelke, *The Great Acceleration*.
15. *Ibid.*, 5–6.
16. *Ibid.*, 207–8.
17. Jason Moore, “Name the System! Anthropocenes and the Capitalocene Alternate,” blog, <https://jasonwmoore.wordpress.com/2016/10/09/name-the-system-anthropocenes-the-capitalocene-alternative>.
18. Moore, *Capitalism in the Web of Life*, 18–22, 77, 119–21, 182–87.
19. *Ibid.*, 92–125.
20. There is an important point to make on this score. It concerns the distinction between early capital and modern capital, a distinction that the Capitalocene argues is not relevant to marking the epoch of climate change. On the one hand, Marx, who is the anchor of Moore’s theory, was himself not clear on the meaning of this distinction in his writings. See Johnson, “The Outer Nature of Capital.” More important, however, is that Marxist materialism, even this updated version of it, finds itself bundled up in a linguistic confusion over the meaning of energy that at once recognizes and then effaces the thermodynamic equivalencies that made modern capital’s project possible. The magic of the fossil system lies in a deep and barely recognized materialism, constituted by an environmental calculus

of functional equivalencies in which (what Moore calls) “the four cheaps” (cheap energy, cheap resources, cheap labor, and cheap food) don’t hold up as categories. The big fact is that fossil capital thrives, as did fossil communism and fossil fascism, on a magical alchemy practiced, minute by minute, hour by hour, year by year, in which energy, labor, heat, and matter swap forms without pause or recognition. Today, food mutates in its grip into labor, labor returns to us as food, timber morphs into steel, and coal resurfaces somehow, and inexplicably, in the form of the forests, fiber, and protein needed to provision the world’s population. Talking of “the four cheaps” is not wrong: it is just insufficiently materialist on this score, and that sets us up to once again bury the significance of modernity’s break with the premodern world. To be clear, fossil capital’s work, documented in detail by energy historians and anthropologists, is a quite particular type of ecological praxis, very different from that of premodern capital, and that distinction matters in both our history and prospects for sustainability.

21. Waters, Stafford, Kooyman, and Hills, “Late Pleistocene Horse and Camel Hunting at the Southern Margin of the Ice-Free Corridor,” 4263.

22. For an early summary of New World crops and their impact on global development, see Crosby, *The Columbian Exchange*, and for a basic introduction to the role of agriculture in the rise of cities, empires, and power, see Diamond, *Guns, Germs, and Steel*.

23. This account is related in Clendinnen, “Fierce and Unnatural Cruelty,” 81–82.

24. Semonin, *American Monster*; Richard Conniff, “Mammoths and Mastodons: All American Monsters,” *Smithsonian*, April 2010, www.smithsonianmag.com/science-nature/mammoths-and-mastodons-all-american-monsters-8898672.

25. John Gibbs, “George Washington’s Mastodon Tooth,” George Washington’s Mount Vernon, www.mountvernon.org/digital-encyclopedia/article/george-washingtons-mastodon-tooth.

26. See Worster, *Wealth of Nature*, 14, 214–20.

27. John Ashworth argues that the American Civil War was at root a bourgeois revolution in “Towards a Bourgeois Revolution.”

28. *Ibid.*, 204.

29. Worster, *The Dust Bowl*.

30. USDA, “World Crop Production Summary,” *World Agricultural Production*, World Agricultural Outlook Board, May 2017, <https://apps.fas.usda.gov/psdonline/circulars/production.pdf>.

31. The Intergovernmental Panel on Climate Change issued its third, and arguably most catalytic, international summary report in 2001.

32. Christensen, Hewitson, et al., “2007: Regional Climate Projections.”

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