Aesthetic Economies of Growth: Energy, Value, and the Work of Culture After Oil

by

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ABSTRACT

Aesthetic Economies of Growth; Energy, Value, and the Work of Culture After Oil offers a cultural history of energy after the industrialization of fossil fuels. My argument is that the political economy of fossil fuels, and the climate change it generates, is anchored to energy's aesthetic economy, the formal and material distribution of its social, environmental, and economic force across overlapping settings of work and life. This project understands energy as a social relation, rather than a technological input or raw material, and recognizes its material impact on the space and time—the setting—of the long 20th century. First I explore the cultural history of what in the philosophy of science and political economy is understood as a positive correlation between economic growth and increases in available energy, or *energy deepening*. I make the case that energy deepening—which is tied to fossil fuel dependency, but describes the much larger impact of energy on structural unemployment, ecological devastation, and what I call a sense of setting—is as much a social and aesthetic process as it is an economic and ecological one. Energy deepening is an aesthetic process because energy both animates, and depends upon, various media forms for its objective and social historicity. In the growing fields of the energy humanities and media ecology, this back and forth between energy and media is the key to energy's uniquely historical character.

My contribution to those fields is to triangulate the political economy of energy deepening with the geographic and cultural sense of setting that underwrites the long 20th century and its economic logic of value. This means tracking energy deepening across three mediums: the modernist energy novel; deindustrialized architecture; and the

physical and philosophical infrastructures of the postindustrial economy, or what the second half of this dissertation calls *energyscapes*.

Part One describes the energy novel in two chapters as it develops in the work of German inventor Paul Scheerbart, and African American writers George Schuyler and Ralph Ellison. In Part Two, I discuss architectural and infrastructural projects designed to both capture and generate the social and physical energy needed to postindustrialize respective economies in Italy, and then the western world more broadly. In chapter three, this means putting the FIAT car company's decision to retrofit their flagship factory in Turin into a factory of culture at the end of the 1970s in the context of the two energy crises of the decade and the growth paradigm that would respond to them. I argue that the aesthetic economy of Renzo Piano's plan for the factory is emblematic of what was then an emergent value paradigm tying physical and intangible assets together in ledgers, law, and production. Finally, this dissertation offers a method for the critical analysis of those physical infrastructures most essential to the lubrication of postindustrial energy needs after 1973. Chapter four claims that the turn to landscape in architecture in the 1980s and 90s, and the posthuman turn in the humanities more recently, portends a larger economic drive to turn all energy into an economic form of elasticity, and all landscapes into the energyscapes necessary for postindustrial growth. Energyscapes, I maintain, calibrate the spatial requirements of energy deepening to social and economic life in order to maintain feasible levels of economic growth amidst the falling rate of profit.

This project's aim is to specify what energy does for industrial and postindustrial societies, how the energy system built up on fossil fuels anchors social relations, and across what mediums its cultural, environmental, and aesthetic force is rendered into

economic value. While ecological approaches to economics have provided a running commentary on the interplay between energy and capital since the 1960s, this dissertation claims that culture is what mediates the two. I periodize the aesthetic economy of energy in relation to the cultural mediums across which energy begins to calibrate the setting of economic growth: literature, architecture, and infrastructure. Energy deepening triangulates and coordinates the cultural logic of late capitalism, this dissertation argues, not just in the factors and relations of production, but across what in the conclusion I call the *forces of social reproduction*. If energy is a social relation, rather than a mere input into the economic system, its relationality is established in the daily reproduction of postindustrial class, gender, and race relations. Meanwhile, the price of energy access is increasingly severing entire populations from the postindustrial project.

Every subsequent development in thermodynamics has added new proof of the bond between the economic process and thermodynamic principles. Extravagant though this thesis may seem prima facie*, thermodynamics is largely a physics of economic value…*

Nicholas Georgescu-Roegen*, The Entropy Law and the Economic Process*

Actually, the principle of the conservation of energy is mingled in every artist or technician with the search for happiness and death. In architecture this search is also undoubtedly bound up with the material and with energy; and if one fails to take note of this, it is not possible to comprehend any building, either from a technical point of view or from a compositional one. In the use of every material there must be an anticipation of the construction of a place and its transformation.

Aldo Rossi, *A Scientific Autobiography*

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And Marija. Finally. Always.

Someone smart told my cohort to have a baby (or get a dog) if we wanted to finish the diss. I did both. And while Anouk got us some way along the line, Marcel Vesuvio Snow—and whoever this next one decides to be—will take us the rest of the way.

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INTRODUCTION

> *But energy and wealth are synonymous. Energy is the thing of which gold itself is but the guinea stamp, to adapt the simile of Burns. A find of energy in Nature means an addition to the general wealth, a postponement of the day of bankruptcy, which each new invention of science, on the other hand, brings nearer.*
>
> Frederick Soddy, *Matter and Energy*

> *Each new age creates an environment whose content is the preceding age. The content is perceptible. The environment is not.*
>
> Marshall McLuhan, "Guaranteed Income in the Electric Age"

In a press release dated December, 2011 concerning the construction of an already approved €566 million cultural centre in Athens, Greece, the directors of the Stavros Niarchos Foundation promised "approximately €1 billion of total economic stimulus" from the building's construction to a Greek economy on the brink of collapse.[1] Little more than a month had passed since former European Central Bank vice-president and Greece's interim coalition leader Lucas Papademos promised to impose the harshest austerity measures that Europe had seen since the Great Depression. In the twelve-minute

[1] Nikos G. Xydakis, "The Grant That's Changing the Face of Athens," *GK* Dec 2011 http://www.snf.org/texts/uploads/files/GK-afieroma%20SNFCC-EN_1.pdf

short film commissioned from ArtfactoryLab, whose French studio has become the market leader in promotional visualization for large-scale development projects across the EU, Renzo Piano—principal architect of the project—projects an afterlife to crisis in Greece. Piano's confidence is anchored to the "magic" with which the project appears to stimulate "discovery" and "tolerance," since (at least in the cultural logic of the film) the complex both visually and narratologically replaces the landscape of austerity, poverty, and riot with culture, ecology, and renewable energy.[2] "We don't celebrate power," Piano insists about the project; "we don't celebrate money." Instead, the cultural centre celebrates the environmental harmony of structure and setting, where buildings "breathe at the rhythm of the land, especially when you are in…Athens when you have breeze, wind, energy, and sun."

The official press release and the architect's comments seem to be at odds with one another: if the building is to stimulate the economy, it seems that its form and function will do so only by cleansing itself of economics. What Piano says next in the short film, however, harmonizes the economic dreams of Stavros Niarchos' directors with the aesthetic economy of its designers. Instead of the twin poles of capitalism (power and money), the building promotes an ecological solution to economic shortfall. To the extent that ours is increasingly a period of energy transition—which is to say, an era where renewables have begun ever so slowly to compete with fossil fuels in pockets across the globe[3]—the *logic* of growth Piano captures is becoming commonplace.

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[2] ArtefactoryLab, "SNF Cultural Center in Athens by Renzo Piano," 2011, http://www.artefactorylab.com/drupal/renzo-piano-fondation-stavros-niarchos

[3] The qualitative competition nevertheless obfuscates the quantitatively disproportionate share enjoyed by fossil fuels, which in 2013 was still well over 90% of total world consumption according to International Energy Agency (2014).

Athens' physical setting—formed in equal parts by solar and nautical energy—gives the building its structure, but is also what removes it from the conjunction of "power" and "money" its directors seek to avoid. Thus as quickly as the Athens project is positioned as a source of economic salvation, Piano and foundation directors isolate its natural resources as the mean through which culture—as opposed to "power" and "money"—will facilitate the effects of economic growth without its conventional variables. If the conjunction of "power" and "money" made Greece insolvent, then an optimized relation between culture and new energy looks to local investors like a safe bet.[4]

Energy is world-making, and therefore also a form of *poiēsis*, or what in Greek is the verb "to make" in its broadest form. In the postindustrial era, energy's world-making capacity is most often figured in the negative, as a world-destroying force tied to a social arrangement—consumerism, Western standards of living, and Chinese growth—in desperate need of revision. But this dissertation is interested in digging deeper into the material concept and history of energy by reading what economists Dale Jorgenson and Bernard Beaudreau call *energy deepening,* or the economic dependence on ever increasing quantities of non-human energy for sustained yields in value, as cultural history.[5] Every time a new source of energy is brought to market, and every year the

[4] More than a safe bet, the Greek Environment Minister Giorgos Papakonstantinou announced in 2012 a joint initiative with German Finance Minister Wolfgang Schäuble to start a state-run solar energy company called "Helios." Through Helios, the Greek state would provide subsidies for foreign companies to harvest solar energy in Greece, and in return the Greek government would reap an estimated four billion dollars a year in royalties. See Jannis Papadimitriou, "Renewable Energy – a Way Out for Greece?" *DW* April 29, 2014. http://dw.com/p/1BpIk

[5] Jorgenson, Dale. "The Role of Energy in Productivity Growth" in Kendrick J.W. ed. *International Comparisons of Productivity and Causes of the Slowdown* (Cambridge, MA: MIT

energy bill for the global economy grows, the physical force embedded in the world (its energy) remakes the cultural, economic, and political forces of the social world. My contention is that the industrialization, and more recently postindustrialization of fossil fuels has given capitalism what it needs to make a world, since today's economic system is logically and historically inseparable from today's energy system. Ferdinand Tönnies recognized the impact of industrialization on the spiritual and social fabric tying communities to place. For him the industrialization of society was a kind of ontological *displacement* of communities from their settings, and in 1887 he described it as a transition from *Gemeinschaft* to *Gesellschaft* (community to society). Energy in that formative account, an account responsible for so much of the sociology that would continue to map the social impact of industrialization, was a *social relation* to the extent that it was a *spatial relation.* Energy, put simply, contours both the physical and social parameters of the setting in which industrial and postindustrial society has unfolded. But herein lies the aesthetic challenge of understanding energy, value, and the work of culture in the wake of oil: all three are as much conceptual as they are material; not things but types of forces. My project situates the cultural mediation of energy deepening, and the political economy it implies, across the mediums historically tasked with mapping the logic, location, and rhythm of setting: the late industrial novel; postindustrial architecture; and todays landscape infrastructure.

Thus the program directors of the Stavros Niarchos Cultural Centre get something right about space while getting something wrong about money. The ruse of renewables is the fantasy that a switch in energy input liberates a company, region, or economy from

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Press, 1981); Bernard C. Beudreau *Energy and the Rise and Fall of Political Economy* (Lincoln: NE, 2008).

the economic and social world made with fossil fuels. Foundation directors of the Athens project materialize this fantasy both by making the landscape and the architecture continuous, rather than contiguous, and by rhetorically staging the project as a solution to the constraints of "power" and "money." Read alongside the state-run Helios company in Greece, whose aim is to subsidize the foreign harvesting of solar energy in Greece for a royalty on the other end of production, the cultural centre in fact gives form to Greece's only remaining commodities: its culture and its solar energy. But Piano's building gives form to cultural and solar stimulus within a firmly established blueprint for postindustrial architecture, one with a historically determined expiry date. In order to materialize this cultural-environmental compact, the architectural team lifts the adjoining landscape up five degrees and slots the man-made structure underneath the slope. For the imagined viewer on the ground, the walk from Athens proper to the 170,000 m² Stavros Niarchos Park thus ends with the realization that this natural setting is indeed an *energyscape*, or a spatial calibration of energy to the economic flows it underwrites: for beneath the park's earth (where one stands minutes after leaving the boulevards) is a building, the power for which is generated by its platinum Leadership in Energy and Environmental Design (LEED) certified infrastructure that doubles for a forest within the city.

ArtfactoryLab's hyper-realist film recreates every detail of Athens—minus the flames and barricades then characteristic of the capital—from street, air, and sea level. In its reproduction of Athens' setting as a whole, the film projects a building that appears not amidst but as the source of the city's serenity, in the same way that foundation directors in their 2009 municipal pitch and in their December 2011 press release, project an economic serenity cleansed of Europe's austerity program. While the projected

scenario appears confusing today in the case of Greece—confusing because growth is imagined not through increased production or spending cuts but instead through the facilitation of culture and an enormous modification to the physical setting of the city—its premise is nonetheless one carried forward from development policies and economic principles of postindustrial growth popularized in the 1970s. Both the film and the economic promise are projections completely in line with a set of cultural and economic commitments to the new economy, in which culture is imagined to drive, stabilize, and grow economics, and in which cultural stimulus is as much sociological as it is material and environmental.

Though not foregrounded in the cultural centre's promotional video or its many press releases, what makes the project so 'stimulating' (and thus expensive) is the accumulated intellectual and technological wealth embedded in its logistical program. Its 100m^2 photovoltaic solar energy canopy generates nearly all the building's energy needs; its glass curtain wall reduces daytime lighting costs; and its green space coverage (which doubles as a roof) keeps the national opera house, agora, national library, and meeting spaces cooled. Hence at the video's close, foundation co-president Andreas Dracopoulos encourages all Greeks to embrace this most promising "asset" to "lift [their] country." What makes the project a national asset, in his final pitch, is its singular role in the "country's aims for an infrastructural advancement befitting the 21st century."[6] The video's visualization thus renders, both narratologically and virtually, the cultural, economic, and infrastructural assets needed to postindustrialize Greece's emblematically broken economy.

[6] ArtefactoryLab, "SNF Cultural Center in Athens by Renzo Piano," 2011, http://www.artefactorylab.com/drupal/renzo-piano-fondation-stavros-niarchos

Cultural centres since the 1970s—this dissertation will concentrate on several of them—have routinely pushed well past the limits of traditional buildings by embodying the cultural innovation they seek to make possible economically. Indeed the economic promise of the cultural centre has been generalized since the 1970s to include the architectural landscape of creative industries, districts, and cities more widely, a development prefigured emblematically by the decision to retrofit the FIAT car company's flagship factory in Turin at the end of the 70s into a factory for cultural production. In chapter two, I lay out the aesthetic economy of this project (incidentally also associated with Renzo Piano), because it is a paradigmatic example of an important transformation in the way value is represented and housed, as well as how it flows across heterogeneous types of assets in the postindustrial economy. FIAT's dominance in the automotive industry also means that its cultural strategy both reflects and helps produce the postindustrial turn.

Important for my purposes here is that the postindustrial project is premised on putting culture to work, which means renegotiating the sources of economic growth. At the end of the 1970s in Italy, and post-recession Greece, a building is no longer simply the setting in which workers create economic, cultural, and personal value, but is rather itself a source of these values. Yet just as important for my concern here is that what makes the architectural setting for cultural labour so valuable has as much to do with the infrastructures that soak the physical setting of the workplace with energy as it does with the economic reorientation of cultural energy. In this dissertation, I will call the inseparability of economic value, cultural labour, and the consistent rise of energy consumption in the spaces we inhabit a specifically socio-historical and qualitative

feature of what Jorgenson and Beaudreau refer to quantitatively as *energy deepening*. Smart materials and systems, special zoning laws, and techniques for capturing as much energy as is consumed, collude in the cultural centre in order to maintain culture's ostensibly 'stimulating' properties, and work as a form of energy more generally. The more capital invested in the physical appendages of productive activities, the more valuable those productive activities become. And as more and more energy flows through the walls and fixtures of today's newest architecture, the precise sources of economic growth get more and more difficult to isolate. This, then, is what I mean to address by referring to the aesthetic economy of growth, since the logical and historical inseparability of culture, energy, and capital after oil became the dominant source of energy is a result of the economic modulation of all three at the level of setting. Historicizing economic growth from a perspective that understands political economy as an aesthetic economy challenges merely technical, developmental, and historicist treatments of growth.

This second element of the postindustrial economy—that the physical spaces we inhabit are hardwired to facilitate a constant (and growing) flow of energy—is an often overlooked condition for the first element—the growing weight of accumulated capital in the material infrastructure of our daily, largely digitized lives. The myth that 'paper free' business in all sectors marks a reduction in the physical consumption required to conduct daily activities is gradually eroding, as I show in chapter four, but the reason that digital substitutes for older, ostensibly more 'material,' infrastructures are not environmentally friendly is because they are part of an enormous infrastructure of servers, devices, clouds, and so on that (unlike the page of a printed memo) literally never stop consuming

energy.[7] We knew by the end of the 1960s that ours was world of overlapping mediascapes; this dissertation proposes that a key feature of the contemporary world we inhabit, and the economic catastrophes punctuating it, is our submersion in overlapping and increasingly volatile energyscapes.

How architects phrase the economic logic of their products is only one, albeit a very important, glimpse into the types of mediums that give shape to these energyscapes. Buildings, according to renewables champion Jeremy Rifkin, are the largest consumers of energy in the modern world.[8] Thus an economic paradigm that understands energy as a form of capital, Rifkin explains, was needed to rewrite the one that defined it as an expense. Whenever policy makers, business owners, and urban planners celebrate the economic promise of culture, they're therefore making a more fundamental investment in energy capital, which is to say a financial investment in non-human sources of physical work.

How, the Athens project gives occasion to ask, did energy and culture emerge triumphant over labour as the sources of continued economic growth? What else must be true in the postindustrial economy for labour to no longer function as the sole source of surplus value, and in what register of analysis might we catch a glimpse of that story? That's the end of the narrative this dissertation seeks to dramatize: the narrative through which energy, capital, and culture became wedded to one another. In order to arrive at this conjuncture, I first establish the cultural preconditions of the postindustrial.

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[7] See for instance the recent work of Allison Carruth, "The Digital Cloud and the Micropolitics of Energy" in *Public Culture* 26.2 (2014) and Nicole Starosielski in *Journal of Visual Culture* 11.1 (2012).

[8] Jeremy Rifkin, *The Third Industrial Revolution* (New York: Palgrave Macmillan, 2011). 44.

Postindustrialization is usually understood as a move away from the physical restraints of an economy weighed down by things. This dissertation, however, probes the material conditions of possibility for immateriality in the economic imaginary, or more specifically the logic by and setting in which both physical and immaterial forms of work transform into a specifically economic genre of value.[9] More directly, my aim in the following pages is to historicize the co-emergence of what are usually understood as two unrelated transformations in the manner and setting in which growth occurs during the 20th and 21st centuries. The first is the unprecedented increase in available energy and the otherwise unthinkable level of global interconnectivity on the level of economics, politics, and culture which accompanied the massive surge in fossil fuel extraction across the globe (and the 98 percent drop in electricity costs in the US between 1900 and 2000[10]). Second is the still persistent commitment by macroeconomists, city planners, policy makers, and even cultural producers themselves to explain postindustrial growth with recourse to culture, even when physical labour inputs significantly decline in relation to overall economic output as in the case of the Stavros Niarchos Cultural Centre in Athens. *Aesthetic Economies of Growth* mediates the historical relationship between the two: energy deepening and the immaterial forms of production associated with a cultural capitalism that groups "human capital," "intangible assets," and "creative

[9] I am deliberately echoing claims about the weight of the postindustrial economy made by Alan Greenspan in *The Map and the Territory*—namely, that it is getting lighter and lighter—as well as in the Italian immaterial labour theory of Maurizo Lazzaratto Michael Hardt, and Antonio Negri, and Silvia Federici (whose critiques of the former I take as the most developed expression of the immaterial paradigm to date). Additionally, I am invoking the counter tendency to take seriously a materialism of matter by new materialists such as Jane Bennett and Mauriza Boscagli, whose *Stuff Theory* pays close attention to energy as a unique property of matter (and thus poses a challenge to new materialism as a theoretical orientation).

[10] Vaclav Smil, *Energy in Nature and Society* (London: The MIT Press, 2008), 338.

capacity" under the cultural content of postindustrial value. Importantly, however, my claim will not be that cultural production, and the valuable information made available through social innovation, is a smokescreen for energy deepening across the economy; but rather that energy deepening *makes possible* the urban and legal structures necessary to valuate culture in economic terms, or—and this is the claim I will develop in chapter one—that the cultural economy *accommodates* the deepening of energy by mediating, regulating, and socializing its political economy. The 20th-century history of energy will thus give us a unique vantage point from which to read the cultural history of economic development, just as it will help us say a thing or two about why in recent years economic development concerns itself so consistently and genuinely with culture.

Energy Deepening and its Discipline

Academic investigations into the specifically social impacts of energy systems have increased in recent years across social science and humanities research. French historians Jean-Claude Debeir and Daniel Hémery along with physicist Jean-Paul Deléage sought in their 1986 book *In the Servitude of Power* to read social history from the perspective of the energy systems that made it possible. In their estimation, the transition from feudalism to mercantile and then industrial capitalism was driven by the transition from organic, or surface energy (wind, water, wood, and animal power) to mined energy, and not the other way around.[11] This kind of energy materialism has become more common since the Intergovernmental Panel on Climate Change (IPCC) released their first report in 1990. Indeed, humanist interpretations of energy, and the energy sector more specifically,

[11] Jean-Claude Debeir, Jean-Paul Deléage, and Daniel Hémery, *In the Servitude of Power* (London: ZED Books, 1991 [1986]).

has been tethered to the urgency with which climate science in subsequent years has confirmed the rapid rise in CO_2—from 350 ppvm to 400 ppvm between 1990 and 2008 alone.[12]

This inseparability of climate change and energy has motivated an ecologically coded return to systems thinking in a number of disciplines, which have helped reimagine energy as a social concept. In the 2013 special issue of *Urban Studies* on "urban energy transitions," editors Jonathan Rutherford and Olivier Coutard make the compelling case that very little can be understood about either energy or urban systems without a framework that positions the two as mutually expressive. In the physical sciences, Canadian physicist Vaclav Smil has been insisting across a number of books that nothing of importance can be said about energy futures, or what he calls "the universal link" between "nature and society," without a *social* scientific analysis of the modalities through which energy is used.[13] Anthropology, too, has been a key discipline in the elevation of energy from a physical to a social concept, perhaps unsurprisingly given Leslie White's introduction of energetics into cultural anthropology in the 1950s.[14] In their 2013 collection on anthropological approaches to energy, *Powerlines*, editors Sarah Strauss, Stephanie Rupp, and Thomas Love go as far as to claim, "given the fast pace of technical innovation, the blockages to responding effectively to the enormous energy challenges facing us all are fundamentally cultural and political rather than

[12] IPCC, "Observed and projected atmospheric CO2 concentrations since 1990," September 2009. http://www.ipcc-data.org/observ/ddc_co2.html

[13] Smil,1.

[14] Leslie White's anthropological materialism still motivates broad historical interpretations of energy. See for instance Ian Morris' *Foragers, Farmers, and Fossil Fuels: How Human Values Evolve,* New Jersey: Princeton University Press, 2015.

technological."[15] And even more pointedly, Dominic Boyer in his introduction to the special issue of *Anthropological Quarterly* on "Energopolitics" connects "energopower" to "biopower" in order to reconceptualize the anthropological system that fossil fuels imply[16]

Growing concern for energy in the physical and social sciences has given rise to what Boyer and Imre Szeman in their *University Affairs* column call the "energy humanities." Organizers of the IPCC, industry leaders, and climate researchers, as Boyer and Szeman highlight, have been "waiting" for humanists to move the conversation on climate change forward because the energy crisis is unlike any other phenomenon traditionally addressed by physical and social scientists. What defines the energy crisis today, according to Boyer and Szeman, is an "impasse" all too familiar to what they call post-Enlightenment thinking in the humanities, where more knowledge about a problem leads not to its solution but to its deferral. Thus what the IPCC and other groups traditionally populated by physical and social scientists recognize is that humanities inquiry "is not an afterthought to technology and policy, but [a] forerunner researching the cultural landscape around us and imagining the future relationship between energy and society that we need to strive toward."[17] Hence while other disciplines have been defining energy as a uniquely humanist concept in need of development, the energy humanities seeks new approaches to energy, redefining humanities inquiry in the process.

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[15] Strauss, Sarah et al, *Powerlines*: *Cultures of Energy in the Twenty-first Century* (California: Left Coast Books, 2013).

[16] Dominic Boyer, "Energopower: An Introduction," *Anthropological Quarterly* 86.1 (Winter 2014). Electronic. Accessed September 10, 2014.

[17] Dominic Boyer and Imre Szeman," The rise of the energy humanities," *University Affairs* (February 12, 2014).

Aesthetic Economies of Growth contributes to the rise of the energy humanities by developing the aesthetic and conceptual dimensions of *energy deepening*. Energy deepening owes its conceptual history to the philosophy of science on one hand, and to postwar tendencies in macroeconomics on the other. In the former lineage, Debeir, Deléage, and Hémery in their remarkable study of energy through (and as) history arrive at what makes fossil fuel a unique and paradoxical source of social development. Unlike other energy transitions in human history, the energy system built around fossil fuels generates a feedback loop where "the solution to its energy problems"—both shortfalls and environmental externalities—is sought "almost exclusively in deepening the logic of producing energy from these fuels."[18] The energy system built around the 20th-century deepening of fossil fuel extraction, in other words, engenders an epistemological impasse where solutions to social contradictions of a world saturated in oil are sought in the technological intensification of the energy available from fossil fuels. The cause is the cure, but the cure is a curse.

Energy deepening is thus both quantitative, since the energy system powering the global economy has required more input every year since the industrial revolution, and qualitative, since the social relations fossil fuels enable and disable generate a political and epistemological impasse roughly proportionate to the urgency with which a transition is occasioned. Examples include the tendency towards or proposals for building larger cities and enhancing the infrastructure that connects them to combat slow economic growth; policies aimed at increasing commodity exports to combat slow demand at home; the search for fuel reserves that bring the energy return on energy investment (EROEI)

[18] Deber, Deléage, and Hémery, 12-13.

closer and closer to parity between extraction and market price; and becoming more and more agriculturally dependent on petrochemical fertilizers, the efficiency of which makes any switch to organic fertilizers demographically homicidal.[19] As a description of historical contradiction, in other words, energy deepening ties the difficulty with which an energy transition is imaginable to the social, environmental, and economic urgency of that same transition. As the need for an escape route grows, the less likely it becomes that we will have the civil means to bring it about.

First published as Charles Cobb and Paul Douglas' "Theory of Production" in a 1928 issue of *American Economic Review*, and still the dominant mathematical formula for plotting economic growth thanks to Nobel prize winning economist Robert Solow's advances on the theory two decades later, the Cobb-Douglas function gives accountants a legend for reading growth variables. In their formula, labour inputs and physical capital inputs are represented as a unity with a combined elasticity pushed up or down by total factor productivity (TFP) or technological maximization. The link between energy and culture is what macroeconomists and growth theorists after Robert Solow have been calling *capital* deepening. Efficient economic growth, in this model, is achieved at different historical moments by managing the ratio of capital and labour in relation to the technology at hand. In periods of slow growth due to high unemployment rates, policy is needed to absorb more labour into the production process (in turn deepening the consumer base in the market), while slow growth during periods of optimum employment (somewhere around 5% in neoclassical theory) is best achieved through increased investment in the capital stock, or the capital fixed in technology, across the economy.

[19] I elaborate on the problem of demographics and energy transition in chapter four and in my concluding remarks about the politics of infrastructure and the coming energy transition.

Growing statistical analysis, however, concerning the specific sources of expanded economic reproduction since the 1970s—whether labour, capital, or some marginal third term—routinely credits *either* increased quantities of capital investment in the production process (capital deepening) or more recently the increased amount of energy transferred from the production process to the final product, as what makes up for a general decrease in labour inputs.[20]

With the exception of a handful of Marxists (Andrew Kliman, Moishe Postone, Robert Kurz, and the journal collective *Endnotes*) mainstream economists have no doubt that growth after the 1970s involved not just increased gross domestic product, but increased surplus value, too. The caveat is that it has become more and more difficult in recent years to credit either labour or capital as the sources of that surplus. Thus in Robert Ayres and Benjamin Warr's 2005 paper "Accounting for growth: the role of physical work," all twelve percent of unexplained growth between 1975 and 1998—what I am calling here the dawn of postindustrialization, and the greatest period of energy deepening in human history—is explained by the two-fold economic factors of energy: increased costs to both extract and maintain access to natural resources, which is reflected in the rapid rise in dollar value of a barrel of oil after the OPEC crises in the 70s; and the total factor of increased technological and labour productivity in the production process, paradoxically increasing the general value of commodities while decreasing the amount of necessary labour to produce them.[21] Ayres and Warr, in addition to former senior member of the World Bank's Environment Department, Herman Daly, as well as Jeremy

[20] Hudson and Jorgenson 1974; Ayres 2013.

[21] Robert Ayres and Benjamin Warr, "Accounting for growth: the role of physical work," *Structural Change and Economic Dynamics* 16 (2005).

Rifkin at the diplomatic level, all claim to have cracked the mystery of postindustrial growth. However, their solution to the puzzle of the postindustrial comes in the form of an even more difficult mystery for economic theory: if energy is increasingly responsible for the generation of surplus value, not in chorus with but at the expense of labour, then energy deepening is logically tied not just to environmental degradation through the industrial metabolization of natural resources into exchangeable goods, but to unemployment too.

Already by 1950, at the dawn of oil's market dominance over coal, the amount of work performed by non-human sources of energy outweighed that of human labourers by nearly ten to one in America. Frederick Dewhurst's classic 1955 study *America's Needs and Resources* reported, "work animals are estimated to have contributed only 0.7 percent of total work output; human workers, 0.9 percent; wind, water, and fuel wood, 7.8 percent; and fossil fuels, 90.8 percent."[22] University of North Carolina economist Edward Renshaw was astonished at the shift in energy requirements by mid-century, remarking, "nearly four times as much prime mover is required today to produce a dollar of real income as was required in 1880."[23] Thus what in economic orthodoxy is called capital deepening is at least by the middle part of the century logically tied to the cultural and physical features of energy deepening. And yet just as the rapid increase in available energy enabled the otherwise unprecedented scale of global economic expansion, once brought into the realm of economics, energy's function is just as much a constraint as it is a multiplier. Externalities aside (environmental degradation, toxified water systems,

[22] Qtd in Edward F. Renshaw, "The Substitution of Inanimate Energy for Animal Power" *Journal of Political Economy* 71.3 (January 1963): 284.

[23] Ibid., 286.

unbreathable air—no small asides!) any increase in the cost of energy, which in virtually all accounts is inevitable so long as fossil fuels remain the dominant source of physical energy, will have a negative elastic effect on all economic activity (production, circulation, and consumption). For anyone with a car fuelled by petro products, or with financial investments tied to national interest rates, this is a strikingly commonplace fact of life: market fluctuations in the Brent Crude reverberate across the entire commodity chain, and most of our consumer interactions with it. And yet this is precisely what makes the cultural history of energy deepening so remarkable: it simultaneously sews the quotidian habits of Western consumers to both intensive and extensive economic phenomena at every corner of the globe. Elasticity goes both ways, and as I explore in chapter four, increasingly the wrong way with a substance as politically and geologically volatile as oil.

What we can glean already from the macroeconomic discourse that wants to put energy in competition with capital and labour, is that the introduction of energy to the classical dialectic between the latter two implies a fundamental revolution in the topography of economic relations. It does so in two ways. First, work available from the environment, from the very matter embedded in the earth, has been effectively sutured to the dynamics of a global market. Indeed energy's reintroduction into the social world of 'the economy' naturalizes economic growth. In its naturalization of economic relations, energy deepening thus desocializes labour and environmental resources too, which helps to explain why increased productivity (more output per unit of labour, which is most easily achieved by substitution of human labour with more and more non-human energy) also produces labour redundancy, unemployment, and a historically unique *global labour*

market—a fundamentally different form of globalization than the global market for simple commodities in the 17th and 18th centuries. The commonplace complaint about Chinese labourers taking jobs from hard working autoworkers in Southern Ontario or Detroit, and the inverse resurgence of transnational labour unions in the transportation sector, are thus part of the same topographical mutation as the more literal one unfolding in Alberta's Athabasca Tar Sands.

Second, energy deepening brings with it extensive transformations to the environment of economics (and thus the *actual* environment, too), since what is chiefly *energized* in the postwar period is the circulation of ideas, goods, and ecological risk. Without the availability of cheap energy at mid century, nothing like the Just in Time (JIT) revolution in Asia or the globalization of the manufacturing sector would have been possible. The slow movement of goods and information characteristic of the steam and coal ages prevented anything like 'the economy' itself, in its singular synthesis of the world as such with the world economic market, from entering into the social imaginary.[24] Likewise, the internationalization of the division of industrial and postindustrial labour would have been unthinkable: petro-power makes possible containerization and thus the synchronized logistics setting places as disparate as Rotterdam and the port of Dalian in China in virtually the same time and space; steam and coal power, on the other hand, only ever enabled regional synchronization; while animal power, still dominant only a century and a half ago, kept cross-continental economies light-years apart. Insofar as energy deepening makes possible *intensive* growth on the production side by way of *extensive*

[24] Political economist and historian Timothy Mitchell makes this claim through a history of the Breton Woods Agreement in "Fixing the Economy," *Cultural Studies* 12.1 (1998): 82-101.

expansion on the side of circulation (by synchronizing old and new markets), what it transforms is both the space and the time of modernity as such.

Thus what I am chiefly concerned with mapping here are those unique moments in the cultural history of energy deepening when what appears most under transformation is setting itself, which is to say the specific logic by which space and time (recall for instance M. H. Abrams' classical definition: "the overall setting of a narrative…is the locale, historical time, and social circumstance in which its action occurs"[25]) give shape to a given text, moment, or era. The aesthetic economies of space, place, and context as literary concepts have been brought back to the fore of cultural analysis due to the ecocritical turn in the humanities, and its investment in place. In her oft-cited introduction to *The Ecocriticism Reader* (1996), Cheryll Glotfelty defines ecocriticism as "the study of the relationship between literature and the environment."[26] In studying that relationship, she further defines ecocriticism by the types of questions it poses: "What role does the physical setting play in the plot of this novel?"; "How do our metaphors of the land influence the way we treat it?"; "In addition to race, class, and gender, should *place* become a new critical category?"[27] Thus a defining feature of both the conceptual apparatus of ecocriticism ("the relationship between literature and the environment") and the critical angles it assumes (that the way we understand the environment is tempered by our literature about it) is the privileging of place over other literary standpoints (like say character or plot). Yet in even the most sophisticated accounts of place in ecocriticism—

[25] M.H. Abrams, *A Glossary of Literary Terms,* (New York: Heinle & Heinle, 1999 [1962]), 284.

[26] Cheryll Glotfelty, *The Ecocriticism Reader* (Athens, Georgia: University of Georgia Press, 1996).

[27] Glotfelty, xix.

Glotfelty's is one of them, and the Buell brothers offer another as we shall see in a moment—place stands in for the physical environment the text aims at representing, even (and especially) when it assumes a mind of its own. My interest, however, is in the medium specific modulation of *setting*, which I will suggest is both distinct from the literary history of place, and vital to the mediation of energy's cultural, economic, and environmental impact.

Place is certainly a more common entry point into the cultural politics of energy, except that, at least in ecocritical philosopher Jeff Malpas' account, place already announces an anxiety with anything resembling a singular, totalizing environment. My account is that fossil fuels give the global economy both its global rhythms, and its closure as an economic system, so that anxiety about totalization in critical discourse limits critique to the appearance, rather than essence, of capital after oil. Malpas distinguished place from setting as "that within and with respect to which subjectivity is itself established."[28] Yet what is so distinctive about the global economy of hydrocarbons, I argue, is its simultaneous production of geographical and subjective plasticity, alongside economic elasticity (more on this in chapter four). An ecological lens certainly requires a commitment to place, while energy and its economy has effectively relativized the spaces of the globe to the point that "place" is a result of, rather than a resistance to, the petro-economy.[29] Hence while in most accounts—especially in the ecocritical tradition of Malpas, Ursula K. Heise, and Greg Garrard—place is not

[28] Jeff Malpas, *Place and Experience* (New York: Cambridge University Press, 1999), 36.

[29] I am thinking here of the now canonical account of globalization as a process of economic and cultural subsumption under capitalism made famous by Fredric Jameson, David Harvey, and Giovanni Arrighi in *Postmodernism*, *or the Cultural Logic of Late Capitalism*, *The Condition of Postmodernity*, and *The Long Twentieth Century* respectively.

reducible to one's particular perceptions of a location, it nonetheless refracts itself through what the subject *feels*, which it turns out in the above accounts is most frequently a sense of particularity, in contradistinction to the mathematical abstraction of space and a deracinated global system. It will prove to be of the utmost political and ecological importance to hold fast to the qualities of place in a world that frequently *dis*places individuals—and in the meantime wreaks permanent havoc on the physical viability of places for humans and non-humans alike—but my conviction here is that there is something of equal political and philosophical importance on offer in setting's formal reverberations with the temporal and spatial coordinates of totality. Where, to paraphrase Heise, a sense of place gives us a view of the physical world, a sense of setting (especially when setting is a result of a particular energyscape) makes available a vista onto the complex processes through which energy conditions economic, cultural, and natural environments. Through the infrastructure, logistics, synchronization, and exhaust of a fossil fuelled economy, setting becomes the mechanism through which capital is able to calibrate and absorb the value of human labour in all its heterogeneity.

Part of why the tradition out of which literary accounts of setting assumed its formal primacy was because character, plot, and mood were invariably impacted by the literary apparatus, the dramatic condition, of setting. Consequently, this is also why classical accounts of setting had not much more to say about it, because unlike character, plot, and mood, setting (beyond the date and place of the text's action) directs our gaze to the formal features of a text, rather than its content.[30] So even though especially

[30] The exception here is Rosalind Williams' somewhat prophetic essay *Notes on the Underground* (1990) which scanned the 19th century literary encounter with underground spaces, like caverns, mines, and tunnels, in order to capture the emergent sense of a technologically determined setting we experience as given today.

environmentally conscious texts mediate the physical environment, place in ecocriticism remains *immediate* as a concept, which is to say something encountered in the content of the world, rather than a formal feature of it.

Though it is no accident that the critical restoration of the physical environment occurred contemporaneously with that of place—the climate crisis named by the former looked in the 90s like it had saturated, and was thus only understandable, at the level of the latter—the conceptual distinctions made in ecocriticsm's core questions foreclose as much as they made available. It is very difficult to overturn what geographer John Agnew called the "devaluation of place in social science" in both orthodox and antithetical social science—sociology, geography, Marxist political economy, and so on. It is difficult because, at least in Agnew's account, social science is largely a reaction to the social results of modernization, the precondition for which is a kind of deracinated concept of community and class: "When the 'modernizing' forces of society overpower the 'traditional' force of community, place is overpowered too and continues to exist only as the location of nationally-defined social activities."[31] Place, in other words, gets lost in space. This means any return to place in contemporary criticism must contend with the conceptual and material wake of what Agnew is calling modernization.

Setting, I am suggesting, has more explanatory power than the ecocritical desire for place, at least in the effort to understand the aesthetic economy of growth, since setting calibrates, and is calibrated by, the historical interplay between all manner of social, economic, and environmental forces. Setting, in other words, names the level at which form and content machinate the particular and the general, the dialectic through

[31] John A. Agnew, "The Devaluation of Place in Social Science," *The Power of Place* (Winchester, Mass.: Unwin Hyman Inc., 1989), 14.

which something like the French revolution makes for bad weather in an Austen novel, or Roman mosquitos carry the weight of bourgeois propriety in *Daisy Miller*. Or more topical to this study (setting does something similar here), when dead dinosaurs explode at 142 MJ/kg in cargo ship carrying microchips to international markets, or when unemployment expresses rising sea levels, and the length of winter tells the story of household debt. Energy deepening mediates the general and the particular because the political economy of postindustrialization relies on an aesthetic regime that keeps economic and environmental crises distinct, all the while fuelling itself on the metabolization of both human and environmental resources.

Three major transitions in the energy systems that fuel economic activity punctuate this study, offering glimpses into the production of new settings. The first, described in Part One, is the maturation of an industrial society premised on the generalization of coal power, the literary problems of which I read as inseparable from how it was generalized. The second, which I take up in Part Two, is the transition since the 1970s towards a plastic petro-economy, the results of which we are now beginning to recognize as "the impasse" where the physical, epistemological, and political results of petroleum are inseparable from the climate change they appear to be accelerating. The third transition, which I narrate in the conclusion, is unfolding before our eyes, where the political economy of a world soaked in the rhythms of oil is bursting at the seams, and the circuitry of a major energy transition is becoming big business. Since each transition took place over half a century, we know that energy regimes take root over generations and across multiple layers of social reality. Which is to say that the specifically cultural qualities of energy—the way it is used, our ideas about it, and the types of things that are

imaginable as a result of it—make the humanities indispensable to the study of energy. In re-narrating the cultural history of 20th-century energy sectors, *Aesthetic Economies of Growth* takes as its objects not only the setting of energy in literature, but key scenes of architectural staging, and urban infrastructures that condition and accommodate the economic and social structure of energy in Europe and North America.

Energy and Environmental Criticism

It therefore comes as natural to advance a preference for what Lawrence Buell's landmark *The Future of Environmental Criticism* names over more conventional ecocriticism. For in the tradition of ecocritism, the specifically natural or even ecological actors in a given setting elicit our critical attention, whereas environmental criticism takes as its dilemma the dialectic between natural and built worlds so characteristic of postindustrial society—where indeed the latter appears more often than not to shape the former. In Buell's account, the ecocritical turn in the 90s owes as much to the structural criticism of Leo Marx and Raymond Williams—*City and the Country* does nothing short of inaugurating the ecocritical turn—as it does to nature writing and the physical sciences. What I mean to make clear in upholding Buell's distinction is that, even though there is no shortage of eco- and environmental concern for the massive impact of our 20th-century energy regimes, scarce attention has been paid to the capacity of those same regimes *to give shape* to the cultural, economic, and political imaginaries—their capacity, in other words, to generate their own settings.

A number of recent works in the humanities have fortified the determinate relationship between energy regimes and the periodicity of culture. Frederick Buell's

complementary study of energy and the built environment came in the form of what he calls a reconceptualization of mainly US symbolic cultures in which energy sources, rather than wars or aesthetic trends, govern our periodization. Using *In the Servitude of Power* as his framework, Buell tracks the cultural structure of exuberance and catastrophe—the twin poles of thought produced by what he calls "oil-electric capitalism"[32]—in order to map cultural cycles that more or less stem from cycles in the energy market. In her editor's column to the 2011 special *PMLA* section on "Literature in the Ages of Wood, Tallow, Coal, Whale Oil, Gasoline, Atomic Power, and Other Energy Sources," the late Patricia Yaeger makes a similar case for the centrality of energy in our periodizing schemes: "Instead of divvying up literary works into hundred-year intervals (or elastic variants like the long eighteenth or twentieth century) or categories harnessing the history of ideas (Romanticism, Enlightenment), what happens if we sort texts according to the energy sources that make them possible?"[33] Jennifer Wenzel in her "State of the Discipline" report to the American Comparative Literature Association has gone even further in her critical engagement with recent turns to geological history by promoting a critical materialism that is more than simply concerned with climate change.[34]

Fossil fuels, in other words, have begun finally to impact the way cultural critics approach their objects of study. Thanks in no small part to the inroads made by eco- and

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[32] Frederick Buell, "A Short History of Oil Cultures: Or, the Marriage of Catastrophe and Exuberance," *Journal of American Studies* 46.2 (2012): 273-293.

[33] Patricia Yaeger, "on "Literature in the Ages of Wood, Tallow, Coal, Whale Oil, Gasoline, Atomic Power, and Other Energy Sources," *PMLA* 162.2 (March 2011): 305-326.

[34] Jennifer Wenzel, "Climate Change," *The 2014-2015 Report on the State of the Discipline of Comparative Literature*, March 3 2014: http://stateofthediscipline.acla.org/entry/climate-change.

environmental criticism in the 90s and 2000s, the epistemological and social division between nature and culture has been reimagined, not coincidentally during a period of unprecedented increases in oil prices, carbon emissions, and signs of a physical world responsively inhospitable to 20th-century energy deepening. What this study aims to add to this growing shift in cultural criticism is an attunement to the economic, cultural, and environmental settings generated by energy deepening: a roadmap to understanding the implicit role that energy plays in *setting* the economic, cultural, and environmental in the built world, which is to say in generating the conditions for their inter-implication.[35]

I don't mean to credit energy with an autopoetic inertia autonomous from those other major players in the economist's trinity: capital and labour. Nor do I intend to retreat back to an energy determinism characteristic of industrial modes of anthropological theory. At a certain point in the history of cultural materialism, when it wasn't cultural theorists but anthropologists like Leslie White who were turning their attention to environmental forces such as energy reserves, human culture itself was understood as (though not simply) a complicated "manifestation of energy."[36] Today it may in fact be uncontroversial to claim, to use Canadian journalist Andrew Nikiforuk's provocative phrase, that we are energy slaves.[37] My project will argue that the political economy of energy *cannot help* but generate a politicized and hostile exterior in relation

[35] In this respect my project is allied to the world-ecology network, and in particular Jason W. Moore's insistence in *Capitalism in the Web of Life* (2015) that capitalism and nature co-produce, that "power, production and perception entwine" and that historicizing the nature our environmental sensibilities wish to protect is the first step towards a post-capitalist orientation.

[36] Leslie White, "Energy and the Evolution of Culture," *American Anthropologist,* 45.3 (July-September 1943), 335.

[37] Andrew Nikiforuk, *The Energy of Slaves* (Vancouver: Greystone Press, 2012).

to its lubricated and wealthy core. Energy in other words is a social relation that extends across sites of production, consumption, and social reproduction. We know this because energy crises of the sort we saw in the 1970s strike working families hardest, not just because our current energy system exerts an enormous influence over the prices of other commodities, but because at a certain point basic or simple reproductive needs cannot be met without stepping outside of the energy infrastructure responsible for most of the tasks we perform for one another.[38]

At the heart of energy deepening is a social contradiction in the form of a ticking time bomb, which is that while productivity gains since the switch from animal power to coal power in the 19th century have been achieved most frequently by increasing the amount of physical energy at a single worker's disposal, less and less human labour is (therefore) required to produce the same amount of goods. This insight forms the history of virtually every sector of the economy, including primary, secondary, and tertiary industries. The "moving contradiction" of capitalist accumulation, as it is understood in the historical materialist tradition, has become a key site around which a growing number of critics, such as Moishe Postone in the US, Robert Kurz and the German value theorists associated with the journal *Krisis*, and the journal collective *Endnotes*, have begun formulating a theory of terminal (rather than perpetual) crisis. And while the rising organic composition of capital—Marx's term for describing the increasing ratio of technological work performed in relation to human labour power in the production process—occurs unevenly across economic regions, capitalism's human exterior (those

[38] I am referring here specifically to the emphasis placed by US Presidents Nixon and then Carter on social austerity, conservation, and the expenses of winter without a cheap energy, captured nicely in Giovanna Borasi and Marko Zardini's *Sorry, Out of Gas,* Montreal: Canadian Centre for Architecture, 2007.

unnecessary to its production needs) has been growing apace with its productive interior. Labour, whether unemployed, under-pensioned, or absolutely superfluous to the needs of economic progress, is routinely forced into a facility with social energies irreducible to the sort that pass through refineries and financial ledgers. Which is to say, more deterministically, that as productivity rises, capital also intensifies forms of social reproductivity working against it, since those shed from the production process have no choice but to find more radical means to take care of one another. But this is to get too close to the social contradictions of an energyscape calibrated for postindustrial growth, and so, too, my concluding remarks about the *critique* of energy. What occupies most of what follows is not that critique, but instead the historicization and reconceptualization necessary for it.

Energy Settings and Spatial Form

I understand setting as the register at which aesthetic and environmental forces are arranged. My sense of setting as simultaneously cultural, environmental, and economic draws on what for Mikhail Bakhtin was the conceptual potential of the chronotope in 1937. In his exhaustive reading of all manner of literary histories, Bakhtin established a taxonomy of temporal and spatial tendencies in literature. Their unitary consistency falls under what was then a concept recently introduced in the work of Albert Einstein.[39] The chronotope names the structural force of time in space and space in time, the symbolic medium in which "time, as it were, thickens, takes on flesh, becomes artistically visible; likewise, space becomes charged and responsive to the movements of time, plot and

[39] Mikhail Bakhtin, "Forms of Time and of the Chronotope in the Novel," in *The Dialogic Imagination* ed. Michael Holquist (Austin: University of Texas Press, 1981), 84.

history."[40] Importantly, in Bakhtin's literary inflection of the concept, "it is precisely the chronotope that defines genre and generic distinctions, for in literature the primary category in the chronotope is time."[41] As opposed to a theme or even motif, what Bakhtin means to understand is the organizing capacity of larger forces in and across texts. That the novel exemplifies the kind of narrative understanding of space and time that Bahktin is trying to describe is a consequence of its facility with narrative, and I will here deal with a good number of novels concerned with stretching out energy into narrative.

Indeed, narratology will turn out to be energy's primary cultural feature since the way we use energy, and the technologies that turn natural resources such as coal and bitumen into usable energy, are always historically and socially specific. Oil is therefore not one energy input amongst a range of other potential replacements, since its density, mobility, and storability have generated a set of social relations specific to its materiality. Energy, understood this way, is a fundamentally humanist concept because its use expresses a full range of human needs, and its inescapably natural constraints—namely, that you can neither create nor destroy energy—ties together anthropological and ecological histories.[42] These two narrative registers of energy, however, have been triangulated since the industrial revolution by a third, which is the inseparability of capital, and the capitalist mode of production, from the social and political capacities made available by fossil fuels. Growth in this third level of energy's narrative structure is

[40] Bakhtin, 84.

[41] Bakhtin, 84-85.

[42] This is the imperative I take from Elizabeth Shove and Gordan Walkers "What is Energy For? Social Practice and Energy Demand," *Theory Culture Society* 31 (2014) which asks us to historicize the assumption that energy needs will continue to grow, that energy is a social given, and that its use is distinct form the economics of its supply.

thus fundamental to the way we ought to read the contemporary questions circulating around energy, climate change, and transition. My claim in this dissertation is that all three registers of energy's narrative structure are negotiated, calibrated, and plotted in the cultural history that mediates energy's social, economic, and political uses, which is another way of saying that energy is only a technical concept as a result of the cultural fields that metabolize it. And since my primary concern here is to understand how energy helps capital mediate heterogeneous forms of labour into economic value in the form of energy deepening, turning to the novel first makes sense since it is the cultural medium most structured by narrative, and most tasked with mediating social relations during the long industrial revolution. But it is perhaps unexpectedly also why the medium of architecture will emerge time and again in the present work as the medium in which narrative concretion in space and the time of dead labour in material form is most on display.

To return to our opening example in austerity-torn Athens, the confidence expressed in architecture's economic-carrying capacity—the capacity, in other words, to both house the value of previously invested labour in its role as what accountants call a fixed capital asset, *and* to give physical setting to new forms of 'stimulus' or economic progress—will by the mid-point of my analysis take over from the novel as the object of analysis. Piano's Athens project is in fact not the first but only the most recent in his portfolio of postindustrial buildings dating back to the early 60s. Piano's oeuvre encompasses a career that coincides with the reorientation in the discipline of architecture towards the cultural and economic *activity* of architecture that, as I will show later, takes off during the 1970s oil crisis. This dissertation's movement between the novel,

architecture and landscape, however, is not merely a symptom of my commitment to locating the place where economic and cultural value converge, though that is part of it; my motivation is to rewrite what in the history of art was routinely a misrecognition of the *institution* of spatial arts such as painting, photography, and architecture versus those that deal with time, such as poetry and the novel, with a theory of their *medium.*

Traditionally it is not architecture and its axis in space that picks up where the novel and its axis in time cannot, but rather painting, or the pictorial arts more generally once photography arrives on the scene. In the landmark set of essays on "Spatial Form in Modern Literature" in the immediate postwar years, Joseph Frank did a great deal to rekindle the classical literary distinction of time and space in the novel, and he did so by returning—as critics are wont to do "every thirty years," according to Frank—to what in his estimation was German Romanticist Gotthold Lessing's aesthetic first principles of spatial and temporal form in the arts. Lessing's *Laokoon* (1766), as part of a larger project to empiricize the study of cultural forms, made medium, as opposed to theme or history, the principle property from which aesthetic effects and hence analysis should follow. In Frank's mid-century reading, "Form in the plastic arts," which in Lessing's treatise means primarily painting but in an important way architecture, too:

> is necessarily spatial, because the visible aspects of objects can best be presented juxtaposed in an instant of time [while] literature, on the other hand, makes use of language, composed of a succession of words proceeding through time; and it follows that literary form, to harmonize with the essential quality of its medium, must be based primarily on some form of narrative sequence.[43]

Hence in *Laokoon*, Lessing would rail repeatedly at what was in the 18th century a growing pictorial tendency in poetry and an allegorical tendency in painting—two

[43] Joseph Frank, "Spatial Form in Modern Literature Part 1," *The Sewanee Review*, 53.2 (Spring 1945): 221-240.

betrayals, in essence, of the laws governing their respective mediums: "the pictorial poet tried to paint with words, the allegorical painter to tell a story in visible images."[44] Lessing thought painting with words and storytelling with paint was unforgivable. By 1945, Frank thought such an inversion timely. For Frank, what made spatial form in literature timely was its contemporaneity with an emergent modernist ethos tied to industrialization.

Frank's estimation of the spatial turn in the highwater cultural achievements of Gustave Flaubert, Marcel Proust, Djuna Barnes, James Joyce, and Imagist poetry was that "the predominance of spatial form" in literature was not a symptom of the modern, but rather the medium of its constitution.[45] In tracing "the evolution of art forms by their oscillations between these two poles,"[46] that is, their spatial and temporal forces, Frank's reframing of modernism as the intensification of space in what he called the "time-art"[47] of the novel involved two quieter, and yet more fundamental claims about the historicity of medium. The first is that "the spatialization of form" in the novel after Flaubert was wedded to the history of bourgeois perception, which is to say the industrial 19th-century epistemological desire to see everything all at once.[48] For Frank, the defining moment of spatial form's imbrication with the industrial division of visual economy is Flaubert's famous scene in *Madame Bovary* in which buyers and sellers of country commodities

[44] Ibid, 223.

[45] Ibid, 226.

[46] Ibid.

[47] Frank, "Spatial Form in Modern Literature Part III," *The Sawanee Review* 53.4 (Autumn 1945): 643-653.

[48] Frank pt 1., 230.

converge in an agriculture fair narrated simultaneously from three levels of action. The main exchange is between the novel's protagonist, Emma Bovary, and the man with whom she is about to begin an affair. They are peering out a window in an empty room of the town hall, beneath which is the local prefect whose speech cuts through Emma and Rodolphe's, while a third exchange between the local pharmacist and Madame Lefrançois triangulates the first two.

The rural marketplace, or rather the multiple scenes of the marketplace, is not a space unique to the 19th century or the 19th-century novel—in fact it was already in competition with larger market forces that would in time reduce it to a niche, rather than necessary market—and yet what Frank gleans from this literary setting is the initiation of a cultural concern for convergences, a belief in Flaubert that "everything should sound simultaneously."[49] In this particular scene, everything really does "sound simultaneously," yet this spatialization of plot mirrors another, more historically familiar modification of space. Yonville-l'Abbaye, where the country fair takes place, is on the cusp of modernization.

At the opening of Part Two, Yonville-l'Abbaye is not insignificantly characterized by its claim on no more than three river mills powered by the "minor tributary" that binds the "market town" to its physical setting. In short, it is firmly preindustrial. The hint that Yonville is on the verge of an industrial breakthrough comes from an exchange between two minor characters that set the scene. Homais, the local pharmacist, is in the middle of a monologue to Madame Lefrançois at the opening of the fair, the goal of which is to teach her (though she is not listening) how agriculture is

[49] Ibid., 231.

actually a branch of chemistry, since knowledge of "the composition of fertilizers, the fermentation of fluids, the analysis of gases, the influence of noxious effluvia"—in short, the scientific management of production—offer farmers advantages in productivity. Homais thinks like an industrialist in a Normandy on the brink of industrialization, and what distinguishes him from the rest of the novel's cast is how odd the emergent discourse of scientific management sounds in a world still steeped in residual idioms, ideologies, and relations built around pre-industrial farming. The clash between cottage industry and what F.F. Mendels would call "proto-industrialization,"[50] is the context for what in Frank's reading is a watershed moment in the modern history of spatial form in literature, yet a good deal of the economic forces getting negotiated in *Madam Bovary* get bracketed in Frank's account of the transition. What the market setting, and its internal scenes of exchange make available in Frank's reading (and this is the second claim I wish to isolate) is the sense that "the unit of meaning is not, as in modern poetry, a word-group or a fragment of an anecdote, but the totality of each level of action taken as an integer."[51] A sense of totality is made available through Flaubert's formal invention of simultaneity across the space of many pages, yet what occasions the formal jolt of many voices speaking at once is the intersection of industrial progress and the breakdown of bourgeois propriety driving Emma's infatuation with Rodolphe. Neither the novel nor Frank's reading of it suggest that the transition in bourgeois subjectivity is determined by the shift to an industrial economy—it would take an established Gerog Lukács to tie *Madam Bovary* to the bourgeois anxiety driving the literary naturalism Flaubert helped

[50] F.F. Mendels, "Proto-industrialization: The first phase of the industrialization process," *Journal of Economic History* 32 (1971): 241-261.

[51] Frank, pt 1., 230.

advance[52]--yet the formal constellation that makes Homais' ideas about industry cut through Emma's feelings about extra marital affairs is one nevertheless triangulated by the setting in which the greatest economic force in European history was already establishing its roots.

While reading the chapters of Flaubert's market scene takes time, its effect by the section's close is to have happened all at once, a technique that for Frank would become definitive in the work of Joyce, whose *Ulysses,* describes but one day of life in an unmistakably industrialized Dublin in 1904. And what makes it possible to set the market "simultaneously" is the capacity of *Madame Bovary* to produce an effect of what Frank called "the totality" by writing the same moment at the same time from different places. In the instance of the agriculture fair, or what the provincials of Yonville-l'Abbaye call simply "the Show,"[53] the totality is sewn together by a quartet of national branches responsible for modernizing post-revolutionary France: "Commerce," "Agriculture," "Industry," and "Fine Arts," the celebration of which laces the clandestine conversation between Emma and Rodolphe so central to the novel's plot. [54]

I rehearse what might seem like an antique moment in the history of cultural criticism not to endorse the anti-historicist framework of semiotic criticism—in Frank's case a thread of formalist criticism *hostile* to historicism—but rather to offer a glimpse

[52] This is the kernel of Lukács critique of naturalism in the famous "Narrate or Describe" essay. I will return to Lukács specifically literary theory of nature in chapter one.

[53] Gustave Flaubert, *Madame Bovary* (London: Oxford University Press, 2004 [1856]), 117.

[54] We might turn Frank's analysis around and note the resurgence of sequence and time in the plastic arts, as his contemporary Etienne Souriau did in his 1949 piece "Time in the Plastic Arts," but it will turn out that this shift in medium does nothing but confirm what in Frank's account are fundamental modifications to literary setting in the modern novel.

onto what already in 1945 is a major transformation in the forces generating, and the way critics talked about, setting. In Part One of this dissertation, I will argue that these late 19th and early 20th century coordinates are anticipated in the novel form, which I read as the medium tasked with setting energy deepening in time and space. For while other more physical mediums—namely, architecture and infrastructure—would take over in the 20th century, as I argue in part Two and the conclusion, the novel's cultural dominance and special relationship to the formation of a bourgeois sensorium meant that its capacity to *set* economic, environmental and social forces in narrative would be of necessity indispensible to negotiating the new space-time of proto- and fully formed industrialized societies.[55]

Frank's contribution to literary studies was not popular until scholars like Mark Schorer, René Wellek, and Robert Penn Warren began championing Frank's account of spatial form, rendering it canonical. So much so that by the late 70s, resurgent critical attention to spatial form would produce a new set of positions with regard to Frank's work in the 1940s and its critical capacity to capture something specific about modern culture. W.J.T. Mitchell would write an expanded version of Frank's argument for an audience more versed in the visual and plastic arts in the Spring 1980 issue of *Critical Inquiry*, to which I return in chapter one; and two years later Jeffrey R. Smitten would publish *Spatial Form in Narrative* with Ann Daghistany where no fewer than three hundred entries would populate their bibliography on spatial form.

[55] My thinking about the novel's relationship to bourgeois forms of perception comes from Franco Moretti, who argues something very similar in *The Bourgeois* (2014), and Nancy Armstrong's *How Novels Think* (2005) in which Armstrong makes the case that the novel is the medium most responsible for establishing the protocols of liberal subjectivity.

Providing a materialist account of what occasions returns to spatial form in the criticism that sought to historicize cultural transitions, such as the one Frank was so taken by, is a larger ambition of this dissertation. While simply nominating coal, and the increased energy made available by what in Flaubert's late 19th-century Europe were unprecedented levels of coal production, is insufficient for an account of what fuels setting's formal transformation, there is also a deficit of critical positions that tie the social and economic force of fossil fuels to cultural history. My sense is that coal's capacity to fuel the daily transportation of goods and people across not just regions but *countries* in Europe and America, and thus an enlarged (and quickened) sense of setting in the social imaginary of late industrial society, is the result, rather than the cause, of a specifically industrial sense of setting mediated at the level of cultural production.

What this project seeks to establish, in other words, is not *the fact* of energy deepening and its effect on setting (one need only double check where your computer, or printer, or cell phone was manufactured to see this, and the business section of your newspaper to see the spatial character of 'the global market*place*'). Rather, my concern here is with *how* energy sets itself into the physical and social fabric. Transportation and manufacturing are, in this more epistemological (rather than phenomenological) question, nonetheless important to energy deepening: they form the beginning and end of the now global commodity chain, where our globality as postindustrial subjects is expressed in the objects of our investments (environmental, social, political, economic, etc.). So the relationship between energy deepening on the one hand, especially in the postwar period when oil surpasses coal[56], and the globalization of commodity circulation on the other, is

[56] Worth mentioning, of course, is the narrative unfolding before our eyes in the mid-2010s in which coal is again rising to the occasion in North America and China (see Mitchell 2013), which

not unimportant either. But there's much more at stake in the critique of energy than the scales at which postindustrial life takes place, but also for the way we understand ostensibly unrelated categories of critical concern. In this study, those categories are: the environment—itself an oddly 20th-century invention; the economy—same thing, very particular to a world run on fossil fuels[57]; and the social politics that oscillate between the two.

For readers of 18th- and early 19th-century fictions in those nations quickest to industrialize, the claim that Flaubert is the first to formalize a setting sensitive to the market will sound at best chronologically convenient. Landmark literary studies like Deidre Lynch's *The Economy of Character* (1998) and Franco Moretti's *Graphs, Maps, Trees* (2005) began to read the novel's anticipation of a world where experience on the level of character gets mixed up with concentric cartographies of competing markets. The novel in Lynch's account, especially by the time Jane Austen invents free indirect discourse, is formally attuned to spatial arrangement that in a market economy (of which it was barely even a part by the end of the 18th century) would put people and things in competition as the bearers of value. Rather, the point about Flaubert is really a point about Frank's restoration of one (albeit incomplete) sense of setting in cultural criticism that coincides, importantly, with the historical generalization of energy deepening across both public and private spaces in the industrializing West. The literary structure of

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is also the entirely unexpected story about the US' rise, by the end of the decade according to most recent accounts, to international energy supremacy. New technologies in both coal and natural gas extraction are responsible for an entirely new possibility of the energy crisis: not that we will run out of fossil fuels, but rather that we will not…

[57] This is central claim worked out by Timothy Mitchell in "Fixing the Economy," *Cultural Studies* 12.1 (1998): 82-101.

setting, as exemplified most palatably in those progenitors of the modernist project, had anticipated the formal force of a fossil fuelled modernity some decades before the cultural criticism that would name it 'spatial.'

Yet to recognize the contemporaneity of the literary production of energy's economic setting, and the economy of energy as in a strong sense an aesthetic economy, does not harvest a solution to energy's conceptual tensions, but instead supplies them with the social context their economic personae rely upon. And this is why what follows will be as much about the historicity of mediums—or to use Jussi Parrika's nice formulation a media ecology of energy, and an energy ecology of media[58]—as it will be about the cultural history of energy. Energy deepening, at least to the extent that it is an economic process responsible for rapid increases in surplus value, can only take root through the social relations that give both energy and value cultural coherence. For though a good number of economists attuned to the world-shaping qualities of energy will periodically convince themselves that economic value is not just tied to energy, but is itself an expression of it, my position will restore the social content of value to the critique of energy. 'Energy' is no abstraction, in other words, but rather the name for historically specific uses of abstract forces irreducible to, but nonetheless expressed through, human labour. Meanwhile, human labour has been redefined by the economics of capital accumulation by the time industrial forms of production reorganize the space and time of advancing economies. And thus the social compact necessary for

[58] Jussi Parikka, *A Geology of Media*, Minnesota: University of Minnesota Press, 2015.

industrialization implies an aesthetic regime through which labour, capital, and energy congeal into a system of value.[59]

I argue that once we make energy the organizing principle of our critical analysis, the habits with which we isolate the social content of value—that is, through a patient working through of class formation, relation, struggle, and finally consciousness in traditional materialist critiques—undergo an involuntary modification that brings us not to an energy theory of value, but rather a more fully materialist critique of capital. For what energy deepening does to the forms, intensity, and relations of labour in the postindustrial era is produce a parallel set of bifurcations: in the global South, where the manufacturing sector is not a thing of the past but a defining principle of life, we have on the one hand brutal forms of mass exploitation in the giant factories of China, Bangladesh, India, and so on, and on the other hand the production of a vast army of reserve labourers pushed outside the needs of the labour market.[60] Put differently, the global division of labour from the standpoint of the global South means either hyper-exploitation (12+ hour workdays for wages nowhere near enough to reproduce the labour power of the worker) or absolute superfluity (global slums, refugee camps, and so on). Meanwhile inside the economic regions of the postindustrial North, work is redefined along two lines. It either coincides exactly with the 24-hour cycle of human biology, so

[59] You would not be mistaken to notice that I have replaced the classical variable 'land' with 'energy' in my trinity of value, which is both intentional and explained in my forthcoming remarks about energy and Marxism in *Marxism and Energy* (Edmonton and Chicago: MCM Prime Press, 2016).

[60] Joshua Clover and Aaron Benanav offer what I take to be the most compelling case for thinking the labour relations of the global south in spatial relation to those of the north, not as a relation of privilege/exploitation, but as two mutually dependent spaces of exploitation/superfluity in their "Can Dialectics Break BRICS," *South Atlantic Quarterly* 113.4 (Fall 2014): 743-759.

that life and work are identical forms of activity (the Google model of the workforce[61]) or makes work casual and precarious, where short-term contracts rather than career paths are the defining feature of the workforce. Either side of the double split is the result of energy deepening: those with work have no choice but to work at a level of intensity that bursts the 8-8-8 work-life model asunder (8 hours of work, 8 hours of leisure, 8 hours of sleep), or to join the rapidly growing ranks of those who work from the fringes of the labour market, which is to say temporarily and with little social, medical, or personal security.

On either side of the South/North divide, the under- and unemployed side of the equation is growing at historically unprecedented levels, while the wages of those on the side of 24 hour workdays have been stalling for decades.[62] Energy deepening speeds up the general law of capitalist accumulation in ways that makes the social content of economic value increasingly difficult to isolate, but not so if these sides of the international division of labour (exploited/unemployed in global South; lifestyle worker/temporary worker in global North) are understood as contemporaneous features of an economy supplied more and more with physical energy external to human labour.

THE VALUE THEORY OF ENERGY

What then is the energy content of value? In what follows, I will engage with a number of theoretical approaches to this question: 18th-century French economics; 1970s

[61] The most recent account tracking the collapse of work and life is Jonathan Crary's *24/7* whose treatment of a fully digitized mode of production entails a frightening extension of the workday into the last bastion of life autonomous from work.

[62] Aaron Benanev and John Clegg from Endnotes, "Misery and Debt," *Endnotes 2* (April 2010), http://endnotes.org.uk/en/endnotes-misery-and-debt

ecological economics; recent German value theory; and historical materialism as it has developed from the writings of Marx and Engels. My contribution is to establish that neither energy nor value make sense as operative concepts without a third term that always animates them in time, which are the social relations that supply both with forms and narrative coherence. This is similar to Marx's insistence that neither capital nor labour is a thing in and of itself but are rather dialectically contingent on the other. Energy, too, is a property of things over time, but not a physical thing isolatable from the matter that expresses it—a calorie is not a thing you can observe, just like a joule is a measure of force over time, and not a concrete object. From an economic perspective energy is an active, or what I will call *elastic*, variable across moments of economic production, circulation, and consumption. Fossil fuels in particular can for a time increase the productivity (and thus relative surplus value) of labour power, but their substitutability for labour as a form of work, combined with its volatility as a pricing mechanism for all other commodities, means that it can also suppress the surplus value available in the production process. The substitution of energy for labour, which as I will show makes up the history of every sector of the economy in the 20th and 21st centuries, causes as many economic problems as it solves, not least of which is the futurity of a form of value tied to labour.

Thus while the positivist and neoclassical account would locate energy as an asset used up as a fixed form of capital (alongside machines, raw materials, and so on) I will show that energy is as much a factor in the forces of production and relations of production as it is in the forces and relations of *re*production. Put simply, energy is not merely another commodity on a market that draws an equivalence between heterogonous

objects, just as it is not merely a factor of production used up like other fixed capital assets, like machines, or natural resources such as iron. Our means of social reproduction, too, depend on an energy infrastructure that has developed in step with the industrialization, and postindustrialization, of everyday life. This means, in other words, that energy deepening contours economic value by saturating the relations and forces of both economic production and social reproduction. This is what I mean by energy *plasticity*, the current use of which in neuroscience—where the brain literally changes shape in response to certain crises—is as important here as the more material fact of plastic's ubiquity across the globe today.[63] Energy remains a theoretical property of matter until it is transferred, at which point it is expressed formally in a change or modification of an object's state. At the level of energy system, especially one fuelled on hydrocarbons from oil, natural gas, and coal, the plasticity I have in mind is as much social as it is material, since what is fundamental about an energy system is the mechanical, social, and environmental infrastructure it provides all other systems. And this is largely what Amanda Boetzkes and Andrew Pendakis mean when on the question of plasticity and the ontology of oil they remark, "plastic—its pleasurable superficiality, its flexibility, its 'lightness'—visualizes a time freed from restrictions and limits even as it dovetails with contemporary neoliberal fantasies about the capacity of individuals to endlessly make and re-make themselves."[64] Oil's plasticity is thus both the quality that

[63] Catherine Malabou has been the single most important critic to branch analytic and continental approaches to plasticity since she recognized in the 1990s that plasticity plaid a formative role in Hegel's dialectic, and that this dialectical capacity to "take form (as in the plasticity of clay) and to give form (as in the plastic arts and plastic surgery)" as she explained in *Changer de différence, Le féminin et la question philosophique* offered important insights into cerebral plasticity as well.

[64] Amanda Boetzkes and Andrew Pendakis, "Visions of Eternity: Plastic and the Ontology of Oil," *e-flux* 47 (September 2013).

sets it free to reign over the material world—to get lodged in it and to change its landscape indelibly—and the one that alters the world of social relations by embodying and accelerating a kind of neoliberal materialism. This uniquely historical quality of energy is impossible to grasp from within the still strictly positivist science of economics.

Social theorists attentive to the spatial and temporal outcomes of economic growth have begun to explain how the plastic and the elastic interact with recourse to energy. In his remarkable account of *Social Acceleration* in modernity, Hartmut Rosa offers extensive quantitative and qualitative proof of the nearly unfathomable speeds with which all dimensions of social life change on pace with technological and economic growth. In Rosa's account, growth itself has been predicated since the early stages of the industrial revolution on what he calls the social detemporalization of technical progress:

> the primary effect in the domain of technical acceleration is a phased transformation of the social space-time regime. The acceleration of transportation, communication, and production does not only bring about an alteration of the spatiotemporal patterns of usage, movement, and settlement and the very experience of space (space seems literally to shrink and lose significance in comparison to time). It also changes the quality and quantity of social relationships, practices, and action orientations. In short, technical acceleration always harbors a tendency to transform the objective, the social, and (mediated through these) the subjective world, because it implicitly transforms our relations to things (i.e., to the material structures of our environment), to our fellow human beings, and to space and time.[65]

What Rosa intuits in his analysis of the temporal qualities of modernization is that a sense of space seems to disappear as both the social and technical sides of postindustrialization respond to one another, but only because space itself appears to *take place* in time amidst modernization. And thus what appears as a relatively stable narrative of modernization

[65] Hartmut Rosa, *Social Acceleration* (New York: Columbia University Press, 2013), 304.

on the side of industrial development is, when viewed sociologically, an explosive series of discontinuous episodes, of "detemporalization" in Rosa's words.

Most of the social structures that made the first phases of industrialization possible—and thus the political responses to industrialization too—have been either abolished, fragmented beyond repair, or sped up to what Rosa insists is intergenerational speed of change (family structures, religious beliefs, place attachment, career maps, romantic relationships, circles of acquaintance, and so on). The consequence is that the social and technical speed of energy deepening has cut the conceptual feet from underneath the *polis*. From this side of modernity, old categories giving political projects their coherence, such as 'family,' 'labour,' or 'friend,' look nothing like they did even fifty years ago. What it means to embed successive phases of energy deepening in the social fabric upon which it depends, in other words, looks nothing like the software update we have come to associate with sociotechnical change, at least not when we take the long view of modernity. From the perspective of social acceleration, energy deepening supplied by fossil fuel intensifies not just our quantitative experience of energy (faster cars, more communication, smarter products) but our qualitative experiences, too.

Rosa's critique of acceleration helps explain two paradoxes I have already implied so far. First, major transitions in energy regimes barely register on the level of content in the fictions we would most expect to represent them. Instead it is on the level of form that the temporal and spatial axes of setting are established.[66] Second, it is not—or at least not *only*—through character or subjectivity as such that an energy regime takes

[66] The claim that there is a deficit, rather than surfeit of fictions on energy, or oil more specifically, is well rehearsed in the wake of Amitov Ghosh's seminal essay, "Petrofiction: The Oil Encounter and the Novel," *The New Republic* (March 1992) 29-33.

hold, but the *setting* through which economic, cultural, and environmental forces meet, where disciplinary positivism breaks down, and where energy, like value, is expressed not as a thing but as a social relation. This is the problem of representation that drives the questions I am asking here as well as the objects through which I intend to answer them. If energy deepening helps explain the problem of value in postindustrial society, but value is nonetheless immaterial (to use Marx's paradoxical phrasing in *Capital Vol. 1*), then a new problem emerges from the resolution of value's source: namely, how energy deepening materializes, or gives form to, the expanded reproduction of capitalism, which as I have already suggested is a question about medium. What does the transformation of immaterial forces (energy and value) into matter (fixed capital on a small scale and capitalist geographies on a larger one) do to our theories of medium, and in which mediums are we most likely to get a grip on the environmental and economic crises borne by energy deepening?

In Part One, I will say it is the novel, or rather in a peculiar type of novel (I'll walk us through three) that allows energy deepening to become the cause of its own ends. In my first chapter, "The Work of Art and the Work of Nature at the Dawn of Oil," German inventor and creative writer Paul Scheerbart gives us an opportunity in his 1910 novel, *The Perpetual Motion Machine*, to think about the logical and aesthetic relationships peculiar to the dream of unlimited and thus free energy on the one hand, and the literary form soaked in expensive energy on the other. Scheerbart's novel, which quickly became a favourite in architectural, literary, and philosophical circles in Germany and the patron text of the German Werkbund shortly after its publication, established with shocking precision the literary debt owed to the social arrangement implied by a world of

energy exclusivity. The novel form itself, in his book's account of itself, not only dramatizes the social compact implied by private property in a world with limited or expensive energy, but is also limited formally to the logic of property. When the novel's protagonist invents the "perpet-machine," capable of working forever and for free, the novel doesn't get more interesting as we might expect, but rather ends, as the book itself becomes the design material considered private at the patent office.

Scheerbart's book poses a set of tricky questions about the nature of literary and physical work at the dawn of the oil age. I read Scheerbart's rendition of literary and physical work in the industrial world of capitalism against the foundational essay on "Critical Theory" that would define the prospectus of the German Frankfurt School, since animating the latter's *raison d'etre* was nothing short of the place of culture, and cultural criticism, in the critique of political economy dually contingent on natural and social wealth. Across chapter one, I let energy mediate the work of art and the work of nature, which by the time we end with Adorno will prove petulant for a theory of aesthetics and of communism too.

In chapter two, "Resource Radicalism and the Infrastructure of Race in *Black Empire* and *Invisible Man*," I place two novels considered to be enigmatic within the canon of African American literature in the context of the petromodernism they uniquely establish. George Schuyler's initially comedic fantasy of a black geopolitical superpower fuelled on solar energy in Africa in *Black Empire* (1936) gets serious when its speculative project exposes the two sides—one electric and the other political—of power. Though Harlem critics initially read Schuyler's book as a parody of the preoccupation in America with black essentialism, when read as an *energy* essentialism, I argue that Schulyler's

conservatism looks like a radical reinterpretation of setting in an America gridded by both electrical and political currents. What this means for Ralph Ellison's *Invisible Man* (1952) once racial struggle gets plugged into the rhythms of postwar New York City is that the only way out of the US power grid is to become it. Ellison's protagonist learns that race in the South has the same material function as race in the North—in both, race turns out to be about cheap labour—and so after testing out both racial and labour based political responses, he and the novel's narrative structure get absorbed into the physical infrastructure lighting the whole thing up. He goes off the grid by stealing electricity in a forgotten, underground room, becoming "invisible, without substance, a disembodied voice."[67] He becomes a form of energy, overcoming the novel's limits as a medium.

Hence the narrative arc I establish in part one depends on the geography not of the nation but rather of where energy in the 20th century draws speculative attention to itself. Energy deepening will by the end of part one have proven to have been, at least in the first half of the century, a major source of literary modernism—of the techniques, structures, and contradictions of modernization in literature. More pointedly, energy deepening will look socially recursive—which is to say, a process that ratifies and intensifies existing social relations, such as race, gender and class—rather than progressive, when viewed through the energy novels I examine. Energy's recursive effects helps explain why *free energy* so frequently resolves the narratological limits of the emerging energy system and the social inequalities it does little to temper.

In Part Two, I will establish that energy deepening remakes the political economy that separates architecture from the infrastructure beneath it, and that the dawn of

[67] Ralph Ellison, *Invisible Man* (New York: Vintage International, 1995 [1952]), 581.

postindustrial economics is premised on this reconfiguration. Chapter three, "The Cultural Work of Architecture: Energy Deepening and the Postindustrial Turn at FIAT" offers a reading of Piano's earlier commission in the Italian North to retrofit the FIAT car company's largest automobile plant into a post-Fordist producer of wealth. Just under a decade after the two oil shocks of the 1970s, the largest automobile manufacturing plant in Europe closed its doors. Only a few years later, however, the former FIAT factory in Lingotto Turin reopened as a cultural complex. Emblematic of a paradigm shift in architectural theory and development practices in postindustrial regions, the FIAT retrofit provides an opportunity to explore the economic theory driving and rationalizing the shift to cultural production. Thus discourses of accounting and growth theory form part of my reading of the cultural turn in architecture, as they make available a framework through which to understand the relations between energy deepening to cultural deepening.

Chapter four, "Energyscapes and the Expanded Field of Postindustrial Philosophy," follows the cultural economy of architecture from the 1970s up to the present by redefining landscape architecture in relation to the energy politics of postindustrial setting. "Landform building," as former dean of the Princeton School of Architecture Stan Allen calls it, shifts focus from "the biological to the geological"[68] potential of building techniques in the postindustrial era. Firms such as MVRDV, Foreign Office Architects (FOA), Bjarke Ingels Group (BIG), and Diller Scofidio + Renfro have been pushing the architectural envelope since the 1990s by turning urban form into terraform in order to maximize "flows of energy, information, and people on-site."[69] In

[68] Stan Allen, "From the Biological to the Geological," in *Landform Building* eds Stan Allen and Marc McQuade, New York: Lars Müller Publishers, 2011.

[69] Allen, 22-23

this chapter I characterize the aesthetic economy of postindustrial landscape architecture and environmental systems design in order to claim that energy deepening establishes itself in spatial forms, or the physical setting, of a fully saturated fossil fuel society. I read the return to landscape, infrastructure, and environmental systems as a temporary solution to capital's energy crisis in the 70s. In reading major landscape and landform projects in Europe and North America, I situate economic planning, energy distribution, and terraforming within a matrix driving a petroeconomy otherwise imagined as unshackled from both physical constraints and planning. By moving through exemplary instances of postindustrial landscape architecture in part one, and the philosophical tradition of its theorists in part two, this chapter claims that the political economy of postindustrial energy is premised on excavating a posthuman source of value, rather than a labour-oriented one, and that this (along with the position that celebrates it) is a political disaster.

My conclusion digs deepest by exposing the infrastructure of energy deepening amidst the so-called third industrial--or "renewables"--revolution underway across the globe. "The Politics of Infrastructure and the Infrastructure of Politics" closes this project by offering a critique of what I call the infrastructure of political economy, or the infrastructuralization of the *polis*. I return to the material bedrock of our postindustrial energy system and isolate the class contradictions keeping any number of recent projections of a renewable energy revolution from altering the trinity of value, energy, and labour. A reading of energy's relationship to class contradiction leads me to theorize the relationship between labour power, alienation, and social reproduction during large-scale blackouts, those rare (though increasingly common) glimpses into the *polis* sequestered from the electrical infrastructure that has come to define it.

Thus there are at least three mediums through which the setting of energy deepening makes itself available as an aesthetic dynamic, which is why the following five chapters are separated into two parts organized by media: from the energy novel to the architecture of postindustrial growth in parts one and two, through to the political and physical infrastructure of the late energy economy in the concluding chapter. My choice of mediums is not accidental, but is instead the result of my thesis that energy is integrated in the age of fossil fuels through the very physical, symbolic, and logical properties of setting as the world finds itself between an environmental and an economic totality in the latest phases of energy deepening. The trans-media picture of how energy integrates itself into the fabric of postindustrial society is then not just a methodological cue to where we might catch a glimpse of energy *being integrated* (the novel, architecture, infrastructure) but is also where energy thickens the plot: through a sense of setting.

And it is precisely the aesthetic process by which a setting becomes given, background—inscribed in the very thoughts and movements of the actors that inhabit it, their orientation and their embodiment of it, and their unquestioning acceptance of it *as setting*—that makes it uniquely capable of capturing the world-making capacity of energy. For though we have become accustomed to thinking about energy only when it is made most spectacular—an oil tanker spills unfathomable quantities of black death into the sea; a pipeline bursts open into a protected ecosystem; Aboriginal communities downstream from the tarsands discover their cancer rates are not accidental—it is the less visible qualities of energy, its more stable (and slow) properties as a structuring mechanism of time and space itself, that concern the following pages.

The Location of Energy

In addition to Frank's cultural criticism, three theorists on either end of the fossil fuel revolution will prove indispensible to this project's theoretical setting: George Bataille's "general economy" of energy in *The Accursed Share*; Henri Lefebvre's still seminal study of *The Production of Space*—canonical not only for geography, but social and cultural theory, too; and Keller Easterling's more recent political theory of extrastate urban zones. This body of work helps establish, if from very different critical standpoints, a critical paradigm of energy premised on waste, excess, and surplus.

In Bataille's earliest and most extensive treatment of energy in modern social theory, it enters not as we might expect as a conceptual concern wedded to industrial forms of production, but instead as a governing logic of what he calls the "general economy" of both social and environmental systems. We might very well surmise that industrialization itself produced the theoretical appearance of a world governed by the laws of energy, but in Bataille's account its historical appearance is all but related to the specifically political economy with which his three volumes seek to dispense. The "basic fact" of energy laws, he says, is that:

> the living organism, in a situation determined by the play of energy on the surface of the globe, ordinarily receives more energy than is necessary for maintaining life; the excess energy (wealth) can be used for the growth of a system (e.g., an organism); if the system can no longer grow, or if the excess cannot be completely absorbed in its growth, it must necessarily be lost without profit; it must be spent, willingly or not, gloriously or catastrophically.[70]

Laws of energy turn out then not to impose the social limits of resource scarcity on human history, in other words, but rather produce the opposite dilemma: how to dispense

[70] Georges Bataille, *The Accursed Share* (New York: Zone Books, 1991), 21.

with the excess energy necessary for the growth. "Catastrophic" spending turns out in the adjacent chapter to mean explosive wars—he's writing with the unprecedented mobility of social and physical power of both world wars in mind—or the equivalent less explosive wars fought unequally between classes.

On the cusp of the 1970s energy crises, and as national liberation movements unfold in the colonial world, Bataille thus reframes energy not just as a political economic variable—though he had no illusions about the function of oil in all of this—but as a restraint on life as such. But the restraint, the transhistorical requirement of excess energy for all growth, biological and industrial alike, proved emancipatory in his vision of things. For though fossil fuels in particular were already accelerating the geopolitical tensions of a world economy bent on perpetual growth, the perspective of "the *general* economy," according to Bataille, "actually accomplishes a Copernican transformation: a reversal of thinking—and of ethics."[71] Namely, "if a part of wealth […] is doomed to destruction or at least to unproductive use without any possible profit, it is logical, even *inescapable*, to surrender commodities without return."[72] What proves "inescapable" in the general laws of Bataille's energy ontology, in other words—and this then is what he means to say is the "ethical" consequence of natural forces—is the abolition of those more political economic laws that hold sway over commodities and their unequal distribution. Energy, in his account, brings us back to a version of Marxism, even if Marx had no patience for energy.

[71] Bataille, 25

[72] Ibid.

Henri Lefebvre is another of the few critics who thought actively about the impact of energy on forms of labour in the early part of the fossil fuel revolution. In Lefebvre's most systematic consideration of capitalism's spatial dynamics, energy invariably names the core problem and possibility of labour in a capitalist economy because a "body with the energies at its disposal, the living body, creates or produces its own space [and yet] conversely, the laws of space, which is to say the laws of discrimination in space, also govern the living body and the deployment of its energies."[73] Thus physical work available from nature makes labour a world-making force, and yet at the same time—since it is not the labourer who possesses the force of energy but the capitalist—is reshaped by the world from which it is alienated. Important for my purposes are two implicit properties Lefebvre isolates for energy: first, that energy is only actualized as a material force in the world when it is "expended,"[74] but that its abstract potential in storage exerts no less a powerful force on space through economic tension and what he'll later call degeneration; and second, that energy names the mediation between both the social and the material coordinates of space—what I have been here calling setting. In his account of the architectonics of space—the physical axioms that govern its shape and politics—Lefebvre will go so far as to claim that energy, though plainly constitutive of economic development, also contradicts "the principle of economy," which is to say, it is a form of value predicated on scarcity:

> The release of energy always gives rise to an effect, to damage, to a change in reality. It modifies space or generates a new space. Living or vital energy seems active only if there is an excess, an available surplus, superfluity and an actual expenditure thereof. In effect, energy must be wasted; and the explosive waste of

[73] Henri Lefebvre, *The Production of Space* (Malden: Massachusetts: 1974), 170.

[74] Lefebvre, 177.

> energy is indistinguishable from its productive use: beginning on the plane of animal life, play, struggle, war and sex are coextensive. Production, destruction and reproduction overlap and intersect.[75]

We might be tempted to accuse Lefebvre here of fetishizing use over exchange value, or of championing a new materialism at the expense of dialectical materialism. But what is at stake in this rather naked turn to the laws of matter over those of dialectical materialism is that the physical force of energy is both intensely dialectical (production is a form of reproduction, and space is just as much the result of the productive use of energy as it is of unproductive use) and thus also historical. In his critique of energy, in other words, Lefebvre neither drops history from the physical, nor the economic from the natural, but rather isolates energy as the dynamic that mediates them.

Lefebvre's redefinition of production, destruction, and reproduction as forms of energy expenditure is the outcome of a long engagement with Leibniz and Spinoza, the two most influential modern philosophers of space. They give Lefebvre license to estimate the physical and social principle of Eros over that of asceticism. "In sharp contrast" to what he calls the "principle of economy," is "the opposite thesis, espoused by a succession of philosophers, according to which waste, play, struggle, art, festival…are themselves a necessity, and a necessity out of which the partisans of this view make a virtue."[76] From Spinoza through Schiller, Goethe, Marx, and Nietzsche, Lefebvre in his energy critique finds a philosophical and political counter tendency to the universalization of private property (land and the energy it bears) and the conceptual framework energy imposes on both work and space. *The Production of Space* makes it clear why reframing energy in terms of Eros and the space of life itself is so crucial: any

[75] Ibid., 66.
[76] Ibid., 177.

theory of social revolution without a critique of energy is limited, in his account, to either "the rational organization of production and equally rationalized management of society," or worse, "the ideology of growth."[77] An economy driven by renewable energy would require the same social and technical contradictions of growth, in other words, as one driven by non-renewables.

Physical work in the form of energy arrives to us, in Lefebvre's account, as a gift from the heavens with the very structure of play and excess built into it. Squandered in the form of economic scarcity and unequal access, energy deepening paradoxically separates most of the world's population from the world itself, from the possibility of self-management in local or even regional settings. Socialism offered but the briefest of glimpses onto what a different social structure of energy deepening might provide, which is why Lefebvre turned his attention many years later to what he called *autogestion*, or self-management, in Yugoslavia.[78] There it looked possible to build a free association of energy users into the fabric of the city, especially when city authorities in Belgrade opened up their "International Competition for the New Belgrade Urban Structure Improvement" to the international community in 1986. That competition, and the political project it more generally symbolized in the Balkans, would prove only a couple of years later to have been the death sigh rather than birth pangs of a new society.

Keller Easterling's urban and architectural perspective on energy emerges not from a fossil fuel economy picking up, but rather from one losing steam. Easterling's *Extrastatecraft* is the latest in a growing critical bibliography concerned with the politics

[77] Ibid., 422.

[78] Sabine Bitter and Helmut Weber, *Autogestion, or Henri Lefebvre in New Belgrade* (Berlin: Sternberg Press, 2009).

of infrastructure, and is—like the vast majority of these texts—speaking to and about the history of critical design.[79] What I will suggest in the last part of this dissertation, however, is that it is no accident that the political stakes of energy deepening are most visibly worked out in the design circles historically tasked with theorizing the architectural and infrastructural spaces of the *polis*. For these two mediums have proven most indispensible to the aesthetic and physical requirements of energy deepening in specifically postindustrial phases of capitalist modernity: architecture, because energy only serves as a factor of production (and productivity) when it is *mechanized* and thus housed in, and as, the physical setting of production; and infrastructure, because just as important as productivity gains for economic growth are the social relations that both make possible and absorb the impacts of economic growth. Thus an infrastructure for postindustrial social *reproduction* has grown in step with growing energy use.

However, unlike the largely state-regulated and subsidized infrastructure of the industrial economy—the electrical grid and railway to name the most recognizable—a postindustrial infrastructure adequate to the energy depths of today's political economy largely circumvents the state governance (though not state subsidy) we have come to associate with industry. This is no accident, however, nor is what Easterling will call extrastatecraft the grand scheme of conspiratorial capitalists. Rather, postindustrial infrastructure, and the *political* economy it generates, is a logical outgrowth of a very palatable economic limit reached at the end of the industrial era, made all too visible by

[79] In addition to Easterling's earlier book on circulation and materiality in *Enduring Innocence,* important contributions to the study of infrastructure (obviously not exhaustive) include issue 30 of *Pamphlet Architecture* on "Coupling: Strategies for Infrastructural Opportunism" (2011), Katrina Stoll and Scott Lloyd's edited collection on *Infrastructure as Architecture* (2010) and Ariane Lourie Harrison's edited collection *Architectural Theories of the Environment* (2013).

the plummeting rate of profit constitutive of postindustrialization in the post-1970s era. In chapter three, I map the shape of this economic reboot, but it is important for my argument about postindustrial infrastructure to say up front that the Fordist form of production, and the social relations it produced, no longer proved profitable enough to sustain economic growth by the end of the 60s. Its labour intensive mode of generating value was too costly both economically and politically. Militant labour unrest burst across Europe, Mexico, South America, and the US in 1968, and continued to burn in places such as Italy, France, and Britain well into the 70s. What critical theorists have come to call 'post-Fordism' or 'late capitalism,' or what I am calling the postindustrial, is thus not simply a developed phase of macroeconomic trends (though it is that, too) but rather a historical strategy to generate surplus value well past its technical limits. In my account, energy deepening is what makes this strategy possible.

Energy deepening too, however, has its limits. One of the most peculiar features of the energy sector's internal fiscal logic is that, while easily accessible oil and gas reserves began to dry up sometime in the mid-2000s, the turn to shale and bitumen extraction has pushed the so-called Energy Return on Energy Invested (EROEI) to approach 1:1.[80] Fossil fuels are so technologically difficult (and expensive) to extract today that energy companies need other reasons to continue in addition to the dollar value of oil. Therefore EROEI expresses a larger problem than the physical restraints of energy. For the 'energy invested' portion of the equation is both a determinate cost indexed to its opposite (the 'energy return') expressed in dollars, as well as a numeric representation of

[80] Robert Ayres, Jeroen C.J.M. van den Bergh, Dietmar Lindenberger, Benjamin Warr, "The underestimated contribution of energy to economic growth," *Structural Change and Economic Dynamics* 27 (2013): 79-88. Electronic: accessed June 2014.

the technical composition of what we might call the oil (as opposed to gold) standard. I will say much more about the impact of energy deepening of this magnitude on monetary policy later, but what Easterling lets us see are those political and infrastructural strategies currently unfolding that effectively defer the total economic crisis implied by a EROEI of 1:1.

Extrastatecraft names the generalization of a zoning and infrastructural strategy initiated in the 1970s, but which today is *paradigmatic* for the transnational companies operating across the globe. In the earliest version of these exceptional spaces, special or free economic zones (SEZ and FEZ respectively) were designed in Hong Kong and China to attract global capital through low tax rates, cheap labour prices, deregulation, and other financial incentives. The "zone itself was a 'gift,'"[81] she notes, that brought the capital needed for large-scale growth. But while in its earliest stages the "zone" was a state of economic exception reserved for geographically discreet spaces in developing economies—and uniquely designed to get the manufacturing sector up and running faster than other sectors—it has more recently become a veritable go-to in state and economic planning across the globe.

What began as a "spatial product" of economic expansion, Easterling says, has become today an "infrastructure space" binding virtually every nation across the world economy to a political and logistical system that operates beyond the state.[82] Hence, extrastatecraft governs capital beyond classical and state-bound systems of governance. Its protocols, she explains, are written "not in the language of law and diplomacy," but

[81] Keller Easterling, *Extrastatecraft* (London: Verso, 2014), 219.

[82] Easterling, 15.

rather in "spatial and infrastructural technologies."[83] These technologies include older forms of hard infrastructures, such as freeways, sewers, and electrical grids, but equally involve *soft* infrastructures, such as the repeatable "formula" plotting urban and economic development patterns in China, Dubai, Abu-Dhabi, Kenya, Russia, South Korea, Malaysia, but just as importantly in the West. Describing the formula as an "operating system for shaping the city," what it *informs* is "how objects and content are organized and circulated."[84] Infrastructure space, in her account, "becomes a medium" of both "information" and "extrastatecraft,"[85] and is thus the condition of possibility for economic growth to continue beyond the monetary impasse dug through 20th century energy deepening.

That today's largest energy producers are both exploring for and extracting difficult to reach reserves through the circuits and liberties of this infrastructure space should at this point come as no surprise. As EROEI creeps back down to its 1970s levels of 8:1, turning gas and oil into dangerously expensive commodities to produce in a world of relatively cheap ones, companies such as Royal Dutch Shell, BP, Exon, and China Petroleum & Chemical Corp have increasingly relied on a system of economic and political rules external to those typical of the market.[86] When asked why oil and gas companies received a combined eighty eight billion dollars in subsidies in 2013-2014,

[83] Ibid.

[84] Ibid., 13.

[85] Ibid., 11, 13.

[86] Megan C. Guilford, Charles A.S. Hall et al. "A New Log Term Assessment of Energy Return on Investment (EROI) for U.S. Oil and Gas Discovery and Production," *Sustainability* 3.10: 1866-1887.

fiscal manager of the Canadian Association of Oil Producers, Ben Brunnan, intimated the real stakes of extrastatecraft: "Oil and gas has unique economics to it that necessitate certain treatment so that it has a competitive foothold in the global economy."[87] What he meant to say is that without game changing subsidies from national governments, and flexible regulations at the site of production, the fossil-fuelled global economy would collapse. Energy deepening seen from the perspective of extrastatecraft has remade not just the setting of modernity, but the logic of what is replacing it, too. What is replacing it is a physical and logistical system that bypasses, and thereby defers, the consequences of everything implied by a low EROEI. Energy deepening is no longer profitable for those who replace living labour with the physical work of fossil fuels, nor those who own the means through which oil, gas and coal are extracted, refined, and transported, *without the simultaneous production of exceptional spaces and governance system untethered from the economic standards of the market.*

Why, I ask in this project, did the turn to culture accompany the economic osmosis of energy deepening sometime around 1973? Why, in other words, would the solution to European austerity come not in the form of increased economic output but in the social compact struck between renewables and culture in (for instance) Greece? The answer of course, just like the policy that makes the claim, presupposes a relationship between culture, energy, and capital, since what is chiefly stimulated in postindustrial economic policies are the most responsive variables responsible for "growth," which is to say, continuing capital accumulation. In most of the blueprints to, roadmaps for, and outlooks on renewables, what's most striking is that the imminent energy transition is

[87] Bob Weber, "Canada Subsidizing Exploration for Oil Reserves that Can't be Used," November 11, 2014 *The Huffington Post*, accessed January 27, 2015.

very rarely imagined to be a fundamental economic transition, much less a transition out of capitalism. Instead, so-called green energy is expected to generate precisely what hydrocarbons were expected to generate in the 20th century. The only difference now is that culture has replaced labour, or at the very least distorted it beyond all recognition. The remainder of this project is dedicated to explaining why.

PART ONE

CHAPTER ONE: The Work of Art and the Work of Nature at the Dawn of Oil

Abstract: This chapter takes stock of tendencies in late-industrial growth theories which positioned natural and cultural wealth in relation to economic value. Beginning with an enigmatic but contemporaneously popular novel that purports to self-destruct at its close—the novel starts as a fictional science experiment and ends by patenting its contents, which is to say, turns into a form of writing at odds with literature—I then move to the mid-century origins of Critical Theory in order to chart the cultural and natural antinomies of economics. The aim of this chapter is to provide a clear narrative arc that ties industrial fantasies of inexhaustible wealth (in cultural production and in natural reserves of energy alike) to postindustrial theories of value once the cultural structure of a coal economy is replaced by that of oil. The critical task is to establish that growth in the industrial period is a literary problem before it becomes an economic solution.

Nature, whose imago art aspires to be, does not yet exist; what is true in art is something non-existent. It comes to coincide with art within that Other, which a reason fixated on identities and bent on reducing it to sheer materiality calls Nature.
--Theodor Adorno*, Aesthetic Theory*

Energy is the ability to do work.
--California Energy Commission, *Energy Quest*

Only a few years before Germany would enter its first major energy crisis of the twentieth century, the unnamed narrator of Paul Scheerbart's part inventor log, part energy novel, first published as *Das Perpetuum mobile* in 1910, claims to have solved it.

Or at least this is the implication of the prologue that opens the novel, and the occasion for its content. He encounters an elderly gentleman who announces to his "laboratory" (which, given the three cognacs he imbibes a few minutes later, is probably a synonym for beer hall) that Robert Mayer's "great law of the conservation of energy," and with it the impossibility of a perpetual motion machine, is no longer the "archmodern legislation" of natural science, since it constitutes a failure of the imagination.[88] "Every mill wheel in a river that is free of ice and never runs dry is a perpetual motion machine," he continues, and the energy input required to hoist it "is provided perpetually by the Sun." Studied mechanically, energy appears to need work in order to count as work, but when read as a resource, energy indeed appears to be perpetual. In any case, he concludes, failed imagination in one field of science should no longer mean the end of imagination in another. At this he steps down, and the narrator declares not only a shared "point of view" with the gentleman, but that the novel we are about to read offers, at long last, the solution to perpetual motion. Thus begins the novel, which our narrator has made available for purchase "in bookstores for one-and-a-half marks."[89] "Why, this is capital!" the gentleman exclaims in response, "I congratulate you." Our narrator agrees, congratulates himself, and the prelude gives way to what by its end will be, at least fictionally, the last energy novel (different, as we'll see, from a novel about energy) ever written.

This chapter asks what the double entendre on "capital!" with which the novel opens might have to do with perpetual motion, which is to say why the 'good idea' on the

[88] Paul Sheerbart, *The Perpetual Motion Machine* (Cambridge: Massachusetts, Wakefield Press, 2011), 5.

[89] Scheerbart, 5.

one hand, and a solution to an energy shortfall on the other, both fuel a form of economic reason still called classical political economy in Scheerbart's day. And why does this first question (when framed as a question about economic growth, which in Marx is what capital names anyways) spell unanticipated consequences for what I will provisionally call cultural limits, or more specifically, the historical barriers to cultural perpetuity once culture, too, is imagined (as it has been since around mid-century) to stimulate growth?[90] What does it mean for our understanding of energy if, as *The Perpetual Motion Machine* turns out to insist, growth is as much a literary problem as it is an economic one?

Fascination with Scheerbart's other novels, including the more classically science fictional *Lesabéndio*, which Gershom Scholem famously gifted to Walter Benjamin at his wedding in 1917, and *Glass Architecture*, which was the primary inspiration for Bruno Taut's contribution to the Cologne exhibition in 1914, stem as much from their literary inventiveness as from their novelization of the Werkbund commitment to the *Gesamtkunstwerk* (total art work). Hermann Muthesius' famous dictum from 1902 that the new, total design would move "from the sofa cushion to city planning" implied an interdisciplinarity and cross-medium ethos upon which modernism would build.[91] By 1910, the total work of art driving German avant-garde culture was conditioned by one of

[90] Michael Leong has also considered the literary merits of energy fiction on display in *The Perpetual Motion Machine* at http://bigother.com/2011/06/05/paul-scheerbarts-perpetual-motion-machine-some-thoughts-on-literature-energy/. Though as will be clear in a moment, my argument is that what matters about the novel's relationship to theories of energy is not so much that a future with free and inexhaustible energy sources is utopic (it obviously is) but that thinking about such a scenario's cultural contradictions (it would most immediately make for very boring novels) tells us something about a dialectic that has tied cultural and economic work together for roughly as long as they've been imagined to be autonomous from one another.

[91] Hermann Muthesius, *Style-Architecture and Building-Art* (Santa Monica: The Getty Center for the History of Art and the Humanities, 1994 [1902]).

the 20th century's two maximum growth peaks (the second would come in the early 1970s). The maturation of coal technology across the industrial economies of Europe and America, in addition to the late stages of European colonialism abroad, resulted in an average global growth of four percent. Only during the second major economic growth peak between 1950 and 1973[92]—not coincidentally the era in which oil overtook coal as the dominant source of energy—would four percent growth return, the wake of which is the postindustrial era still unfolding. Significant for the argument I will put forward here regarding the relationship between energy deepening and the cultural accommodation of it, is that Scheerbart's novel fully anticipates the aesthetic contradiction of the oil economy from within the heights of Europe's coal-driven modernism. Scheerbart's novel captures the final moments of an economic sequence driven by the abundance of coal, in turn formalizing the fundamental relationship tying energy to the value form necessary to grow an economy. What's surprising about this, his shortest work, is its almost neurotic visions of what we'll see in a moment is a world *without* culture, which is to say a world in which the physical work of nature—in the form of free energy—makes the work of art implausible.

But the German cultural criticism to which Scheerbart's work would have spoken most directly was in the midst of a romance with the artistic promise of industrial expansion into everyday life. Growth in the prewar decade was revving upwards of five percent, and though the apex of Europe's imperialist tensions was on the horizon (and forecasted in *The Perpetual Motion Machine*) the accord struck between cultural and

[92] These two eras are referred to as the long booms of the twentieth century in Robert Brenner's groundbreaking account of growth in *The Long Downturn*, and the period after 1973 I'm calling 'after oil' is the era named in his title.

economic producers constitutive of the Werkbund was being fed by what appeared to be a nearly unlimited supply of cheap coal in the still newly unified German territories, and in colonies abroad. Indeed, Germany's tactical manoeuvring around French coal mines in WWI, and the fifteen year UN stewardship over key German mines after Versailles in 1919, would make it clear to at least one observer that the social and economic conditions of modern life were almost exclusively due to the mechanical work available from nature:

> The provisions relating to coal and iron are more important in respect of their ultimate consequences on Germany's internal industrial economy than for the money value immediately involved. *The German Empire has been built more truly on coal and iron than on blood and iron*. The skilled exploitation of the great coalfields of the Ruhr, Upper Silesia, and the Saar, alone made possible the development of the steel, chemical, and electrical industries which established her as the first industrial nation of continental Europe. One-third of Germany's population lives in towns of more than 20,000 inhabitants, an industrial concentration which is only possible on a foundation of coal and iron.[93]

Coal's capacity to modernize social and economic life on the continent was, for Keynes, an overlooked consideration in the conditions of post-war peace, since a key feature of the treaty of Versailles was to deprive Germany of much of its coal supply, thus crippling its capacity to regrow. The pre-war accord between industry and designers, in other words, was a state sponsored effort to bring the consumer goods market up to levels of output achieved in the capital goods market driving industrial production, the effect of which was the promise of long term gains economy wide. In order to accommodate the nation's sudden good fortune of energy supply, German industrialists commissioned an aesthetic retrofit of consumer culture. Thus what the new "foundation" of coal made

[93] John Maynard Keynes, *The Economic Consequences of Peace* (New York: Harcourt, Brace, and Howe, Inc, 1919), 41.

possible in prewar Germany was the fantasy of a hermetic relationship between culture and the economy.

In the opening pages of *The Perpetual Motion Machine*, thinking about energy, culture, and capital as the three sources of industrial growth is precisely what keeps the novel moving. For while on the face of things, the novel is about the prototype to which the book owes its name, the narrative that surrounds it projects a world where labour and capital are disarticulated, since a machine that runs on free energy would in theory "do the work for us."[94] The forms of labour typically associated with the labour theory of value constitutive of classical political economy would wither away, and yet at the heart of that same discipline is a conceit about the perpetuity of growth blind to the natural limits to capital expansion.

The stakes of what the novel calls the "perpet-future," we learn during an early reflection on the machine's potential, are world-historical. "Humanity will hereby be released from the burden of labor," the narrator declares: "the planet Earth will do the work for us."[95] If one perpetual motion machine is possible, the narrator thus imagines, then all machines can be put into perpetual motion, and "Misery…will come to an end."[96] Since everyone will become unemployed—their labour power will be turned into pure quantities of energy, the surplus of which makes them superfluous—unemployment will paradoxically end. Both riddles (how to grow the economy indefinitely and how to run a machine without an energy cost), which turn out to be two registers of the same enigma

[94] Scheerbart, 11.

[95] Ibid.

[96] ibid.

of value, answer the central problem of political economy with a science-fictional solution: In order to sever the dialectical knot whereby labour and capital live and breathe, labour is naturalized as energy, and capital is turned into a question of distributed resources. Instead of labour, there are quantities of energy, and instead of capital there are limitless possibilities of development.

For Scheerbart's inventor-narrator, the promise of energy surplus amidst industrialization is a matter of how to configure the arts and industry in order to optimize the new capacities made available by coal. And this is also a problem of spatial form. Or at least this is what first occurs to him once he imagines he has discovered the principles of a perpetual motion machine, which is to say a resolution to the impending energy crisis across industrial Europe. For while the discovery that "the work of attraction exerted by the Earth is perpetual" elicits fantasies of a world "released from the burden of labor," the idea of a post-industrial world quickly becomes monstrous in both scale and implication.[97] Between ruminations on a grand new architecture emancipated from human scale, diagrams of what he calls the "perpet-machine" in its march towards realization, and diary accounts of a nightmarish perpet-future dominated in 2050 by the "Barbaric General" of Germania, Scheerbart's narrator foregrounds the inseparability of political economy and literature in its own historical present. In theory, he suggests, news in the daily *The United States of Europe* would in the postindustrial world imagined by the novel take the place of literature, side by side with "technology, art, and science."[98] In the same entry, however, he considers the possibility that "literature will be stimulated more by the non-functioning of the wheel [his pet name for the perpetual motion

[97] Ibid., 4.
[98] Ibid., 21.

machine] than by its function."[99] Literature's stimulation then is tied to *the search* for perpetual motion, which in the narrator's words is because he "simply" doesn't "believe that a period of economic expansion serves the cause of literature."[100] We know this is its function because in the new era, publishers will "promote only the *infrastructure* of books".[101] Their contents will have been gutted, meaning that content and narrative are hypothetically tied then to the industrial era of growth supposedly resolved, or made perpetual, by the machine.

In this way, Scheerbart's post-work future modernizes Thomas More's *Utopia* where the only form of culture is one in which content is subsumed without trace into the formal features of gardening: no work means no narrative, only spatial arts. Indeed the idea that a perpetual motion machine will licence "landscaping on the largest scale imaginable" and thus promethean megastructures is the result of the narrator's confidence that the "colossal art of space" will replace literature. The relationship between cultural mediation and energy deepening, in other words, appears in the novel to be a problem of spatial form, and the reason for the turn to spatial form during periods of intense energy deepening (on the narrator's account) is because economic growth—what he earlier imagined ran counter to literature—is only possible amidst the cultural and spatial calibration period of a new source of energy. In the narrator's opinion, literature enjoyed a "spirited development in the first half of the nineteenth century," while it suffered "in the second half, just as the economy soared" on the back of a coal-powered

[99] Ibid.

[100] ibid.

[101] Ibid 22.

industrialization push. Likewise, in the perpet-future, literature will become a surrogate to the architectural requirements of economic expansion.

Which helps explain why the novel's call for an architectural landscape consisting of megastructures larger than "the entire Harz region" in northern Germany begins to occupy as much of the novel's attention as the machine around which it is structured.[102] If literature in the pre-perpet-present functioned as an indispensable mediator between an economic now and a post-work future, the actualization of the latter could only unfold, on the novel's account, with a new cultural imaginary—or what he calls a "cultural earthquake"[103]—appropriate specifically to megastructural scales: "there's no question," we are told early on, "that architecture must be raised to a higher level before it can take on the colossal tasks of the perpet-future" (17). The end of one form of cultural production, on the novel's account, is marked with shocking precision by the transition from literary labour (or we might say immaterial labour) to the materialization of that labour into fixed capital, or the means of specifically *economic* production. Understood this way, however, architecture, in its dual capacity to both aestheticize and materialize physical property, is strictly speaking another name for the relay between culture and economics (literary/immaterial – fixed capital/means of production). Architecture, both in the perpet-future Sheerbart's novel foreshadows, and in novel's internal logic about cultural ends and economic means, is the most precise medium through which different forms of value crystallize into a form most useful for economic growth, but only once a certain stage of energy deepening has been achieved.

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[102] Ibid 18.

[103] Ibid. 81.

In addition to oddly positing capital as the primary benefactor of a world without work, *The Perpetual Motion Machine* positions literature and political economy as two sides of the same industrial coin. That is, it positions literature (or more generally culture) itself as a genre of value, one only possible with labour's opposite: "capital!" That the world without work is a world without literature is not, on the novel's account, because there's nothing to write about; rather, it's a world without literature because the literary as we understand it (even if we don't always think of it this way) was born, and will therefore die, with specifically capitalist genres of value.

By the end of the novel, this peculiar distinction between economic value and cultural autonomy at the heart of specifically cultural forms of production is dramatized in the form of the patent. Unsurprisingly, the novel's promise of a diagram for the successful perpetual motion machine—the one to which the preface refers to simply as "capital"—is deferred indefinitely, since as soon as the narrator cracks the puzzle, he sends his findings off to the patent office for registration. More on the literary stakes of this later, but for now I want to draw our attention to the antinomy of this ending, which keeps the cultural object distinct from other sorts of objects.

This surely is a strong, though perhaps not immediately obvious version of what Fredric Jameson means by interpreting literature as a "socially symbolic act." In *The Political Unconscious*, Jameson is committed to outlining and exhibiting a specifically Marxist mode of cultural interpretation, not in order to supplement other forms of interpretation—ethical, stylistic, psychoanalytic, and so on as he says on the opening page—but to resolve the dilemma of historicism. If historicism's "old dilemmas" block our capacity to read for historical continuity amidst historical specificity, then it is

Marxism's theory of modes of production and their constitutive social relations, dramas, and antagonisms that give us access to "a single great collective story."[104] This story, of course, is not made available merely through an experience of the literary object, however, but requires an orientation towards it that recognizes its relationship to political economy, or the narrative fabric that holds a given mode of production together. Jameson says "History is not in any sense itself a text or master text or master narrative, but that it is inaccessible to us except in textual or narrative form, or, in other words, that we approach it only by way of some prior textualization or narrative (re)construction."[105] This gap between "History" and our decisions about how to narrativize it is captured by Jameson's term for the manner in which "History" moves, which is as "an *absent cause.*"[106] Hence the socially symbolic act is able to *mediate* the perennial gap between base and superstructure, which is an entirely different way of thinking about culture from the one that positions it superstructurally.

Pierre Macherey's roughly equivalent way of positioning literature in *Theory of Literary Production* (1966) even more directly confirms that the labour of literature, as well as the labour of reading, is a privileged form of metabolization for historical materialism. Both the literary and its criticism are privileged because they generate unique forms of knowledge irreducible to empirical ways of knowing. In Macherey's treatment literature's irreducibility is a result of repetition and difference of literary

[104] Fredric Jameson, *The Political Unconscious* (Ithaca: Cornell University Press, 1981), 3.

[105] Fredric Jameson, "Marxism and Historicism," *New Literary History* 11.1 (1979), 42.

[106] Ibid.

structure—the generation and dissolution of unity from within a single object.[107] Macherey therefore begins by separating commodity production from literary production, and proceeds to criticize those traditions, mainly positivist, that either ignore the former or collapse the latter into it. Literature has a unique function within a given mode of production, in other words, because it stands out against other forms of production, thus giving us a vantage point onto those other forms otherwise unavailable. The early Frankfurt School-inspired work of media-theorist Marshall McLuhan also offers a way of thinking about culture's unique material function in the maintenance and transformation of economic systems. In McLuhan's words, new forms of media, like literature during the slow industrialization of Europe, mediate the new "environment" being produced technologically and socially. I have been using the word "setting" to mean the same thing, which is neither visible as an isolatable object nor reducible to the physical contours of a conjuncture, but is rather the spatial and temporal fabric that anchors a given mode of production. This is why literary culture is indeed privileged in the tradition of dialectical criticism, since it provides visual and narrative inroads into a feature of history that is otherwise fundamentally invisible—its setting. Thus for McLuhan, "the reason" settings have a literary quality "is simply that environments are as total as they are imperceptible. Each new age creates an environment whose content is the preceding age. The content is perceptible. The environment is not."[108]

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[107] Pierre Macherey, *A Theory of Literary Production* (London: Routledge and Kegan Paul, 1966), 40.

[108] Marshall McLuhan, "Guaranteed Income in the Electric Age," *The Guaranteed Income* ed. Robert Theobald (New York: Doubleday and Company, 1965), 74.

From within this critical tradition, literature is a socially symbolic act because it at once participates in, but is also aesthetically autonomous from—which is to say irreducible to—the unfolding logic of a given mode of production.

Superstructures ↓	Culture Ideology (philosophy, religion, etc.) The Legal System Political Superstructures and the State
Literature	
↑ *Base or infrastructures*	The Economic, or Mode of Production: • Relations of Production (classes) • Forces of Production (technology, ecology, population)

Literature in the dialectical tradition that locates it between base and superstructure also understands it as an expression of cultural production more generally, and hence economically valuable at specific periods in the history of capitalism. To put it schematically, cultural production always contains within it an element of the literary, while literature is always implicated in the political economy of culture (or superstructure). Culture always had the capacity to become valuable in a crudely economic sense since it held a key position within the diagram of interacting fields that make up a mode of production. To use the words I chose in the introduction to this project, culture reconciles something like the base and superstructure of a given period by accommodating its spatio-temporal qualities to the social base that economic sequence depends upon. One such sequence has been the one inaugurated in the 1970s called the postindustrial, when cheap oil and the growth associated with it gave way to increasingly expensive oil and the emergence of so-called immaterial assets, human capital, and

affective forms of labour most famously anticipated by the Harvard sociologist Daniel Bell.[109]

Attached to the early accounts—both descriptive and celebratory—was an implicit belief that these new sources of growth were the result of a combined developmental victory across sectors, rather than the expression of certain fundamental limits at the heart of capitalism. The confidence in the perpetuity of growth once the economy had entered the postindustrial phase was perhaps most usefully captured in Gary Becker's (et al.) estimation that "initial levels of human capital and technology, and subsequent productivity and other shocks, determine whether a country grows richer over time or stagnates at low income levels."[110] Becker won the Nobel Prize in economics for his earlier theory of human capital in the mid-1960s, but by the 70s and 80s his findings led many economists to believe that a new source of growth had been discovered, despite slowing levels of labour productivity. Instead of anxiety about the rising organic composition of capital where more and more accumulated labour in the form of technology and machines suppresses the amount of human labour necessary to achieve the same output, economists now had reason to celebrate it. Investment in the capital stock of education, creative industries, and technological innovations appeared in the new growth theory to increase the value of labour as well. Lurking in the background of this new capacity for output, however, was another kind of work only very recently understood as important to growth. Oil. And its global infrastructure has given the economy a new base from which to build the postindustrial society.

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[109] Daniel Bell, *The Coming of Post-Industrial Society* (New York: Basic Books, 1973).

[110] Gary Becker, Kevin M. Murphy, and Robert Tamura, "Human Capital, Fertility, and Economic Growth." *Journal of Political Economy*, 98.5 (1990), 14.

1.1 The Economic Work of Nature

What, then, is the precise relationship between culture and energy if they appear to form a foundation for economic growth? What I will suggest next is that both energy and culture function as genres of value heterogeneous from economic value, and that they are together indispensible to the negotiation, evaluation, and expansion of economic value.

In his recent re-evaluation of the logic driving the switch from water to coal powered mechanical power in the 19th century, economic historian Andreas Malm makes a startling claim about the economic origins of fossil fuels. Contrary to standard accounts of the introduction of coal into the cotton industry, which insist water and the overall organic energy available from the surface area of the earth had proven insufficient to industrial needs, Malm exposes a rather different story. "The transition from water to steam in the British cotton industry did not occur because water was scarce, less powerful, or more expensive than steam," he shows; instead, "steam gained supremacy *in spite of water being abundant, at least as powerful, and decidedly cheaper*."[111] Why then, Malm asks, did British industrialists abandon renewable and *free* energy for an exceptionally expensive and complicated energy regime? Citing an 1827 treatise on the steam-engine by John Farey whose consulting firm helped carve out a market for coal power, Malm offers a simple answer: coal driven steam engines can be put in the middle of cities, where workers are, while water driven engines cannot. "The edge of steam, in

[111] Andreas Malm, "The Origins of Fossil Capital: From Water to Steam in the British Cotton Industry," *Historical Materialism* 21.1. (2013), 31.

other words, was its unique suitability not for the generation of power per se, but *for the exploitation of labour*."[112]

When the energy supply gets detached from its site of origin—when in other words water and rivers are replaced with coal and steam engines--the site of production, too, becomes mobile and is no longer fixed to a geographical logic of space, and becomes instead part of an economic one. Put in the terms of my discussion here, setting is no longer the condition of production, but rather what is generated by it.[113] Malm is concerned precisely with this question of space and time, since his compass is Moishe Postone's theory of domination and abstraction in *Time, Labour and Social Domination*, and fossil fuels (while missing from Postone's book) are the condition of possibility for capital's expanded reproduction. In Malm's words, the "dense energy" of fossil fuels "permits capital to produce its own abstract spatio-temporality for the production of surplus-value. They are incorporated into capital *as its own motive force*."[114] By the end of the century, continental Europe would require 20 times its land surface to produce the equivalent organic equivalent of its hydrocarbon energy.[115] Capital, after the introduction of fossil fuels, would become logically and historically dependent on them for its content, insofar as the organization and exploitation of labour power became a consequence, rather than a cause of energy deepening.

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[112] Ibid, 33.

[113] Ibid, 41.

[114] Ibid 56.

[115] Rolf Pieter Sieferle, *The Subterranean Forest: Energy Systems and the Industrial Revolution,* (Isle of Harris: White Horse Press, 1982).

Labour's historic and logical inseparability from a fossil fuelled energy system explains why economics' standard conception of itself as a science, as Philip Mirowski has noted and criticized, is that of a "physics of society."[116] Formulas for energy and value were, Mirwoski points out, simulacra for one another in the 19th century, since economic theory in Britain especially developed in an empirical tradition bent on mapping natural laws. The theory of energy that grew up alongside the labour theory of value—both theories, it turns out, were responding to the same historical conditions of rapid industrialization—grandfathered a mechanical view of work into political economy as a science. But if the first and second laws of thermodynamics applied too literally to laws of value, too, then every political economist would of necessity have to fully expect an end to capitalist forms of accumulation as well. They tend to expect no such thing, however, because while workers bring determinate quantity of energy to the production process, exchange value expresses labour power's social qualities. When surplus-value, rather than value-as-energy, becomes the *sin qua non* of capital accumulation, economic equilibrium becomes infinitely deferred, and perpetual growth becomes again imaginable. Economic growth, in other words, is as much a math problem as it is a narrative one, because the question of quantitative inputs and outputs is just as important as the qualitative question of labour's historical character.[117]

While the inexhaustible and autonomously fuelled machine no longer looks like a desirable project in which to invest one's energies (much less one's capital), it's not because the idea of inexhaustibility or even machinic autonomy have disappeared from

[116] Philip Mirowsky, *More Heat Than Light* (New York: Cambridge University Press, 1989).

[117] Mirowsky, 2.

the economic imaginary of contemporary capitalism. In the example of the postindustrial above, theoretical inventions and standardized practices in both accounting and growth management have since the 1970s sought to imbricate the fantasy of inexhaustible growth with the temporality of the intangible asset—a principle for measuring the value of an asset linked not to its devaluation but to its current cost on the market (current cost principle accounting), or more recently its predicted value in a future market (mark-to-market accounting). In later chapters I will make a more thorough case for why and how accounting theory forecasted a qualitative transformation in value theory after the OPEC crisis, but for now the point is that instead of including the temporal certainty of wear and tear in the current value of a commodity (including buildings, machines, a certain quantity of labour, etc.) value on the books has been brought into harmony with market price, and has thus been gutted of any materially bound temporality.[118] With standards for measuring value, national and international accounting practices have made a paper version of perpetual growth possible through a system of notation immune to capital's own historicity.

Early industrialists, however, also had reason to expect inexhaustible growth, since at the heart of growth was human labour, or labour-power, and what the industrial division of labour made possible (in addition to the technological advances powered by steam) was ever more productive labour. This is how Adam Smith puts it in *An Inquiry into the Nature and Causes of the Wealth of Nations* whose account of growth begins with the division of labour and the three means by which the labour of one man is made

[118] The exception is going to be a handful of stubborn national practices on the part of auditors in the interest of tax streams, but even these (about which I'll say more in chapter three) are disappearing in favour of a market model of valuation.

"to do the work of many": namely, the dexterity developed by performing a single task over time; time saved by not changing tasks; and "the invention of a great number of machines which facilitate and abridge labour."[119] Before writing *The Wealth of Nations*, Smith had personally visited the Soho Manufactory where the new Boulton-Watt rotary-drive steam engine was first introduced, and he so had a very particular abridgement of labour in mind—not merely machinery, but machines powered by an energy source so powerful that in turn made workers appear Herculean.[120] In Smith's influential thinking about wealth, an increase in the power available to the worker broadened the wealth of nations since it increased the labourer's capacity to turn natural wealth into economically exchangeable value.

Framing growth this way—as the synthesis of otherwise incompatible genres of value, rather than a measure of productivity or Gross Domestic Product (GDP)—helps explain why growth in economics differs fundamentally in this respect from natural or ecological growth as figured in the natural sciences; in the homology, growth is not a measure merely of energy inputs and energy outputs but is rather a measure of transformation in which different forms of value (labour, energy, culture) get plotted within economic time. Money as the universal *form* of value is uniquely equivalent to all other forms of value (namely, different commodities) but is all but unthinkable on the other side of the economy-ecology homology mapped by Mirowsky, and, more recently,

[119] Adam Smith, *An Inquiry into the Nature and Causes of the Wealth of Nations* (London: Oxford University Press, 1993), 15.

[120] The story of Smith's visit to Soho Manufactory is recounted in Bernard C. Beaudreau's *Energy and the Rise and Fall of Political Economy* (New York: iUniverse, inc, 2008).

by John Bellamy Foster.[121] Value's homological relation in economics to growth in the natural sciences explains a good part of the enigma by which it appears to independently grow in economic mass. But if growth itself was already a measure of subsumption of new sources into the domain of economics, then the problematic I'm addressing here is what material form subsumption takes when cultural and natural genres of value crystallize into economic value. What, in other words, is the primary means through which ostensibly disparate *genres* of value crystallize into economic *forms* of value in the paradigm of growth that develops alongside fossil fuels?

Scheerbart's proto-modernist novel threads the indefinite future of economic value through its generic antecedents in natural philosophy and literary science fiction; but what is perhaps most surprising in what is already a novel full of surprises, is that its visual investment is almost exclusively in the history (and future) of architecture and landscape. The answer to the opening enigma (why proof of perpetual motion is "capital!") will elicit a wide variety of social fantasies in the novel, but what will finally anchor the novel's projections in its (and our) economic setting will be its capacity to narrate a world where architecture soaked in free energy, and everything that ties buildings to cities, appear to do the work of humans.

Thus "capital!" is a peculiar response to Scheerbart's fictional discovery of natural science's philosopher's stone for at least two reasons. First is the obvious fact that in a world without labour (that is, in a world where machines did all the work perpetually) *there would be no such thing as capital*, just as there would be no such thing as value so long as value is understood as a representation of labour time embedded in the

[121] John Bellamy Foster, *Marx's Ecology* (New York: Monthly Review Press, 2000).

exchangeable object, as it is for Smith, Ricardo, Marx, and so on.[122] There would be no capital, in other words, because there would be no labour. After all, in the novel's German context and Mayer's earlier moment in which European industrialization was rapidly expanding, the riddle by which inexhaustible energy (and thus inexhaustible growth) is posed as the object had always been answered not with "capital!" but with "labour!", especially cheaper and cheaper labour! Lower wages for more work, and more work from better machines—what Marx calls the general law of capitalist accumulation in chapter 25 of *Capital Vol. 1*—is, from a capitalist's point of view, the same as a reduction in energy costs where energy is both a physical and economic property of production. If the dream of the perpetual motion machine involved the elimination of energy costs, in other words, then the relationship between value and production (assuming the machine was used for manufacturing) would be permanently severed, which is why shaving labour costs (or variable capital) in the production process amounts

[122] In her remarkable contribution to the 1979 collection *Value: Representations of Labour in Capitalism*, Diane Elson offers (among a great number of other key insights into value as it works across Marx's texts) a provocation regarding Marx's debt to the natural sciences, arguing that at the core of commodity relations is a substantial equivalence: "…in the same way that in natural science, light, heat and mechanical motion are posed as substantially equivalent, as forms which are interchangeable as embodiments of a common substance, which is self-activating, in the sense of not requiring some outside intervention, some 'prime mover' to sustain it and transform it, i.e. as forms of energy. Similarly different chemicals are posed as substantially equivalent as forms of self-activating matter. Only with such a concept is a materialist account of the process of transformation and conservation of energy and matter possible, an account of this process as one of *natural* history, proceeding with a dynamic internal to it, and requiring no extra-natural 'cause,' no *deus ex machine* to sustain it" (158). For Elson, the solution to the problem of a looming idealist understanding of value is to emphasize at every turn the abstract subsumption of concrete labour as the precondition for the equivalence shared by commodities, which is the opposite of saying that you can turn the dialectic backwards to value's origins in concrete labour either logically or politically. Value in her characterization of Marx is not just an abstraction from concrete labour, but more fundamentally *makes labour abstractable* and thus exchangeable. What Elson makes clear is that you can neither sub energy in for labour, nor can you isolate labour (simply) in order to measure value.

even today to a capitalist response to the riddle's conceptual cousin: how do you grow an economy indefinitely?

1.1A The Culture Theory of Value

The gentleman's fantasy in *The Perpetual Motion Machine* that the discovery of perpetual motion is the same as "capital!" then makes no sense from the standpoint of a labour theory of value, but makes all the sense in the world if "capital!" is another name for his commitment to the self-perpetual motion of value in its cultural, or here literary, form: it's fairly easy to imagine a world where machines do all the work of humans, for the same reason that is very difficult to imagine an end to literature. In *The Perpetual Motion Machine*, it turns out, these are both features of the same economic imaginary where the mental labour of solving physics' core enigma provides a cultural contradiction loaded with economic energy. The other way to read "capital!" then is as a reference not to the machine itself but to the narrator's forthcoming text *about* the perpetual motion machine (i.e., the novel that begins when you turn the page). In its form as cultural narrative, the perpetual motion machine is not a machine at all but an aesthetic object distributed across (in this case) the medium of the novel, both in a series of diagrams that punctuate the novel's linear time, and by fuelling its narrative of a post-work future—what it calls the "perpet-future." Which is to say that there are at least two genres of perpetual motion in the novel--the scientific and the literary--that by the novel's final page we will see dissolve into the singularizing genre of economic value.

Autologically, *The Perpetual Motion Machine* remains true to its object of perpetual motion without any discernable limit to the novel's duration; there's no logical

conclusion to a novel fuelled on an impossible problem solving exercise. Nor does its durability limit the literary genres capable of wrestling with it (one could imagine both an epic and a romance about the perpetual motion machine—both of which, incidentally, are at work in George Schuyler's back to Africa novel from two decades later, *Black Empire*, about a global empire of blacks powered by Africa's inexhaustible solar sources). While there's no limit to the type of narrative the perpetual motion machine takes, there's only one possible ending to a novel about this particular puzzle: its last page closes the novel, the narrator claims, not because the project is abandoned but because the provisional solution to the machine's technical configuration is out for patent registration.

Any more pages, in other words, and the novel would interrupt the economic legitimacy of what it had been mapping: a blueprint for perpetual motion. The novel would become a breach of contract, and thus not a novel at all, because its contents have become an intangible asset. Thus while the promise of perpetual motion in the novel motivates the novel as a medium with duration, it also marks the novel's limit when it becomes a reproducible and patentable object. On the novel's account, then, the transition from one form of labour (i.e. literary labour) to its economic equivalent (i.e. to the productive capacity of the now patented machine) marks the limit of literature. In addition to literalizing the implicit economic capacity of cultural production, *The Perpetual Motion Machine* foreshadows the formal ends of postmodernism in which the gap between culture and economics collapses.[123] However, the idea I am proposing is that such an interdependence was not only underway in the industrial phase of capitalism, but

[123] I'm referring here to Fredric Jameson's oft-cited provocation in "'End of Art' or 'End of History'?" (1998) and elsewhere that the economy is now expressed in cultural terms while culture is now expressed in economic terms.

was, more to the point, a consequence of thinking both culture and economics in a paradigm dominated by energy.

1.2 The Energy Novel and Critical Theory

The narratological split-personality around which Scheerbart's novel is structured, though perhaps too obvious to dent the surface of its proprietary logic, has everything to do with its project to wed literary history to the social structure of energy: the novel's description of a world without work ties the abolition of private property to the abolition of scarcity, which is to say that the collective forms of land use, in the novel's logic, are only possible once energy loses its precious character. The standard account of property rights by legal historians is that they first arise in a scenario of competing resource interests. Exclusive access to water, land, or lumber, for instance, plots social and natural history on the same axis where, in Carol M. Rose's account, property rights not only prevent exhaustion, they also induce "individuals to invest and trade resources instead of dissipating their time and effort—and the resources themselves—in unproductive disputes."[124] In this account, energy and natural resources are thus encountered not as the world external to economics, but as a world shaped by economics, where in legal terms private property, and the economic inequality that comes with it, are naturalized. Only in this legal tradition, therefore, does it make sense for some other social relation to nature, such as one in which everything belongs to everyone, to first require free (or unlimited) energy as its precondition. What Scheerbart novelizes, then, is the implicit structural relation holding together a capitalist history of property—and thus implicitly a post-

[124] Carol M. Rose, *Property and Persuasion* (Oxford: Westview Press Inc., 1994), 164.

capitalist future without it—to the natural history of energy: only when the fundamental laws of science are abolished (the first and second laws of thermodynamics) can a world "without misery" take the place of this one, so long as energy takes the form of property, and property is structured as an expression of limited energy.

It might seem odd to claim today that energy and property share more than an incidental relationship, that the two coproduce a narrative structure of capitalist modernity and the limits to imagining a fundamentally different future outside of that narrative structure, when the contemporary mood attached to oil--today's hegemonic form of energy—is one not of composure but, to use Frederick Buell's words, of "catastrophe."[125] Part of what distinguishes today's economic landscape of energy from its industrial heritage, however, is that energy commodities such as oil, natural gas, and even coal, have been subsumed into financial markets—so much so that the price of oil itself has, during especially volatile periods, served as a temporary gold standard for international currencies.[126] Even before the financialization of energy, however, energy and property have been constitutive concepts in the critical history of the first industrial revolution in England, from which modern economic theory emerges. Arnold Toynbee's pioneering "Lectures on The Industrial Revolution in England" in 1884, for instance, explained that England's "unrivalled stores of coal and iron […] and geographical

[125] Frederick Buell, "A Short History of Oil Cultures: Or, the Marriage of Catastrophe and Exuberance," *Journal of American Studies* 42.2 (May 2012): 273-293.

[126] Timothy Lane, "Drilling Down—Understanding Oil Prices and Their Economic Impact," *Bank of Canada* (January 13, 2015) < http://www.bankofcanada.ca/wp-content/uploads/2015/01/remarks-130115.pdf> accessed March 1, 2015.

position," as opposed to its invention of a labour market, were the primary reasons why industrial growth took off there first and not the continent.[127]

As economic historian Stefania Barca argues, energy is at the heart of "one of the most powerful cross-field narratives concerning the 'rise of the western world' and its techno-economic supremacy" since "the story of the [Industrial Revolution] is [at] the core of a broader progressive narrative about the relations between energy patterns and Modern Economic Growth, including a number of implications about society/nature."[128] One such implication I have been reading from the literary history of this structural and epistemological conflation is that it forms a narratological impasse, beyond which the political capacity to narrate a future without social inequality is made unreasonable, unnatural, and (crucially) unliterary. More than this, such a project (to narrate a future without property from within a genre saturated with its logic) would spell the end of the literary as such: instead of novels, we would have as the novel puts it "the infrastructure of books."[129]

Thus if *The Perpetual Motion Machine* establishes what we might call the generic protocols of the energy novel, it is (for the same reasons) the last of its kind. Such a genre contains the seeds of its own destruction, as evidenced by the novel's hypothetical self-destruction when it arrives at the patent office. So if one way to read the novel's end is to say something about its form (what sort of property can a novel patent), then the second

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[127] Arnold Toynbee, "Lectures on The Industrial Revolution in England*"* (1884) http://www.saylor.org/site/wp-content/uploads/2011/08/HIST304-4.4-Lectures-on-The-Industrial-Revolution-in-England.pdf

[128] Stefania Barca, "Energy, Property, and the Industrial Revolution Narrative," *Ecological Economics* 3.12 (2010).

[129] Scheerbart 22.

is to say something about what its genre tells us about energy, and what energy tells us about genre. Claudio Guillén's now classic study of literary genre in *Literature as System* establishes the socio-historic coordinates of literary genre; in his account, the institution of writing and the activity of reading are codified into literary structures. Genre in Guillén's account was thus in an important sense statistical, but with a qualitative influence over how readers and writers imagined the literary history of a work. In Jonathan Culler's still canonical estimation of its social infrastructure, genre works primarily through "recuperation, naturalization, motivation, *vraisemblablisation*."[130] While each of these four generic characteristics labour to make genre recognizable in a particular text, it is the last—the work of making *a narrative structure* plausible—that in the structuralist account works at the level of cultural narratology. In his elaboration of yet further distinctions within the five types of *vraisemblance*, Culler moves genre into a standpoint closely resembling a post-structuralist phase of criticism where genre does the work of "what we should today call an 'ideology.'"[131] It is on this level, genre's more developed capacity to coordinate narrative and ideological structures—that is, genre's provision of ideology in its narrative structure—that the energy novel concretizes and vaporizes in its oscillation between cultural and economic work. Which is to say that energy turns out to be another name for the social structure of property in a world where energy comes with a price; that other world, named "perpet-future" in Scheerbart's novel, has no genre in this one, so the literary as such can be no longer *vraisemblable*, in Culler's terms, on the other side of that physical and epistemological revolution. The

[130] Jonathan Culler, *Structuralist Poetics* (New York: Routledge, 1975), 161

[131] Culler 168.

work of nature and the work of art, once thought to bear such intimate and romantic family resemblances, are brought to an explicit and logical impasse in the energy novel.

This way of reading the work of genre in literature tells us something else about the cultural requirements of any energy system, which is that in order to accommodate the rhythms of a new energy structure into the time and space, or indeed the setting of an economy, capital needs the narratological labour of ideology as it works in literature. For if genre naturalizes through repetition, and advances through difference, then its aesthetic economy would prove indispensible to the modernization necessary for capitalism fuelled on carbon. Read this way, the energy novel as I have been describing it was a natural fit, since energy deepening after coal was of necessity a literary problem before it was an economic solution.

1.2A Petromaterialism Before Critical Theory

Scheerbart's energy novel took seriously the narrative structure in which culture and nature appeared to labour in an energy economy increasingly soaked in coal power. What he couldn't forecast, or at least not fully, were the enigmatic narrative qualities of an oil economy still in its infancy. That Scheerbart's coal hungry German tradition could not yet imagine the narrative implications of oil, however, was not because he failed recognize energy as a social relation—*The Perpetual Motion Machine* is nothing if not a strong account of energy's social features—but because, as Amitav Ghosh argues on the other side of the century, oil would have a most peculiar and unexpected effect on the content of modern and postmodern culture: oil would have, in his account, none at all.

In a cultural analogy that imagines oil as a possible correlate to spices (the latter functioned as a metonym for larger flows of populations and goods in literary history), what Ghosh calls "The Oil Encounter…has produced scarcely a work of note."[132] Given oil's near universal saturation of postwar social and economic life, the comparative lack of a recognizable "petrofiction" is, for Ghosh, remarkable. He explains this lack by contrasting the market spaces associated with previous commodities to oil's peculiar impact on setting:

> the experiences associated with oil are lived out within a space that is no place at all, a world that is intrinsically displaced, heterogeneous, and international. It is a world that poses a radical challenge not merely to the practice of writing as we know it, but to much of modern culture: to such notions as the idea of distinguishable and distinct civilizations or recognizable and separate "societies." It is a world whose closest analogues are medieval, not modern—which is probably why it has proved so successful in eluding the gaze of contemporary global culture. The truth is that we do not yet possess the form that can give the Oil Encounter a literary expression.[133]

Oil's cultural, geographical, and economic functions are, in other words, unrepresentable in and of themselves, in part because there is no material precedent for its historical impact (coal's impact came close, but you can't make a house, chair, shirt, or lubricant out of coal). But more to Ghosh's sense here, *oil remakes setting* in as yet incomprehensible ways: oil produces a space "that is no place at all," and novels are nothing if not the place where settings get plotted in social time.

Ghosh's desire for a fictional genre able to give "the Oil Encounter a literary expression" is thus also a desire for a literary space attuned to the setting produced by advanced energy systems. That a global economy saturated in oil reconfigures economics

[132] Amitav Ghosh, "Petrofiction." *The New Republic* (March 2, 1992), 29.

[133] Ghosh 30-31.

and political spaces is fairly uncontroversial: plainly, the space of oil is only artificially mapped onto national spaces, for instance; oil in the ground sits in deposits that extend across vast regions on all continents, while oil *out of the ground*, once refined and made into plastic forms, is also unmappable in the way that, say, coal was in a cartography of industrial resources. Ghosh's essay shows us the representational limits of living within a petroculture. Some of our representational resources, narrative strategies, and so on, are based in earlier moments suited to the ages of empires and nations states, and the productive relations these entailed; only recently, Ghosh suggests, has cultural production adapted to coal power. Of course the real and imaginative mappings of the coal age are now likewise obsolete, since the rise of oil based commodities involved not just quantitative leaps in available energy, but a plethora of chemical, plastic, and electronic products unimaginable form the standpoint of a coal economy. These representational problems are symptomatic of the contradictions of our petroculture, namely, as Jennifer Wenzel suggests, "oil is everywhere and nowhere," by which she means, "oil is everywhere, ubiquitous in our daily life, and yet we so rarely see oil, either literally or metaphorically."[134] Approached from this perspective, the lack of a genre appropriate to the oil encounter is not at all surprising, yet what is so interesting to me is the simultaneous tension oil poses to literary genre, and its capacity to mediate heterogonous genres of value. Oil is everywhere, certainly—its plasticity knows no limit—but its surface ubiquity is pegged to its capacity to modulate the time and space of late capitalism.

[134] Jennifer Wenzel, "How to Read for Oil," *Resilience* 1.3 (2014), 157.

As I suggested earlier, the specifically plastic qualities of oil distinguish it from other energy sources, and yet they also close the gap between the cultural and the natural in a fashion only comprehensible from a theoretical standpoint. Oil's plastic forms—its material breadth, and ability to assume radically different forms—implies a radical contortion of the older dialectic at the heart of Critical Theory where nature and culture sat at odds with one another. In the classical Marxism that informed the early accounts of Critical Theory, nature was only experienced internal to the social metabolism of labour and cultural mediation, whence it lost its character as wholly other from culture and became instead a resource either economically or symbolically.[135] In the cultural materialism of Raymond Williams, too, ideas about nature tell us about the organizing paradigms of a given historical moment—whether the search for essences in the Greek and Roman worlds, or the metaphysical realm of God in the Middle Ages, or the evolutionary paradigm of an intentional system of selection, adaptation, and so on during the industrial period. As Williams puts it, "the idea of nature contains an extraordinary amount of human history."[136] In the materialist tradition, then, the separation of nature from culture tells us something specific about the *implicit* identity this difference contains.

Critical Theory, however, developed contemporaneously with the ascension of oil and the chronotope of modernization it made possible; thus critical theory was in some

[135] The cultural side of this argument is of course not exclusive to classical Marxism, but is the foundation of early environmental criticism in literary studies, such as Frank Kermode's seminal *English Pastoral Poetry* in 1952. Kermode's memorable treatment of pastoral poetry is premised on the argument that the resurgence in nature writing during the English Renaissance was indexed to the rise of urban living and the structures of thought it engendered.

[136] Raymond Williams, *Problems in Materialism and Culture* (London: Verso, 1980), 70.

ways able to anticipate the effects of energy deepening later in the century. Nature, for instance, in Georg Lukács' still pre-Marxist *The Theory of the Novel* emerges at the tail end of the 19th-century realist tradition in which the aristocratic Tolstoy, and not the bourgeois Flaubert, frames its narrative energies in what Lukáks describes as a permanent altercation with culture. Lukács had just completed *The Theory of the Novel* at the time he met Frankfurt School co-founder, Friedrich Pollock, at the *Erste Marxistische Arbeitwoche* to discuss Karl Korsch's manuscript on "Marxism and Philosophy."[137] What his early literary theory sought to expose was the cultural imaginary responsible for the bourgeois antinomy between culture and nature, and his description of the antinomy would translate into the principle of Critical Theory by the time Max Horkheimer would distinguish it from what he called "traditional theory." Though Lukács will admit the "result" of this antinomy is "a problematic novel form," it is not because nature is sentimentalized or psychologized in Tolstoy's epics, but "for reasons of form and of the relationship of form to its historico-philosophical substratum."[138] In Lukács' account, nature poses a problem for the realist novel because its formal tendency is always towards "a totality of men and events" which are only available "on the basis of culture," which is to say from a cultural standpoint *on*, rather than *in* nature. In a novel such as *War and Peace*, however, "nature, although it cannot become an immanently complete totality, is objectively existent," and thus "the work contains two layers of realities which are completely heterogeneous from one another both as regards the value attached to

[137] Martin Jay, *The Dialectical Imagination* (Berkeley: University of California Press, 1973), 5.

[138] Georg Lukács, *The Theory of the Novel* (Cambridge, Mass.: MIT Press, 1971 [1920]), 146.

them and the quality of their being."[139] Tolstoy's characters suffer from a general state of "ennui" despite (or because of) their proximity to epic constellations—namely, Napoleon's world historical exploits—and yet their attempt at rejuvenation through "the second, more essential reality of nature" generates "the lived experience of going from culture to nature," which is to say that instead of reconciling the one with the other (and thus licencing an organic totality in the novel) the latter's hostility to culture destroys the narratological consistency of both.[140] Hence for Adorno nearly fifty years later, "second nature" in Lukács' theory of the novel "remains the negation of any nature that might be conceived as the first," and thus (as per the epigraph above), "nature does not yet exist."[141] Only in "moments of death," such as when Andrey Bolkonsky awaits the end in the battlefield, or Anna Karenina lays in her deathbed, when "a reality reveals itself to man in which he suddenly glimpses and grasps the essence that rules over him and works within him, the meaning of his life" does the novel form reconcile itself with its natural antinomy.[142] But, as the dialectic goes, "going beyond culture has merely destroyed culture but has not put a truer, more essential life in its place"; "the great moments vanish without a trace"[143] as soon they are reflected back in consciousness, when nature is mediated again by culture. Culture, in this formulation, snuffs out the world of nature, but strives towards it all the same.

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[139] Ibid 147.

[140] Ibid.

[141] Theodor Adorno, *Negative Dialectics* (New York: Continuum Press, 2007 [1966]), 357.

[142] *Theory of the Novel*, 149.

[143] Ibid.

Why then is it Tolstoy and not the realism of Balzac or Flaubert that gives the novel its most advanced expression, when Tolstoy's is the "final expression of European Romanticism" and not the social realism we would expect in a foundational text of Marxist literary criticism? On Lukács' account, it is because the ecological contradiction of Tolstoy's epics, where a cultural impasse strives towards its self-abolition in nature, is where we see a "clearly differentiated, concrete and existent world, which, if it could spread out into a totality, *would be completely inaccessible to the categories of the novel and would require a new form of artistic creation*: the form of the renewed epic."[144] We thus come nearly full circle back to where the socio-economic contradictions of the energy novel left us a decade earlier in Scheerbart. Except in his novel, culture abolished itself in the narrative contradictions of energy, or what I claimed earlier was its political economic character, and not nature. To adapt the logic on display in Lukács' literary materialism, energy is already second nature, even if its concept invites a reading of nature as such.

Both in Scheerbart's novel and in Lukács' account of the formal antinomies of realism, the work of art and the work of nature are bound to the narrative structure of energy deepening, which is why the projection of a world where both forms of work are disarticulated occurs not *in* the novel form *but at its expense*; all that would remain would be the "infrastructure of books," or in Lukács' words, "a new form of artistic creation." Energy has been converted, in the transition from its literary climax to the early stages of Critical Theory, *into the cultural mediation of nature*, rather than nature as such—it has become, in other words, a component of productive force, and thus allied more with

[144] Ibid 152.

technology than with culture. Energy's unrepresentablility, or in Lukács' terms, hostility to representation, is a consequence not of energy's enigmatic or metaphysical properties—it does not merely *escape* representation as does, say, air—but rather because it is unthinkable (at least from within the cultural limits of capitalist modernity) as anything but a form of economic work. Tolstoy's late Romanticism is, for Lukács (at least in 1920s) the last narratological embrace of this limit, and what follows will quickly become its forgetting. Energy is thus held in special regard in the early formation of Critical Theory, and modern dialectics more generally, because it names the barrier between capitalist consciousness and consciousness (unavailable from the standpoint of capital) as such.

The work of nature and the work of culture are, in Lukács' canonical advances on a dialectical theory of literary materialism, bound to a historical narrative of bourgeois cultural consciousness, and are therefore at odds with one another. What it means to be at odds in Lukács' dialectical tradition, however, is to be in an important sense in motion, where nature is not autonomous from culture but rather mediated (and thus unavailable in itself, but nonetheless active) by the industrial function of energy. An epic appropriate to the industrial world, on the other hand, would be "a world which would have outstripped our dual world of social reality by as much as we have outstripped the world of nature."[145] Lukács thus offers an early formulation of the narrative antinomy between culture and nature long before this would get named a problem specific to capitalist modernity in later critical theory (including in his own work).

[145] Ibid.

In the more developed dialectical materialism of Lukács' *History and Class Consciousness*, this narratological antinomy embedded in bourgeois cultural thought gets repositioned on the more familiar terrain of political economy. In classical Marxism, nature and culture form two sides of a social process where labour mediates (or metabolizes) matter into material with social form. Nature is thus not external to thought, but constitutive of it, except that it is only known through the social process that gives it form (second nature) and is thus never available as an immediate object in and of itself. Hence, in what would become the axiom that divided Western Marxism from orthodox (or in this moment Soviet) Marxism—and a likely reason he'd have to renounce the book in front of Soviet authorities a few years later—Lukács' famous footnote on the dialectical method in the opening chapter, "What is Orthodox Marxism":

> It is of the first importance to realize that the method is limited here to the realms of history and society [and not nature]. The misunderstandings that arise from Engels' account of dialectics can in the main be put down to the fact that Engels—following Hegel's mistaken lead—extended the method to apply also to nature. However, the crucial determinants of dialectics—the interaction of subject and object, the unity of theory and practice, the historical changes in the reality underlying the categories as the root cause of changes in thought, etc.—are absent from our knowledge of nature.[146]

The reference here is specifically to the Engels' *The Dialectics of Nature*, where Engels was encouraged by early developments in evolutionary biology as well as the thermodynamic theory of entropy, to extend the dialectical method into the laws of nature. However, the political risk of a dialectics of nature understood this way, on Lukács' account, was to reduce the critical capacity of dialectics to a pseudo-science, or worse, to a positivist discourse all but incapable of politicizing, much less recognizing, the material and ideological force of negation.

[146] Georg Lukács, *History and Class Consciousness* (Cambridge, Mass.: MIT Press, 1971), 24.

Dialecticians in the Western Marxist tradition would have much more to say about the relationship between natural and economic history—so much so that, according to Martin Jay's influential history of the Frankfurt School, the second generation (after Lukács, Adorno, Marcuse, and Benjamin) replaced class conflict with "the larger conflict between men and nature."[147] Later in the century, Neil Smith would offer a new geographical standpoint from which to observe the economic laws of nature, effectively reconciling the study of nature with the critique of class. Capitalism, in his account, produces its own natural and social settings at the expense of others, and it does so within the laws of uneven accumulation.[148]

And yet there remains a kernel of unfinished business in the early history of Critical Theory where cultural production names both the project to render the economic properties of nature, and the natural properties of economics, into political contradictions, and the narrative impasse preventing the cultural mediation of nature and economics. And what I will suggest in this last section is that this unfinished business at the heart of Critical Theory—an incomplete account of how culture, energy, and nature work in the narrative of capitalist modernity—helps historicize more recent critical responses to the cultural and environmental impacts of an oil economy, such as Gosh's.

What Max Horkheimer called the distinction between "Traditional and Critical Theory" would appear paradoxical or even contradictory when read exclusively in line with Lukács' influential treatment of nature in *The Theory of the Novel* and *History and Class Consciousness*. Critical Theory's theoretical ambition, in other words, is to realize

[147] Jay, 256.

[148] Neil Smith, *Uneven Accumulation*: *Nature, Capital, and the Production of Space* (Athens: University of Georgia Press, 2008).

the force and freedom of what Lukács calls nature, only not as a romanticism of the outside but rather from within the realm of second nature. In my reading, Critical Theory's investment in the political potential of second nature is an appropriately industrial mediation of capitalism's political and natural economies. Reading Critical Theory as part of the same critical sequence initiated by the cultural and economic intervention of the energy novel, in other words, makes for a radically different frame of critical reference at the dawn of oil:

> the idea of a future society as a community of free men, which is possible through technical means already at hand, does have a content, and to it there must be fidelity amid all change. In the form of an insight that the dismemberment and irrationality of society can now be eliminated and how this is to be accomplished, this idea is constantly being renewed amid prevailing conditions. But the state of affairs upon which judgment is passed in this conception and the tendencies inciting men to build a rational society are not brought into existence outside thought by forces extrinsic to it, with thought then, as it were, accidentally recognizing its own reflection in the product of these forces.[149]

Horkheimer shifts the focus of critical theory from natural history to the social history in which nature appears as value: in the social history of energy where productivity gains for the capitalist imply, paradoxically, political promise for the proletariat. He does this by subsuming what in Lukács' account of nature is the narrative flash of an unrepresentable future in the present into the "technical means already at hand," or the technical composition of the production process where the worker discovers her ability to extract value from machines at the same time as productivity gains for the capitalist means less and less work for her. Freedom, alas, is a feature not of nature but of labour; not first, but second nature. Contra a positivist reintegration of nature into the social history of dialectics in the tradition of Engels, Horkheimer lays out a procedure for politicizing the social forms taken by natural "forces." When natural "forces" appear as

[149] Max Horkheimer, "Traditional and Critical Theory," 217

the "technical means already at hand," historical materialism recognizes its own narrative impasses in the social history of energy, which is to say in the narrative structure that puts labour and energy as two sides of the value form of capital.

Thus the shape of totality we get in Horkheimer's early plan for Critical Theory is not at odds with nature, but rather mediated by the economic forms it takes as energy. Rather than a singular totality where the work of culture is naturalized, Horkheimer's materialist dialectic renders the "two-sided character of the social totality," or what used to be culture and nature, into "a conscious opposition." In insisting that "the present form of economy and the whole culture which it generates" is "the product of human work as well as the organization which mankind was capable of and has provided for itself in the present era," Critical Theory resituates labour as the site where "will and reason" are attuned with the "totality" it produced: "It is their own world," the world made (even if it isn't encountered this way) by the social energies of labour.[150]

And yet a new contradiction emerges as soon as the metaphysical opposition of nature and culture is arrested in the more mature stages of Critical Theory: "At the same time…they"—the workers—"experience the fact that society is comparable to nonhuman natural processes, to pure mechanisms, because cultural forms which are supported by war and oppression are not the creations of a unified, self-conscious will. That world is not their own but the world of capital."[151] The world made by labour is not the world it encounters. "Cultural forms" intervene again as a form of false consciousness. A new opposition emerges; no longer culture and nature, but rather culture and labour—a dialectical twist (and temporary closure) attuned to what would soon become a new phase

[150] Ibid.
[151] Horkheimer, 207-208.

in the history of growth. For in the decades following the birth of Critical Theory, as I show in chapter three, culture would emerge again and again in economic theory as itself a form of labour, which is to say an increasingly measurable asset in the wealth of nations.

1.2B The Culture Industry and the Energy Industry

The whole gamut of debates about aesthetics and politics that would ensue most notably between Lukács, Adorno, Benjamin, and Brecht, would revolve around critical theory's self-imposed impasse.[152] How, if culture had become the terrain on which labour was reconciled with capital, could critics speak of something like a committed culture, much less committed criticism? What then of the critical capacity of cultural production in this dialectical closure embedded in critical theory, when capital seals off the escape hatch built by labour—when, as capital increasingly fuels itself on cheap and plastic forms of energy, culture paradoxically re-emerges on the other side of the twentieth century as a postindustrial source of wealth? Part of what makes social totality a moving target in the history of critical theory—at times exposing its content as labour, while at other times sealed off by the pace of capitalist expansion—are the economic qualities expressed by the work of culture and the work of nature.

In *The Culture Industry*, Adorno and Horkheimer famously critiqued the calculability of culture in an economic regime intent on managing cultural production. The postindustrial fantasy is that culture broadly understood as the sociological capacity to create and imagine outside of the immediate production process can be incorporated

[152] "Critical theory" is hereafter denominalized since I am moving beyond Horkheimer's initial essay on its constitution.

not as labour-power, but as ready to hand value in the abstract on the level of asset valuation. Adorno later remarks in "Culture Industry Reconsidered" that "the culture industry intentionally integrates its consumers from above" in order to orient their desires towards predictable habits of consumption."[153] Even though the culture industry worked largely on the level of ideology, Adorno's point is that the subject of culture is rendered into an object of capital, an operation synthesizing economic and cultural consumption. But for Adorno, the availability of cultural objects to the logic of capital was always latent in modernism in particular but especially cultural production as a general correlative to capitalist production—two, as it were, modes of production co-dependent on one another. The objects produced in one register were always liable to appear in the other because what made them different (artworks and commodities) had nothing to do with their material properties—you can sell a sculpture and you can exhibit a urinal—and everything to do with the dialectic between subject and objecthood. The defining move of new materialism will be to deny the terms of distinction here. The object for someone like Jane Bennett is a subject, in all the same ways that a subject contains objective properties like organic matter, electricity and so on. Matter is in her words "enchanted," which is another way of saying that agency is not exclusively the domain of the human.[154] Instead, new materialism aims to enfranchise the power of things, or more specifically "*Thing-Power*: the curious ability of inanimate things to animate, to act, to

[153] Theodor Adorno, "Culture Industry Reconsidered," *New German Critique* 6 (Fall 1975): 12-19

[154] Jane Bennett, "A Vitalist Stopover on the Way to a New Materialism," in *New Materialisms* eds. Diana Coole and Samantha Frost (Durham: Duke University Press, 2010).

produce effects dramatic and subtle."[155] Elsewhere this "power" is called simply energy, but as we have already seen, the idea of an unmediated experience of energy as nature—as opposed to culture—is logically bound to a world without capital. Explicit in the new materialism is a critique of the human standpoint of earlier materialisms. Yet as even Bennett herself will note in her extended analysis of Adorno, the logic (and character) of critique is not as chronological as the *new* in new materialism and *post* in posthumanism implies.[156] Bennett, in other words, imagines her new materialism is prefigured in Adorno's. Yet for Adorno, the structural third term always lurking around the corner from the encounter between subject and object is the commodity relation, and not an identity of matter with Nature. Critical Theory recognized the political economy of energy while it matured amidst oil-driven energy deepening. Today's new materialism effaces this history in its quest to democratize the world of matter. However, in Adorno, art objects and commodities make the ambitions of an immediate relation to matter unavailable.

Which is not to say that any experience of the work of art is the same as a consumer's experience of the commodity; indeed something happens in the objective experience of the artwork that distinguishes it, indeed for Adorno opposes it, to the commodity in much the same way that Nature was in Lukacs' account of Tolstoy a code word for an experience of the world as one found it that threatened to end the one made

[155] Bennett, *Vibrant Matter* (Durham: Duke University Press, 2009), 6.

[156] I am thinking of Bennett's chapter on "the Force of Things" in *Vibrant Matter* where Adorno's negative dialectics, and more specifically the remainder, encourages Bennett to pursue an analysis of things directly, which is to say without mediation and the human standpoint.

by man. In his later *Aesthetic Theory*, Adorno would name this the "processual character" of artworks. More elaborately:

> Whatever may in the artwork be called totality is not a structure that integrates the sum of its parts. Even objectified the work remains a developing process by virtue of the propensities active in it. Conversely, the parts are not something given, as which analysis almost inevitably mistakes them: Rather, they are centres of energy that strain toward the whole on the basis of a necessity that they equally perform. The vortex of this dialectic ultimately consumes the concept of meaning. When according to history's verdict the unity of process and result no longer succeeds, when, above all, the individual elements refuse to mold themselves to the ever latently preconceived totality, the gaping divergence tears meaning apart. If the artwork is nothing fixed and definitive in itself, but something in motion, then its immanent temporality is communicated to its parts and whole in such a fashion that their relation develops in time and that they are capable of canceling this relation. If artworks are alive in history by virtue of their own processual character, they are also able to perish in it.[157]

In this section, dedicated to a "theory of the artwork," Adorno takes the logical ends of the artwork to consist of its capacity to unravel into parts external to itself, into a disunity that its own "centres of energy" threaten to actualize on their own through aesthetic entropy, or the "propensities active in it." Unlike the commodity, however, the unity and disunity of aesthetic entropy is in Adorno's formulation a form of labour belonging to objecthood and not subjecthood. What gives the commodity its objective properties is the abstract labour it conceals, whereas the artwork owes its shape to its own internal dynamics, what Adorno calls "the vortex" where parts and whole are at dialectical odds with one another. And this internal capacity or energy of each part to become something other than itself through an autopoetic disassemblage—none of this, the unity of its parts nor its potential disunity, requires further labour on the part of a maker or viewer, but only the dialectical index of history in the object—is what, in Adorno's account, mediates the social and natural history of the artwork and our experience of it. The tension of

[157] Theodor Adorno, *Aesthetic Theory* (Cambridge: MIT Press, 1970), 178

aesthetic forces is what makes available, in other words, an aesthetic "experience" that "results from the surrender of the subject to the aesthetic law of form."[158]

What in the "Paralipomena" section Adorno will call the negation of positivism in aesthetic criticism is where the collapsibility between commodity and artwork is made more explicit: "only he who submits to [the artwork's] objective criterion understands it; he who is unconcerned about it is a consumer."[159] Aesthetics is the name for the problem that separates owning an object from being absorbed by it, and the objective criterion Adorno has in mind is the one that marks each part with an "energy" that threatens to rupture the whole. In the logical relationship between duration and temporality, in other words, aesthetic form renders time into an objective property of aesthetic experience, and what makes the work alive is not its relationship to a market invested in its circulation but rather a natural setting towards which it strives at its own peril: "Aesthetic distance from nature is a movement toward nature […] the telos of nature the focal point toward which the force fields of art are organized, compels art toward semblance, to the concealment of what in it belongs to the external world of things."[160] What conceals the artwork from "the external world of things," however, orients it back to the socio-economic laws of the commodity, a back and forth it cannot escape until its internal "energy" runs out; until it returns either to the world of nature or the world of commodities.

In Adorno and Horkheimer's estimation, this is why culture lends itself to the commodity form once it becomes industrialized: the sociological image of an electrified,

[158] ibid., 266

[159] ibid., 265-266.

[160] Ibid. 279.

which is to say industrialized world, is mass culture. Which is why Scheerbart's novel is able to anticipate the theoretical dilemma that Critical Theory sets for itself a few years later: the economic and natural properties of industrial energy systems, then fuelled on coal but more and more on oil, had already combined in 1910 to structure their own narratives about the future and our aesthetic relation to it today. Sheerbart's novel provides an excellent example of a cultural medium whose duration coincides exactly with that of the free labour required for economic innovation, and whose exterior—the technical narrative that turns back on the literary one—retroactively makes the novel an economic text with a future time defined by the now copyrighted machine's value on a market. For both legal and logical reasons, in other words, it would make no sense to read patent portfolios as novels today, and the reason it would make no sense is central to what a cultural object is in relation to its twin: the commodity form. Both in what I've been calling the energy novel and in Adorno's temporary resolution to Lukács' desire for nature is a glimpse into the kind of cultural and economic work energy will perform in postwar society: it will simultaneously make available a world without work, and foreclose it.

CHAPTER TWO: Resource Radicalism and the Infrastructure of Race in Black Empire and Invisible Man

Abstract: This chapter builds on the aesthetic theory of energy deepening I established in chapter one in order to map the narratological contradictions of modernization from within two sides of the literary modernism driving the Harlem Renaissance. For both George Schuyler and Ralph Ellison, the physical power of a recently gridded America exposes the intractability of a racial politics from the inequalities accelerated in the nation's new energy infrastructure. Thus while two different forms of free energy resolve the literary limits of a class and race based energy system, the novel form itself (by the time *Invisible Man* concludes in the musical frequencies of free electricity, contemporaneous historically with the post-war epoch of oil) looks exhausted. Schuyler and Ellison's contribution to the literary history of energy turns the specifically aesthetic qualities of energy into a source of resource radicalism—what anthropologist Dominic Boyer calls "energopower"—exposing the two sides of power and the narrative shape of an energy system to come.

Some weeks after George Schuyler concluded his two-year literary account of a back to Africa campaign in the pages of *The Pittsburgh Courier* in 1938—a literary provocation in which a new Black Internationale turns the sun soaked surface of Africa into its primary source of physical and political power—he offered a non-fictional coda in order to settle the score: "The three generations since Lincoln signed the Emancipation Proclamation...have been the most momentous in the history of the world," he began, yet

blacks from a global perspective looked none the better.[161] In the 75 years between 1865 and 1938, he continued, "colored people" had seen their legal freedom instituted across America, while they simultaneously watched the symbolic geography of their racial origins subsumed under the colonial economies of the "White Internationale." While "the fortunes of the darker races" were visibly up against the ropes as early as "the 15th century," this most developed phase of colonial conquest was fueled not merely on military or physical domination, but rather on what he will first call the energy structure of "the new world economy," and then a sentence later rename "the new power economy."[162] Lightening speed modernization in the West, Schuyler observed, owed its source not merely to cheap or free labour (though Schuyler was no stranger to the demographics of capital and labour) but to a racial monopoly over the new energy resources indispensible to rapid economic and political expansion. If the serial novel initiated two years earlier sourced free energy for its literary future of the African solar state —named "The Black Internationale" and "Black Empire" in the newspaper, but herewith called *Black Empire* as its novelization would later have it—its coda would set the energy structure of the "new power economy" in the political history of race; or rather—and this is why I am calling it a coda instead of an appendix—"the international color line," once the supply chain for the "new power economy" is up and running, is cartographically identical to the infrastructure of that new energy economy Schuyler spent two years dramatizing.

[161] George Schuyler, Appendix B: "The Rise of the Black Internationale" of *Black Empire* (New York: Northwestern University Press, 1991).

[162] Ibid.

From where Schuyler sat in late depression America, it was all too clear that the new energy system built around coal and oil constituted both the physical and political power of "the new world economy" from which the US (or a specific version of the US) would emerge triumphant. Though the vast majority of US citizens would reap no material benefit from wealth accumulating in the energy sector, Roosevelt's so-called New Deal for America made visible the infrastructural future of the nation, and the racial lines it would cement. Virtually overnight, explosive growth in public utilities companies coupled with a national electricity grid changed the political, physical, and energy structure of America. Not only would American blacks play little part in the ownership of the energy revolution sweeping the nation, they would have little part to play in business ownership as such.

It would thus come across as more than odd to those familiar with Schuyler's polemics against Harlem Renaissance champions Alain Locke and Langston Hughes, when he does a complete 360° in the final part of his coda and observes the revolutionary potential of the "new negro," a nominalization famously popularized by his opponent's poetry anthology on *The New Negro* in 1925. Aware that "both the 2nd and 3rd Internationales abandon[ed] the colored peoples to the mercies of their masters," the "new negro" can now confidently build, Schuyler insists, a "Black Internationale" cleansed of the worker movement's racial contradictions. In the new economy, Schuyler saw the seeds of a new power source capable of turning blacks into the "Damoclean sword dangling over the white world," for "he is on the march, he cannot be stopped, and he knows it."[163] The physical materialism fueling the most advanced stages of what he

[163] Ibid.

calls the "White Internationale"—Western capitalism at its most industrial heights—thus lays the foundation for a racial materialism rid of what Schuyler saw as Locke and Hughes' racial idealism.

This is almost universally opposed to the legacy with which Schuyler has come to be associated. In short, he has since those debates been read as the ultra conservative wing of the otherwise progressive new negro movement. Compare Schuyler's racial materialism with his non-fictional rebuttal to Locke in "The Negro Art Hokum" from a decade earlier, for instance, where what's most pressing is not the isolation of black content in black art (an essentialism central to Locke's "new negro") but an aesthetic politics blind to color: "Aside from his color, which ranges from very dark brown to pink," he argued, "your American Negro is just plain American."[164] Between these two opposing views held by Schuyler—one that racial essentialism runs counter to racial emancipation, and the other that "the new negro" is on the threshold of its revolutionary potential—is *Black Empire,* the logic of which will help explain why Schuyler will offer energy as both the problem and solution of 20th century race, and in turn build a type of *resource radicalism*—consistent, I will maintain, with the *political* conservatism with which he later gets associated—into the energy novel he helped introduce.

Except an important problem is left unresolved by the close of Schuyler's energy experiment. If *Black Empire*'s Africa and its solar potential reverses the racial coincidence with energy infrastructure in America—effectively writing a neo-native origin myth into the continent's energyscape—then those blacks left in the US become conceptually difficult to place. What would it mean to be black in the US when Africa, or

[164] George Schuyler, "Negro Art Hokum," *Nation* 122 (June 16, 1926): 662-3

more specifically the unlimited power soaking its surface, has provided a new black nativism? We thus follow the energy novel through to Ralph Ellison's more widely read *Invisible Man,* a novel incidentally not read for its concern with energy infrastructures, but as we shall see quite literally set amidst the grid. Ellison's enormous novel is remarkable not just for its extensive and intensive cartography of race consciousness in the first part of the century, but for its opening and closing solution to veritable dead ends in the literary history of race. Those problems concern how to rewrite the migration novel—where the black subject escapes the US south in order to discover a conditioned freedom in the North—and where to end a black *Bildungsroman* when structural *inequality* defines race as much as hard fought legal *equality*. Both genres proved indispensable to the Harlem Renaissance, from which both Schuyler and Ellison would emerge as leading figures, and yet Ellison's novel in particular would begin and end with a singular rupture in the continuity of both literary migration and the black *Bildungsroman*, for what is named in the title of his work is a literal standpoint (invisibility) achieved by actualizing the narrator's subjectivity as the infrastructural objectivity found in New York City's electrical grid.

Across these two novels then is a literary history of power's two faces amidst the post-depression phase of American modernism, when structural inequality—to paraphrase Michael Szalay—became the means of modernist cultural production: one generated physically from energy resources, which anthropologist Dominic Boyer has termed energopower[165], and the other the political and conceptual nexus that emerges from the uneven access to resources, including race, class and gender. Power thus framed

[165] The concept "energopower" was originally coined by anthropologist Dominic Boyer in his introduction to a special issue of *Anthropology Quarterly* (2014).

names the technologies and logics by which forms of exploitation reinforce forms of domination, and vice versa. Hence a petromodernism, or cultural sublation of the problems of energy during the fossil fuel revolution, was always going to share space dominant modernisms, just like the unevenness named by race in America was always going to have something to do with what Rob Nixon has more recently called the slow violence of resource regimes on the poor, even if this is not the lens through which these two novels usually get read.[166] It will turn out that in Schuyler and Ellison racial and energy inequality tell not heterogeneous histories but rather the historical dialectic of power during 20th century modernization. Except—and this is no literary mistake—neither novel has much to do *explicitly* with oil at all. Oil, to borrow Amitav Ghosh's now familiar phrasing, is not encountered in the energy novels to which I pay attention here, but is rather made implicit through the forms of competition that emerge when different energy infrastructures are made to bear the weight of political futurity.

2.1 Resource Radicalism and the Solar State

Mine is not the first account of Schuyler's novel to highlight its technological inventiveness or its prophetic anticipation of no fewer than five advances in medicine, agriculture, renewable energy, telecommunications, and bio-warfare. Indeed of the little scholarship that has taken *Black Empire* seriously—a gap in part explained by the novel only appearing as a single text in 1991, but also because Schuyler's earlier *Black No More* has been consistently read as the climax of his literary career—its anticipation of

[166] I'm referring to Rob Nixon's excellent *Slow Violence and the Environmentalism of the Poor* (2011).

key 20th century technologies is what has licensed critical engagement.[167] Without exception, however, the curious case of *Black Empire's* techno-futurism has motivated at least three commentators to confirm Schuyler's conservative views on what in the 1930s was a groundswell in internationalist politics amongst American blacks. Alexander Bain's 2007 contribution reads the technological medium of the novel's fascist irony as Schuyler's veiled argument "that any collective politics of difference is a structure not of liberation but of delusion."[168] Perceiving the same posture towards black internationalism in the 30s, Henry Louis Gates delivered the nail in Schuyler's literary coffin when he called its politics "schizophrenic,"[169] by which he meant (and this would become a trope of Schuyler criticism) that Schuyler was black in skin only. What makes the political force of the novel's techno-fascism so effective in the narrative is its recognition that the Black Internationale is pre-existed by a White Internationale, and—more to my interest here—the former will remain satirical so long as the physical power of the latter is not understood as merely historical.

Thus when the novel's narrator, Carl Slater, decides to leave his journalism career in story's opening to join the Black Internationale's (B.I.) Harlem mastermind, Dr. Belsidus, it is not merely because Belsidus is "something else," which is to say an icon

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[167] This includes Pavla Veselá's "Neither Black Nor White: The Critical Utopias of Sutton E. Griggs and George Schuyler," *Science Fiction Studies* 38 (2011); and the remarkable historicization of what Kali Tal calls "Black Militant Near-Future Fiction" in his 2011 "That Just Kills Me," *Social Text* 71 (Summer 2011). In the latter's account, Schuyler's second novel, for all its conservative undertones and indictment of the "natural" elements of a racial internationalism, is the most hostile to fantasy fiction since its "hard science" is both the subject and object of the novel.

[168] Alexander Bain, "*Shocks Americana!:* George Schuyler Serializes Black Internationalism," *American Literary History* (September 2007): 939.

[169] Qtd in Bain.

and megalomaniac. At first, Slater is as sceptical and appalled as many later critics of the novel. Instead, Slater joins upon receiving a tour of the organization's economic and technological sources, since only then does the project of a black empire become probable. Mr. Fortune, the B.I's resident mechanical engineer, realigns the "amusement" with which Slater initially responds to the B.I.—his attitude at first is that Belsidus' plan to out manoeuvre "white civilization" was somewhere between "mad" and "Garveyistic"[170]—and he does so by revealing the furnace that renders jewellery stolen from rich whites into "an entirely different shape and form."[171] A crew of "40 young Negros," we quickly learn, steals goods from rich whites uptown in order to optimize the commodity form of value in Harlem. Rather than simply pawn off the goods at the discount rate of the black market, Mr. Fortune puts them back into the white market, saturated with black labour both physical and intellectual. Discovering the true nature of the commodity form—that its exchange value is not shackled to its use value, but rather the social relations its shape expresses—the B.I. is able to invent a market share in luxury goods, in turn funding its more fundamental economic monopoly: the energy economy.

Their discovery that economic value is indexed to a racialized market map also explains why the novel devotes so much attention in its early pages to establishing Belsidus' racial ambiguity, for while his complexion is recognizably black, nothing else is. His "austere and respectable" mansion in the "Seventies between Park and Madison Avenues"[172] puts him not just outside of Harlem, but at the centre of the rich whites his

[170] *Black Empire,* 10.

[171] Ibid., 18.

[172] Ibid.

organization seeks to supplant. More than his property, his "perfect white teeth contrasted sharply with his smooth, almost black skin" and "his voice were cultured."[173] He is, in short, "someone of consequence," which in Slater's Harlem means not of Harlem. Hence when Slater admits his first impression of the B.I. is that it is "rather Garveyistic," he learns very quickly why he's wrong. Though Belsidus' scheme looks consistent with what in the 30s was already a long history of back-to-Africa initiatives—it in fact begins not with Marcus Garvey but rather the resettlement of Liberia with freed slaves from America in the 1820s—its ambition and claim on the "shape and form" of power at stake in racial colonization distinguishes it from Garvey's in at least two respects. The first is that the B.I.'s understanding of the political economy of power is that blacks could never expect a different shake in the world without stripping whites of theirs. Belsidus recognizes, in other words, that power is not pluralistic. Taking Africa back in order to establish a state formally equal in the abstract to all states would merely reproduce power relations of race internal to the US, except at the global stage. Instead, Belsidus' "ideal and objective is…to cast down the Caucasians and elevate the colored people in their places."[174] Recognizing that "white people got all the power, all the industry, all the money," Belsidus' "ideal and objective" is not merely to compete with whites, but (in an economic sense) to become them.

More than his nearly white appearance, real estate, and disposition, Belsidus' idea for the B.I. is to outmanoeuvre whites in the economic sphere in order to strip them of their power in the political sphere. What this means is to cut them off from their physical

[173] Ibid., 3.

[174] Ibid., 10.

power, their monopoly on energy and its infrastructure, in order to flood the market with black power. For Slater, it all sinks in once international delegates gather for the first convention of the B.I., whereupon Belsidus reveals the organization's silver bullet. "Unity" he explains to the delegation, is historically elusive because anticolonial forces never understood "how to properly organize and exploit [their] own resources."[175] For the B.I., however, radicalizing resources literally means actualizing the enormous energy *in potentia* housed on the African continent. When Slater gets a chance to meet the B.I.'s head chemist, he learns their power play will be fueled not by fossil fuels but the sun.

The B.I.'s massive fortune amassed through the luxury goods market, it turns out, was only a means towards investing in the technological infrastructure of the B.I.'s future victory. The first is the invention of hydroponic agriculture, a process in which high quality fruits and vegetables are grown underwater supplied "with liquid chemical food, the same elements vegetables extract from the soil" and "sunshine" through a transparent greenhouse dome. Sam, the in-house chemical engineer, explains the technical and economic significance of chemical fertilizers:

> There is no plant disease, no poor distribution of food elements, no excess or lack of light. Our plants grow quickly and the quality of the vegetables is better. Our tomato plants grow fifteen to twenty-five feet tall, and others in proportion. Soil culture produces about twelve tons of vegetables an acre. Our yield is 200 tons an acre. Each pool will produce 400 tons of produce, and it is ready for market long before products raised in the soil…White folks can't equal that…We'll take all the quality trade, not only for strawberries but everything else.[176]

[175] Ibid., 34.

[176] Ibid., 49.

Through advanced scientific management of the most important commodity sector in the economy, the B.I. is about to "knock 'em dead" and "put the farmers out of business."[177] Not only does Sam discover productivity gains light years ahead of his white competitors, he does so at dramatically reduced cost. And why it is virtually cost free is because the B.I. has invented a revenue neutral means for generating the second most important commodity for the modern economy: energy.

Slater intuits the problem of energy costs in the current landscape, and thus logically asks "isn't your overhead enormous?"[178] "It must cost a tremendous amount of money to steam-heat a mile of water two feet deep. Where is your powerhouse?"[179] But of course "power" in Schuyler's novel has meant not one but two things all along, and so Sam's surprising answer carries weighted meaning given the economic implications of what we have just learned: "neither our steam or electric power," Sam explains, "costs us a cent. Tomorrow I'm going to show you a source of power, hitherto practically neglected, that is inexhaustible. Negro brains…have harnessed it and put it to work to serve our ends."[180] The source of power is, of course, an enormous solar engine, and the powerhouse that contains it puts the B.I. on track to redraw the historical cartography of power. And in the meantime, *Black Empire* will slip a radical theory of the infrastructure of race through the back door. What it will have meant to be white all along will have

[177] Ibid., 48.

[178] Ibid., 49.

[179] Ibid., 50.

[180] Ibid., 50.

something to do with the political economy of energy, and virtually nothing to do with skin.

2.1A Perpetual Motion and Perpetual War

Neither Sam nor Slater are blind to the geopolitical or world historical significance of energy, or more specifically free energy, which is why the novel is able to swiftly move from a first person detective novel to one that anticipates the dramatic scale of a world war—imminent in 1936 to anyone paying attention—once the B.I's energy core is explained. Hence a techno-delirium, or a kind of geo-consciousness, bookends Sam's explanation of the solar farm's technical specifications: the "sun engine" as Sam calls it, costing only $100 but lasting "indefinitely," is "probably the most revolutionary invention in the past thousand years."[181] What makes it revolutionary, in addition to its incredible Energy Return on Energy Invested (EROEI)—approaching the autogenetic 1:0 so motivating to the scientific imaginary driving the study of energy centuries before—is that the solar engine is uniquely tailored to the B.I.'s geographical ambitions:

> This engine is capable of converting the sunlight falling on an area of one square mile into 70,000 horsepower on a cloudless day. Imagine what that will mean when we set up these batteries in the tropics? Why, the sunshine falling on the State of New Mexico alone furnishes a hundred times as much energy per year as the total of all coal, oil and water power used per year in the United States.[182]

Implicit in Sam's thought experiment—"imagine what that will mean"—is the solar engine's redefinition of geopower, where the significance of setting in the coming war between Black and White Internationales, or more specifically the power of Africa, is

[181] Ibid., 53.

[182] Ibid., 54.

literalized. Africa's massive surface area, and its global share of the equator, means that it is poised to become a global leader in an energy economy indexed to solar power. Thus while the B.I. shares a lineage with previous back-to-Africa efforts, its historical significance is made incidental.

Hence when Slater wakes up the next morning back in the city, he finds himself in "a dream, like traveling in some strange world."[183] For what the B.I.'s energy strategy has effectively done to the "world" is redefine its material setting in relation to a future history inflected by an equatorial advantage. Sub-Saharan Africa, historically synonymous with the most extreme form of economic poverty within the global dynamics of industrial capitalism, is rendered into the future *centre* of political and physical power due to its geographical setting in the *solar system* actualized by the B.I. "Some strange world" indeed, one whose political axis shares an identity with its celestial one.

Black Empire's invention of a "strange world" moulded by a solar system of energy in Africa is not just logically justified in foregrounding the political irony of African hegemony, but also consistent with at least two notable solar enterprises in the novel's living memory. Fresh in the scientific imaginary of Schuyler's America would have been Frank Shuman's solar hot boxes installed in Egypt in the years leading up to WWI. Profiled in a 1911 issue of *Scientific American* and in *Nature* the following year, Shuman and the British backed Sun Power Company became science celebrities due to their sun powered irrigation system installed on the banks of the Nile. War and swift advances in coal and petroleum technologies would prove fatal to Shuman's promise of a

[183] Ibid., 55.

solar aversion to fossil fuel "barbarism."[184] Instead of a solar modernity, we would have come to have a petromodernity.

The earlier example has become famous again since the specter of peak oil has restored scientific and business investments in renewable energy. Champions of renewables often cite French inventor Augustin Mouchot's 19th century efforts in Europe and North Africa in their mythology of alternative energies. Funded by Napoleon III's treasury, Mouchot expanded on his early experiments to convert solar energy into steam for cooking by building in 1867 what was then the largest solar steam engine.[185] Mouchot offered a demonstration to the emperor along with *La Chaleur Solaire et ses Applications Industrielles* (Solar Heat and its Industrial Applications) and reportedly won immediate favor given France's notorious reliance on energy imports. Though the steam engine encouraged the emperor to boost funding for Mouchot's future research into renewables, the book is today the only remaining evidence of the machine due its destruction during the Franco-Prussian war in 1871.

Not only was Mouchot's prototype turned to ash during the Prussian occupation of Paris in 1871; so, too, were France's hopes of sustaining a steady coal supply from the contested territory in Alsace-Lorraine, since its resource rich hills were the first to change hands during the war. No small loss, considering France's dependence then (as today) on energy imports, most notably from Britain and its coal reserves. Hence Mouchot's earlier warning about the economic and political necessity of solar power proved all too true:

> One cannot help coming to the conclusion that it would be prudent and wise not to fall asleep regarding this quasi-security. Eventually industry will no longer find

[184] Qtd in Frank T. Kyrza, *The Power of Light* (New York: McGraw Hill, 2003), 25.

[185] Jeffrey Gordon, *Solar Energy* (London: Routledge, 2001).

> in Europe the resources to satisfy its prodigious expansion…Coal will undoubtedly be used up. And what will industry do then?[186]

The Prussians' deficit in colonial resources abroad meant France's energy lifeline in the North would "be used up" some three years later.

More ironic than the double loss to the Prussians—both solar and coal security—was the other major discovery exhibited at the 1867 Universal Exposition: petroleum. For the first time, the unimaginable range of products available from petroleum was made public, and the Americans were the most prudent marketers of its future. Certainly, crude forms of oil predate the Exposition by decades, and by some accounts, centuries. The major deposit discovered at Oil Creek near Titusville, Pennsylvania in 1859, however, launched the early stages not just of fuel oil, but of the petroleum industry that would half a century later remake the physical and social shape of the globe. At the Universal Exposition, no fewer than seven consortiums exhibited petroleum products from the United States in the Chemical and Pharmaceutical Products section alone.[187] Mouchot's solar future, in other words, was in direct competition not only with Prussian energy aggression, but with the birth of the oil sector. And yet, Mouchot's bad timing in Paris is also what led him to Africa the next decade. Mouchot would once again exhibit a solar machine in Paris in 1878, but only after developing a more efficient prototype in the sun soaked continent. Recognizing that solar intensity and duration would prove as important to mechanical output as the reduction of heat loss in his engine, Mouchot moved his lab to the newly establish French colony in Algeria.

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[186] Kyrza, 152.

[187] William P. Blake, "Reports of the United States Commissioners to the Paris Universal Exposition," Washington: Government Printing Office, 1871: 242-244.

In the 1870s, French Algeria was rapidly becoming as French as it was Algerian. The newly established Third Republic made the acquisition of property both affordable and streamlined for French citizens willing to resettle the colony. As solar historian Frank T. Kryza puts it, "the combination of constant sunshine and cheap land convinced Mouchot that solar power would be commercially successful in the French colonies."[188] Mouchot's insight into the solar potential of Africa had as much to do with its physical geography as it did with its economic geography: only with cheap land does the sun that hits it promise economic surplus. No small wonder, then, that his decision to exploit both proved beneficial not to the colonized population then suffering under the weight of a resource thirsty French state, but the colonizers and their resident army. Mouchot's most notable and lasting invention, in other words, was a portable solar oven able to feed the French army without costly fossil fuels.

Mouchot would very quickly recognize the obverse effect his invention was having on the local population and the *pieds noirs* (poor white migrants from Europe) who "lived and died without either memory or hope, happy for the crusts that kept them alive or the sleep that brought them the brief, uneasy solace of dreams."[189] The promise of free energy, optimized in Algeria because of its fortuitous geography, was never going to turn the tide of those social relations necessary for a successful colonial enterprise. Unlike the fantasy in Schuyler's *Black Empire,* the only empire that would profit from free energy was the one with the biggest army and the largest property portfolio. Even though Algeria proved ideal for the technical side of solar power, Mouchot could no

[188] Kryza, 165.

[189] Qtd in Kryza, 169.

longer stomach the historical reality of power in the colonial landscape and requested a return ticket home to Paris. Angered by the threat of a squandered investment, French authorities refused, insisting instead on a bigger and better solar machine worthy of the 1878 Universal Exhibition. Mouchot would successfully improve his original 1867 design—in Paris his new machine would run at a pressure of 91 pounds, able to simultaneously make ice and print 500 copies of the *Journal Soleil* by 1880—but the lesson about physical and political power in Algeria was instructive.

Today when the German consortium Desertec scrambles for desert property and solar energy in North Africa backed by a nine billion euro investment from Siemens and Deutsche Bank, Africa is once again poised to satisfy the energy needs of European capitalism. In a tragic twist to history, however, Africa's most prized possession—its surface area—is set not to solve the problem of its uneven development, but to instead facilitate it further. Desertec is one of a number of ventures seeking large-scale infrastructure opportunities for renewable industries in Africa, along with Chinese, Brazilian, and Indian firms whose collective investments account for over 83 million hectares of land.[190] Most of this activity amongst the BRIC nations is meant to address food shortages since the 2007 food crisis, but foreign investment in Africa is increasingly directed at natural resources like water and energy in a bid to avoid future energy crises. At bargain prices and with fertile conditions in places like Ethiopia where much of this capital has been directed, a wide range of resources can be shipped back to production centres for manufacturing. And since the energy increasingly extracted from African soil is routed first through foreign infrastructures—Desertec will lay a 4000km direct current

[190] International Institute for Sustainable Development, "Agriculture, Water and Investment," http://www.iisd.org/investment/research/agriculture.aspx <April 11, 2015> web.

pipeline under North Africa and the Adriatic sea linking the two continents[191] —Africans will once again become consumers, rather than owners, of commodities that originate in Africa. Renewable or not, energy under capitalism will further intensify the separation of workers and consumers from the means of their own reproduction, and the vast quantities of profits available from energy as low cost as solar will accumulate in the centres of the postindustrial economy.

This is precisely the narrative tendency of energopower that Schuyler's literary experiment anticipated at the cusp of national liberation in 1930s Africa. It would do so by rewriting the color scheme of colonialism right at the cusp of its historical breakdown, imagining a world where African blacks trained in America used the physical power of energy to turn the tides of political history. Anyone reading Schuyler's book in its original serial form would also have been reading about the Italian-Ethiopian war in the paper's news section. For from 1935-1936, Mussolini's fascist state made what would be its last foray into the colonial market, and Ethiopia—famously the only African nation never to live under colonial rule—would come symbolically close to its neighbors' political fate.[192]

It is no accident then that the B.I.'s first conquest in Africa, after taking out the colonial government of Sierra Leone, is Liberia. In each remained the residue of previous attempts to resettle Africa with freed black slaves: the British in Sierra Leone and the Americans in Liberia. Historically, Liberia was the first and only result of American

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[191] Daniel Clery, "Sending African Sunlight to Europe, Special Delivery" *Science* 329.13 (August 2010): 782-783.

[192] Etsuko Taketani, "Colored Empires in the 1930s: Black Internationalism, the U.S. Black Press, and George Samuel Schuyler," *American Literary History* 82.1 (March 2010).

colonialism on the continent. Initially imagined as a depository for freed black slaves in the US in 1821, the extreme class divisions and political corruption more typical of its modern history had already taken hold by the 1930s. In its effort to reverse the tides of white colonialism in Africa, the B.I. first targets those failed leftovers from state sanctioned back-to-Africa campaigns. What becomes quickly clear once the B.I. establishes its foothold, however, is that theirs is not a force of liberation from colonialism. Rather, the Black Internationale's ambition is to totalize the colonial project both on the black continent and the white sea that surrounds it.

We know this because part of the B.I.'s social planning involves a rigid network of institutional apparatuses, including vibrant churches, schools, and athletics. And while those state apparatuses prove able to weave a nearly immutable social fabric conducive to the B.I's ambition, those historically external to the currents of modernization—notably, the black indigenous population spread out across Africa—find themselves outside of black modernization, too. Though at this point in the novel the B.I. has defeated nearly every major threat to its empire in Africa, Slater and his romantic partner find themselves taken hostage after crashing their plane in the middle of the bush. Convinced that his skin color will save him from the "brown men, naked except for breech cloths," Slater is given a quick lesson in colonial history: "don't you know" a comrade remarks, "that most of the French soldiers and aviators in these parts are black men? Oh no, color can't save us now."[193] What the "cannibals" thus remind our colonial heroes is that race has been redefined as a measure of power, and that in this moment Slater and company are as white as the black Frenchmen they're mistaken for. While the B.I. is able to convert the

[193] *Black Empire,* 231.

geography of Africa into a literal and political force field to turn the tides of history, the colonial history of their present nevertheless persists.

This is perfectly consistent with the logic of race and history established in the first part of the novel, where what it means to be black is to sit at the wrong end of the energy spectrum, and what it means to be part of the "new negro" movement is to become an energy sovereign. In the novel's version of race, African aboriginals—the mythic origins of that other more familiar logic of race—are black neither before the conquest of the continent, nor after. For if race in *Black Empire* is tied to the history of political and physical power, then those untouched by its energy infrastructure remain external its political inclusion, too. African aboriginals therefore make explicit the historicity of race and the racial determination of resource radicalism, and *Black Empire* dispenses with both racial sentimentalism and essentialism.

Schuyler's non-fictional coda written a few weeks after the final instalment of *Black Empire* is perfectly consistent with the neo-conservatism with which he would later become associated, so long as both are read as critiques of racial essentialism in America and the "new negro" movement that relied on it. Read as a solution to the problem of race in the "new power economy," however, Schuyler's contribution to the energy novel is an unapologetic resource radicalism built not on an equality between races, but a struggle over the physical power that defines race. And the petromodernity already quieting the political promise of a solar system would nonetheless reproduce the promise of a Black Empire in Africa in the negative—a historical impossibility logically tied to that more familiar setting established by the fossil fuel revolution.

2.2A After Africa and the Infrastructure of Race

At first glance, Ralph Ellison's landmark novel, *Invisible Man*, has virtually nothing to do with *Black Empire*. Though its formidable antagonist, Ras the Destroyer—a militant reincarnation of Marcus Garvey—is bent on returning African Americans back to Africa and leaving America decisively scorched in the meantime, his is only one of at least three at once attractive and ultimately deluded political positions offered by the novel, none of which get us back to Africa either physically or politically. We know this long before we learn anything about Ras, the socialists, and the Harlem liberals that will populate the latter stages of the narrative, because *Invisible Man* begins in a prologue that, famously set off from the rest of the novel—and published a few years earlier than it to great acclaim—is also its end.

Thus while chapter one of the novel initiates a rather familiar narrative structure to those paying attention to the new negro movement—a classic *Bildungsroman* that charts the young black figure's growth in character in the south before migrating north to discover Harlem's cultural integrity, albeit one inflected from all sides by class—the novel forecloses the coherence of that narrative by pre-empting it with the aesthetic contradiction named in its title. Invisibility, then, is first on the agenda—a most unsustainable result for a Bildungsroman, whose whole point is to stretch identity out into time, rather than dissolve it—and with it a new standpoint from which to observe the visible.

The standpoint is actually a "hole" in "a building rented strictly to whites, in a section of the basement that was shut off and forgotten during the nineteenth century."[194]

[194] Ralph Ellison, *Invisible Man* (New York: Random House Inc., 1995), 6.

Our narrator's discovery is that this hole is both plugged into the electricity grid of New York City, and off the grid's proprietary divisions. All "Monopolated Light & Power" know "is that according to the master meter back there in their power station a hell of a lot of free current is disappearing somewhere into the jungle of Harlem." More striking still, he explains, is that he doesn't "live in Harlem but in a border area."[195] The hole then is more of a crack in the otherwise gapless map charted by real estate and utilities. What he learns, in other words, is that the grid distributes not just energy, but the visible contours of those who receive it—their identity, both literally and conceptually, is illuminated—and that a very different political aesthetic is available amidst the infrastructure of the city. Invisibility, rather than visibility, available not with distance from the energy grid but immanence to it, and a political aesthetic quite at home amidst the medium specificity of the novel anyways, whose form is premised on deferring visualization *ad infinitum*.

Pre-emptively, then, *Invisible Man*'s prologue stretches forward and renders the political positions available above ground into ready-mades. He tries his hand at black liberalism, African nativism, and even international socialism, but discovers their disquieting consistency with black conservatism in the south and the subjective contours it produces. Up at the surface, the invisible man (IM) experiences the raw material of what Seth Moglen calls American literary modernism's "effort to mourn the destructive effects of modern capitalism,"[196] since what he found impossible to escape were those racial and economic divisions cemented by a fully industrialized American modernity.

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[195] *Invisible Man*, 5.

[196] Seth Moglen, *Mourning Modernity* (Stanford: Stanford University Press, 2007), xiii.

Hence his move from one side of the Mason-Dixon to the other represents a move across the uneven development, but historical consistency, of racial inequality in America. At the surface, too, is the political result of what Michael Szalay has effectively defined as *New Deal Modernism*, where the actuarial accord negotiated between the Works Progress Administration's Arts Projects and modernist cultural producers followed in step with the national grid project, the new deal's literal engine for economic and national revival.[197]

Invisible Man neither begins nor ends up at the surface but is instead *modern* both formally and affectively as a consequence of its infrastructural standpoint (and not the other way around). At least this is the reading that becomes available once the historical specificity of its infrastructural setting is understood as not just incidental, but a primary force of the novel's form. Chalking the standpoint of New York City's electrical grid up to a quirk or to the novel's modernist pedigree, rather than a fundamental intervention into the politics of the novel's form itself, sets those above ground political positions free once again, which is why so many commentators on *Invisible Man* put it in line with those same positions the novel works so hard to escape.

Kenneth Warren's book length study of Ellison and what his subtitle calls "The Occasion of Criticism" is a notable exception in this regard. Warren's contribution to Ellison criticism is to historicize the forms of critique that *Invisible Man* in particular—the only novel Ellison completed during his life—had turned into literary contradictions. In Warren's book, what matters foremost about Ellison's intervention into the politics of race at mid century was that it was conferred almost exclusively in literary form. Though Ellison's work has been packaged to serve all manner of cultural and political programs,

[197] Michael Szalay, *New Deal Modernism* (Durham: Duke University Press, 2000).

its intervention into the wake of the Harlem Renaissance and interwar Black Marxism was to thematize the specifically stylistic, habitual and dispositional dimensions of race in order to turn them into effects of the novel—by making explicit, that is, the aesthetic protocols of race—in turn delegitimizing the politics that relied on a stylistic account of race.

Cultural or black nationalism turned out, in Warren's treatment of Ellison, to essentialize race even as it looked to the autonomy of *style* rather than the essence of pigment, because the banner of style sought to make African Americans a nonetheless transhistorical denomination. Neither Ellison nor Warren doubt the political force of cultural nationalism's aesthetic theory of race, "yet whatever importance is attached to African life prior to the arrival of Africans in the Americas," Warren insists, "neither the Negro nor the African as a distinct cultural and political entity has existed for time immemorial."[198] African Americans, at least from a cultural perspective, were historically *after Africa* (even if reactionaries still strive to establish Barack Obama's African genealogy) and thus beyond a political theory that would bind American blacks either temporally or spatially to the African continent. And yet racial distinctiveness, especially when what is understood to be distinct are the aesthetics, rather than the physicality of race, seems perfectly at home in the novel form.

But this is precisely the point Warren wants to make about *Invisible Man's* historicization of critique and the occasion of criticism it defines, which is that "the problem of race, then, was the problem of the novel."[199] This doesn't mean that race in

[198] Kenneth W. Warren, *So Black and Blue* (Chicago: University of Chicago Press, 2003), 6-7.

[199] Warren, 21.

America was merely a consequence of its invention in novels, but instead that the novel, insofar as its medium gave visual breadth to its content without visual means—it provides time to its objects, without ever arresting the object like, say, a painting—was by definition in the business of race once race gets redefined by cultural nationalists as an aesthetic. Thus "although Ellison was attuned, as perhaps few others were, to the variety of ways that race shaped and refracted American reality, he necessarily approached the subjects of 'race,' 'America,' and 'democracy' from a specific standpoint—that of the novelist—and as a result was as likely as any other commentator to assume that the lens provided by his medium was the one best suited to bring his subjects into view."[200]

High paradox, then, that Ellison's novel about race in America—his most concerted attempt at bringing "his subjects into view"—would result not in narrative clarity about race, but its invisible coincidence with the electrical currents that animate the city's characters. Thus the reading of the prologue and epilogue that understands them as metanarratives about the novel form itself, in which case the sense that the narrator's racial identity had been exchanged for an invisible one would be a consequence of the literary medium that *racialized* race in the first place, would miss the energy-race complex that those two parts of the book uniquely establish. A reading that thinks of the energy infrastructure of the novel as incidental would still have nothing to say about that other capacity made explicit in *Invisible Man*, which is its ability to assume the standpoint of something as hostile to narrative as urban infrastructure, much less anything to say about the literary problem of what Schuyler was earlier calling "the new power economy." In my reading of *Invisible Man*, "the new power economy" that had remade

[200] Ibid., 20.

the physical and political landscape of American power as a consequence of the 1930s grid project meant that the aesthetics of both energy and race conjoined in what would prove to be the apex of their literary history in *Invisible Man.* To anticipate the argument I'll forward in the next two sections, Ellison's novel would both name and conclude the literary history of energy by infrastructuralizing race, or rather by establishing the poetic ends of America's new power infrastructure as the end of the novel's occasion, too.

Importantly, what I have been arguing about the relationship between the nation's energy infrastructure and its racial divisions is not that the former determines, or diminishes the importance of, the latter. Instead the idea is that between *Black Empire* and *Invisible Man*—two trajectories of what I have been calling the literary history of energy deepening—is a fundamental departure from the familiar political logic to which both New Critics and New Historicists would want to return the novel. Thus a comforting rediscovery or affirmation of "identity" either in the novel's structure or its content proves redemptive in major studies of Ellison's fiction, but not here.

In Editch Schor's *Visible Ellison*, "the discovery of his identity" is accomplished precisely in the moment that I have been arguing displaces the vocabulary of identity and division: "the underground," in Schor's reading, makes possible "the descent into self,"[201] which in her account was the key motivation in the novel more generally. In an earlier account, Robert O'Meally's introduction to his edited *New Essays on Invisible Man* puts the novel at the centre of a literary modernism populated by Joyce (the connection was made by Ellison himself, but cemented in Robert List's *Dedalus in Harlem*), Faulkner (who admired the connection) and Hemmingway, in order to read "invisibility…as a

[201] Edith Schor, *Visible Ellison* (London: Greenwood Press, 1993), 2.

metaphor that has moved from its original literary context to become a key metaphor for its era."[202] O'Meally's formal appreciation of *Invisible Man* thus turns the *infra*structure of the novel into a heterotopic space from which to advance questions about "the nation" and the legacy of slavery, leaving the material function and lyrical significance of what flows through that infrastructure (the nation's energy supply) by the wayside. And with ambitions not disconnected from O'Meally's collection, Alan Nadel's *Invisible Criticism* from the same year concludes by tying Ellison's expert allusions—and "allusive literature" more generally—to a literary tradition restored by *Invisible Man,* but invented by Melville.[203] The stakes for Nadel are to confirm another popular reading of the novel; namely, that the prologue and epilogue "culminated in the narrator's assuming a *postmodern* stance, as interpreter of signs, outside of time, framing experience with a new set of questions"[204] in order to pre-empt forthcoming modalities of the fragmented self. This no doubt is an accurate periodization of Ellison, yet it also means that what makes postmodernism distinct from modernism are its techniques—rather than a logic wedded to historically specific transformations—and that Melville, then, is a postmodernist, too, thus dis-establishing the relationship between history and setting. Strictly speaking, this makes no sense since history is the history of specific settings, and setting both in literature and in disciplines concerned with it is, to begin with, where history happens. Meanwhile, Kenneth Burke had championed *Invisible Man* for precisely the opposite reason: it was the very *best* of modernism since what it revealed was the racial

[202] Robert O'Meally, introduction to *New Essays on Invisible Man* (Cambridge: Cambridge University Press, 1988), 2.

[203] Alan Nadel, *Invisible Criticism* (Iowa City: University of Iowa Press, 1988), 150.

[204] Nadel, 26.

complexity of consciousness far more literary than one coded white,[205] which also, so long as the specific material history of the novel is bracketed, seems right. At any rate, I would like to move past a reading of the novel's underground that satisfies itself with the literary history of its trope, and instead offer one that takes seriously the earliest phases of postwar transformations at the level of setting, and the function of culture in mediating that transformation.

2.2B So Black and Blue

Amidst the city's grid there's no political fenestration—we are meters beneath architecture and its elements—and yet Invisible Man's retreat has "1,369 lights" with "every inch of" the ceiling lit up, and so we are not dealing with a deficit, bur rather a surplus of exposure. It is "*full* of light," and he "doubt[s] if there is a brighter spot in all New York."[206] We might pause again and consider the consequence of aligning the literal darkness of underground space with the excessive illumination it produces subjectively. A good clue, in addition to the narrator's insistence that stealing unlimited electrical current is "an act of sabotage," is the circumstances that lead to his subterranean escape. Running from riot cops during the novel's climactic race riots in the final chapter, the narrator slips through a half opened manhole into a "load of coal." In the "black dark" of the coal pit underground, he slips into and begins his "hibernation" outside of the novel's setting—its time and space in addition to its rhythms and refrains—discovering abstract

[205] Kenneth Burke, "Ralph Ellison's Trueblooded *Bildungsroman*" in *Ralph Ellison's Invisible Man: A Casebook* ed. John F. Callahan (New York: Oxford University Press, 2004).

[206] *Invisible Man*, 6.

"space, unbroken and impenetrable."[207] Yet his exit from the time and space of the novel's setting does not amount to an exit from history or the occasion of mid-century America, but rather a standpoint on what in the prologue he called the shape of history; it will be important that meta-history is here encountered in a self-consciously *spatial form* of narrative—the "unbroken and impenetrable" space of the grid—of Ellison's most celebrated sequence.

In her most extensive study of Ellison's legacy, Barbara Foley turns to the theory of history on offer in the prologue and epilogue in order to reconcile the novel's uneasy place in leftist literary history:

> The prologue's reader is invited to consider the narrator's sceptical attitude toward not just bourgeois progressive notions of history (the arrow) but also toward Hegelian Marxist conceptions (the spiral); the latter, he warns, is especially dangerous, requiring armament of the vulnerable brain. Until readers learn how he came to be so blue, however, they will have to keep in abeyance any questions about his somewhat confused and confusing historiographical metaphors.[208]

What for Foley is confused in the narrator's opening critique of history is its mistrust of the latter—the spiral and its politics—because in its place is an ambiguity that merely stalls a political alliance with the former's liberal teleology. Yet Ellison's relationship to Black Marxism in the 1940s was nothing short of ambiguous. Though he had played a major role in advancing a racially conscious Communist Party in America (CPUSA),[209] both Ellison and Richard Wright would leave the party shortly after WWII for what they

[207] Ibid., 567.

[208] Barbara Foley, *Wrestling With the Left* (Durham: Duke University Press, 2012), 347.

[209] Nikhil Pal Singh, "Retracing the Black-Red Thread," *American Literary History* 15.4 (2003): 830-840.

both perceived as its betrayal of blacks in place of the white working class.[210] When the narrator warns that those who "speak of the *spiral* of history…are preparing a boomerang,"[211] he is recalling not simply an abstract philosophy of history but rather a particular occasion of it in America's interwar political landscape.

Even though a good number of commentators would celebrate Ellison's departure from the Party in the name of the black nationalism it supposedly endorsed—in turn motivating what both Foley and Warren call the Ellison Industry, where his literary contribution stands in for any political program that encounters it[212]—*Invisible Man* is just as hostile to the cultural and institutional project of pluralism in America as it is to mid-century Marxism. What sparks the narrator's departure from the Southern Tuskegee Institute in the novel's first section is his revulsion at "the strength of philanthropic dollars, deeper than shafts sunk in the earth for oil and gold,"[213] and with it Booker T. Washington's program for post-Reconstruction rehabilitation. The trustees—likely also major players in the oil and gold business—define an airtight curriculum at Tuskegee, and with it the parameters of racial consciousness. But the narrator learns of a parallel, antebellum investment in black education while driving Mr. Norton, a visiting trustee from the North, through the town's black "slum."[214] By the time the narrator gets a sense of Mr. Norton's fascination with the poor black Jim Trueblood in the slum—Jim is

[210] Alan M. Wald, *Exiles from a Future Time* (Chapel Hill: University of North Carolina Press 2002), 294.

[211] *Invisible Man* 6.

[212] Barbara Foley, "The Ellison Industry," *Symbolism* vol. 8 (New York: AMS Press, 2007): 323-41.

[213] *Invisible Man*, 112.

[214] Ibid. 138.

famous for sleeping with his daughter and uses the rumor mill to garner favor with the sheriff's department once the college tries to evict him—he realizes the social implications of white philanthropy. Far more pleasing to the trustee is confirmation of black poverty and primitivism, than those success stories inside the college, or at least a reassurance that racial uplift is not the same thing as economic uplift. Pluralism, the narrator discovers, depends upon the separation of the former from the latter.

When Dr. Bledsoe, the school's headmaster, learns of the narrator's road trip with the trustee, he quickly expels him from the school. The narrator's naïve defense is that he "only stopped there after [Norton] ordered [him] to," but Bledsoe gives up the ghost and reminds him that "the dumbest black bastard in the cotton patch knows that the only way to please a white man is to tell him a lie!"[215] To the narrator's astonishment, Bledsoe pins the downfall of American blacks to the half an hour spent with Norton. "Instead of uplifting the race," he concludes, "you've torn it down."[216] Bledsoe therefore makes explicit the true structure of the Reconstruction-era South, where Plessey v. Ferguson's separate but equal racial relations are actualized economically as separate and radically unequal. "When you buck against me," he insists, "you're bucking against power, rich white folk's power, the nation's power—which means government power!"[217]

Cultural nationalism therefore comes and goes in the novel as a prerequisite for Jim Crow in the South, a necessary form of distraction to naturalize the political ambitions of blacks in an economic system that requires their servility to "power." We

[215] Ibid. 139.

[216] Ibid. 140.

[217] Ibid. 142.

discover the muffled class interests of cultural nationalism by the time the narrator opens his letter of recommendation from Dr. Bledsoe to Emerson, the son of one of the college's rich white trustees, which rather than endorsing his employment in the North, describes his insubordination and terminates any chance he had on either side of the Mason-Dixon. The young narrator's chances on the labour market are therefore tied to the account of his character recorded in the physical letter, which by the time he is set loose and penniless in Harlem is both a literal and symbolic synecdoche for the social structure of "power" in postbellum America. Dr. Bledsoe therefore stands as a gatekeeper of a strategic racial mobility, only nominally more promising than the individualized form of mobility the narrator elects.

Going it alone in Harlem, IM discovers, means nothing more than exchanging his labour for wages and work that, rather than distinguishing him, reinforces his blackness. The dead end of cultural nationalism results in stoicism in the face of an inherently racialized labour market, since what it means to be a black worker in Harlem is that both the value and forms of work made possible are predetermined, rather than the results of a free market. At Liberty Paints, the narrator becomes a piece worker manufacturing the white paint necessary for the company's entire line of colours. Getting the white just right, however, proves impossible, so he is sent to pressurize paint resins alongside Lucius Brockway in the basement. Here the trick of both the emerging petrochemical industry, and the power structure it depends upon, is laid bare, for while Brockway is the single most important source of knowledge in the factory, and "caint a single doggone drop of point move out of the factory lessit comes through Lucius Brockway's hands,"[218]

[218] Ibid. 215.

such concentration of physical and political power has the opposite effect on what we might call the workers movement. While Brockway boasts of his self-taught expertize, and guards his knowledge of the many gauges and valves that make up the core engine that pumps out oil-based paints, his suspicion of young white "engineers" taking his job curtails any politicization that such power might otherwise enable.

Counter-intuitively, intensification of physical power at the site of production does not lend itself to larger bodies of workers working alongside one another as was the norm in the earliest phases of factory production. Instead, energy deepening generates an ossified and competitive workforce whose expertize is expressed not as a force of labour but as a function of the machine that energy wealth makes possible. Thus Brockway insists that he "learned it by doing it,"[219] while the new breed of engineers are all book smart and not worth their salt. The narrator's black body and "liberal arts" education means he is of no threat to Brockway's job, but the Brotherhood upstairs—the local union Invisible Man entertains for the better part of the novel—most definitely is. So while Brockway comes close to something like labour consciousness when he reminds the narrator that "*we the machines inside the machine*"[220] it is a "we" divided to the core—in this case, along the lines mapped out by the factory's spatial division of labour—and more to the point, premised on a false identification with the dead labour embedded in the machines, rather than the living labour that gives the new material force of fossil power its economic value.

[219] Ibid.

[220] ibid. 217.

Brockway understands his expertize as the condition of possibility for the new accord struck between carbon and capital, where the underground furnace applies vast amounts of pressure and heat to raw materials in order to render "brown crystals" into adhesive polymers required for "the best white paint in the world."[221] His labour reflects back to him as ego—without him the factory fails—rather than an ethos of the plural and collective worker. The form of recognition we learn about in the prologue therefore already pre-empts this second encounter with the infrastructural scene of labour's imbrication in the energy system. There it is not the identity of worker that speaks, nor is it an identity in any traditional sense, but rather the unshackled voice of a resource radicalism located at the centre of America's new energy infrastructure. Brockway's betrayal of the narrator at the end of the factory scene—he eventually *lets* Invisible Man taint the paint supply in order to have him fired—therefore supplies the prologue and epilogue with its political contours. Inside of infrastructure is an indeterminate space of political possibility; inside the factory is a political dead end. And since the factory scene as it unfolds in *Invisible Man* is as much about division at the heart of factory labour as it is about the racial aesthetics literalized in white paint "so white you can paint a chunka coal,"[222] we know too that these two competing spaces in the novel have at stake the modulation of class with race, and race with class.

Small wonder, then, that what makes the communist Brotherhood so attractive to the narrator, the key members of which absorb him once he's expelled from Liberty Paints, is also what proves unforgivable at the end of the novel. For while a collective

[221] Ibid.

[222] ibid.

ethos of the worker resolves the regressive politics of the white worker in the factory, it is ultimately as committed to a form of racial division as the Brockways of the world, since its aim is not abolition of factory work, but the worker's management of it. Here, however, is where the novel's figuration of resource radicalism in its opening and close intervenes in what has been the typical conclusions drawn from Invisible Man's eventual hostility to the Brotherhood's socialist option. For while the Brotherhood's socialism, Ras' pan-Africanism, and Tuskegee's cultural nationalism get a bad wrap in the novel, liberal individualism has already been established in the prologue as the fabric that holds those other false choices together, and not an alternative to them. Black individualism, in other words, turns out to be an oxymoron, since the hyper visibility of the former quality renders the personal desires of the latter literally and politically invisible in the novel's opening pages. Something else far more interesting, I have been arguing, emerges once the energy infrastructure of the novel's narrative structure is taken seriously.

Reading *Invisible Man* not as the literary return to liberal individualism but rather as a formative instance of resource radicalism also clears up a good deal of the ambiguity with which the novel ends, for while the narrator's invisibility makes clear the absurdity of those above ground political narratives, his disposition underground still hinges on "infinite possibilities."[223] Seceding from both the racial and urban "division" above ground, the narrator acquires epistemological clarity about the contradictions of class politics without race, and racial politics without class, and is thus ready to "go on to the

[223] ibid., 576.

next conflicting phase."[224] The "next phase," however, proves allusive, and is muted each time he has again "gone up above to seek it out."[225] Any reader hoping for a narratological reconciliation with those political logics more familiar to the novel's body would no doubt agree with the narrator's meta-commentary a few pages later when he says " 'Ah,' I can hear you say, 'so it was all a build-up to bore us with his buggy jiving,'" because a metaphorical reading of his "hole" will miss the material significance of not just where but what infrastructure is in relation to the rest of the novel. We are, put simply, at a "frequency" of politics only audible from the energy infrastructure of the city. This much is clear from the novel's concluding question, "Who knows but that, on the lower frequencies, I speak for you?"[226] And so the "infinite possibilities" of that "next phase" the narrator circles around both in the prologue and epilogue are born not of political resolution but a resource radicalism quite literally inaudible, unnarrativizable, from within the novel proper.

That same drop in frequency is responsible for the stranger and more memorable poetics of the prologue where, with the help of some "reefer" and no fewer than five record players, the narrator "discover[s] a new analytical way of listening to music."[227] Louis Armstrong's "Black and Blue" would already serve as the soundtrack to the invisible man's ritual of eating vanilla ice cream and sloe gin, "pour[ing] the red liquid over the white mound, watching it glisten and the vapor rising as Louis bends that

[224] Ibid.

[225] Ibid.

[226] Ibid., 581.

[227] Ibid., 8.

military instrument into a beam of lyrical sound."[228] His affinity with the "lyrical sound" of Armstrong gets more specific, however, once he syncopates his own "disembodied" experience with the "poetry" Armstrong makes "out of being invisible."[229] If lyrically Louis' "only sin is in [his] skin," then the "poetry" of invisibility rings out in the horns and steady march of an upright bass so rhythmic as to fade back into the baritone frequencies that rise from "Black and Blue's" vocals. The vinyl then codes an aesthetic experience *of* frequency where the difference of instrument and notation produces a space giving "one a slightly different sense of time[:] instead of the swift and imperceptible flowing of time, you are aware of its nodes, those points where time stands still or from which it leaps ahead…and you slip into the breaks and look around."[230] Looking around from the still points of "Black and Blue," the invisible man slips simultaneously into a slow, italicized lyricism in the next few pages that draws out an instant of religious impression, followed by a supercharged narrative voice recapitulating the entirety of the novel that starts three pages later. That is, until he "somehow com[es] out of it, ascending hastily from this underworld of sound to hear Louis Armstrong innocently asking,

What did I do

To be so black

And blue?"[231]

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[228] Ibid.

[229] ibid.

[230] ibid.

[231] ibid., 12.

This musical refrain functions as a threshold between the "underworld" marked formally by a poetics without a lyrical body—the disembodied invisibility grasped amidst the frequencies of the record's reach—and the world as such built in the novel around the anonymous but stable "I" of the narrator. Well before the novel officially begins, we have seen where both geographically and aesthetically it will end, which is neither the setting of the novel nor that of NYC, but rather the invisible space of music and electricity.

The idea here has been in large part to understand how energy *deepens* at the moment that oil emerges triumphant over coal around 1950. To the extent that the modernist novel is on the front line of mediating the physical power of fossil fuels with the setting it depends upon, the *how* of energy deepening appeared largely beneath the surface, where the infrastructure of modernization held the answer to many of the vexing questions about race, class and culture above ground. *Black Empire* promised one kind of political novelty by literalizing the geography of a resource radicalism harmonious with the solar system of energy—if the Sun was king, then Africa would be its nobility—while *Invisible Man* imagined what a racial politics *after Africa* meant for a fully gridded America. For the latter, it meant "infinite possibility," but as the best of Louis Armstrong makes plain, and the political resonance of gospel music at the cusp of the civil rights movement a decade later, those possibilities are neither for, nor of, the novel. The cultural forms of racial consciousness at mid-century thus appear to move from the novel to music. Yet for our purposes, which is to pursue the aesthetic economy of energy deepening (not divorced from the question of race, but not the same either), yet another cultural form emblematic of setting as such will at this moment assume the responsibility of narrating

the cultural history of energy deepening, especially once the idea of a postindustrial society begins to chip away at the architectonics of the industrial world it inherits.

What Scheerbart, Schuyler, and Ellison's form of the energy novel established is that free energy is a specifically literary problem for two reasons. The first is that the energy deepening brought about by fossil fuels renders the literary mediation of free energy the last place in which to glimpse the modulation of labour and capital to a new form of natural resource uniquely capable of qualifying the rhythms and scale of economic output. The energy system upon which factory work and an industrialized economy were built made the idea of perpetuity, which is to say inexhaustible growth, an important, and importantly literary, conceit. Energy's economic properties emerge on the other end of these novels as the consequence of its cultural properties first. This explains why Ellison needs to abolish the Bildungsroman in order to establish any duration to his narrator's standpoint amidst the grid, once the "occasion" of *Invisible Man* – inter war race relations in America—has been surpassed, and why Schuyler's conservatism is not a critique of race consciousness but rather a disappointment with its liberal aversion to class antagonism. What's radical about the treatment of resources, infrastructure, and the energy system more generally in both is the perhaps vulgar, but nonetheless unexpected materialist resolution to the political impasse plaguing the tricky relationship between class and race in America.

The second reason that energy deepening, and the narrative of perpetuity attached to it, is initially a literary problem is because—and this is a claim I first sketched out in chapter one– literature's mediation of base and superstructure puts it in position to negotiate the physical and social setting of emerging energy systems while also exposing

the infrastructural denominator that weds political history to economic history. Both of these novels take as rudimentary the inseparability of America's physical and political power housed in its energy infrastructure. While remarkably different in genre and tone—one is an acerbic science fiction, while the other takes seriously the project of modernism for the novel form—both anchor plot to a cartography contoured by competing ideas about energy. *Black Empire* turns the physical surface of the African continent into the single most physically and politically powerful asset in the march towards a Black Internationale, while Invisible Man discovers the poetics of an unrepresentable politics amidst the frequencies emitted by some combination of jazz and the electrical grid underneath New York City. My claim here has been that the extent to which both of these novels are invested in a literary materialism is wholly contingent on their encounter with an energy system that cannot but modify the course of political thought. Which is another way of saying that US literature on the brink of oil's post 1945 ascendancy establishes the physical and social setting of energy deepening in order to very quickly isolate the social inequalities it accelerates in the name of modernization. In the industrial world out of which modernism grew, racial domination and economic exploitation cohered in a physical system of power all too deeply soaked in fossil fuels.

Implicit in my qualification of Robert Frank's claim about modern literature and spatial form is that this formal calibration is a feature of the cultural and aesthetic requirements of energy deepening. While one of the virtues of Frank's argument is that examples of spatial form in modern literature are legible in virtually every novel after Flaubert, my attention in this chapter on two enigmatic novels loosely tied to the Harlem Renaissance is meant to make explicit the materialism of the novel's medium in this,

surely the most intense moment of energy deepening the world has seen, or will ever see. Once the hydrocarbon system responsible for the physical, social, and economic environment of the global economy is up and running, however, the industrial paradigm of value it helps generalize will reach definite limits. For critics on both the right and left, that limit is expressed sometime around 1973. For it is then–somewhere between the Nixon shocks and the first major energy crisis of late capitalism–that the so-called postindustrial economy is born. And while from a strictly technical standpoint on the value form– to wit, that surplus value after 1973 is no less dependent on the exploitation of labour than it was before 1973 –we nevertheless see the emergence of a very peculiar breed of assets and ideas about the temporality, which is to say inexhaustibility of value, that will once again alter the physical and social landscapes that make up the settings we inhabit. If the energy system responsible for industrialization worked primarily on the level of extension, then the architectonics of postindustrial value will depend upon the capacity of certain mediums–namely architecture itself–to negotiate successive waves of cultural and financial intensity tied to energy deepening. Thus I turn my attention next to a car factory turned cultural factory in Italy's industrial North where the material husk of Fordism anchors the turn to so-called immaterial forms of production, and where the postindustrial modulation of culture, capital, and energy is built into space itself.

PART TWO

CHAPTER THREE: The Cultural Work of Architecture: Energy Deepening and the Postindustrial Turn at FIAT

Abstract: This chapter offers a new reading of Renzo Piano's 1970s retrofit of the FIAT car company's marquee factory in Lingotto-Turin in relation to current debates about the cultural, political, and economic content of postindustrial value. In addition to arguing that theories of immaterial production have missed something fundamental about the function material assets serve in the postindustrial economy, I also insist that a Marxist exegesis appropriate to today's political-economic relations is one that attends not just to the distribution of value, but to its representability as well. For the purposes of this chapter, that means checking in on the accountants in order to better grasp what architects have been up to.

This truth is, that just as there cannot exist a class political economy, so too there cannot be founded a class aesthetic, art, or architecture, but only class criticism of the aesthetic, of art, of architecture, of the city itself.

–Manfredo Tafuri, Architecture and Utopia

Just under a decade after the two oil shocks of the 1970s, what was until then the single largest automobile manufacturing plant in Europe closed its doors. Only a few years later, the former Fiat factory in Lingotto, Turin reopened not as a manufacturer of commodities but as a cultural complex. Of course Fiat's decision to reinvest a significant portion of its capital into an ostensibly unproductive capital asset—a building that on the face of things

produced nothing, and instead housed cultural objects, leisure activities, education facilities, and entrepreneurial startup space—was anything but a free gift back to the Piedmontese economy, of which they were fondly considered "La Mamma." Chairman Giovanni Agnelli reportedly owned nearly a quarter of the companies on the Milan stock exchange in the 1970s and with Fiat alone controlled 16.5 percent of Italy's industrial investment in research.[232] The board's response to overaccumulation during the recession was a combination of outsourcing, property development, and what Josh Whitford calls "guided growth."[233] Understood as a historically specific economic strategy, Fiat's investment in culture alongside the then-new research and development facility elsewhere in the city and manufacturing expansion into the Italian South, Brazil, and India was a specific wager on how to extract future surplus value from a population that its own factories had until then organized as worker and non-worker. Its post-retrofit renominalization, known now simply as Fiat Works, is perhaps no accident, but instead an insistence on its postindustrial dynamism: Fiat Works.

Politically this chapter's concern with Fiat's flagship factory will surely not strike most as fortuitous given Fiat's role as both an antagonist in and a setting for what in the English-speaking world has come to be known as the birth of Italian Autonomous (and later Post-) Marxism. In fact what strikes me as necessary still, some forty years on, is

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[232] See John Tagliabue, "Giovanni Tagliabue, Fiat Patriarch and a Force in Italy, Dies at 81," *New York Times* (25 January 2003) <http://www.nytimes.com/2003/01/25/business/giovanni-agnelli-fiat-patriarch-and-a-force-in-italy-dies-at-81.html?pagewanted=all&src=pm> and Luca Ciferri, "Agnelli—The Uncrowned Monarch of the Italian Motor Industry," Automotive New Europe <http://www.autonews.com/files/euroauto/inductees/agnelli.htm>.

[233] Josh Whitford and Aldo Enrietti, "Surviving the Fall of a King: The Regional Institutional Implications of Crisis at Fiat Auto," *International Journal of Urban and Regional Research* 29.4 (December 2005): 771-95.

precisely the relationship between the political economy of architecture in places like the Italian North and the emergence of two competing though in a strong sense mirror positions on the nature of the new economy: on one hand, a widespread enthusiasm at the level of macroeconomic policy in the cultural and creative content of what were then new ideas about the coming postindustrial society; and on the other, the political blowback against those same economic transformations which in more recent memory has been dubbed, thanks to Silvia Federici's critique of it, immaterial labour theory.[234] The latter is but one of the many theoretical positions that would emerge out of the heated years preceding the factory conversion at Lingotto. And while the explanatory and rhetorical power of their theses on affect and rent in what they call Post-Fordism is not in question here, what strikes me as urgent is the need to consider earlier counter-tendencies in proletarian theory from which that more popular and influential one emerged: namely the aesthetically attuned insights into economics made available by the criticism of Marxist architectural historian Manfredo Tafuri on the one hand; and the split, on the other hand, precipitated between Mario Tronti and Antonio Negri with the publication of Tronti's 1966 *Operai e capitale* (*Workers and Capital*, much of which had already appeared in *Quaderni rossi* a few years earlier), in no small part because the recent shorthand "Italian theory" occludes the heterogeneity of what was arguably the most rigorous period of

[234] Maurizio Lazzarato's influential essay on "Immaterial Labor" from 1996 usually stands in as the most developed expression of the theory, but I have in mind the even more recent collection on *Crisis in the Global Economy* put out by the UniNomade network on *Semiotext(e)* in which "financialization," "biopower," "cognitive capitalism," "the becoming-rent of profit," and the "new affective enclosures" are all deployed diagnostically to describe, in no uncertain terms, what in Carlo Vercellone's contribution is called "the crisis of the *law of labour time-value.*" The position I am favoring in this chapter is not one that understands Post-Fordist capitalism as a break in the long view of capitalism's internal laws, as in the case of the UniNomade position, which is not to say that their work (and Vercellone's in particular) is not endlessly insightful and indispensable to political organizing after 2008.

Marxist analysis in the postwar period. And the urgency of considering other directions in Italian Marxism in order to understand the kinds of cultural strategies developing at firms like Fiat is also not due to a nostalgia for a more militant period of struggle but is rather born out of a concern for a more politically attentive and, we might say, older materialism (hence the interest in architecture, buildings, urbanism, and the economics of fixed capital during the transition to intangible assets) than the one on offer by immaterial labour theory.

As a work of architecture, Renzo Piano's retrofit beginning in 1982 makes murky the distinction between avant-garde architecture in Italy during the previous two decades—a period characterized by experiments and hypotheses largely concerned with typologies of collective living and megastructural interventions by Superstudio, Archizoom, and the group known now as La Tendenza—and the physical needs of big industry. A discipline imagined in the postwar period as uniquely political in its capacity to make concrete modes of socialist belonging through strikingly modernist forms, architecture, and architectural theory had by the 1970s reached a widely recognized terminus point.

Manfredo Tafuri in *Architecture and Utopia,* perhaps his most famous book in the English-speaking world, insisted that the professional impasse was written in the stars because "the fate of capitalist society is not at all extraneous to architectural design."[235] What it meant for the two to share a fate on Tafuri's account was that architects had a defeated and yet critical "task" ahead of them: namely, the political function of architecture consisted in its capacity to put "the working class, as organized in its parties

[235] Manfredo Tafuri, *Architecture and Utopia* (Cambridge: MIT P, 1976), 179.

and unions, face to face with the highest levels achieved by the dynamics of capitalist development, and relating particular moments to general designs."[236] The "particular moments" of both the "working class" and "capitalist development," here, are imagined at a much larger scale than their proximity in the factory, and so the modernist commitment to functional or figurative architectural forms of socialism such as collective housing or even the *casa del popolo* (house of the people) is made, at least from a political perspective, obsolete. Though it was inconceivable for architecture to distribute or make space for socialism, Tafuri nonetheless saw in its specific material qualities the capacity to make available a version of totality, or "general designs," to a "working class" undergoing rapid transformation. Tafuri thus reestablishes the same critique of radical Viennese urbanism he had been developing in the radical journal *Contrapiano,* except that in the case of the Italian postwar North, class composition and urban forms of economic planning make architectural *interventions* virtually impossible. For the same reason, however, Tafuri recognized the indispensability of architecture to a working-class standpoint because of its capacity to distribute both an aesthetic and economic materialism. The "search for architectural alternatives" to capitalism, his final provocation insists, "is a contradiction in terms" not because architecture was no match for capitalism, but because architecture at that moment had become a constitutive moment in the urban plan "of the technician, of the organizer of building activity, and of the planner, within the compass of the new forms of capitalist development."[237]

[236] Ibid., 172.

[237] Ibid., 182.

Though Tafuri's critique of what he calls an architectural ideology and its corresponding operative criticism is often understood as a dismissal of neo-rationalism or apolitical formalism in architecture, his argument through the 1960s and 1970s had far more to do with what I will here explain is the architectural logic of capitalism than with a capitalist logic of architecture. The former had always been at work through what Tafuri called "the utopia of form" and architecture's capacity to distribute both perspectives and people, but with the rise of Decision theory and the cybernetic revolution in economics, he imagined it had become a far more immediate impasse to something like a "radical antidesign."[238] In the cybernetic paradigm of economic development, Tafuri, wedding his criticism to leading design and planning theorist Horst Rittel's, insisted that the old opposition between plan and value had fallen away, and in its wake was a model in which "the very structure of the plan…generates its systems of evaluation."[239] The idea advanced by Rittel and taken seriously here by Tafuri was that growth in the new economy would consist of a version of surplus value planned in advance by state and private enterprise, and that the consequences for working-class composition (and the architecture that would distribute it) would be transformative in unpredictable ways. The integration of architecture into building cycles, economic zoning, and long-term regional plans signaled to Tafuri that the state and the private sector had signed a new accord putting architectural development at the core of its plans. Thus in Tafuri's account, the postindustrial phase of capitalist development required

[238] Ibid., 179.

[239] Ibid., 175.

architecture's capacity to rationalize the distribution of different kinds of value (geometric, social, functional, and property values to name the most important). Without question the most material of all the classically aesthetic orders—which is to say the most voluminous, heavy, and static form of art according to both Kant and Hegel—architecture will turn out not accidentally to accelerate a new phase of value-time necessary for postindustrialization. In Turin especially, Tafuri's particular attention to the overlap between urban planning and capitalist development takes the Fiat car company's economic and architectural activities as one and the same. Our purpose here is thus to reconsider Tafuri's claim that architecture sits at the core of postindustrial growth in relation to the other "Italian" position associated with immaterial labour theory, and to forward a modest hypothesis about what the capitalist world must look like for us to agree that there is something of an architectural logic to growth during the simultaneous dematerialization of the economy.

3.1 Fordism and Futurism; "Architecture or Revolution"

Fiat's wager on future economic development was an immediate response to an historic impasse in the Fordist paradigm of value creation. The board's decision to refunction its factory in Lingotto says as much about its own historical position within a politically hostile labour market—Fiat's other factories in Turin were of course key sites for labour struggles through the 1960s and 1970s and the historic centre of Italian workerism called *operaismo*—as it does about what policy makers and industrial leaders imagined drove economic growth. Two such assumptions worth noting up front are first that intensifications of both the working day and the productive capacity of workers (relative

surplus-value by another name) are not the only means in which to valorize capital, and second that a capital asset geared for cultural production and circulation is a sound resolution to a liquidity trap. Neither assumption was entirely new in the 1970s. What was particular, however, was the emergence of a set of macroeconomic commitments within technical discourses on value that sought to generalize the kinds of bets unfolding at Fiat (more on this below).

Italian manufacturers' relationship to the question of technology and progress, when Fiat-Lingotto initially gained notoriety earlier in the century, was framed by at least two factors. On one side, an increasingly attractive Fordist mode of production appeared capable of transitioning continental Europe's agrarian economy, then still only sparsely punctuated by city states, to a national labour market needed for mass production; and Futurism on the other side as an avant-garde ideology adequate to aestheticizing and universalizing Fordism. Taken as combatable modes of wedding material and labour together as an industrial force, Fordism and Futurism characterized the early stages of Fiat's dominance in the North and in the architectural imaginary of twentieth-century modernism.

F.T. Marinetti's "Futurist Manifesto" in 1909 was not a little certain about the source of their modernity, or what they modestly understood as "the very first sunrise on earth."[240] Fueled on "machine gun fire," the "new beauty" of speed put the automobile at the core of their engineered future. Museums, libraries, and cemeteries marked and maintained the slowness of the past. Only with "factories suspended from the clouds by the thread of their smoke" would the "great crowds agitated by work," on Marinetti's

[240] F.T. Marinetti, "The Futurist Manifesto" <http://vserver1.cscs.lsa.umich.edu/~crshalizi/T4PM/futurist-manifesto.html>.

account, bring modernity to a pace acceptable to its aesthetic, liberating them not *from* but *to* work.[241] The romanticization of war and its aesthetic which we tend to associate with Futurism today only served half their project: the other took what would become the Fordist factory as the ground zero of a new society, of which war was only the loudest expression. Thirteen years later they would get Il Duce, the same year Giacomo Mattè Trucco finalized Fiat's plans for its flagship factory of the future. Within the decade, Mussolini would use Fiat's heavenly fortress to stage Italy's own take on the fascist factory rally, filmed and distributed for all Europe's modernists to eat up.

Upon returning from a tour of Detroit and Chicago at the cusp of World War I, Fiat owner and founder V.G. Agnelli commissioned company engineer Mattè Trucco to design the largest and most efficient industrial complex in Europe. Indeed for automobile manufacturing, Fiat-Lingotto came second only to Ford's River Rouge Complex in Michigan. The latter, finished in 1917 by Albert Kahn, translated Frederick Winslow Taylor's techniques for scientifically managing the division of manual labour into the assembly line for Ford's burgeoning empire. Each of the Lingotto's five floors was designated for a distinct phase of automobile manufacturing with raw materials entering at ground level; assembly, motor calibration, upholstery, and finishing from floors one through five, all tied together by the first helicoidal ramp in the world made from reinforced concrete; and a full kilometer long oval open-air test track on the roof. The Taylorist logic informing its layout was a direct response to a factory occupation of Fiat's older and more open plant in Turin by workers looking for syndicalist control of production in 1921. Sparked in no small part by Amadeo Bordiga and Antonio Gramsci's

[241] Marinetti.

newly founded Italian Communist Party (PCI) in January of 1921, workers at the beginning of the decade, especially in the North, were encouraged as much from the left as from Mussolini's *Il Popolo d'Italia*. Mussolini's newly minted fascists called for social and economic reform and a nationalization program nearly indistinguishable from the platform developed by the PCI in Livorno, though as theoretical positions on value and distribution the two couldn't have had less in common.

Internally, Fiat workers then as in the 1960s and 1970s made no mistake about which flag to fly. Theirs was red throughout, unduly flanked outside by the black shirts of Italy's other radical wing. Agnelli's appointment to Mussolini's senate in 1923 effectively sealed the company's political future, however, and with it the interim success of its ambitions for a monopoly in the region. Fiat's new factory, in other words, installed an organizational logic as much imported from Detroit as from the National Fascist Party's (PNF) Roman headquarters. Designed for an ideal division of optimized labor—a combination of cooperation for increased output and division for specialized assembly—Lingotto announced a future relation between labour and capital emblematic of advanced industrial production across the globe. And though the factory would outlive the PNF later in the century, one was unthinkable without the other in the 1920s.

That the Lingotto factory came to emblematize modernist architecture for both Reyner Banham and Le Corbusier, and a future coterminous with fascism for the Futurists at Capri and Mussolini himself, was because what makes it modern in both positions is a formalization of an economic promise in cultural terms. What for Banham is "the most nearly Futurist building ever built"[242] arrives on the scene in the art world

[242] Reyner Banham, *Theory and Design in the First Machine Age* (New York: Praeger, 1960), 193.

through Werner Graff's visualization of a *de Stijl* reloaded in a 1922 issue of *G* where the Turin factory brackets a more militant declaration of Bauhaus outlook: "Uninfluenced by the methods of mechanical technology, the new and greater technology begins—the technology of tensions, invisible motions, action-at-a-distance, and speeds unimaginable now in 1922."[243] The promise of a technological future for Graff, as for Marinetti and Mussolini, expressed itself in the new Fiat factory through a building and workforce understood not as complimentary but as singular. Elementarism (a term introduced and canonized in *de Stijl* by the Russian constructivist El Lissitzky) referred in the early modernist aesthetic as much to the rationalism of an architecture as to the technologization of the variable side of capital, which is to say human labour power itself. With newly available reinforced concrete and a technique of ribbing enabling a seamless spiral ramp to link floors one through five, Fiat-Lingotto materialized workflow not just through management but also in the building itself. The irony is that Mattè Trucco's layout was actually more rigid than flexible as a result of its concrete flow. The larger complex at Mirafiori resolved much of Lingotto's engineering flaws in 1937 (whose guest of honor during the opening ceremony was none other than Mussolini himself) by separating workers into discreet buildings while maintaining flow with assembly belts and subcontracting. Still, the North's largest employer became so by understanding the project of mass production as an architectural one first, and a management one second. The postindustrial promise half a century later would be that technology had finally liberated mankind from heavy lifting; the claim in its Fordist mode is that workers, given the right buildings, have finally become technological.

[243] qtd. in Banham, 193.

No one took the singularization of worker and machine more seriously in the 1920s than Le Corbusier. That three aerial shots of Fiat's Lingotto factory line the final page of *Towards a New Architecture,* as the visual equivalent of "architecture or revolution,"[244] should come as no surprise given the book's core conviction in a machinic modernity. If the progress of enlightenment had stalled at some point in the nineteenth century for Le Corbusier, it wasn't because mechanization had come to organize most of social and political life, but rather that it hadn't organized it enough. Between the advancement of production, and what were for him dead styles of an architectural prehistory, lies the fundamental contradiction between the home and the factory, which his manifesto aimed to fix. His first order of business then was to make the house a "machine for living in."[245] Industrialization meant for Le Corbusier that "everywhere can be seen machines which serve to produce something and produce it admirably, in a clean sort of way."[246]

Le Corbusier's admiration for the "clean sort of way" that modern industry produced things found its most advanced expression in Fiat's factory at Lingotto. In Italy, Fiat's Fordism and Futurism looked to Le Corbusier like a prefiguration of the problem of "architecture or revolution" in no small part because of its maximization of the fixed part of capital in the production process and its mechanization of the variable part. Which is to say that Fiat's engineering feat at Lingotto supplied modernism, at least in Le Corbusier's parts of the world, with its aesthetic and economic synthesis. One could

[244] Le Corbusier, *Towards a New Architecture,* trans. Frederick Etchells (BN Publishing, 2008 [1923]), 289.

[245] Le Corbusier, 107.

[246] Le Corbusier, 277.

therefore say that in the 1920s, at least in the idiom of Le Corbusier's famous either/or, that Italy didn't need a revolution: just Fiat.

3.1A FIAT WORKS

If what is made available in narrating Fordism and Futurism together, though, is a sense of the aesthetic (and in this case architectural) imaginary at the heart of the more technical qualities of that historically specific logic of production—which is to say in more simple terms that art history and economic history are best read not separately but rather as two sides of the same historical process—then Fiat's factory conversion would mark much more than a diversification of the company's assets. What I will suggest now, in other words, is that the conversion of what was once the largest car factory in the world into Europe's largest cultural factory, in an architectural idiom associated with craftsmanship and a sympathy for regionalism,[247] is nothing short of a *material* blueprint for the postindustrial commitment to immaterialization, intangibility, and weightlessness. Which is another way of putting Gail Day's recent claim that the architectural criticism Tafuri developed at the Istituto Universitario di Architettura di Venezia (IUAV) understood avant-garde negation in the postwar years "as wrapped up with capitalism's modern coming-to-being, its artistic innovations ultimately playing a role in social restructuring."[248] Day's point, which is one she shares with Fredric Jameson in his earlier

[247] The two best examples of recent architectural criticism to isolate building craftsmanship and critical regionalism are Hal Foster's chapter on "Light Modernity" in *The Art-Architecture Complex* (London: Verso, 2011) and Kenneth Frampton's chapter "Towards a Critical Regionalism: Six Points for an Architecture of Resistance" in *Postmodern Culture*, edited by Hal Foster (Port Townsend: Bay P,1983) 16-30.

[248] Gail Day, *Dialectical Passions* (New York: Columbia UP, 2012), 80.

assessment of Tafuri's contribution to the history of dialectical criticism, is that Tafuri's patience in tracking the force of aesthetic negation in twentieth-century art tells us as much, if not more, about economic development and contradiction than economics itself. As I began to suggest above, this is due in no small part to Tafuri's intuition of a uniquely *architectural* logic of capitalist development; a distributive logic in which material and immaterial elements are brought to bear on the periodicity of space.

Piano's conversion of Fiat's Fordist factory is thus best understood up front as a conversion of its periodicity; a material reconfiguration of the aesthetics of Futurism in order to make space for an after to Fordism. In fact, Piano's earlier and still more famous Centre Pompidou in Paris with Richard Rogers paved the way for an expansion of the cultural sector into heavy industry (indeed, the façade of Pompidou prefigures this expansion), a project whose mandate, Piano explains, "was to find a different tool for making culture and information."[249] Pompidou thus gave an early indication of how architecture would give physical shape to a process of extraction invested in the immateriality of culture and information. The idea there would be to externalize the infrastructure of the building: "utilities are positioned along the west façade and have been color-coded (blue for air, green for water, yellow for electricity, and red for the vertical air circulation systems)" and the "elevators and escalators have been placed upon the support structure, along the façade"[250] in order to make the building's machinic qualities transparent. Pompidou—and in a qualitatively new fashion at Fiat Works a few years later—began working out the aesthetic of a cultural economy in which architecture

[249] Renzo Piano, *Pezzo per pezzo* (Rome: Casa del libro editrice, 1982), 23.

[250] Fondazione Renzo Piano <http://www.fondazionerenzopiano.org/project/83/centre-georges-pompidou/genesis/>.

appeared to do a kind of work while the people inside engaged in activities until then thought of as outside the realm of economic growth.

Pompidou's program to make the infrastructure of the building architectural, which effectively made the working elements of the structure transparent in order to thematize transparency more generally, was in fact the last (and not the first) in a sequence of Piano's work that began with his first three major projects in 1966-70. The first was his earlier firm's initial results in experiments with polyester, plastics, and transportable structures. His Mobile Structure for Sulphur Extraction in 1966 consisted of a steel tension structure that could be erected in a variety of configurations *in situ*, reinforced by a polyester wrap that protected the sulphur mine and machinery from the environment.[251] Studio Piano's 1967 Shell Structural System for the Fourteenth Milan Triennale used a similar steel infrastructure to support a transportable and multi-use glass fiber container that could house unlimited activities. And the third, the Italian Industry Pavilion at Expo 1970 in Osaka, Japan used the principles invented in the first two projects and rendered the steel and polyester structural elements into a mobile square where Italy's newest industrial products could be framed by the most forward looking product of them all: postindustrial architecture.

Pompidou is the fourth in a sequence of projects interested in making interior space light and flexible (the two terms most immediately associated with Piano's career more generally), eliminating the gap between façade and structure. The Fiat conversion is thus part of a new sequence, and is more accurately the sequel to what had then become the Building Workshop's first major retrofit at the Schlumberger factory in Paris, 1981-

[251] Peter Buchanan, *Renzo Piano Building Workshop Complete Works, Volume One* (London: Phaidon, 1993) 46.

84. Schlumberger's specialization in electronic equipment was at the cutting edge of oil detection and extraction and had launched the company, by the end of the 1970s oil crisis, into what was quickly becoming the centre of the economic universe: the energy sector. Schlumberger had, much like Fiat in Turin, rid itself of a significant portion of its workforce—indeed, on a macroeconomic scale, it was precisely the substitution of oil for coal that had dramatically increased productivity and thus decreased the relative size of the workforce to the rate of output in the manufacturing sector—and so its eight-hectare lot that once housed workers, industrial manufacturing, and management facilities needed to be reconfigured to accommodate the company's more capital-intensive future. This meant replacing the factory that sat in the centre with a garden, and communal spaces for eating and meeting directly beneath and above it housed in a Teflon awning. All the remaining structural elements were left intact, such as trusses and purlins, and the new infrastructural elements were again color-coded based on concrete, fenestration, circulation, and air conditioning. And while outside the building is a landscape architecture that anticipates much of the corporate campus architecture of the next fifty years, the idea at Schlumberger is to "invade" the factory's interior space with the natural elements that form the communal exterior through the planned continuity in color schemes based on botanical seasons. Work time inside the factory, which more concretely is based on the geopolitical and global economic thirst for and the capital deepening implied by oil, is framed architecturally as the time of natural seasons.

Still owned by Fiat, but financed jointly by Fiat's development company, SITECO, and the city of Turin, Piano's next factory conversion came in four stages starting in 1984, coming in at just over one billion U.S. dollars by the final stage in 2002.

The division of labour at the new Fiat is no longer organized around the assembly of a material commodity but rather what is imagined to constitute the multifaceted activities of culture: an exhibition centre, cinema, private gallery (funded and supplied by Agnelli's grandson), polytechnic university, concert halls, and a shopping centre, all of which, according then to the *Architectural Review*, "constitute such a rich mix of enterprises for whom creativity is crucial that they should spark between them a lively and fertile entrepreneurial ecology."[252] Of course the fantasy here is that having space designated for social and cultural activities serve as a stimulus for innovation, and that innovation is a constitutive dimension of future economic development. That the husk of a Fordist factory can ground a value-creating set of activities, though not function as a site of production, however, is a wager on the logical relation between architecture as fixed capital and the accumulation of surplus value in whatever comes after Fordism.

At Fiat, in other words, it wouldn't be nature that drove the architectural imaginary of economic growth, but rather its cultural rhythms. And yet the distinction between the two, between an idea of economic time linked to nature and one linked to culture, would appear in Piano's architectural philosophy not as a contradiction at all, but rather as two sides of the same feature of architecture's unique facility with the "organic."[253] So while the heavy-handed landscaping seen at Schlumberger is more restrained at Lingotto, but nonetheless central to masking the new auxiliary spaces a multi-use cultural centre requires, what instead gets naturalized is what architectural and

[252] "Reviving Lingotto—Mixed Development, Turin, Italy," *Architectural Review* (November 1996).

[253] Peter Buchanan, "Further Dimensions of the Organic: The Continuing Evolution of a Natural Architecture" in *Renzo Piano Building Workshop Complete Works, Volume Two* (London: Phaidon, 1995): 6.

environmental critic Peter Buchanan calls the building's "primitive consciousness": for the first time, Piano wired the entire structure with smart systems monitoring human movement, external climate, and supplies, all of which is communicated to a "central nervous system."[254] Only this way can the various exhibitions and open spaces on the first and second floors energize the entrepreneurial spirit of its other "incubator units" housing new and small businesses in need of Fiat's bump. As each venture grows, plenty of premium space is available for lease on floors two and three. Higher up is a four-star hotel and departments of the Faculty of Science at the University of Turin. In the middle of Fiat's famous rooftop racetrack sits the helipad and globular conference space, and the sixth floor of the private Agnelli art collection housed in the Pinacoteca Giovanni and Marella Agnelli Gallery emerges to tie the economic limbs of the building down to its cultural spine. Twenty-five pieces ranging from Manet, Renoir, and Matisse to Picasso and, with appropriate historical irony, Italian Futurists Giacomo Balla and Gino Severini, sit in the "Scrigno" (or treasure chest). The collection itself is part of the Agnelli family's estimated fortune of over $5 billion (USD).

Thus what began on the concourse level as a "fertile entrepreneurial ecology" where startups rubbed shoulders with the creative class—which is to say where the intense capital deepening embodied in the building's conversion has provided the costly means for *cultural* and *creative* production—has upon ascending through to the sixth floor become the opposite: the means of more speculative, managerial, and intangible forms of production in the larger and more expensive spaces approaching roof level are the very cultural objects for which the new factory has been designed to showcase. The

[254] Buchanan, 158

fixed cultural assets emerge at the top of the factory where cars used to in order to shore up the admittedly less-valuable capital asset (the building itself) choreographing the Lingotto's workflow. The elasticity between the two forms of capital deepening—architectural on one end and art historical on the other—provides, to use the director's language, the organic composition of postindustrial production. What used to be the geographic centre of class struggle in Italy had become by the mid-1980s the "nervous centre" of Fiat's international division of labor.

It's also at about this time that Fiat began to diversify its investments and regional stronghold by becoming what we now know as the multi-sector behemoth Fiat Group. So far as workers in Turin were concerned, Fiat's expansion into property development and insurance meant the full-blown urban transformation of, and relation between, capital and labor. The closure of Lingotto, effectively Fiat's international headquarters for over half a century, came at the tail end, rather than at the beginning, of a twofold restructuring scheme. The first phase included breaking up the company effectively into a financial and property developer called Fiat Engineering and SITECO respectively, in addition to its more traditional role as automobile manufacturer. The second phase saw an internal reorganization of the production process itself: the new Melfi plant in the southern province of Potenza finished in 1993, surrounded by twenty-two subcontractor plants, is emblematic of the new just-in-time strategy we've come to associate with post-Fordist production and is one of many Fiat plants opened globally after the crisis of the 1970s. Phase two was a strategy as much about flexibility as it was about the maximization of fixed capital in the form of robotics in the place of variable capital, i.e., workers.

Layoffs reached 23,000 in 1980 in Turin with productive capacity slowing to 60 percent.[255] Meanwhile, Fiat Engineering opened Central Research Fiat (CRF), one of the most ambitious R&D centres in Italy since Olivetti's experiments in the 1950s and 1960s. Where the latter sought to formalize and facilitate an "anti-industrial" "republic of the intellect,"[256] Fiat instead committed itself to organizing both immaterial and material forms of production across the space of the city. Of course the argument here is not that Fiat is exceptional in its deployment of a new logic of accumulation. Certainly even in Italy its mobilization of capital away from the factory floor proper was facilitated and necessitated by the state through new taxation and financial laws, and the unfolding of a similar logic was visible elsewhere much earlier in the century.[257]

The introduction of a financial regulator, CONSOB, in the early 1970s is one such example, but perhaps more relevant to the transformation of Fiat-Lingotto is the aftermath of what came to be known as Progetto 80 in 1969-70. Championed by Giorgio Ruffalo at the Ministry of Finance and Economic Planning, Progetto 80 consisted of urban planners, economists, civil servants, and business leaders planning a three-tiered program for future economic and urban development in Italy. Aiming to grow the northern economy by 1980, the program cohered first in the construction of a system of accounting policy changes; second, program budgeting and integrated planning; and third, the regionalization of integrated planning. Unsurprisingly, its "long term

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[255] Whitford and Enrietti 782.

[256] Manfredo Tafuri, *History of Italian Architecture, 1944-1979* (Cambridge: MIT P, 1989) 37.

[257] Pier Vittorio Aureli's analysis in *Log* 23 (Fall 2011) of Cedric Price's 1966 plans for the Potteries Thinkbelt in North Straffordshire, England suggests one such predecessor to the architecture of intangible assets.

perspective" was one grounded not on an intensification of manufacturing exclusively, but instead a model of value creation choreographed by transformed urban relations.[258]

Perhaps most relevant for the discussion here, Progetto 80 laid the policy necessary to change valuation protocols in the Civil Code for property holdings in 1974. Instead of the "historical cost principle" determining the value of capital assets in which a building's initial cost and value trend attached to its land use determined its long-term value depreciation (and thus to what value it would contribute to the production process), new provisions were put in place to address events that change the asset's economic nature, such as the conversion of a prototypical Fordist factory into a hub for culture. Debates about which method best represented the value of an asset had been raging for decades in the U.S. and U.K. in what is now known as the Cambridge Capital Controversy, or what Ian Steedman, Paul Sweezy, and others on the left called the value controversy—debates that if anything were about how fixed capital could be understood as value-producing in the newly developed science of econometrics once it was understood as a commodity just like labor. By the 1970s, however, the International Accounting Standards Committee (IASC) sought to globally abandon the historical cost principle on company ledgers and auditing reports. Market value came to replace the law of devaluation, and buildings that would have otherwise been depleted of their congealed value got a new lease on life. With new property law comes a new narrative of property; and instead of a graveyard of dead capital, Fiat was able to expand the capacity of its capital assets to assume the uncanny appearance of workers themselves.

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[258] "Progetto '80: A Project for the Renewal of the Italian Society," *Planning Studies Centre* (8 April 2012) <http://www.planningstudies.org/research/progetto80/index.htm>.

3.2B Social Capital and Its Organic Composition

A good part of the Italian left had already anticipated the kinds of transformations unfolding at Fiat at least a decade before the decision to close Lingotto. From the perspective of a Marxist analysis of the basic categories by which capitalism grows—namely the organic composition of capital in which the increase of constant capital (c) which is the capital invested in fixed assets like machinery and buildings, over variable capital (v) spent on labour power, or capital deepening in order to increase labour productivity, defines the general tendency of economic growth—the limit is a natural one, which is to say that it will develop internal to capitalist development, rather than external to it. At a certain point so little labour time is required to produce the same output that the class antagonism between proletariat and bourgeoisie becomes instead an antagonism between those with and those without employment. The organic composition of capital, in other words, has as much to do with economic growth as it does with the sustainability of social relations over economic time. The question then is not whether or not the logical limit to the Fordist value form had been reached by the 1970s (it had) but rather how best to characterize the strategic reactions that were swiftly remaking the shape of economic relations.

To Mario Tronti in 1966, it was already clear that while the traditional site of production in its factory form remained the dominant expression of working-class struggle, surplus value as the *sine qua non* of capitalist accumulation could not be explained or critiqued exclusively from the factory floor. That all of society had become a factory was actually, at least in Tronti's early analysis, a claim not just about the privatization of the city but about the socialization of capital and labour at a definite point

of development in the organic composition of capital. On the question of whether or not the composition of capital over time takes more or less variable versus fixed capital (or value from labour as opposed to machines), Tronti adds that an increase in the fixed component always means a simultaneous increase in the "non-paid part of the social working day."[259] Tronti doesn't mean simply that unemployment rises as machines do more work but rather that the work done outside of the factory—namely, cultural, intellectual, and creative work, or social reproduction more broadly, including what by the end of the decade would be the most important oversight of all: gendered work—comes to constitute more and more of the variable side of capital once those lucky few with jobs show up to work.

Instead of an intensification of the paid part of the working day, which in Marx's terms would constitute an increase in relative surplus-value, or what we can call the Direct Sphere of Variable Capital (DSVC), Tronti's thesis about the social factory is premised on a claim about the intensification of human labour before it arrives on the labour market, or what we could call here the Indirect Sphere of Variable Capital (ISVC). Tronti's hypothesis that more and more surplus value comes from the reorganization of the ISVC, or "the social factory," is another way of highlighting the social history contained in the organic composition of capital, which is to say that both "v" and "c" and the ratio between the two are results of socially mediated conditions external to the factory at any given moment. The idea that you can isolate a definite quantity of either C or V without historicizing the social, cultural, and importantly gendered conditions of

[259] Mario Tronti, "Social Capital" *Telos* 17 (1973) is a translated reprint from the original chapter in *Operai e capitale,* 1966, which first appeared separately in the Marxist journal *Quaderni Rossi* in 1963. Future reference will be to the online version, "Social Capital" found here: http://zerowork.org/TrontiSocialCapital.htm.

value—as the Marxist feminist group Lotta Femminista, Selma James, Leopoldina Fortunati, and Sylvia Federici will point out in the next decade—is nothing short of a technical fallacy.[260]

But the intensification of the ISVC brings with it immediate consequences too for the process by which the value embedded in fixed capital is produced, consumed, and valorized over the course of the total workday, in addition to the variable side of capital: "within this process of production," Tronti maintains, social capital "produces, reproduces, and accumulates new capital; it produces-reproduces and accumulates new labor-power" because "at this level the division between necessary labour and surplus-labour does not disappear at all: it is simply generalized, i.e., socialized in the total process of capitalist production."[261] So while one side of the organic composition of capital is intensified, the other follows suit by virtue of the social organization *outside* the factory required and implied by a high degree of capital deepening *inside* it. And the final twist to what appears first as a tautology is that the increased value produced in the ISVC is itself the result of form of capital deepening outside the factory in which large-scale capitalists begin investing in the urban means of social reproduction, about which Fiat knew plenty by the time they hired Piano to update their flagship factory.

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[260] The Marxist-Feminist critique of the technical fallacy upon which male-centric workerism is built is in my mind a watershed moment in the critical theory of capital, since it reintroduces a break with the verifiability of the labour theory of value in order to conceptualize the contradictions of surplus value more generally. The gender critique of class set loose in the 1970s is the first step, I would argue, in the larger project to critique the conceptual basis of capitalist accumulation. Gendered forms of social reproduction are indispensible to the production of surplus value, but are invisible from the perspective of the wage. Energy deepening, I have been arguing, is likewise indispensible to the production of surplus value, but as I will say in chapter four and my conclusion, is also the condition of possibility for much of the social reproduction that takes place *indirectly* from the perspective of capital, too.

[261] Tronti.

Thus the transformations that would become both architecturally and politically explicit at Fiat in the following decade, and more generally associated with Post-Fordism during the 1970s through the 1990s—that is, postindustrialization and with it immaterial forms of production—had in Tronti's early estimation little to do with a return to rent or a fundamental breach in the capitalist value form. Rather, the economic and social transformations increasingly becoming paradigmatic during the most intense years of Italian ultra-leftist struggle were logical extensions of tendencies embedded in the most fundamental laws of capitalist accumulation, however misleading their initial appearances were for the traditional left. "Capitalists," Tronti continues, "know this well: the real generalization of the workers' conditions can introduce the appearance of its formal extinction."[262] The formal extinction of workers, however, only appears as a negative image in its organizational forms, which by 1966 across Europe was already breaking apart at the seams. Trade unions, parliamentary parties, and the like continued to take the identity of the working class as the beginning and end of socialism, but its function in the production and valorization of capital had shifted from beneath its feet. "Because of this," Tronti concludes, "when the working class politically refuses to become people, it does not close, but opens the most direct way to the socialist revolution,"[263] in no small part due to the emergence of a new phase of value where the ISVC began making up for the shortfall in the DSVC. As we have already seen, however, the capitalist concern with the working class as such was both the cause and result of capital deepening inside the factory and urban planning outside.

[262] Tronti.

[263] Tronti.

Which is another way of saying that what Piano's factory conversion made material was the particular architectural relay that would mediate direct and indirect spheres of variable capital in relation to a postindustrial materialism deeply concerned about the nature of value. The idea here, though, has been to read the architectural and aesthetic history of Fiat's economic transformations in order to distinguish between the types of radical materialisms that would take shape around its factories. Piano's cultural conversion didn't merely figure a future growth model as a set of immaterial forms of labor, but instead materialized the architectural side of postindustrial work as the setting in which increasingly indistinguishable spheres of variable capital would get mediated into value. The so-called shift into cognitive, creative, affective, or broadly named immaterial forms of labor, in other words, seems to address only half the picture of postwar political economy. As capital assets, the architecture of Fiat not only coordinates and leverages, but also assumes an active role in the transformation of cultural activities into value, just like its shored-up value in urban fixed capital has as its aim the coordination of the unpaid part of the workday. Thus to the extent that any viable movement of proletariat force is finally able to abolish "the present state of things,"[264] the *state of things* in the age of immaterial assets will remain a very material concern, which is to say that the so-called immaterial, financial, or creative economy never eliminated, but rather intensified, the capacity of architecture to work and for work to congeal in architecture. Piano's most recent commission for the Stavros Niarchos Cultural Centre touted as the "rebirth of Athens"—i.e., the ground zero of late capitalist austerity and

[264] Karl Marx, *The German Ideology* <http://www.marxists.org/archive/marx/works/1845/german-ideology/ch01a.htm>.

ultra-leftist confrontation—should therefore surprise no one when it imagines culture as the bailout package for which we have all been waiting.

CHAPTER FOUR:
Energyscapes, Architecture, and the Expanded Field of Postindustrial Philosophy

Abstract: In this chapter I characterize the aesthetic economy of postindustrial landscape architecture and environmental systems design in order claim that energy deepening establishes itself in spatial forms, or the physical setting, of a fully saturated fossil fuel society. I read the return to landscape, infrastructure, and environmental systems in architectural theory and curriculum at the end of the 1980s—more recently called "ecological urbanism" and "landform architecture" by deans of leading US architecture schools—as a temporary solution to capital's energy crisis in the 70s, and also a "root cause" of postmodernism as Rosalind Krauss terms it. I isolate the relationship between energy deepening, economic elasticity and social plasticity as the key matrix driving a petroeconomy otherwise imagined as unshackled from material constraints. By moving through exemplary instances of postindustrial landscape architecture in part one, and the philosophical tradition its theorists mobilize in part two, this paper will claim that the political economy of postindustrial energy is already an object-oriented ontology, rather than a labour-oriented one, and that this (along with the position that celebrates it) is a political disaster.

In a special report to the *New York Times* entitled "Power, Pollution, and the Internet," tech-reporter James Glanz made public what was until then a bit of an industry secret: digital forms of information were not only environmentally unfriendly compared even to

the thick and heavy forms they replaced; more surprising still, the so-called immateriality of information, the internet, and our everyday engagement with it, had produced a worldwide leviathan hungry for quantities of energy "sharply at odds with its image of sleek efficiency and environmental friendliness." [265] Digital farms or warehouses required the energy output of thirty nuclear power plants since whether in use or not, the information housed in these warehouses remains online.[266] Globally, data warehouses consume thirty billion watts of electricity everyday. Inside each warehouse are enormous complexes of servers, wires, and electrical circuitry (the heat from which can be visualized from space) which necessitates a constant source of cooling. And since the vast majority of electricity comes from coal, diesel, and petroleum products, the so-called immaterial economy is not only premised on, but actively motivates, the rapid expansion of an energy infrastructure now indisputably responsible for significant contributions to climate change.

Glanz's report foregrounds the infrastructural and environmental costs of the internet in order to temper the association of digital culture with weightlessness and green immateriality. My claim in this paper, however, is that the infrastructural truth of the postindustrial economy tells an equally troubling, if not coterminous feature of the postindustrial, which is the inseparability of constant increases in global energy wealth since the 1970s (today's climate crisis) and the simultaneous decrease in labour requirements across the global economy (today's unemployment crisis). Which is to say that the aesthetic misrecognition of digital culture and communication for the immaterial

[265] James Glanz, "Power, Pollution, and the Internet," *New York Times*, September 22, 2012. Web. May 11, 2015.

[266] Ibid.

takes place in a larger context that includes the disfiguration of labour from its social ground (what I will refer to later as energy's economic elasticity), and the emergence of fossil fuels as a form of social regulation (what in a moment I will call the social plasticity of oil).

This chapter will clarify the aesthetic economy of postindustrialization by establishing that while development in the Fordist era was primarily designed to standardize and increase labour productivity in and around the factory, *the postindustrial economy is instead premised on redefining and reshaping all landscapes as energyscapes, and all energy as economic elasticity.* In the critical theory that has grown up alongside landscape architecture and ecological urbanism, which I explore in part two of this chapter, intensive and extensive growth in flows of energy and information across landscapes gets recognized as an opportunity to endorse and experiment with speculative philosophies and so-called object-oriented ontologies. By moving through exemplary instances of postindustrial landscape architecture, and the philosophical tradition its theorists mobilize, this essay will claim that the political economy of postindustrial energy is already an object-oriented ontology, rather than a labour oriented one, and that this (along with the position that celebrates it) is a political disaster.

Energyscape in the account that follows names the expanded field—the historical and physical settings—in which capital accumulation is provided its energy infrastructure, or rather where the latter is optimized aesthetically and socially for the sustained growth of the former. By combining energy with landscape in the settings I'm nominating here, I'm not just referring to what Alberto Toscano and Jeff Kinkle call "logistical landscapes," such as the ports, oil patches, pipelines, and freeways captured by

Allan Sekula and Edward Burtynsky.[267] Certainly logistical or infrastructural landscapes are critical to the smooth operation of everyday life. What I am more interested in here is the aesthetic and economic saturation of postindustrial landscapes with energy intensive infrastructures, so that logistical landscapes, sites of resource extraction, industrial factories, and postindustrial cities are sewn together in an expanded field.[268] In order to calibrate what I have elsewhere called the peculiar carbon-capital complex, or what Andreas Malm has called "fossil capital," the postindustrial economy makes seamless the circuit of energy extraction, circulation, and consumption.[269] Specially planned economic zones provide the economic and logistical infrastructure required to keep postindustrial growth apace, while energyscapes—which is to say the infrastructural and technological base of the fossil fuelled fantasies driving the immaterial, the digital, and the fluid—normalize particularly troubling features of what we might term the aesthetics of a vanishing labour force at odds with the carbon-capital complex.

At the level of cultural theory and philosophy, this aesthetic economy expresses itself as a set of conceptual preferences shorn of a materialism able to triangulate labour, capital, and energy. In particular, these features include the liquid, plastic, and elastic preferences of political economy and political philosophy in the postindustrial era, both of which have (consciously or not) driven the concept and standpoint of human labour

[267] Alberto Toscano and Jeff Kinkle, *Cartographies of the Absolute* (Winchester, UK: Zero Books, 2015), 205.

[268] My thinking about the singularity of infrastructural circuits across distinct geographies of extraction, circulation is heavily informed by Keller Easterling's reading of "infrastructure space" in *Extrastatecraft* (London: Verso, 2014).

[269] Jeff Diamanti, "Three Theses on Energy and Capital," *Reviews in Cultural Theory* special issue on "Envisioning the Energy Humanities," forthcoming; Andreas Malm, "The Origins of Fossil Capital: From Water to Steam in the British Cotton Industry," *Historical Materialism* 21.1 (2013): 15-68.

power into the ground, and excavated an accelerated, albeit accidental and depoliticized unity between capital and energy in the meantime.

4.1 Visualizing Value

There is no shortage of committed attempts to expose the true environmental costs of energy hungry infrastructures. The trouble with exposition, however, is that one can no more see a pipeline through a computer screen than one can see the caloric and affective output of a Chinese worker in a smartphone. Part of this is a problem of scale, no doubt. In the words of Peter Gross, who helped design the data warehouses that anchor the internet, "it's staggering for most people, even people in the industry, to understand the numbers, the sheer size of these systems."[270] What staggers about the "size" and "numbers" of digital infrastructures is that (save for technicians and industry insiders) we never see it. Infrastructure more generally, of course, remains for the most part hidden from view, except when its contents are exposed, distributed, spilled or sabotaged. This is why central to any environmentalist politics, as Nicole Starosielski explains, is the struggle to visualize infrastructure, both because ecological devastation is a logical outcome (rather than an accident of) our global energy system, and because state security blocks easy knowledge of it. When it comes to infrastructure of any kind, talk of state security and terrorism is never far from view.

Environmental risk, however, is logically tied to the specifically economic function of energy infrastructures. Globally, the International Energy Agency predicts that energy supply will need to grow by forty five percent between 2006 and 2030 to

[270] Glanz, "Power, Pollution and the Internet."

more than seventeen billion tonnes of oil equivalent annually in order to maintain growth, seventy three percent of which will be consumed by cities.[271] A significant portion of that energy will be tied to the production, distribution, and consumption of digital information. Already in 2013, the Information and Communication Technology (ICT) ecosystem uses fifty percent more energy per year than the aviation industry.[272] This accelerated correlation between economic growth and energy consumption has been steadily climbing since the industrial revolution. The World Bank's estimated sixteen-fold increase in economic output in the 20th century ("from about $2 to $32 trillion in constant 1990 dollars") indexes a seventeen-fold increase in annual commercial energy consumption (from "22 to approximately 380 EJ") during the same period.[273] This, in a nutshell, is a statistical picture of the saturation I have in mind when I refer to energy deepening and the energyscapes that provide economic growth with its infrastructural fix. For while a good deal of the energy consumption that has made capital accumulation possible has been at the site of production—what World Bank experts term commercial energy—we are increasingly unable to imagine either public or private activities that do not too require an enormous amount of energy consumption mediated by an impossibly complex system of automation, logistics and infrastructure. This colloquial fact of energy, however—that we not only use a lot of it, but are hard pressed to find spaces, activities, or ideas about the future that do not—obscures an equally implicit, but perhaps

[271] International Energy Agency, *World Energy Outlook* (Paris: OECD, 2008).

[272] Mark P. Mills, "The Cloud Begins with Coal: Big Data, Big Networks, Big Infrastructure, and Big Power," *National Mining Association* August 2013. Web. May 2, 2015.

[273] Vaclav Smil, *Energy Transitions* (Oxford: Prager, 2010), 14.

more politically volatile fact about the historical shape of the capitalist exploitation of labour.

Metaphors and lexical fields clothing so-called immaterial culture have gone a long way towards displacing a full grasp of digital culture's spatial and historical contours. As Allison Carruth has recently suggested, most of our ecological metaphors for digital technologies, such as the 'cloud' and 'streaming,' mask, "willfully in some cases, what is an energy-intensive and massively industrial infrastructure."[274] Digital culture, in other words, depends on the ecological mediation of infrastructure, and a visual economy that displaces, in order to defer contact with, advanced energy systems.

While we certainly have no shortage of time in touch with digital culture, its infrastructural coincidence with our postindustrial energy system recedes both phenomenologically and logistically to the level of setting, rather than content. The experiences of daily life depend on an ecological characterization of infrastructure, in other words, not because some hidden truth about the Internet lurks beneath the surface of its presentation, but rather because economic growth, state security, and postindustrial culture are all contingencies of a political economy that weds the growth in value to the deepening of the total energy circulating through the spaces we inhabit. Digital culture is an expression of a resource aesthetic whose ecological reality runs deep, but whose economic logic is hidden in plain sight.

Making visible the economic and ecological contents of infrastructure, however indispensible a practice, does not of necessity generate a political counterforce, precisely because the economic and ecological contradictions of a world fueled on and formed by

[274] Allison Carruth, "The Digital Cloud and the Micropolitics of Energy," *Public Culture* 26.2 (2014): 342.

fossil fuels are intimately bound together. Energy's economic elasticity comes in the form of the logistics revolution in shipping and manufacturing sectors, as well as the productivity gains made available through automated, and energy intensive technologies; while oil's plasticity, which is to say its capacity to not only fuel daily life, but to give it a material shape as well, regulates and modulates the economic value of postindustrial society.

Clear now, following Wikileaks, the BP oil spill, and other daily manifestations of what is an otherwise deep and hidden infrastructure, is that knowledge of infrastructural content does not lead to its politicization. This is because, to use Amanda Boetzkes and Andrew Pendakis' useful phrasing, the fossil fuels on which life today depends provide us with not just plastic products but plasticity as a historical "paradigm."[275] From the now inseparability of exchange rates and oil prices, the plastic materials of everyday life, or what Boetzkes and Pendakis call "contemporary neoliberal fantasies about the capacity of individuals to endlessly make and re-make themselves," the second half of the 20th century and beyond is fundamentally saturated with and mediated by social, economic and psychological plasticity.[276] Digital culture is the example *par excellence* of plasticity's two sides: on the back of enormously complicated and expensive infrastructures, and a multitude of electronic materials made from oil, is an experience of immateriality, lightness, and global communication emancipated from the weighty limits of matter. Plastic's materiality is world shaping, just like its immateriality—or the experience of speed, freedom, and deracinated communication— contours the social. The energy

[275] Andrew Pendakis and Amanda Boetzkes, "Visions of Eternity: Plastic and the Ontology of Oil," *e-flux* 47 (September 2013). Web. April 12, 2015.

[276] Ibid.

system we find ourselves in depends on this dialectic between oil's universality, its conditioning of the possible, and oil's material or infrastructural realism—the weighty anchor for postindustrial life as we know it. Hydrocarbons give energy to virtually every activity we engage in via infrastructural acceleration, just like it gives the postindustrial world a sense of a *world* by unhinging it from geographical limit —a freedom expressed through the postindustrial immediacy with both itself and more industrial parts of the world through digital communications and logistics. The spatial and temporal sides of oil's dialectic generate a setting unique to its plastic qualities—since the other name for spacetime is setting—which is what, in my title, I've termed *energyscapes*: a concept which like the land- and media- scapes it *re*figures, names both the form and historical specificity of the setting we find ourselves in.

Catherine Malabou's 1996 book on Hegel and plasticity made clear the problems and possibilities of the plastic dialectic in the age of oil, while her most recent turn to cerebral and cognitive plasticity has redefined the very concept of the cerebral and the imagination. For her, plasticity involves itself in our thinking about it, since at base it is "a capacity to receive form and a capacity to produce form."[277] Like many of the contributors to the more recent collection on *Plastic Materialities,* Alberto Toscano turns plasticity into the concept that captures both the materiality and epistemological condition of a critique of capital today, insisting that capital accumulation is dependent on a constant making a remaking of locales and regions in its own image.[278] My

[277] Catherine Malabou, *The Future of Hegel*, trans. Lisabeth During (London: Routledge, 2005). 9.

[278] Alberto Toscano, "Plasticity, Capital, and the Dialectic," *Plastic Materialities,* (Durham: Duke University Press, 2015).

contribution here is to double the dialectical sense in which capital is dependent on plasticity, since plasticity itself is tied to not just to the abstract capacity to give form, but to the historical specify of the energy system from which its material expression (plastics) come. If capital remakes the world in its image, its global success in the 20th and 21st centuries has been wholly contingent on its ability to turn fossil fuels into both its essence, by achieving growth gains through energy deepening, and appearance through the plasticity of postindustrial social relations and the objects that surround us. What I mean to draw out from the philosophy of plasticity and the energy infrastructure that gives form to the digital, 'immaterial,' and postindustrial forms of work and communication, is the context in which I critique the explicitly political ambitions of speculative philosophy, or what in part two I will call postindustrial philosophy.

Following Levi Bryant's lead, who coined the term Object-Oriented Ontology (OOO), I mean to designate Speculative Realism, Actor Network Theory, and OOO [279] as speculative positions that imagine capital as a form of energy, but not energy (and its infrastructure) as a property of capitalist exploitation. I do this by establishing the indispensability of dialectical thinking in a plastic world, which is a consequence of the energy regime I am trying to foreground, since the postindustrial dialectic between energy and capital (in my account) is what cuts across the philosophical hubris of speculative philosophy. While Bryant's own attempt at providing speculative philosophy with a politics importantly grounds itself in what he calls thermopolitics, where energy gets turned into a fact of nature that cuts across what he calls critical theory and its

[279] In Bryant's account, what distinguishes these speculative positions is their hostility to what routinely gets called correlationisim, which assigns a determinant role to the subject that discovers an object in the world. Critical theory, very broadly understood, is in Bryant's account opposed to speculative theory.

obsession with discourse, rather than as a concept tied to capital, capitalism, or the economic more generally. Energy stands in as the interruption of second nature by first nature in speculative realism, ANT, and OOO because these positions abandon dialectical thinking, and thus any chance of mediating the historicity of energy and its relation to capital. In order to think about the historical specificity of concepts, especially ones that seem to refer to matter itself, Bryant and others would need a specifically *historical* materialism. Capital no doubt expresses itself as energy all the time, but importantly only because of its unique capacity to combine what Marx in the "Critique of the Gotha Program" called natural wealth and human labor, into a force severed, and therefore ostensibly autonomous from, its origin.

4.1B Postindustrial Landscapes

Setting the infrastructural base of postindustrial society is a means towards historicizing the relationship between energy, capital and labour. Setting, as I have suggested already, is neither the space nor time of a drama exclusively, but rather the texture, rhythm and environment in which it takes place. Isolating the force that both capital and energy exert on a setting can only occur in what Rosalind Krauss famously called the "expanded field" in the 1970s since neither energy nor capital are things in and of themselves. I am deliberately invoking Krauss's celebrated insights into the "rupture" in art history sometime around 1970 not only because "Sculpture in the Expanded Field" is itself a rupture in the way we talk about aesthetic economies, but because the transformation that concerns her (the elastic logic of sculpture amidst the turn to land art) is both contemporaneous with and constitutive of the one that concerns me. At the end of

her essay—which is as much about the weird things going on in the sculpture of the Smithsons, Robert Morris, Richard Serra, Sol LeWitt, Alice Aycock, and so on, as it is about historicism in criticism—she asks her audience to get moving on a theory that addresses "the root causes—the conditions of possibility—that brought about the shift into postmodernism."[280] Because she is troubled by historicism's "genealogical trees," Krauss instead wants to promote an approach that addresses "the cultural determinants of the opposition through which a given field is structured."[281] In the vocabulary of the expanded field of sculpture, this means that the political economy of the 1970s is not autonomous from that decade's aesthetic economy. Krauss's role in formative debates about the role of artists in designing the postindustrial environment, as we shall see in a moment, is another indication that what she meant by the expanded field had everything to do with overlapping spheres of political and aesthetic economies, in addition to the historicity of medium. This at least is what lurks behind the notion of an expanded field in the first place, even if that essay means to stick to a specifically aesthetic reading of that field until the final page. Krauss's critique of historicism gets her out of medium specificity, which is why much of the work that follows the 1979 essay develops a theory of what she calls the "post-medium condition."[282]

My own account concerns itself with putting energy deepening at the heart of the expanded field of the postindustrial, which I am arguing here is a crucial component of what Krauss called the "root cause" of postmodernism. Energy deepening is a "root

[280] Rosalind Krauss, "Sculpture in the Expanded Field," *October* 8 (1979): 44.

[281] Krauss, 44.

[282] Rosalind Krauss, *A Voyage on the North Sea: Art in the Age of the Post-Medium Condition* (London: Thames & Hudson, 2000).

cause" because it made possible not only the financialization of the global economy—which, erupting on the back of the energy futures market in the 1970s, itself had major impacts on things like currency delinking, rapid expansion in resource industries, and a period of artificially cheap energy for consumers and businesses—but also a whole host of digital technologies that enable and shore up the so-called immaterial, creative, and affective turns in the global economy. Energy deepening, then, provides the infrastructural link between what in an older vocabulary would have been the base (postindustrialism) and superstructure (postmodernism) of our current era. When directors of the then Organization of Arab Petroleum Exporting Countries (OAPEC) began an embargo on oil shipments in 1973 in response to the US involvement in the Yom Kippur War, it exposed the increasing saturation of global markets in the geopolitical and material properties of fossil fuels. Only two years earlier, Nixon's recess from the Bretton Woods Agreement meant that a new standard of value was on the horizon, since the US dollar that was meant to replace gold was itself more vulnerable to market fluctuations than physical reserves of commodities like gold, sterling, or oil. In a handful of years, in other words, energy had become more than an intensive factor in the productive forces of society, and had begun to contour the very substance and landscape of the market. Contemporaneous with energy deepening at the market level, however, was an equally dramatic turn back to landscape in architecture and urban design at the cusp of postindustrialization.

The precise moment that landscape became the general frame of reference for architects is still widely debated. For architecture theorist and historian Felicity D. Scott, the ambition to "design the environment" was already made explicit during the

Universitas Project hosted at MoMA in 1972. There, design curator at MoMA, Emilio Ambasz, invited names as varied as Krauss, Joseph Rykwert, Peter Eisenman, Octavio Paz, Henri Lefebvre, Jean Baudrillard, Manuel Castells, and Hannah Arendt to collaborate on an interim report imagining "Institutions for a Post-Technological Society." Though the report itself reached only a limited audience, it nonetheless established a specifically "postindustrial conception of environment" that involved new scale, in Scott's words, "such as systems theory, cybernetics, information theory, and semiology."[283] The environmental impact of a world saturated in difficult to extract sources of energy, had already begun to take shape at a theoretical level even before the first major oil crisis, yet the spatial paradigm that emerged in response to it foreshadowed the oxymoron of postindustrialization: in order to temper the environmental costs of industrial cities, the postindustrial city would need to wholly new infrastructure hungry for energy. .

In Grahame Shane's brief history of the discipline, Kevin Lynch's call for an "ecological approach to landscape"[284] in his 1984 *Good City Form*—itself a response to Howard Odum's 1963 *Ecology*— paves the way. In Shane's genealogy, echoed by many of the key players in American landscape urbanism, the turn is expressed loudest somewhere between the Parc de la Villette competition in Paris (1984-1989) and the International Building Exhibition for postindustrial renewal in Germany's Northern Ruhr region (1989-99)—where Leon Krier, Peter Eisenman, Elia Zveghalis, Rem Koolhaas, and Aldo Rossi submitted landmark proposals. The biggest names in the architecture

[283] Felicity D. Scott, *Architecture or Techno-utopia* (Cambridge, Mass.: MIT Press, 2007), 89-90.

[284] Grahame Sheen, "The Emergence of Landscape Urbanism," in *The Landscape Urbanism Reader*.

world seemed, in both Shane and Richard Weller's accounts, to confirm that architecture had broadened its ambitions to include what the discipline's key theorist, James Corner, called "a truly ecological landscape architecture" where architecture "might be less about the construction of finished and complete works, and more about the design of 'processes,' 'strategies,' 'agencies,' and 'scaffoldings.'"[285] Art and architecture historian Kenneth Frampton's 1995 "Toward an Urban Landscape," in addition to Koolhaas' landmark essay "The Generic City" and Paola Viganò's *Territories of a New Modernity,* to name but a few examples, announced that the turn from architectural objects was complete, and that what now needed to be designed were landscaped settings.

Even in this origin story, what fueled the turn from objects to settings in architecture and design was not merely a raised environmental awareness, but the site-specific demands of development initiatives explicit about the ambition to postindustrialize. In the case of Germany's Emscher Park (the historical centre of coal and steel production), the aim was, as Kelly Shannon puts its, "simultaneously [to repair] environmental damage and [to project] economic renewal."[286] While for Bernard Tschumi's Parc de la Villette—the former abattoir district of working class Paris—the aim was to turn the city's centre of caloric production into a permanently unfolding "event." In Tschumi's sense of the word—a hybrid term mutated through conversations with Jacques Derrida, who collaborated and wrote extensively on the project, and Michel Foucault—"the event here is seen as a *turning point*—not an origin or an end—as

[285] Richard Weller, "An Art of Instrumentality: Thinking Through Landscape Urbanism," in *The Landscape Urbanism Reader*, 77

[286] Kelly Shannon, "From Theory to Resistance: Landscape Urbanism in Europe," in *The Landscape Urbanism Reader*, 148.

opposed to such propositions as form follows function."[287] Modernism's commitment to the concrete contours of the architectural object, in other words, no longer captured the ambitions or capacity of urban design, since for Tschumi the relationship between building and landscape was interactive, always "turning." Instead of objects in space, Tschumi sought to build an environment.

Tschumi was relatively clear about his discursive ambition at La Villette, which was to materialize a "deconstructive architecture" which would extend beyond the "drama" of object-functions (what users do in a building) into the coordinates of a "setting."[288] Hence inside the park are individual *folies* or interactive sculptures in a variety of shapes and sizes—some look like excerpts from a children's playground, others half finished scaffolding for a bank façade—while the total landscape of La Villette is the setting Tschumi set out to design. For Derrida, who took great pleasure in elaborating the meaning of La Villette, the *folies* were material equivalents to the ongoing "invention" necessary for the new economy, of which La Villette is a flag bearer.[289] Thus both in form and function, La Villette announced an ambition for the coming turn to landscape in architecture, which was to subtract spaces from the realm of the immediately productive (a coal mine, steel mill, or abattoir) in order to design an indeterminate setting where use, invention, and program are variable.

If what fueled Tschumi and Derrida was La Villette's deconstructive ethos, it was only due to the theoretical weight then attached to indeterminacy in general. For those

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[287] Bernard Tschumi, *Architecture and Disjunction* (Massachusetts: MIT Press, 1996), 256.

[288] Ibid.

[289] ibid, 257.

that would look to the project as a sign of things to come in landscape urbanism, however—the US's two leading figureheads, Charles Waldheim and James Corner, for instance—something much more interesting was underway. Corner would put it best, though many landscape theorists would echo this in order to distinguish their practice from classical landscape, when he named "terra fluxa" the new terrain of architecture and landscape. Liberated from the two axes of space characteristic of architecture's classical domain, terra fluxa "suggests shifting attention away from the object qualities of space (whether formal or scenic) to the systems that condition the distribution and density of urban form."[290] In Corner's eyes, architecture's move towards landscape was also a move from objecthood to systemhood. Thus while it looked from the outside as if architects were invited into the garden at La Villette, major firms and theorists such as Corner, Waldheim, MVRDV, Koolhaas (whose own proposal for La Villette was most inspiring for Corner) and Foreign Architect Office (FOA) understood it to modify architecture's claim on the environment it now sought to produce.

This also helps explain why just as quickly as major architects turned their attention to landscape in the 80s and 90s, landscape architects redefined landscape as a form of infrastructure, or more generally as a design approach to infrastructure space. James Corner himself did this in the major 1997 collection *Recovering Landscape*, but W.J. T. Mitchell had established the inseparability of landscape and the infrastructures of power in his *Landscape and Power* collection from 1994. In addition to the early influence of Deleuze on architecture and urban theory in the 80s and 90s, the widespread redefinition of landscape as where information, matter, energy, and ideas flow was a

[290] James Corner, "Terra Fluxus," *The Landscape Urbanism Reader*, 28.

consequence of the gradual obsolescence of industrial infrastructures—and ways of thinking about infrastructure—upon which the postindustrial was predicated.

4.1c Landscape Infrastructures

In David Gissen's estimation, the architectural shifts toward "research" "organization," "landscape," and "infrastructure" were generally part of the same historical process: "This involves not only a turn toward specific geographical concepts and theories, but toward material and representational transformations as well. We can see this in various contemporary works that advance the territory of maps over plans, the flow of matter over subjects, and the concept of environment over that of space-time."[291] Gissen charts the decline of design—a professional aesthetic practice tied to the modern movement, but also the types of commodities that were necessary to generalize modernity—and the recent ascendency of the geographical as the disciplinary and political terrain of architecture. Design, in his account, was about accommodating a space-time of modern governance, whereas the geographical is about setting up the postindustrial matrix of "governance, production, and management" which are otherwise "everywhere and nowhere." Even if this geographical ethos is not universal across building practices, for Gissen, Stan Allan, Jesse Reiser and Nanako Umemoto of Reiser + Unemoto, among many others, it defines landscape architecture's material function in the postindustrial economy.

Landscape urbanism's leading figures have anchored their vision of the new economy to Aldo Rossi's earlier and canonical provocation in which architecture names

[291] David Gissen, The Architectural Reconstruction of Geography," *Coupling: Strategies for Infrastructural Opportunism*, Pamphlet Architecture 30, 2011: 42.

the mediation of matter and energy. In their field manual, which doubles as a postindustrial manifesto for energy's material economy, Reiser + Umemoto go as far as to implicate architecture's "substance, its scale, its transitions and measurement" with "the dilations and contractions of the energy field."[292] For Resier + Umemoto, whose built and theoretical ambition is self-purportedly to realize the full and determining potential of "material and formal specificity over myth and interpretation," this alliance between the spatial aesthetics of architecture and the fluid tectonics of "the energy field" is not a novel idea, but a restoration of an older idea. In Rossi's late modern version of landscape tectonics, the idea is that architecture's principle sits between the two sides of *tempo* in Italian, namely "both atmosphere and chronology."[293] Thus what is *architectural*, as opposed to merely built, is the "fog" that "penetrate[s] the Galleria in Milan: it is the unforeseen element that modifies and alters, like light and shadow, like stones worn smooth by the feet and hands of generations of men."[294] Though Rossi's motivation in re-describing architecture as atmospheric in the 1980s was to design political spaces, the economic crisis that occasioned his investment in 1981 generated similar conclusions amongst developers.

Architecture's landscape is here reimagined by Rossi and then Reiser + Umemoto as atmospheric space (like weather) and materialist time (the smooth stones after generations of pilgrims), in order to calibrate its forms to "the energy field" it mediates.

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[292] Reiser + Umemoto, *Atlas of Novel Tectonics* (New York: Princeton Architecture Press, 2006), 22

[293] Aldo Rossi, *A Scientific Autobiography* (Cambridge: MIT Press, 1981), 1.

[294] Ibid., 2.

Now we might expect the primacy of energy and "material logics"[295] in architecture to result in an civil engineering approach to aesthetics—that is, optimized distribution of forces—but Reiser + Umemoto generate what in 2006 is in many ways a novel materialism much closer to speculative brands of contemporary philosophy than a new rationalism. Indeed it is the rationalist approach to distribution of forces that they most want to move past, which for them "precludes the productive and rich capacity of matter to define or influence geometry."[296] Using Manual DeLanda's speculative philosophy as their cue—a book that predates Quentin Meillesoux's veritable bible for speculative realism in 2006, but is nonetheless of the same sequence in philosophy stretching from Deleuze through to today's object-oriented ontologists—their novel tectonics prioritize *intensive* properties of matter over *extensive* ones.

In their words, "intensive differences, also known as gradients, are properties of matter with indivisible difference, such as weight, elasticity, pressure, heat, density, color, and duration."[297] These non-Cartesian properties cannot be divided since half of red is still red and half a pot of boiling water is just as hot as the original pot. In contrast to intensive properties are more traditional elements of matter's divisibility, like length, mass, volume, and so on. What they wish to emphasize about architecture's new horizon is that its older preoccupation with extensive properties came at the expense of intensive ones, since the latter were not considered properties of matter at all. Architecture's landscape, however, consists in the interplay of "the creative tendency of intensive fields

[295] Reiser + Umemoto, 27.

[296] Ibid., 74.

[297] Ibid. 72.

and the codifying tendency of extensive fields,"[298] because Reiser and Umemoto "regard expression as the properly impersonal capacity of matter and material systems."[299] The new materialism of landscape urbanism, in other words, lets this "impersonal capacity of matter" breathe by designing systems able to facilitate the intensive force of electricity, energy, and ecology. In order to become more ecological, in other words, landscape architecture had to first reimagine its structural coincidence with energy flows.

Reiser + Umemoto may have had any number of their own projects in mind here, but Diller, Scofidio + Renfro's "Blur Building" for the 2002 Swiss Expo has become notorious for its dramatization of intensity over extension. Blur, in their words, "is an architecture of atmosphere—a fog mass resulting from natural and manmade forces."[300] Users cross a narrow bridge out into the middle of Lake Neuchatel in Switzerland until they reach an enormous cloud that seems to hover autonomously between the lake and the bridge. The cloud itself is the lake vaporized through 35,000 high-pressure nozzles, guided by the building's "smart weather system."[301] Though the fog itself is supported by an intricate piping, plumbing, and an oilrig-like structure that extends into the lakebed, its architecture is properly landscaped since it both responds to, and produces, weather systems, and reduces the visual field to a minimum in order to maximize the atmospheric.

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[298] Ibid., 80.

[299] Ibid., 104.

[300] Diller Scofidio + Renfro, "Blue Building," Web. April 12, 2015. http://www.dsrny.com/#/projects/blur-building

[301] ibid.

In this version of landscape architecture, figuration is abandoned entirely in favor of a generalized and atmospheric ground.[302]

Both Reiser + Umemoto and Elizabeth Diller have tied the rise of intensive spatial properties to the dematerialized production sites central to the information economy. The new office space, in Resier + Umemoto's theory of tectonics, and in their major Dubai office tower "O-14," is characterized by shrinking hardware, expanding "soft spaces,"[303] and a landscape designed to augment creative and non programmed forms of work. "Against Program" is how William J. Mitchell puts it when he describes the spatial paradigm required to settle the digital, postindustrial economy in cities not yet ready for it.[304] Program, in his criticism, implies a hardware priority that stunts creative use and coopts communication between user and building, and building and system. Hence Corner's paradigm shift, where landscape urbanism moves from "terra firma" to "terra fluxa," is one that saturates the larger field of urbanism today, and is situated not just within the philosophical tradition of new materialism, but the spatial coordinates of the energy rich postindustrial economy, too.

ENERGYSCAPES

[302] This is precisely the qualities of "Blur" that makes Cary Woolf enthusiastic for the project's implications for a specifically posthuman architecture in *What is Posthumanism* (2009), and what is so alarming about it for Mark Dorrian in "Clouds of Architecture" for *Radical Philosophy* (2007).

[303] Reiser + Umemoto, 109.

[304] William J. Mitchell, "Against Program," *Architecture Theories of the Environment* (New York: Routledge, 2013).

It should come as no surprise that the peculiar qualities of energy in its material form—namely, those intensive properties emblematic of design and the theoretical preference for flows—have come to dominate the way we think about space and the organization of it today. My argument so far has been that the carbon-capital complex is built on optimizing the social and economic plasticity of oil through the elasticity of energyscapes. The replacement of human labour time with a combination of dead labour in the form of machines, and non-human sources of power in the form of energy deepening, is a governing law of economic history. Thus as human labour is freed from the factory floor and its static hardware, the absent cause of postindustrialization—namely, energy deepening at a most alarming rate—begins to saturate both theories and plans for the postindustrial setting. As global energy supply rises gradually, energy's economic elasticity is optimized through the specifically gradient qualities of oil, including its plasticity and elasticity at the socio-cultural level, and its intensity and extensity at the level of setting.

If energy's intensive properties have become the dominant point of reference for designers and landscape urbanists, it would perhaps explain why landscape urbanism is at times as able to normalize the enrgy structures of a fossil fueled postindustrial society as it is to arm that same society with an environmentalist countertendency. This at least is the line that Mohsen Mostafavi walks in his opening remarks to the mammoth *Ecological Urbanism* collection. Mostafavi, dean of the Harvard Graduate School of Design, promotes a ecological approach to urban design first defined by Felix Guattari. Initially developed in Guattari's *The Three* Ecologies in the 1980s, "ecosophy" read through the lens of landscape is a commitment to developing intensive capacities across the

environment, social relations, and human subjectivity (the three ecologies). Here energy is shed of its economic function, and instead promoted as an ecological force *counter* to capitalist modernity. Hence what is so attractive about Guattari's ecosophical approach to landscape architects and ecological urbanists is the idea that new forms of spatial design enable designers to reshape "the objectives of the production of both material and immaterial assets."[305] Instead of programming energy efficient spaces, Mostafavi insists that a design approach to the environmental crisis views the fragility of systems "as an opportunity for speculative design innovations rather than as a form of technical legitimation for promoting conventional solutions." The fragile relationship between human energy needs and environmental sustainability, in other words, is "the essential basis for a new form of creative imagining."[306] And what finally proves illustrative for his vision of ecological urbanism is the informal markets of the lumpen-proletariat in Lagos and Brazil, and the reclamation of abandoned brownfields for community gardens in Detroit and New Orleans. Thus when Mostafavi insists that "ecological urbanism must provide the necessary and emancipatory infrastructures for an alternative form of urbanism,"[307] he means infrastructure as a form of spatial product that enables stimulating forms of postindustrial interaction: the market and the farm are both economically complementary, and offer an image of urban life with both manufacture and power generation cut out.

[305] Qtd. In Mohsen Mostafavi, "Why Ecological Urbanism? Why Now?" 22.

[306] Ibid. 26.

[307] Ibid. 40.

Pop-up factories, for instance, are not part of this picture, but are presupposed like the coal plants and oil refineries currently fueling the global economy. Externalizing production and hydrocarbon infrastructures at an aesthetic level is one of two tendencies in ecological and landscape approaches to the problem of postindustrial energy (the other as I will suggest next is to index form to the force of energy). These "aesthetic" clues about an urban modality ecologically coded are meant, in Mostafavi's account, to offer a picture of a design ethic able to "counter the global dominance of capitalism,"[308] and in one obvious sense it would be able to counter it since carbon and capital appear to have been disarticulated in this view of the world. The transition out of capitalism, in ecological urbanism's most distinguished voice, is simultaneously a transition out of petromodernity.

The other tendency in ecological and landscape approaches to energy is to let the physical features of renewables guide urban form. A good number of designers and academics are thinking about innovative forms of energy generation from within urban design. In "Energy Sub-structure, Supra-structure, Infra-structure," for instance, D. Michelle Addington encourages the decoupling of direct and alternating current electrical systems in order to minimize energy loss in buildings. City planning guided by renewable energy systems like Masdar, parts of London, or large parts of Germany conceive of each building plot as a parcel for energy production that can be plugged into the larger grid. Addington's argument, though, highlights that this presupposes a universal form of energy exchange between buildings and grid, whereas most renewable forms of energy production operate nearly 25 percent more efficiently on direct current, versus the

[308] Ibid. 50.

alternating current system for which our cities are hardwired.[309] Plugging digital devices and optimized thermal consumers, such as water and space heaters, into a localized direct current system—ideally sourced by photovoltaic panels on or near the building—would mean gaining that 25 percent back, and would mean optimizing energy sub-structure (the internal composition of energy types) to energy infrastructure (the grid and the parcel). Parceled plots of land and the social division it implies would make little sense from a design perspective, in other words, once energy optimization is the governing principle of new urban forms.

Whether strategically excised from the picture, or made the dominant variable in future projections, energy systems and the *energyscapes* they imply have become the primary concern in ecological urbanism and landscape architecture. What I have been arguing so far is that this preoccupation is both a theoretical insight into the physical impact of hydrocarbon systems on the social and economic settings in which we live, and a consequence of how the carbon-capital complex establishes itself in the physical and social setting of the postindustrial. To the degree that energy in its most abstract definition is that which animates all matter, landscapes of any variety will thus also be *energyscapes*. What the postindustrial economy requires, however, are spatial modulations of energy deepening, since without energy deepening there is no economic growth, and without spatial modulations of energy there is no setting for expanded cycles of deepening. In addition to reimagining the spatial field of architecture as an energy field, the turn to landscape in architecture has brought with it a redefinition of architecture as a form of energy infrastructure for a new economy. From the trading floor

[309] D. Michelle Addington, "Energy Sub-structure, Supra-structure, Infra-structure," in *Ecological Urbanism*.

of the energy futures markets in New York, Chicago, and London, to the ports, pipelines, and servers that facilitate the cultural conditions of late capitalism, energy deepening gives the global economy a sense of setting. Where the vulgar economic reality of fossil fuels is most mediated, however, is where postindustrial energyscapes calibrate the spatial heterogeneity of our fossil fueled energy system.

4.2A Philosophy and the Problem of Energy

The aesthetic preference in landscape architecture and ecological urbanism for intensive properties, such as energy and information flows, and the infrastructure systems that maximize them, was a necessary feature of the larger project to postindustrialize key economic spaces. This, I have been suggesting, is neither an accident, nor a tendency separate from the philosophical disposition that has matured during the same postindustrial transformations at the global stage. It is not an accident because the philosophical turn to intensive properties in Deleuze, Laurelle, De Landa, and Meillassoux is always a form of theoretical legitimation that gives license to the speculative stance characteristic of their philosophical tradition, a stance premised on a rejection of nearly all philosophies tied to industrial forms of measurement and thinking. Speculative realism, and the object-oriented ontology it made possible, is historically and theoretically dependent on an insight into intensive properties of matter, of which energy is the most obvious, important, and economically valuable. Yet neither of these two positions, nor the political philosophy of accelerationism indebted to them, take seriously the elasticity that energy deepening makes available for capital after oil reigns supreme. While a reading of energy as cosmic force animates much of speculative philosophy,

energy's dialectical imbrication with capitalist accumulation appears only at the register of climate change. What is so serious about energy's economic elasticity, in my account, is that it is responsible for both the aesthetic and economic effacement of labour in the postindustrial economy. In Robert Ayres and Benjamin Warr's groundbreaking analysis in ecological economics, upwards of 12% of growth in the 20th century remains unexplained so long as energy is considered an independent variable in economic growth. When they internalize energy in their measures of growth, on the other hand, continued global growth is fully explained despite lowering labour inputs (due mainly to automation) at the macroeconomic scale.[310]

Lurking behind the assumptions of what I will call here the postindustrial philosophy is a sequence that usually acknowledges Gregory Bateson's cybernetic ecology, Roy Bhaskar's scientific realism, and Isabelle Stengers' speculative realism as important predecessors. While I won't have time here to fully discuss Bateson's[311] contribution to today's philosophy, I will show how Bhaskar and Stengers' speculative critique of empiricism and positivism make space for, but are crucially distinct from, object oriented ontology and speculative realism in 1999 and 2007 respectively. At stake in collecting both speculative realism and object-oriented ontology under the periodizing term *postindustrial philosophy* is my sense that while earlier speculative philosophies sought to undermine the very basic principles of the normalizing discourse attached to

[310] Robert Ayres and Benjamin Warr, "Accounting for Growth: the Role of Physical Work," *Structural Change and Economic Dynamics* 16 (2005): 196.

[311] For Keller Easterling, Bateson's redefinition of "a man, a tree, and an ax as an information system…made self-evident the idea that the activities of infrastructure space can be a medium of information." Indeed from a design perspective—and Bateson is a favorite among designers, curators, and art critics alike—space itself is repositioned as an infrastructure of information, and information an infrastructure of space.

empiricism and positivism, their inheritors today seek instead a hyperbolic identity with it (even if that identity is in the service of destroying its object). The idea then is to recover those earlier materialist insights made available by speculative philosophy into the historical force of energy, which more recent speculative ambitions, I'm insisting, have lost.

What both Bhaskar and Stengers sought to do away with were the "regulative ideals" of empirical science on the knowability of an object. In order to move from an empirical realism to what he first called critical, and then scientific realism, Bhaskar returned to Hegel's dialectic of subject and object and the speculative possibility of the negative erased from empiricism's wager on identity. For Bhaskar, "models, paradigms, heuristics" and "conceptual schemata…functioned as social surrogates for natural necessity."[312] The trouble, for Bhaskar, was not so much the substitution of social surrogates for natural necessity in empirical science, but rather the assumption that the same bad habits of epistemological thinking were appropriate to questions of ontology. In Hegel's much earlier anticipation of what ensues form a philosophy that separates things and thoughts in order to pursue the infinite—what Quentin Meillasoux would later dub the *After Finitude* of speculative philosophy—"a type of consciousness which takes on the form of infinitude" immediately follows. Only, it was not a revolution of thought that ensued for Hegel, but rather the unhappy dilemma of stoicism (where one accepts the contradictions of the world with a calm comportment) and skepticism (where uncertainty about the world leads to the doubt of its existence).[313] Unhappy consciousness ensues

[312] Roy Bhaskar, *Scientific Realism and Human Emancipation* (London: Routledge, 1986), 3.

[313] The section is §197 on "Free Self-Consciousness," the first paragraph on what will become the problem of Unhappy Consciousness: "Since, however, the form and the self-existence are for us,

because what gets divorced in empiricism and bad forms of infinite thinking is labour and consciousness, since labour can't possibly have a relation to consciousness of an object in a world where subjects and objects have no correlation (the mantra of what speculative philosophers call anti-correlationism). Bhaskhar whished to pursue the infinite as far as possible without succumbing to an unhappy consciousness, and he achieved this anchoring his pursuit to an immanent critique of empiricism and positivism, since the negative or "absence" he understood as ontological was of necessity tethered to its appearance in the subject-object dialectic. In Bhaskar's account, the speculative only arises out of "immanent critique," rather than ruminations on the infinite, and takes the historical force of dialectical thought (to the point that Hegel himself is not dialectical enough) far more seriously than the newer generation. For the newer generations of thinkers that would elaborate Bhaskar's insight—though not always making their debt to him clear—the snapped umbilical cord meant, in no uncertain terms, that all bets were off.

Bhaskar's restoration of a radical form of realism in the philosophy of science was occasioned by the ostensible victory of positivism in the sciences, and in particular the sociological critique of that victory and its theory of knowledge associated with British cultural studies in the 1970s. In the French tradition continued by Isabelle Stengers, the occasion for a speculative form of philosophical realism stretched back to

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or objectively in themselves, one and the same, and since in the notion of independent consciousness the inherent reality is consciousness, the phase of inherent existence (*Ansichsein*) or thinghood, which received its shape and form through labour, is no other substance than consciousness. In this way we have a new attitude or mode of consciousness brought about: a type of consciousness which takes on the form of infinitude, or one whose essence consists in unimpeded movement of consciousness. It is one which *thinks* or is free self-consciousness."

the heart of industrialization, or more specifically, to the irreconcilable rupture between mechanics and thermodynamics.

Animating the gap between a thermodynamic faith and the rational observation of mechanical force, in Stengers' account, is the aesthetic economy of the former. The idea of "conversion between 'forces' was initially an aesthetic idea," she maintains, "which communicated with the presentation of an 'indestructible force' that gave nature its permanent unity."[314] This "indestructible force" stretched back to Leibniz's "life force" and to the post-Kantian philosophy of nature, both of which cohered in an aesthetic irreducible to scientific reason. Energy and its 19th century theory, Stengers makes clear, requires an aesthetic understanding of universal convertibility—and this would matter later once energy and human labour become ostensibly interchangeable in the postindustrial period—since for energy to make sense, it must be equally visible in the burning candle or the heat given off by a chemical reaction as it is in electrolysis, the electric battery, and the steam engine. Hence what energy initially establishes is not just a theory of matter's behavior, but what Stengers calls "a 'way of seeing,' an aesthetic" that unified not just the rhythms and tendencies of the physical world, but the disciplines charged with studying them.[315]

Lurking behind the metaphysics of energy and the theory of thermodynamics is, in Stengers' words, an energy "landscape" involving not just scientific inquiry but historically specific structures of thought.[316] And the implications for political

[314] Stengers, 179.

[315] Stengers, 192.

[316] Ibid., vii.

economy—which in the 1860s was up against what would prove to be its most hostile opposition to date, namely Marxism in its most mature stage—are not difficult to grasp once Stengers extends her critique to the theory of entropy and its consequence for value standards of work. The leap of faith required for the theory of universal energy convertibility gave the industrial economy its economic doxa. At issue is the relationship between measurement and the object of measurement when energy is understood as a form of work. In the formative theses of Carnot and Claussius*, the measurement of energy necessarily creates* the object called energy. This is because "in the case of energy transformations…measurability is in no way a 'given,' it must be created, fabricated from whole cloth."[317] Motivating this scientific form of perlocution is a conundrum introduced by the theory of entropy. Namely, that not all transformations are reversible. Though the first law of thermodynamics states that energy can be neither created nor destroyed, the second law eliminates any chance of equivocation between transformations since entropy names that portion of energy that permanently escapes transferability. Thus one cannot measure energy like one can measure the extensive properties of matter (length, volume, weight, and so on) because at its heart—and this is why object-oriented ontologists and landscape architects are both blind to and stimulated by energy—*energy is pure intensity, with no inherent extensive properties, and thus not measurable from within a rationalism premised on extension.* Unlike mechanical force, which has a source and a result that on paper can be reversed, energy "obligated the physicist to be conscious that he was a manipulator, an active participant in the definition of equivalence."[318]

[317] Ibid., 210.

[318] Ibid., 211.

The point here is twofold. Energy, or more specifically the two faces of energy—one is positive force, the other is negative entropy—are in Stengers' words "a rather strange" object for science. It is strange because it betrays the logical forms of measurement that had, until then, defined not just scientific systems of measurement but economic forms, too. And this is the second point. The labour theory of value emerged as a logical extension of the mechanical universe, lock, stock and barrel. Labour power, in its original formulation, was a measurable form of energy, the equivocation of which was supplied by the wage. Energy and its enigmatic theory made any measure of human energy (labour) more than a little odd, since the value of a commodity implied an economy of different states of accumulated and potential energy (labour, most obviously, but capital too). If labour is a form of energy, and energy is pure intensity evading rational measurement without the active intervention (and invention) of an observer, then the specifically economic form of rationality associated with classical political economy would require as much faith as the physicist measuring energy. Positivism, both in physics and in economics (and the money form of value is the greatest positivism of them all), was already a form of speculation, since what they took as their universal objects (one energy, the other labour time) troubled the very enterprise they supposedly verified.

On the cusp of the thermodynamics revolution in science, Marx was fast on the heels of the second enterprise. *Capital* is an enormous exercise in a type of materialist critique that intervenes, too, within the logical assumptions of the then novel science of political economy in order both to expose its fallacies and to catch a vista from within its contradictions onto what might succeed it. We might then call Marx, like Bhaskar does, the first realist in the modern era. Stengers, too, comes close to recognizing the

significance of energy's historical and complimentary coincidence with the political economy of capital in the 19th century. Surprisingly, however, this is not the political or philosophical sequence in which the more recent generation of speculative realists place themselves. Instead, Marx is a correlationist like the rest, and "the real in itself"[319] will have nothing to do with the critique of capital, but will have everything to do with the intensities of energy.

4.2B Postindustrial Philosophy

One consequence of dropping capital from speculative forms of realism is that philosophy is imagined, with a few major but swift modifications, to be in a position to resolve 'the dual crises facing humanity.' Or at least this is the clear and pending ambition of Levi Bryant, Nick Srnicek, and Graham Harman, whose introduction to the first major collection on *The Speculative Turn* establishes a necessary complication of Cartesian philosophies—again, in which objects of thought are correlated to the subject thinking them—and "the looming ecological catastrophe, and the increasing infiltration of technology into the everyday world."[320] Abandoning the correlative philosophies that flow from the Cartesian subject—so, nearly all of philosophy—is the first and most urgent step, in this account, towards abandoning "human finitude," and returning instead to "reality itself."

[319] The refrain most repeated in Levi Bryant, Nick Srnicek, and Graham Harman's "Towards a Speculative Philosophy," *The Speculative Turn* eds. Levi Bryan, Nick Srnicek, and Graham Harman (Melbourne: re. press., 2012).

[320] Bryant, Srnicek, and Harman, 3.

Importantly, both Bryant and Harman are largely responsible for advancing an object-oriented ontology in materialist criticism, which while initially allied closely with the speculative realism associated with Stengers and Meillassoux, has been recently divorced from that enterprise. As we have already seen in Bhaskar and Stengers' pivotal critiques of positivism and energy, speculative realism is first and foremost an immanent critique of science and its philosophical commitments, while object-oriented ontology frees itself from that immanent methodology in order to establish, as its name suggests, an ontology unshackled from thought and its historical procedures. Both take speculation as their guiding principle, but the grounds for that speculation—like their results—are quite different.

Hence, while Bhaskar and Stengers are attuned to the relationship between the philosophy of energy and the political economy of capital, Bryant and Harman in their larger corpus understand dialectical thinking of this sort as too indebted to an anthropocentric form of criticism. Capitalism occasionally enters the landscape of object-oriented ontology, as in Timothy Morton's hyperobjects, and Srnicek's own contribution to *The Speculative Turn,* "Capitalism and the Non-Philosophical Subject," but in both cases its conceptual function is to snap philosophy back to what repeatedly gets called "radical immanence," or an ontology that takes "the real as matter-without-determination."[321] These are French philosopher (or 'non-philosopher') François Laurelle's words in *Introduction au non-Marxism,* paraphrased in Srnicek's critique of economic determination in Althusser. While superstructural elements of society increasingly maintained a degree of relative independence from the economic base in

[321] Srnicek, 169.

Althusser's framework, economics nevertheless (and naturally, since this is an axiom of Marxism) functioned as the last-instance of determination in the constellation of the capitalist universe. For a speculative realist, this will not do.

Against this, Srnicek endorses Laurelle's critique of Althusser, which is a fine stand in for the many variations inspired by Whitehead, Heidegger, Deleuze, or De Landa of the new materialism undergirding both speculative realism and object-oriented ontology. For Laurelle, "only the Real as radical immanence"—or "matter-without-determination"—"can provide a sufficient base,"[322] which means that Marxism is too proximate to its object (political economy) to count as a materialist philosophy. Since Marxist theory has never claimed to be a philosophy, or to treat *matter* as a first cause of *history*—in fact, Marx's unexpected claim in the first chapter of *Capital* that "the value of commodities is the opposite of the coarse materiality of their substance, not an atom of matter enters into its composition"[323] suggests exactly the opposite—it is a bit misleading to subject Marxism to the litmus test of 'non-Philosophy' since it is a methodology anchored dialectically to its object (capital), and thus only relatively autonomous from it. More to the point, however, object-oriented ontology assumes Althusser's philosophical mistake—to begin and end with the economy, as opposed to "matter itself"—as a reason to abandon the critique of the economy as such, since economics is another name for the abstraction of the material world into a social system.[324] Thus the Laurellian critique of

[322] Ibid.

[323] Karl Marx, *Capital Volume One* (London: Penguin Books, 1976), 138.

[324] Though in Srnicek's account, which is a paraphrase of Deleuze and Guattari's notion of the "capitalist socius," the political economy of capital is more than an social abstraction of matter, since what produces capitalism in this critique of it are, crucially, not capitalists and their forceful, though contractual exploitation of workers. Rather, "capitalist socius" precedes

Marxism is actually a critique of what the economy does to "matter itself"—namely, makes it exchangeable—but forgets that the whole point about economic determination is that one's engagement with it is not voluntary, or a result of the bad philosophical "Decision" Laurelle weds to correlationism. The world in which one could think one's way out of economic determination is an idealist world which is exactly how a number of skeptics in *The Speculative Turn,* including Isabelle Stengers herself, characterize the enterprise of speculative realism today.[325]

Here the irony of object-oriented ontology's coincidence with the economic desires of postindustrial capitalism—namely, to replace human labour with the work of nature, to replace as many workers with non-human energy sources as possible, or to use Nick Srnicek's phrase, "a fierce desire to break through the finitude of anthropomorphism"[326]—is not only obvious, but tied to the same contradictions.[327] Our

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capitalism fully formed, and is proto-capitalist in its "inventive and constituent power" as a "multitude," which is why capitalism "is produced by their labour power, prior to any appropriation by capital." Leaving aside the difference between formal and real subsumption, and the forms of a) labour and b) social relations the latter uniquely establishes (and relies upon for expanded accumulation), the implication here is that capitalism is in the first instance an elaboration of existing practices and modes of thought, and can thus be negated (excuse my dialectical French) through alternative practices and forms of thought. All to say, more broadly, that this theory of capitalism is a form of volunteerism, and thus disastrously idealist and horrendously apolitical.

[325] I also have in mind Alberto Toscano and Peter Hallward's critiques of object-oriented ontology in *The Speculative Turn*, but Slavoj Zizek has made a similar remark about the idealism of new materialism's anti-Hegelianism in *Absolute Recoil*.

[326] Srnicek, 164.

[327] I am echoing here Alexander Galloway's critique of realist philosophy—Badiou, Meillassoux, Harmen, and Latour—in "The Poverty of Philosophy: Realism and Post-Fordism," *Critical Inquiry* 39.2 (Winter 2013): 347-366. Galloway's position there is that the "philosophical project that seeks to ventriloquize the current industrial arrangement is, for this very reason, politically retrograde…" More recently, Nina Power has extended this line of critique to include accelerationism "Decapitalism, Left Scarcity, and the State," *Filip* 20 (Spring 2015) http://fillip.ca/content/decapitalism-left-scarcity-and-the-state

first hint is that "ecological catastrophe" and the "increasing infiltration of technology into the everyday world"[328] are annexed from economic crisis and contradiction.[329] Considered independently—indeed, we have seen why economic crisis is in fact an oxymoron in this tradition because capital is an abstraction from the matter that supposedly matters most—ecological crisis in fact occasions post- and anti-human forms of philosophy, and thus, too, a hostility to the collective politics to which communist theory is anchored. In order to get to what Meillessoux calls "the great outdoors" of philosophy, speculative realists must bracket both labour and capital from the crises philosophy overcomes. And it is here, when speculative realism historicizes itself through the crises that occasion it, that we see the postindustrial landscape fleshed out. Neither the political, nor aesthetic, nor philosophical economy of postindustrial energyscapes has much investment in labour, much less the historical specificity of capital. Instead, space is reimagined as the infrastructure of flows—where energy is information and information emancipatory—and the philosophical standpoint of the subject is abandoned for the intensive properties of matter.

In this most developed form of postindustrial philosophy, capital and energy have been finally and permanently collapsed into one another, such that the machinic and automatic rhythms of the former have taken on the physical and cosmic force of the latter. There is no question that variations and tensions continue to contour what I have been calling postindustrial philosophy, but there is also no question that the political economy of energy deepening, and the philosophical and aesthetic economy of today's

[328] Ibid.

[329] In a similar way, women are almost entirely excised from *The Speculative Turn*, with a male to female ratio of 22:1.

energyscapes, consist in an intentional and consequential, which is to say mutually supportive, anti-humanism. When read through the lens of capital as a concept or capitalism as a system, postindustrial philosophy and landscape architecture's preference for flows of energy over human labour power—what new materialists call posthumanism, and speculative realists call the overcoming of human finitude—look not at all disinterested in the further evisceration and immiseration of workers shed from the world of wealth. Energy deepening from the perspective of new materialism is a measure of the successful and systematized deanthropologization of economic and theoretical systems. From the perspective of historical materialism, it makes the crisis of climate change a labour crisis, too, and is therefore utterly disastrous.

CONCLUSION: The Politics of Infrastructure and the Infrastructure of Politics

Communism is Soviet power plus the electrification of the whole country"

Vladmir Lenin, "Our Foreign and Domestic Position and Party Tasks"

"Twentyone. This is how to set an oil well on fire. Rub and lean against it. Spread your front legs and swing your neck at it. The power of a blow depends on the weight of your skull and the arc of your swing. Then sparks."

Joshua Clover and Juliana Spahr *#misanthropocine*

When asked about the relationship between energy and war in an interview conducted for a 2001 issue of *2G* magazine on architecture and energy, Paul Virilio insists that "the break in energy supplies, and in particular electricity, so indispensable for modern society, becomes an element of absolute power" (4). NATO's use of graphite bombs to cut off electricity in Kosovo and Belgrade, and Kabila's monopoly on Congolese dams evince, for Virilio, something of a bedrock

upon which "absolute power" has unfolded at least since the first industrial revolution, and no less fundamentally today.[330] This point alone—that transformers, and thus what are in some places now nearly century old electrical infrastructures, still constitute a political chokepoint in a time of war—should strike most political commentators and critical thinkers alike as a reality check where politics assumes a most material shape. Infrastructure under duress exposes the ineluctable relationship between civil engineering and the social and political capacities it enables. Important to Virilio's claim, though—and this is no accident given his professional concern for speed and the acceleration of social practices—is that modern political power is no less *infrastructural* after civil engineering's divorce from military logistics at the end of the 18th century. Indeed, when John Smeaton first nominalized civil engineering in England, and they got their first professional association in 1812, it was the combination of expertise in roads, bridges, and aqueducts with mechanical power that made civil engineering a distinctly economic, and thus modern occupation.[331] What Virilio's account makes clear is that the almost naked political content visible in something like energy infrastructures, especially from the perspective of state power, is at one and the same time an opportunity to visualize the more fundamental infrastructure of modernity as such. In the power grid and pipelines that make or break military

[330] Michael Jakob, "Conversation with Paul Virilio*," 2G* 18 (2001): 4.

[331] Timothy Mitchell makes the intriguing claim that mechanical engineering also provided 20th century political economy with its paradigm of the universe, eventually generating a singular picture of "the economy" built on one tied to the mechanical universe. Those pioneers of econometric modeling in the 1930s credited by Mitchell in "Fixing the Economy" with inventing "the economy" as a closed totality might have had something other than energy in mind when they began mathematizing their economic nominalism, but their mostly mechanical frameworks for translating economic history and futures into reliable formulas implied an unmistakably mechanical principle at the heart of "the economy." For Irving Fisher at Yale in the early 20th century, the principle was motion itself, and the model was a machine consisting of "cisterns, levers, pipes, rods, sliding pivots, and stoppers"; the economist and the engineer brought back into harmony. More importantly on Mitchell's account, though, was the capacity in this new method for mapping economic totality to map, too, growth not across the surface of the globe, but as "the internal intensification of the totality of relations defining the economy as an object."

forces in the time of war is also a social infrastructure that makes or breaks the relations, rhythms, and reproducibility of a labour force, and those trying to join it. And since a transition to an energy system delinked from hydrocarbons is the first step in the crusade against a 2°C rise in average temperatures globally, infrastructure grounds, modulates, and gives setting to the three most pressing dimensions of politics today: military, economic, and environmental.

Aesthetic Economies of Growth has offered an account of the relationship between energy deepening, political economy, and the cultural history that mediates the relationship between the two. My contention has been that the perpetual expansion and intensification of the energy system upon which late industrial and postindustrial society is built is a cultural process before it is an economic or environmental one. Since the capacities and logistics of an expanding energy system must first get *accommodated* or *reconciled* to the physical and social setting it is designed to reconfigure, energy deepening (and the political economy it makes possible) requires mediums of exchange heterogeneous from explicitly or traditionally economic ones. In the first part of this project, I claimed that the medium most appropriate for the generalization of an economic infrastructure built on coal power was the novel, because its unique capacity to negotiate radically new logics of time and space—or what Joseph Frank called its "spatial form"—put it in a position to both reflect on and anticipate the temporal and spatial features of the new setting fuelled on coal. In the second part, my claim has been that architecture and the landscapes that give texture to the space of the city had become the media in which to watch the hegemony of oil turn all spaces into energyscapes. This was both because the physical features of architecture and landscape have figured and accelerated the electrical circuitry necessary for the appearance of immaterial assets, labour, and politics so central to post-Marxism in Italy and

France and postindustrial philosophy more generally, and because the switch to current cost bookkeeping in the 1970s gave buildings a new (and potentially inexhaustible) lease on life.

Most of this dissertation has been about mediating what I noticed were two separate, though consistently cited sources of economic growth in the 20th and 21st centuries: the work of culture on the one hand, and the expansion (and intensification) of today's energy system on the other. I intentionally avoided promoting one theory of growth over another in part because neither understood the qualitative shift in labour (one named cultural, because of a certain technological sophistication that results from widespread investment in education, and the other energetic, because hydrocarbons both supplemented and turbo charged labour productivity) as a *problem* for labour politics. I do understand energy deepening as a labour issue since both sides of economic growth have simultaneously severed the durability of the polis from the world we find ourselves in (energy deepening) and postindustrial political subjects from those in 'underdeveloped' economies in the 'Global South' (cultural deepening). The specifically postindustrial composition of work available from culture and energy cements, I have been claiming, the larger impasse the same political subjects now face once environmental devastation is exposed as a feature, rather than an accident, of a very specific economic logic and sequence. The antinomy this project has been turning into a contradiction (culture and energy) becomes at last, in this final medium through which heterogonous genres of value congeal into economic value, a contradiction perhaps now obvious from the start, which is the as yet under theorized identity and difference between *capital* and energy.

If my attempt to develop a theory of what in the introduction I agreed to call *the impasse of energy* has been at all successful, then the peculiar medium of infrastructure is both the problem and the solution to what I have described as the two sides of the impasse: culture and

energy capital. Infrastructure is the end of the story of energy deepening, not just because pipelines, power stations, and digital systems most literally contour the settings we inhabit, but because the energy system that developed on the back of oil at once makes contemporary forms of social reproduction possible, and threatens to unevenly eviscerate them. Infrastructure, in short, is *fundamental*, which is precisely why you cannot photograph dams in the United States, cut train tracks in France, or sabotage pipelines in Canada, without falling into the legal abyss of terrorism, and why capital accumulation grinds to a halt (however provisionally) during a blackout.

5.1 Every Building Imagines an Economy

2G's special issue on the then already pressing issue of sustainable building practices sought, as Michael Jakob explained in the opening essay of that issue, to make visible the "invisible" history and present of architecture's function in the production and circulation of energy, supported in this case by a growing concern for architecture's role in environmental degradation.[332] The occasion of the special issue was an editorial discomfort with the rhetorical work of green design, which sought at the turn of the millennium to rationalize economic growth as such, though with an explicit shift from land exploitation to a more closed system where external costs are brought back into the production cycle. Though the editors recognized early in the millennium why conservation and small scale renewables posed no threat to the larger system built on hydrocarbons, turning the architecture of postindustrial cities into the infrastructure for what economist and policy advisor Jeremy Rifkin and others imagine will be the third and final industrial revolution has more recently turned 'the transition' into a lifeline for capitalism.

[332] Michael Jakob, "Architecture and Energy or the History of an Invisible Presence," *2G* 18 (2011), 8.

Rifkin's recent blueprint for *The Third Industrial Revolution*, for all its euphoric projection of a world where buildings do the work of humans, which is to say supply and distribute all the energy necessary for economic subsistence, is nonetheless emblematic of the other more political economic horizon of what Virilio is calling "absolute power," though not in terms of military logistics but rather an economic confidence in the postindustrial imaginary: namely, that if all society is a factory, then every building is a site of production because the infrastructure that undergirds the postindustrial society is one where energy flows coincide (and this really is Rifkin's point) with the flow of value. One need only look at what in Germany is getting called the *Energiewende* (the German Energy Transition) where, according to a recent *Financial Times* special report on energy, 6.5m households now produce surplus energy with the help of solar, thermal and wind power, which has in turn collapsed the terminological distinction between consumer and producer in that country, the result of which is the "prosumer."[333] Infrastructure, framed this way—that is, as an old but nonetheless contemporary bedrock of state power, and a new object of desire for both capitalists and environmentalists—sits oddly at the core of both a critical analysis of military systems on the one hand (whoever controls the transformers wins the war) and positivist projections of a capitalism run autonomous from labour on the other (if every building on earth created surplus energy, an energy internet could launch us into a new era of economic growth).

Consensus appears to have been reached on the question of what will need to change in order to usher in a post-carbon society.[334] New buildings, or at least newly retrofitted buildings,

[333] Guy Chazan, "Technology drives change in Energy," *Financial Times,* June 3, 2014.

[334] In addition to the collection *Ecological Urbanism* I spoke about in chapter four, rethinking the networking potential of architecture and the landscape that sits between has become a dominant theme of

nearly always emblematize the transition, while the physical infrastructure currently wiring postindustrial life gets reimagined according to supposedly post-carbon political aesthetics. In the "Third Industrial Revolution" anticipated by Rifkin, these two levels—one above ground, and the other beneath it—are treated as continuous, rather than contiguous. Rifkin's project is primarily aimed at convincing EU and American real estate and construction leaders to anticipate (and therefore accelerate) what in his mind is the inevitable shape of the third industrial revolution. His consultancy group encourages development firms and policymakers to shift investments away from our current oil or carbon infrastructures towards what he's been calling "lateral power".[335] "Lateral power" refers in his arguments both to the horizontal production and consumption of renewable energies made possible when every building becomes a net producer of energy, and the democratization of the new energy grid's demographic shape. Everyone, in his estimation, becomes an equal player in the energy game, a tiny node in what he calls the 'energy internet.' He boasts convincing not just environmentalist groups but also the European Parliament whose representatives endorsed the "Third Industrial Revolution economic development plan" in 2007. The OECD followed suit in 2011, incorporating Rifkin's plan into their green growth economic plan which has itself been isolating infrastructure as both the source of economic stagnation and the cure to sluggish growth in both advanced and developing economies.

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numerous design approaches to environmental crisis. For example, Mike Hodson and Simon Marvins "Low carbon nation: Making New Market Opportunities" in *Infrastructural Lives* (2015) make the case that with "new sources of energy production, particularly offshore wind" comes the capacity to think "new sources of mobility, here mediated through low carbon vehicles and associated infrastructures; reshaping consumption through a programme of the 'retrofitting' of buildings based on the forging of low carbon consumers; and finally the redesign of the electricity transmission grid" (220).

[335] Jeremy Rifkin, *The Third Industrial Revolution* (New York: Palgrave Macmillan, 2011), 5.

The revolution around which Rifkin organizes his thesis is, while hyperbolic in its symbolic scale, certainly plausible as a practice at the level of regional development policy. Germany has effectively revolutionized the way postindustrial society is powered. But what makes it so attractive to EU leaders has as much to do with its environmental promise (to which we likely have no objections) as its economic implications (to which we should have a few). In creating not a homology but an identity between energy and value (in this case specifically sustainable energy sourced from solar, wind, hydropower, biomass, and geothermal) the increasingly popular policy named by Rifkin's work circumvents most models of growth indexed to human labour without fully grasping the class differences his policy helps intensify. Those with property will save those without it, except those without will have no means of accessing, let alone accumulating, a form of economic value pegged to energy production. So in Rifkin and his supporters' account, the Third Industrial Revolution is a revolution not just in environmental terms, but in monetary and social terms as well: it is a fundamental alternative, they imagine, to the slow death of austerity. Though this isn't to say that the fantasy (again, that energy and value share an identity) is a new one in models of political economy. In addition to sourcing the current economic downturn to the implicit value relations embedded in both an oil economy and the infrastructure of oil itself, Rifkin's model for the third industrial revolution is one that both retroactively (hydrocarbons) and proactively (green energy) renders economic value an expression of the form of energy around which production and social reproduction are organized.

As I just suggested, however, accounts of value that posit energy as its substance are not unique to today's ecological economics.[336] Fredrick Soddy's *Matter and Energy* from 1911 and Nicholas Georgescu-Roegen's 1971 *The Entropy Law and the Economic Process* both sought in

[336] Philip Mirowsky, *More Heat Than Light* (New York: Cambridge University Press, 1989).

this vein to refine dominant economic theories of value (the first, Austrian School and British marginalists, and the second more recent neoclassical Chicago theories) by reintroducing the earlier conceptual identity between energy and value back into the discipline and with it policies that seek sustainable equilibrium. Rifkin himself in his 1980 book, whose afterword is provided by Georgescu-Roegen's protégé, Herman Daly, sought to complete the coup by arguing that human labour power, too, is a non-equilibrium thermodynamic system and that the value of labour-power is not just identical in numeric appearance to energy but a metonymic form of non-renewable energy (and thus value) itself.[337]

One can see fairly quickly in the model fleshed out for the Third Industrial Revolution that environmentalism and the switch to renewable resources is first a claim about the value form itself, or at least needs to make such a claim in order to pierce the policy barrier. But what kind of value theory is an energy theory of value? In the case of Rifkin and the discipline of ecological economics on which his policy pitch is built, the aim is to replace labour with a notion of energy that itself abstracts labour-power into a commensurate form of energy like any other. If there is a *coup* on the level of value theory at the heart of the so-called Third Industrial Revolution, it is the reintroduction of a strong nominalism into the now proper noun 'The Economy': what gives it life, on this account, is not specifically human labour, but work at both the terrestrial and celestial scale. Energy in the abstract, as a real abstraction of heterogeneous forms of work most visible in technological motion (which in this way reaches back in order to render human labour in the concrete a technology in motion, too) occurs in this model as a both an economic and political synthesis to what Rifkin understands as the disunity and unsustainability of economics as a discipline. And thus the infrastructure project Rifkin forwards as the new and truly Public Works

[337] Jeremy Rifkin, *Entropy: A New World View* (New York: Viking Press, 1980).

of the TIR, the retrofit and expansion of a universal energy grid where what we would call fixed capital does nearly all the work of valorization, is from a labour standpoint the most developed expression of the postindustrial fantasy of inexhaustible capitalism where neither capital, nor history, would have an end in sight.[338] Buildings, in the model of value Rifkin inherits from the discipline of ecological economics, will do the heavy lifting, making space for a paradigm of work that makes all labour socially reproductive labour. Technological innovation, in Rifkin's version of things, will save not only *us*, but the economy too.

Understood this way, Rifkin's insistence on a new energy infrastructure as the final investment required for global postindustrialization looks less like another postindustrial bait and switch and more like a strong demonstration of the immediacy with which a theory of value structures its own political imaginary. This is why we'd get some way but not much further than Rifkin himself were we to start with energy as such: that is, so long as labour is understood as a form of energy and all forms of energy as value creating labour in the abstract. What Rifkin is calling "lateral power" then is a claim about the relationship between forms of energy and a fundamentally infrastructural political imaginary—one where the physical shape of the energy grid generates the social shape of the political. Not only will there be no viable concept of profit in the new economy, on his account, the "future of society" will be characterized by a surplus of "social capital," by which at least in Rifkin's narrative is none other than a return to wealth as such.

Buildings themselves have at least since the inauguration of economics as a discipline been represented as forms of constant capital, but only under unique (though certainly increasing) conditions is infrastructure, at least in national and professional accounting protocols as they

[338] Karl Marx, *Grundrisse*, 17.

were standardized in the US and UK during the 1970s, considered immediately productive forms of capital (or constant capital). Most large-scale capital projects in North American and European economies consist of publicly funded land and infrastructure development on the one hand, and a privately funded architectural dimension on the other. The rationale in most municipal budgets for this arrangement sounds much like New Deal public works initiatives in the 1930s US where the underground and invisible materials of cities stand in for the polis itself, and all visible elements the domain of private property. In fact it is conceptually very difficult, even for the OECD, to imagine a private rather than public urban infrastructure, even though private holdings in infrastructure have been growing at over thirty percent a year since the mid 1990s.[339] This is why the vast majority of new infrastructure spending in postindustrial economies, especially after the blitz of media attention directed at failing infrastructure in the 2000s, now comes in the form of public-private partnerships (P3s).[340] Not only are state and provincial budgets too small to ever keep up with the infrastructural needs of a postindustrial economy; infrastructure is also far too valuable (both as a form of value, and a facilitator of it) for big business to ignore it.

Projections of a post-transition world, and current growth policies aimed at privatizing public infrastructures, both anchor the continued expansion of capital to a realization of infrastructure's true potential. The real reason that infrastructure captures the growing inseparability of energy deepening from both the conceptual and material history of capital,

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[339] The precise financial instruments at the heart of this rapidly expanding trend is well documented by Morag Torrance in his "The Rise of a Global Infrastructure Market Through Relational Investing," *Economic Geography* 85.1 (2009). From a less critical, though equally revealing lens, see Rae Zimmerman, "Making Infrastructure Competitive in an Urban World," *The Annals of the American Academy of Political Science,* 626 (2009): 226-241.

[340] *The New York Times* ran numerous exposés on infrastructure, and failing bridges in particular, but their documentary series "Retro Report" has kept up the momentum since the *New York Times Magazine* ran a special issue on "Infrastructure!" in June 2009.

however, is because the limits of the working day as it concerns business owners are coordinated with great precision by the infrastructural capacity of a given economic setting. Lenin knew the power of an electrified polis all too well, as did Smith when he witnessed the shiftwork made possible by electric lighting and mechanical power at the Soho Manufactory: once labour power becomes an expression of the physical power available through energy deepening, productivity and reproducibility alike become indices of the infrastructure that gives the figure of labour its ground.

Thinking about the value of labour this way also helps explain why so much work in the Marxist feminist tradition has targeted unrepresentable forms of labour's infrastructure—land rights in developing economies, gender divisions in industrial ones, and the historical character of affective or immaterial forms of labour everywhere[341]—in order to debunk what I am tempted to call the technical fallacy of orthodox Marxism. Silvia Federici is probably the best-known figure in this tradition, in large part because her involvement with the Wages for Housework campaign with Selma James and Mariarose Dalla Costa in 1960s and 70s Italy and subsequent writings on Nigeria and the ongoing history of primitive accumulation. In the Italian context, most of the women associated with Wages for Housework, as well as the breakoff group Lotta Femminista (a direct counter to the large, male dominated Lotta Communista) were once affiliated with *Quaderni Rossi* where Renzo Panzieri, Mario Tronti, and Antonio Negri initiated the leftist theory known now as *operaismo* (or workerism). Marxist feminism, which foregrounded the reproductive labour necessary for (mostly) working men to arrive at the factory with their labour power for sale, was therefore already a critique of a certain way of thinking about labour and

[341] On the critique of affective and immaterial labour theory, I am thinking in particular of Silvia Federici's excellent polemic against Michael Hardt, Antonio Negri, and Maurizio Lazzarato in 2006 lecture on "Precarious Labor: A Feminist Viewpoint" at Bluestockings Radical Bookstore in New York City, found here: inthemiddleofthewhirlwind.wordpress.com/precarious-labor-a-feminist-viewpoint/

value. Implicit for Marxist feminism, in other words, was a commitment to moving past the fallacy plaguing orthodox Marxism, namely that value is reducible to the work done *on the job*—or worse, positivist Marxism and its scientific measurement of labour inputs and the falling rate of profit—in order to move revolutionary attention to the social (and I am arguing physical) infrastructures of labour as such.

In relation to the larger argument about energy deepening and the historicity of the impasse this project has been building, two extensions of the infrastructural critique initiated by Marxist feminism are important to the critique of capital and energy with which I wish to end. First is the theory of development countered in Maria Mies and Vandana Shiva's *Ecofeminism* from 1993, where the universal and mechanical view of science that bore the labour theory of value in the 19th century is credited with more contemporary forms of ecocide, medicalization and mechanization of women's bodies, and primitive accumulation in what was then still called 'the third world.'[342] Important for Mies and Shiva is that the conceptual and idealist paradigm of a masculinist and mechanical universe is reproduced daily in the material settings in which we find ourselves. Hence while an organicism lurks not far beneath the surface of ecofeminism—the historical baggage of which has been questioned even by the authors since the book's publication—more central to the mode of critique their book helps generalize is a political orientation towards industrial systems, which includes but is not reducible to industrial ideologies.[343]

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[342] Maria Mies and Vandana Shiva, *Ecofeminism* (London: Zed Books, 1993) 26.

[343] A more recent version of this form of infrastructural critique (though I don't know that he would claim his work is ecofeminist) is Timothy Mitchell's historicization of democratic forms of power in the age of coal in *Carbon Democracy*. Industrial life forms and the political systems they enabled, namely mass democracy, required at first the incorporation of massive populations into the industrial mode of production in no small part because of the rate of innovation enabled by coal (which replaced biomass, artisanal, and animal power as the dominant source of energy in the production process). Coal extraction,

This is more acutely spelled out in their co-authored chapter on "People or Population" where the implicit colonial discourse undergirding the environmentalism of *The Limits to Growth*, and the class contoured racism of policies targeting population growth in Africa, Asia, and Latin America, are exposed as international forms of class warfare, expressed as a twofold crisis of reproduction (if poor women don't stop birthing poor babies, then we're all screwed). Cheap resource extraction in the global South, made possible by cheap labour from the same regions, on their account, is far closer to the truth of environmental and social crisis, since the crisis of social reproduction manifests a long history of uneven development accelerated by 20th century energy deepening in the North. Family planning in India and China, in other words, is part of the same economic logic that simultaneously requires a reserve army of labourers in 'developing' nations, and the 24/7 workday in the postindustrial core. For Mies and Shiva, the infrastructure responsible for the environmental (and therefore population) crisis is one and the same as the one accelerating global inequality and extreme forms of poverty. Since the policies built on the false problem of population are anchored to the scientific measurement of 'carrying capacity'—that is, how many people a given setting can handle over an economic sequence—the material infrastructure on which ecofeminist struggle is waged is one and the same as the one that facilitates energy deepening.

"The world must accept that India's per capita carbon emissions will need to rise rapidly if it is to eliminate poverty," explained India's minister of environment explained during the

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however, brought with it a particular infrastructure both at the site of extraction and in cities themselves consistently sensitive to political demands on the part of workers. Coal, in other words, ushered in not just the political project of mass democracy, on Mitchell's account, but a form of worker militancy otherwise difficult to imagine on a large industrial scale, with tactics such as blockades and sabotage in the arsenal of the new industrial worker's movement.

UN's 2014 convention on climate change.[344] Today the social and environmental ills of industrial and postindustrial forms of energy deepening are treated with a pattern of thought this dissertation has sought to historicize. Energy, in other words, is the answer to most political questions getting asked today, even when the problem in need of address is the direct result of energy deepening. How, given the hermetic nature of the impasse, are we to ever politicize what in the final pages I have been describing as the infrastructure of politics? How, if infrastructure is today the dominant medium in which heterogeneous genres of value congeal into economic value, is the deadlock of the postindustrial, including its philosophical preferences and political impasses, going to break in our favour?

5.2 Towards a Political Economy of Infrastructure

My argument so far has been to insist that the volatility with which the topic of energy has been thought in relation to environmentalism and demographics in the past few decades is thanks in no small part to the almost crude relationship between political power and the social systems energy supplies and logistics support. More than this, though, is the peculiar imperative in postindustrial economic policy to produce an account of value (in this case, as energy) in order to legitimate a new growth program. On this point, I'll suggest finally that what we're actually talking about when we talk about an energy theory of value is the discursive and sometimes concrete elimination of all boundaries between *social* and *economic* reproduction.

In some form or another—whether new, refurbished, or expanded—infrastructure has always functioned as a *kickstarter* for macroeconomic recovery, leading later (so this fantasy goes) to long-term growth. The idea is a somewhat paradoxical one: the current economic

[344] Tommy Wilkes, "India says carbon emissions will grow as it drives to beat poverty," *Reuters* December 5, 2014. Accessed December 6, 2014. http://www.reuters.com/article/2014/12/05/us-india-climatechange-idUSKCN0JJ1BS20141205

configuration of a given economy (call it economy A) has either 1) reached a natural limit, or 2) never really worked but works so badly now that its contradictory core has become inoperative, and so needs in either 1 or 2 to become A+ (that is, the same economic setting but bigger, faster, and with the capacity to become much larger than the original A). Hence, an 'infrastructure boom!' (a phrase that's been bouncing around North America for at least a decade now, just as it did moments before and long after 1929) after proverbial decline; more of the same, but different.

Even during times of relative stability, infrastructure (more; different; better) occupies a unique position in the economic imaginary of growth: not only does it seem necessary; indeed, almost in spite of social constraints, it appears to itself *produce* growth—this is what the Rifkin example above was meant to show—and is thus indistinguishable from it. Infrastructure therefore shares key characteristics with bonds in the medium-view of business cycles. For one, neither is in the strict sense a commodity (even though both are treated as such more and more), though a deficit in one or the other will immediately spell dire consequences for growth. Bad (or no) roads, electrical grids, or waste management systems, either through negligence or strike, and all three moments in the cycle of accumulation—production, circulation, and consumption—dry up. This is why the OECD has given so much attention in recent years to long term policy forecasts regarding infrastructure in developing and developed economies alike: needing roughly 3.5% of global GDP to keep apace with capital's growth needs, infrastructure is set to become a major economic sector in its own right (a roughly 2.5 trillion dollar a year industry as of 2012 figures).[345] Unlike bonds, however—and this is increasingly the case as investors find new ways to turn the material infrastructure of social and economic life into a cash grab—the stuff beneath

[345] Taken from the OECD's 2007 "Infrastructure to 2030: Volume 2, Mapping Policy for Electricity, Water and Transport," the exact quote is "Through to 2030, annual infrastructure investment requirements for electricity, road and rail transport, telecommunications and water are likely to average around 3.5% of world gross domestic product (GDP)" (13).

both house and factory is always *immediately* social and political. Bonds, on the other hand, are *mediation par excellence.* If you burn down the treasury, you still have to round up the accountants; but if you take down the power plant, the workday comes to an end.

5.2A Nobody Works in a Blackout

Only very old materialists would assign such political primacy to roads, sewage systems, and power plants. Newer materialists would say such systems have a life of their own. In any case, infrastructure fits neither in the art history taken up by architecture (though the two are indistinguishable fifty percent of the time), nor in the naturalism implied by architecture's external constraint, much less the economic structure that gives value to both (land and buildings). How then, given the sensitivity with which investors have turned their attention to material infrastructures in recent years,[346] are we to develop a political and epistemological relationship to infrastructure? The degree to which access to basic resources such as electricity and water increasingly defines the process of proletarianization at a global stage[347]—not to mention the process whereby access to electricity became what Paul Virilio calls the "absolute power" of state militaries[348]—means we have in infrastructure today something of the naked *medium* of political economic friction. Which is a claim not far from Angelas Mitropoulos'—which is in turn Hannah Arendt's—that politics, after a definite moment in the history of economics (sometime around 1945) "is premised not on a subject…but on the *infra*, the

[346] Private holdings in infrastructure have been growing at over 30% a year since the mid 1990s (the precise financial instruments at the heart of this rapidly expanding trend is well documented by Morag Torrance in an oft cited 2009 issue of *Economic Geography*).

[347] See Endnotes, "Misery and Debt" *Endnotes* 2 (2010): http://endnotes.org.uk/articles/1

[348] Jakob, 4.

unnassimilable plurality of that which lies between."[349] We should add: once the social gets electrified, and once the primary source of energy is no longer coal but oil (also not too long after 1945, it turns out), *infra*structure is the place where (economic) value and (social) energy share a provisional identity.

At the level of economic growth, or what in an older idiom are the forces of production, infrastructure regulates the value-time of a given economic setting. Any given regional economy will have a limit beyond which production, circulation, and output are system clogging (this would be A1 in the above formulation, whose natural limit is expressed in traffic jams, power outages, and slow delivery times), which is why 'upgrading' electrical, transportation networks, and now bandwidth availability is synonymous in policy speak for economic stimulus. Obama's novel plan to open an "infrastructure bank," for example, where upwards of ten billion dollars would sit in reserve for states most desperate for new hardware thus literalizes not only the crisis of public coffers in the US (which have suffered hand in hand with Public Works departments), but also how much infrastructure is a code word for economic growth, and therefore tells us something about the internal logic of growth as such.[350] An "infrastructure bank" of the sort the Obama Administration envisioned in 2012 would actually fundamentally alter the way urban construction is financed. In the bank's model, public and private pension funds have all tax barriers removed from investing in infrastructure bonds, a financial instrument designed to open the market to private investment invented in the 90s. Bearing in mind that this still stinks too

[349] Angela Mitropoulos, *Contract & Contagion* (New York: Minor Compositions, 2013), 115.

[350] Peter Baker and John Schwartz, "Obama pushes plan to Build Roads and Bridges," *New York Times* (March 30, 2013): http://www.nytimes.com/2013/03/30/us/politics/obama-promotes-ambitious-plan-to-overhaul-nations-infrastructure.html?_r=0

much of 'nanny-state economics' for most Republicans, the idea is to treat infrastructure as a commodity like any other in order to transfer the costs of upkeep onto users, or publics, and the risk onto pensioners—the idea, in other words, that energy spent outside the factory creates as much value as inside, and should thus be brought to market.[351]

At the level of political relations, or what in an older idiom are the relations of production, the watts, water, and waste that flow across today's social bedrock constitute the immediate conditions of social reproducibility as such, without which—say, in a post-apocalyptic wake—we'd have nothing but its symbolic remains. This, put simply, is why there are so few characters in post-apocalyptic fictions.[352] If that's true, though—if infrastructure *is* the moment and place where labour power as a value-creating commodity *and* a concrete social relation is fuelled (with watts, water, and waste removal)—then what it is 'between' is the antinomy of the value form itself: the moment between concrete and abstract; between labour in itself and capital in itself. For if the "hidden abode of production" is for Marx where all the secrets of the commodity are to be found, then it is in infrastructure—the material bedrock upon which social, political, and economic life now almost universally depends for its energy—where the secret of labour's

[351] In Canada, the Canadian Pension Plan's Investment Board (CPPIB) helped pioneer this investment strategy two decades ago and is now the third largest holder of foreign infrastructure bonds in the world (mostly in East Asia and the UK) according to Raffaele Della Croce, (2012), "Trends in Large Pension Fund Investment in Infrastructure", *OECD Working Papers on Finance, Insurance and Private Pensions*, No.29, OECD Publishing. In 2010 their portfolio boasted over 136,000 billion US dollars in assets, and theirs is one of three Canadian pension funds in the top ten. The question of 'what's in Canadian water' aside (answer: investment opportunity!), fixed and variable capital have been brought back into unexpected relation with one another.

[352] Though his novels are almost universally racist and express the worst kind of nostalgia, James Howard Kunstler nevertheless gets this part right: the world after oil is a world we'd first encounter as demographically *much* smaller than this one.

metamorphosis into labour-for-capital takes place, or its *re*production into a (indeed, the *only*) source of exchange value. Which is why nobody works in a blackout.[353]

5.2B Everyone is a Homeworker in a Blackout

In a long-term blackout, everyday habits become life threatening: food turns sour; weather is unmediated; water becomes undrinkable; use-value temporarily trumps exchange-value. Variegated moments of production, circulation and consumption are isolated, emptied of value-time, leaving only a social time determined by reproductive (crucially *not* productive) needs: How long will it take to make a fire; when will the sun light up the city; how many days of food do we have left; how can we collectivize our skills. Stored fuel becomes a source of heat, streets a place to find one another. A unique materialism emerges capable of arresting moments of what is otherwise the unity of labour (work done by a body, for other bodies) and labour *power* (work is a real abstraction of market values). *If infrastructure is the medium where politics and economics are made unitary (i.e. autonomous in appearance during the work day) then its breakdown is where the separation of social energy and energy as value takes place.* Even though most of us can't help but wait for the return of power, the city-wide blackout generates a long series of important disarticulations. Without a functioning infrastructure, system and subject sublate one another, and the aesthetic genre of the electrified city mutates temporarily into a post-work naturalism. Labour power is returned to the worker as collective labour; instead of working to increase the mass of value, we work to keep one another alive. Economic setting, where the

[353] Of course, it isn't quite true that *nobody* works during a blackout. But the crucial economic function of those that do work—city workers on one side of things, and caregivers (of children, the elderly, etc.) on the other—is made anxiously clear for everyone to see as the panic of a day without profit and a day with *life* threatening shortages become one and the same, and also why those same workers are more and more considered "essential services," rendering their labour exceptional before the law.

material world is mediated by the value form, becomes one where objects are either useful for labour or not—a tyrannical and ruthless materialism inverting the class tyranny under capitalism.

Circuit breakers and aqueducts are more likely found in engineering histories than the art historical cannon of architecture studies. The *beaux-arts* inheritance of buildings puts them formally on a disciplinary register with painting and poetry, making them primary sites for an archive of cultural historicity. Theirs is a humanities standpoint given their universal function: to house people, and the things people need. Yet infrastructure is the thing that houses all the *stuff* in between: it gives time to moments between production, circulation and consumption—indeed makes time the unitary medium across which all three become instants of one another—and is thus the most immediately historical of any medium we'd want when what we want is a medium in which to describe the proximity of politics and economics, or culture and work. What's at stake in the new turn to infrastructure, in other words, is the very terrain upon which social and private labour pivot.

The infrastructure of energy is a fundamental site of social and political transformation due to the now dual economic function it serves (as a financial commodity and as the regulator of value-time in a given economic setting). Certainly the example of a city-wide blackout used above, however, is too catastrophic and passive to endorse as a politics. Blackouts and system wide infrastructure failures nevertheless feature political transformations worth isolating and generalizing. This at least is what American essayist Rebecca Solnit does in her exhaustive rereading of key events caused by failed infrastructure, such as the 1906 earthquake in San Francisco; the 1917 explosion in Halifax harbor; 1985 earthquake in Mexico City; 9/11 in New York City; and Hurricane Katrina in New Orleans. Natural disasters and blackouts are plainly

horrifying for most (which is to say mostly poor) people, and yet for Solnit there is a social "truth," as she puts it, that peaks through the rubble:

> One reason that disasters are threatening to elites is that power devolves to the people on the ground in many ways: it is the neighbors who are the first responders and who assemble the impromptu kitchens and networks to rebuild. And it demonstrates the viability of a dispersed, decentralized system of decision-making. Citizens themselves in these moments constitute the government—the acting decision-making body—as democracy has always promised and rarely delivered. *Thus disasters often unfold as though a revolution has already taken place*.[354]

Even if what we were looking for was a form of struggle that *brings about* blackout conditions—not, strictly speaking a cut to the grid, but instead a commitment to voluntarily assuming the immediate forms of social labour that take place in such conditions—what would be missing is an account about why what happens on either side of the blackout is *un*political; why a *mediated* relationship to capitalist materialism somehow forecloses a mediated relationship to communist materialism, or the revolution—to use Solnit's phrase—that unfolds in the immediacy of disaster.

Short of a natural disaster, the impasse this dissertation has been mapping will break open only in the midst of a politics that chips away at *the fundamental.* Infrastructure houses the fundamental, I have just argued, and is therefore as good a place as any to begin. Energy, value, and the work of culture cohere in the physical infrastructures that make social and economic reproduction possible. Infrastructure, in other words, is the most vivid example of an aesthetic economy of growth I have been able to locate, since the socially and historically specific sources of growth I have been tracking are very literally grounded in the pipes, grids, data warehouses, and transformers lighting up the polis. This outcome is the result of a process embedded in capitalist modernization that ties labour and capital to a logical dependence on energy, which is

[354] Rebecca Solnit, *A Paradise Built in Hell* (New York: Penguin Books, 2009), 305 [emphasis added].

to say larger and larger quantities of the work of nature appear sometimes as a supplement to, but more frequently as a replacement for human labour power. I have decided to name this problem the problem of energy deepening, but only because my conviction has been that capitalism builds a world in its own image, and that human muscles are unable to satisfy its needs at a certain point in its development. Industrialization names that first limit, which is not accidentally another name for the substitution of water and animal power for coal power. Since the generalization of oil as the fundamental substance of postindustrial society between the 1950s and 1970s, the social and physical world has become a plastic one, while energy deepening has provided economic growth with its post 70s elasticity. Yet the history of energy deepening and its function in the uneven accumulation of capital has been neither immaterial nor ontological. Part of what mystifies the impasse of energy and capital is an acceptance of this world, which is to say the time and space of capitalism, as natural. Energy deepening has taken place through the aesthetic mediums that shape the settings of economic growth. Infrastructure today thus forms both the limit of political transition—to a society *after oil* and thus *after capital*, too—and the setting where the political is itself grounded in the materiality of social reproduction. A radical redefinition of our relations to, and as energy will be the first step in demystifying the impasse. Second will be the disarticulation of energy from capital, which can only occur through infrastructural seizure or sabotage.

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