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POWERING THE FUTURE: ENERGY RESOURCES IN SCIENCE FICTION AND FANTASY

Neuromancer: The Cultural Logic of Late Fossil Capital?

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This paper develops a take on the cultural moment of the long energy crisis (1973–1992) through two popular science-fiction texts. It divides the period in two: 'oil shock' and 'oil glut'. Further periodizing Fredric Jameson's intervention into the discussion of postmodernism and his successive naming of postmodernism as the cultural logic of late capital within this framework of crisis, I ask what might be said about postmodernism in light of this moment of fossil-fuelled turmoil in the global system. My essay has two poles each located in a text from the period: Isaac Asimov's essay 'The Nightmare Life without Fuel' (1983) and William Gibson's *Neuromancer* (1984). From oil shock to oil glut, this paper uses Patricia Yaeger's and Graeme Macdonald's work on the concept of an energy unconscious in order to begin elaborating the cultural logical of late fossil capital.

> Fossil Capital, in other words, is *self-expanding value passing through the metamorphosis of fossil fuels into* CO_2. It is a triangular *relation* between capital, labour, and a certain segment of extra-human nature, in which the exploitation of labour by capital is impelled by the consumption of this particular accessory. But fossil capital is also a *process*. It is an endless flow of successive valorisations of value, at every stage claiming a larger body of fossil energy to burn. One could think of it as the biophysical shadow of Marx's general formula of capital, coming to the forefront only at unexpected biospheric dusk (Malm, 2016: 290, emphasis in original).

If one were to update the opening of Fredric Jameson's *Postmodernism, Or, The Cultural Logic of Late Capitalism* today, one might start by adding to the litany of endings that constitute postmodernism. Jameson's list reads 'the end of ideology, art, or social class; the "crisis" of Leninism, social democracy, or the welfare state, etc. etc.' (1991: 1). The inverted millenarianism of this list appears culturally, economically, and politically bound. It seemed, at the time of writing, that one had to insist history had indeed not ended and historical materialism was more pertinent than ever as a method of understanding and addressing social ills. In the current moment, the question of futurity is now characterized by atmosphere, global temperature, and science as well. Today, Jameson's list would certainly include the end of the Holocene—a real end, to be sure, but one that sees the nature-culture dyad firmly shoved aside after the realization that humanity has fully entered an era of 'culture all the way down'—climate included—at least on the planet Earth.

Whether dated to the dominance of James Watts' steam engine in mid-nineteenth century, as in Andreas Malm's *Fossil Capital: The Rise of Steam Power and the Roots of Global Warming* (2016); or to what has become known as 'The Great Acceleration' of the mid-twentieth century (Steffen, et al., 2007), critical thinkers tie the end of the Holocene to humanity's changing energy habits. Yet it was not until the 1970s that people began to register the massive change in energy-use patterns of humans, particularly in the first world. In a 1972 speech to the Pensacola Area Chamber of Commerce, Admiral Hyman G. Rickover described the magnitude of the shift from

renewable energy to nonrenewable energy sources, noting that in 1850, 'fossil fuels supplied 5% of the world energy; men and animals 94%. By 1950 the percentages had reversed themselves, 93% coming from coal, oil, and natural gas, 1% from water power, and only 6% from the labour of men and animals' (qtd. in Sobel, 1974: 1). However, the aim of this article does not lie in looking too far back into history, for we already find ourselves in a fully industrialized future not of our own making. Rather than the origins of fossil capitalism I turn to the early years of the long downturn; to the decades of energy crisis and oil glut that provide the immediate background of Jameson's analysis of the postmodern. If the ends enumerated by Jameson hint at the formation of a particular cultural logic, might the dominance of fossil fuels and the end of the Holocene accept similar cultural periodisation? How might one begin to describe the cultural logic of late fossil capital?

Research on energy in the humanities has already sought inspiration from a dialectical approach to cultural forms. Recent scholarship has identified, with a certain Jamesonian flourish, a vast 'energy unconscious'. Posited by Patricia Yaeger in an editor's column of *PMLA* on energy and literature (2011) and elaborated by Graeme Macdonald (2014), such a concept attempts to name the unarticulated cultural logic whereby fossil fuels permeate human life yet remain unintelligible, though embedded across a whole range of practices. If ideology in Marxist parlance names a problem rather than addressing false consciousness, bad thought, or worldview, then the term 'energy unconscious' names the very pivot around which materiality, sociality, and culture find common machination. In this passage, Yaeger provocatively elaborates an extension and development of Jameson's 'political unconscious':

> Following Jameson, we might argue that the writer who treats fuel as a cultural code or reality effect makes a symbolic move, asserts his or her class position in a system of mythic abundance not available to the energy worker who lives in carnal exhaustion. But perhaps energy sources also enter texts as fields of force that have causalities outside (or in addition to) class conflicts and commodity wars. The touch-a-switch-and-it's-light magic of electrical

> power, the anxiety engendered by atomic residue, the odor of coal pollution, the viscous animality of whale oil, the technology of chopping wood: each resource instantiates a changing phenomenology that could re-create our ideas about the literary text's relation to its originating modes of production as quasi-objects. (2011: 309–310)

Yaeger's dialectical move here opens up the possibility of a methodological revision of how researchers interested in the intersection of cultural forms, fossil fuels, and socially-just futures periodize historical development. To put it in the form of a question, I would ask, 'how might a critic go about properly exploring and expressing the relation between energy sources and cultural milieu?' In light of this question, my essay attempts to demonstrate how such an analysis might operate alongside Jameson's argument about postmodernism. I focus in particular on the difficulty and promise of coming to terms with what can be described as the cultural logic of late fossil capitalism. This aim requires a closer consideration of the world of fossil fuels during the decades surrounding the publication of Jameson's 'Postmodernism' essay—the 1970s and 80s—and in particular their relationship to science fiction (sf), a mode of writing which Jameson has often elevated as having the 'representational means' to designate the 'unrepresentable totality' (2015: 230).[1]

Graeme Macdonald's SFRA Pioneer Award-winning essay, 'Improbability Drives' takes up Yaeger's concept of an energy unconscious and runs with it. Like Jameson, Macdonald posits sf as a genre 'best placed to advance our understanding not only of present and future energy crises but also the manner in which we (fail to) envisage and conceive energy as a matter for culture' (2014: 111; cf. Ghosh, 2016). Macdonald makes quick work of anyone, critics or otherwise, who dismiss sf as a site to understand energy culture:

> The fact that future fuel or hypothetical power sources *are* or may be entirely 'made up' can in fact provide a useful vision, a starting jolt to think

[1] Here, the unrepresentable totality Jameson refers to is not fossil capital, but financial capital, or what he calls 'one of the most original dimensions of late capitalism' (2015: 230).

> of alternatives to the inherent flaws (and impressive prowess) of our carbon-driven system and the hegemonic energy ontologies it reproduces. Any cynical response that recognizes the fuel of sf as purely fictive denies the place of impossibilist visions as potential solutions to present and projected ecological crisis. (2014: 121)

Macdonald situates his extensive reading of sf *vis-à-vis* energy in a monumental re-narration of the opening of *Star Wars* (1977), which elaborates the dynamics of resource and empire captured in the opening shot of the film where a star destroyer chases down the Corellian corvette *Tantive IV*. Through this reading, Macdonald provides a lucid framing of what is at stake in reading sf for energy:

> To see the *Star Wars* opening scene from a petro-perspective, then, is to perceive its rendition in part realized and contextualized *by* oil, not only in modern cinema's production process, from location trucks to special effects labs to film stock, but also as a film conceived and consumed in the volatile climate of a mid-1970s America that had been shaken by the tectonic shifts that the 1973 oil shocks created in the world-system. (2014: 118)

Macdonald's point is that sf provides an opportunity to realize the predicament humanity is in in time to intervene. Yet, there have been plenty of warning signs. In *Postmodernism*, Jameson uses George Lucas' *American Graffiti* (1973) as the prime example of what he calls 'nostalgia films'. This argument has the aura of fossil fuels about it—one might posit that this film, a whole swath of B-grade trucker films after it, and *Star Wars* too respond to the 1970s shortfall of oil production in the US by looking back longingly to the energy abundance of the 50s.[2] Gerry Canavan aptly outlines the impasse of futurity that attends fossil capital. In his essay 'Retrofutures and Petrofutures: Oil, Scarcity, Limit' Canavan writes that '[i]n the era of oil ontology,

[2] I owe this point to Caleb Wellum who presented a paper on this topic at Petrocultures 2016: The Offshore titled '"Keep Your Eyes on the Road and the Foot on the Pedal": 1970s American Car Films and an Energy Imaginary in Crisis.'

oil becomes synonymous with progress, even with the future itself' (2014: 334), but demonstrates this as a retrograde form of futurism, bound up with the concisely formulated truth that '[o]il got us here, but oil can't get us out' (2014: 332). Yaeger, Macdonald, and Canavan thus set the stage for a closer examination of fossil capital in specifically Jamesonian terms by demonstrating the capacity of critical theory and sf to engage the cultural and environmental dimensions of energy.

By its multinational phase globally and the beginning of its financial phase in the US in the 70s and 80s, capital accumulation had become a thoroughly fossil-fuelled endeavour. Thus, any insights about late capital ought to hold water for an elaboration of late fossil capital. My contribution here will be to insist, alongside Macdonald and Canavan, that sf is crucial, as both cipher and symptom, to the endeavour of decoding the energy unconscious. I begin with an assessment of the oil crisis through an essay written in 1977 by Isaac Asimov that thinks about fuel *explicitly*. Then I develop a reading of William Gibson's *Neuromancer* (1984), a novel that only registers fuel *implicitly*.[3] The different approaches required by the overt energy text (Asimov) and the covert one (Gibson) bear out in part what makes energy analysis a rich and necessary practice for the aim of imagining energy transition. Together Asimov's and Gibson's texts speak to the 'changing phenomenology' of energy culture described by Yaeger. After analysing both texts, I return to a section on technology from *Postmodernism* in order to read it for traces of its own energy unconscious. To reiterate, my abiding aim in this essay is to model a dialectical approach for energy critique as a method for science-fiction studies and a critical tool for mapping the cultural logic of fossil capital. Such an approach might just be able to register the way the tools of science fiction studies, and literary analysis

[3] I have selected this novel specifically because of Jameson's own claims about it as an ur-text of postmodernism: '[Postmodern sublime narratives] have only recently crystallized in a new type of science fiction, called *cyberpunk*, which is fully as much an expression of transnational corporate realities as it is of good paranoia itself: William Gibson's representational innovations, indeed mark his work as an exceptional literary realization within a predominantly visual or aural postmodern production' (1991: 38); and '[t]his is the place to regret the absence from this book of a chapter on cyberpunk, henceforth, for many of us, the supreme *literary* expression if not of postmodernism, then of late capitalism itself' (1991: 419).

more generally, are profoundly suited to detecting and addressing the entangled relationship of the mode of production, energy regimes, and cultural texts.

The 1970s, Scarcity, and Asimov

In the US, an energy shortage preceded the energy crisis (Sobel, 1974: 7). In 1969 the rising levels of energy consumption and stagnating energy production created an energy gap. The gap widened in 1970—Nixon described the moment as an incipient 'energy crisis.'[4] To make matters worse, catastrophe followed in the wake of the mounting crisis: on February 13 a Greek tanker, the *Delian Apollon*, spilled nearly 10,000 gallons of crude in Tampa, Florida; on April 22 an oil slick in Alaska was reported; and on September 7th the *Irving Whale* sank just off the coast of New Brunswick spilling 875,000 gallons of oil (Sobel, 1974: 36). In the shadow cast by rising oil prices and in response to US policy on the Middle East, on October 17, 1973 the Organization of Arab Petroleum Exporting Countries (OPEC) revised their production and distribution of oil resources in order to influence the US, especially with regard to policy on Israel. Fuel prices in the US and around the world soared ever higher—the price of oil went from $3/b to $12/b. The US responded by lowering the speed limit and rationing gasoline.

In 1977 *Time Magazine* asked Asimov to imagine an 'energy-poor society' (Asimov, 1983: 34) that could plausibly come to exist by the end of the 20th-century. This task marks a major shift in Asimov's writing. Gerry Canavan differentiates between his earlier works—with all their atomic-utopian hope—and the piece he would pen for *TIME*, 'The Nightmare Life Without Fuel.' Asimov's *I, Robot* (1950) for example, features an African Atomic Age Utopia that stands out from other world powers for having undeveloped fossil fuel reserves. His *Foundation* novels (1951, 1952, and 1953) project a galaxy that has long since moved past fossil fuels, and his time-travel novel *The End of Eternity* (1955) features characters shocked to learn that they must use automobiles to get around. Canavan argues that 'Asimov's sidelong references to oil and his repeated insistence on oil's *absence* as a marker of human progress are

[4] 'The term "energy crisis" did not appear in American political debate until … the summer of 1970' (Mitchell, 2013: 177).

unique to the period only insofar as he bothers to mention the existence of oil at all' (2014: 338). Perhaps Asimov's reputation as a thinker of energy-plenty futures landed him the *Time* gig.

'The Nightmare Life Without Fuel' is extrapolative. The essay looks twenty years into the future—to 1997 and a world without fossil-fuel reserves. The essay operates through a second person address, interpellating the reader thus: 'you'll have to walk to work again' (1983: 34). It features the rise of demolition workers—a new common trade for labourers. Asimov writes, 'The fading structures of a decaying city are the great mineral mines and hardware shops of the nation' (1983: 34). No longer able to power the machinery required to extract resources from the earth, Americans turn to their built structures for necessary components. The life without fuel is one characterized by recycling and scavenging from the high-carbon structures of the past.

Asimov works through the practical question of what might be kept running. 'What energy is left cannot be directed into personal comfort … and then of course energy must be conserved for agriculture' (1983: 35). In this imagined future, car factories only produce and maintain agricultural machinery, people accept no light in the evening, and can find ways to stay warm on their own in the winters, but they cannot go hungry for long. Moreover, Asimov convincingly explains why people stopped using cars: 'any automobile that dared show itself on a city street was overturned and burned … Cars just vanished and became part of the metal resource' (1983: 34). Though this seems a dire bit of catastrophism, the future is not all bad. Asimov's speaker frames the advantages of this world through what the newspapers have to say about them: 'the air is cleaner and there seem to be fewer colds … the crime rate had dropped … policemen are back on their beats. More important, the streets are full. Legs are king in the cities of 1997, and people walk everywhere far into the night … The suburbs were born with the auto, lived with the auto, and are dying with the auto' (1983: 34–35).

To those critical of petroculture's environmental impacts, clean air and walking for transport seem like desirable future outcomes; while, looking back from the

violently securitized present, the thought of more police on the street is not so attractive. One could surmise that the crime rate has dropped as officers have had to give up their cruisers (without the depersonalizing filter of the automobile, officers on the beat are much more likely to know the people in the community). On a national level, armies are gone as 'no one can afford to keep those expensive, energy-gobbling monstrosities' (1983: 36). Equating powering-down with peace, Asimov effectively presents a relatively utopian vision of the world.

Asimov's essay reads more like notes towards a story than a fully elaborated thought experiment. For instance, a checklist quickly writes off energy options: '[c]oal is too difficult to dig up and transport to give us the energy in the amounts we need, nuclear fission is judged to be too dangerous, the technical breakthrough toward nuclear fusion that we hope for never took place, and solar batteries are too expensive to maintain on the earth's surface in sufficient quantity' (1983: 34). The essay is remarkable for its capacity to construct a viable storyworld in such a short format: foreign policy and social reproduction are included in his vision, but they are not as clearly thought through as energy and infrastructure. Though, during the actual crisis, Americans did not start stripping buildings for materials, the dire affect of this piece—'[e]nergy continues to decline, and machines must be replaced by human muscle and beasts of burden' (1983: 36)—seems to capture quite clearly the feeling of the 70s, which was the first decade in US history when the consumption of energy outpaced its domestic production (Sobel, 1974: 51).

The essay's form and its subject matter make Asimov's thought experiment about an energy-transitioned future an explicit one. The honed tools of Jameson's symptomatic reading and Yaeger's exposition of unconscious signs of energy are not required here. The explicit-*ness* of Asimov's writing is built on the basis of not have enough oil; the essay's storyworld is still oil-ontological, in Canavan's terms. One can clearly make out that Asimov posits a set of conditions and then extrapolates two trends. I have already been elaborating the first. Its temporality is more immediate. The second takes a longer view of what an energy-poor world might eventually come to look like:

> Energy continues to decline, and machines must be replaced by human muscle and beasts of burden … Where will it end? It must end in a return to the days before 1800, to the days before the fossil fuels powered a vast machine industry and technology. It must end in subsistence farming and in a world population reduced by starvation, disease and violence to less than a billion (1983: 36).

Asimov's conclusion seems forced from the little speculative evidence he provides. It certainly fits with Canavan's assessment of the essay as a whole as a retrofuture—a civilizational regression that imagines the only way forward is to return to a previous historical epoch. Yet, 'The Nightmare Life Without Fuel' does have unintended lessons to offer. Sites of extraction are ephemeral, as history has borne witness. So are pipelines.[5] While sites of extraction pop up and close down, leaving ghost towns and depleted reservoirs behind, refineries remain where they are built.[6] For fossil capital in full swing, they just cost too much to demolish. Yet, Asimov's *Time* piece suggests a prudent way to approach the hulking infrastructure of fossil capital: with a demolition crew.

'The Nightmare Life Without Fuel' is easily read in terms of its relation to energy crisis, which informs both its subject and historical context, yet it is crucial to remember that energy scarcity is only scarcity in relation to certain energy demands. Now, in an era of technological development and offshoring, of just-in-time production and individuated automobility energy demand has never been higher.[7] When energy runs on oil, oil runs everything.

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[5] In *Living Oil*, Stephanie LeMenager describes the energy industry's culture of abandonment, 'partial removal, or toppling' of oil and gas pipelines in the vernacular as 'reefing' (2014: 180).

[6] Refineries, such as those in Philadelphia, PA are too expensive to shut down and they have been open since oil was discovered in Titusville (Hein, 2016).

[7] For offshoring and just-in-time production see Harvey, 1990. Peter Freund and George Martin note in their *Ecology of the Automobile* '[t]he ascendance of the private passenger auto as a dominant mode of transport, along with the fact that this mode is held to be part of a global model for development, represents a major triumph of twentieth century capitalist production' (1993: 10).

The 1980s, Energy Glut, and *Neuromancer*

If the 1970s saw a crisis in the world supply of oil, the 1980s saw the inversion of that crisis. In 'The Energy Crisis is over ... Again', energy policy analyst John P. Weyant writes that as of 1983 there was already 'abundant evidence of chronic world oversupply of oil,' and he ties this to the fact that oil consumption fell from 51 million barrels a day (mbd) in 1979 to near 41 mbd in 1983 (Weyant, 1983: 12).[8] The crisis of the 1980s gets murkier when one also considers government policy and manufacturing. The thicket of US energy policy presented a dense problem for those looking to manage the crisis from the government side, because, as Joseph S. Nye Jr. suggests, it is 'far easier to fund the defence budget than the strategic petroleum reserve and far easier to cooperate in NATO than in the International Energy Agency (IEA)' (1982: 122). Meanwhile, in a 1985 paper in *Energy Policy*, Walter Goldstein gets at the heart of a mounting contradiction in production. He claims that 'more industrial products were manufactured and more energy consumed in 1984 than in any previous year' (1985: 525). Unlike the high fuel costs of energy crisis, the oil glut presents a new set of problems and produces a different set of assumptions. In this moment prices become tied to the market, rather than governments and price-setters, and volatility reigns.[9] Moreover, the apparent abundance produces a sense of security in the energy-rich future. Rather than providing a moment for energy transition away from fossil fuels, the oil glut of the 1980s ensured an entrenchment of fossil capital, a redoubling of investments in the oil sector, and a tightening of petroleum's grip on the shape of the future.

Unlike Asimov's bleak, retrospective outlook, sf authors write from a different set of conditions in the 1980s. To read William Gibson's debut novel *Neuromancer* today one can get the sense that he was largely describing the same present as Goldstein, Nye, and Weyant. In both the novel and the real world energy-washed industries

[8] These figures are for the first and third world. Weyant has not included second-world consumption figures.

[9] Matthew Huber ties the volatility in the price of oil to the opening of crude-oil futures for trade on the New York Mercantile Exchange in 1983 under Ronald Reagan (2013: 126).

pump out commodities, the development of electronics complexifies, and world population climbs. Let me describe the situation in Gibson's novel.

Banished from cyberspace, Gibson's protagonist Case begins the novel psychically caught between its two cityscapes, a state of exile that aligns in illuminating ways with Jameson's diagnosis of postmodern alienation in the modern city:

> A year later and [Case] still dreamed of cyber space, hope fading nightly. All the speed he took, all the turns he'd taken and the corners he'd cut in Night City, and still he'd see the matrix in his sleep, bright lattices of logic unfolding across that colorless void … The Sprawl was a long strange way home over the Pacific now, and he was no console man, no cyberspace cowboy. Just another hustler, trying to make it through. But the dreams came on in the Japanese night like livewire voodoo, and he'd cry for it, cry in his sleep, and wake alone in the dark, curled in his capsule in some coffin hotel, his hands clawed into the bedslab, temperfoam bunched between his fingers, trying to reach the console that wasn't there. (Gibson, 1984: 5)

On one hand, this passage explores Chiba City through a drug addled stupor that stumbles down the twists and turns of the layered forms of so many film-noir depictions of the city, framed by the now classic opening line description, 'The sky above the port was the color of television, tuned to a dead channel' (Gibson, 1984: 3). On the other, the promise of cyberspace—a mappable system of logic, which offers the possibility of finding purchase on the present.[10] Case's eventual return to cyberspace and the challenges he faces there act out a sort of wish fulfilment—with the right techniques and technologies, an individual agent could not only determine where they are, but how to act in the face of that knowledge. Gibson's novel addresses the same historical problematic as Jameson's postmodernism essay: the complexity of history and the unmappable present in late capitalism for the still-modern subject.

[10] Gibson may very well have invented the term 'cyberspace'. Regardless of its specific origins he certainly did bring the term into the popular imagination as with the genre-term 'cyberpunk' (a term first used by Bruce Bethke for a short story title in 1983) (Higgins and Duncan, 2013: 126).

Gibson's cyberpunk science fiction encounters the same problematic Jameson's theory identifies, even if it does so with the bleary, red eyes behind a strung-out console jockey's ambitions.

To start thinking about the energy imaginary of *Neuromancer*, one might recall the modes of transport that characters use in the novel. In Chiba City, they travel mostly by foot. In the Boston-Atlanta Metropolitan Area, otherwise known simply as 'The Sprawl,' they rely on trains to whip them from Boston to New York. Then, in Istanbul, Case and Molly ride a self-driving, speaking car. 'The Mercedes' talks to them, describing their location and the sights (1984: 87, 90, and 91). Gibson extrapolates a vision of the future of automobility that, from the vantage of the present, seems like it must rely on extensively mapped terrain with a vast overlay of information—consumer GPS in the 80s. Later, they employ a shuttle to launch them into space and the *Marcus Garvey* and the *Babylon Rocker* to transport them to the space station Freeside. Throughout the book, they ride planes from continent to continent—Japan to the USA, the USA to Turkey. The train and even the car could conceivably be electric, but the jets and the spaceships would seem to require some form of fuel. The point in reading a text for its fuel signifiers should not be to determine whether the fiction has given up fossil fuels, rather one might use the survey of transportation to begin an inquiry into how energy gets taken for granted and what this revelation says about their cultural imaginary. Indeed, the point here is that the energy unconscious is, indeed, unconscious.

What if, following Herbert Sussman's argument about Gibson and Bruce Sterling's *The Difference Engine* (1990), one was to read *Neuromancer* not as a science-fiction novel but as a novel of alternative-history? What if, taking a cue from Gibson and Sterling's reinvention of Charles Babbage's steam-powered Analytic Engine—with its 'thousands of clockwork gears and yards of punched paper' (Sussman, 1994: 1)—one were to locate the point of divergence in *Neuromancer* not in a science-fictional novum of cyberspace but in the invention of an energy regime capable of fuelling such a demanding electronic endeavour? Put otherwise, what happens when one considers Gibson's first novel as an alternative history where, in Sussman's words, 'what we accept as inevitable is only contingent' (1994: 2)? The reading that accepts

a world of consoles, cyberspace, jacking in, the net, and so on without asking how these components come to be powered misses a crucial development: the fictional world of Gibson's cyberpunk runs, as readers later learn, on hydrogen power and, perhaps, on nuclear power. The more obvious lesson that attends the generic difference between *Neuromancer* and *The Difference Engine* is that cyberpunk names a bottom-up narrative set in a techno-cultural milieu, whereas steampunk names one set within a particular energy regime. As a cyberpunk novel, *Neuromancer* reveals its energy regime only in a mediated fashion, only in glimpses of distant power plants, only in the briefest mention of hydrogen fuel cells.

Neuromancer offers hints that some kind of energy transition has taken place. On the way to Istanbul, Molly and Case both look out the train's window, '"It was like this when we headed to Chiba," Molly said, staring out the train window at the blasted industrial moonscape, red beacons on the horizon warning airplanes away from a fusion plant' (1984: 85). Some technological development has taken place, similar to the one that Gerry Canavan attributes to the Asimov of the 40s and 50s who imagined developments in nuclear power would proceed without issue. But the 'blasted industrial landscape' they pass by indicates that there is more to the story here than unblemished scientific progress. The narrator says, 'The landscape of the northern Sprawl woke confused nightmares of childhood for Case, dead grass tufting the cracks in a canted slab of freeway concrete' (1984: 85). Here, the past and present overlap. This sentence describes a scene and then implies Case saw it played out in his youth—a nightmare vision he sought to repress. The pitch of the shifted highway and the failed reclamation of it by the grass indicate an arrested state. Though the scene reveals little more about the nuclear question, it does offer information about transport in the Sprawl—the highways are not in use and have either been destroyed or left unmaintained to crumble.[11] The narrator

[11] The novel occasionally indicates that some kind of nuclear incidents have taken place. Here the narrator describes Peter Riviera, the illusionist Armitage employs to get them into The Villa Straylight—the Tessier-Ashpool space-station fortress: 'He was a product of the rubble rings that fringe the radioactive core of old Bonn' (1984: 97). Like the moment on the train that implies a nuclear event, this brief mention of old Bonn's 'radioactive core' leaves me guessing: is the core radioactive because of an Atomic bomb, a reactor leak, or is this a way of describing a nuclear energy program used by Germany in the novel, which means a different incident created the rubble? The novel is not

passes one final piece of information to the reader: '[t]he train began to decelerate ten kilometres from the airport. Case watched the sun rise on the landscape of childhood, on the broken slag and the rusting shell of refineries' (1984: 85).[12] Case and Molly pass through a landscape uncannily reminiscent of Philadelphia, where since 1870 oil and gas refineries have lined the Schuylkill and Delaware Rivers.[13] The 'broken slag' and 'rusting shells of refineries' evoke a sense that fossil fuels, whether or not they are extracted and refined elsewhere, might not be at the core of US social and economic activity in this story world, which raises the question; what *is* powering this world?[14]

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clear on this issue. Yet, in an interview, speaking about the anxieties surrounding nuclear war in the 1980s, Gibson acknowledges that upward slant of setting *Neuromancer* after an aborted nuclear war: 'That war was really a conscious act of imaginative optimism. I didn't quite believe we could be so lucky. But I didn't want to write one of those science-fiction novels where the United States and the Soviet Union nuke themselves to death. I wanted to write a novel where multinational capital took over, straightened that shit out, but the world was still problematic' (Wallace-Wells, 2011).

[12] These descriptions also resonate with Bruce Springsteen's 'Born in the U.S.A.' which, like Gibson's novel, was also released in 1984. In that song Springsteen rhymes 'shadow of the penitentiary' with 'gas fires of the refinery,' and the song also describes the plight of Vietnam veterans in the wake of the conflict, returning home with 'nowhere to run to nowhere to go'—a point I make because Gibson is himself famously a draft dodger, having moved to Vancouver, B.C. to escape military service.

[13] According to the Philadelphia Energy Solutions website: '[i]n 1866, one year after the end of the Civil War, Atlantic Petroleum Company established its operations at Point Breeze along the Schuylkill River below Passyunk Ave. Four warehouses were built, and those could store 50,000 barrels (2.1 million gallons) of refined oil product, mostly kerosene used as lamp oil to light the homes and businesses in the growing city....Atlantic also built docks and railroad trunk lines to connect with the new refineries in Western Pennsylvania that were established after oil was discovered in Titusville, PA, in 1859. Atlantic installed its first petroleum refining units in 1870, changed its name to Atlantic Refining Company and soon became Philadelphia's largest employer. Right after the turn of the century, Atlantic introduced the first fractionating tower, which would radically alter and improve the way oil would be refined.... In 1982, Gulf was bought out by Chevron, and the Girard Point refinery became the Chevron USA Philadelphia refinery' (Philadelphia Energy Solutions).

Here is a list of refineries that Case and Molly could have seen on their journey: ConocoPhillips refinery in Linden, NJ cap 250000 bpd, or in Trainer (Closed), PA cap: 190000 bpd; Chevron USA Inc refinery in Perth Amboy, NJ idle cap 83000 bpd; Hess Corporation refinery in Port Reading, NJ cap 65000 bpd; Nustar Asphalt Refining refinery in Paulsboro, NJ idle cap 35000 bpd; PBF Energy refinery in Paulsboro, NJ cap 166000 bpd, or in Delaware City, DE cap 190200 bpd Sunoco Inc refinery in Marcus Hook (Closed), PA cap 194000 bpd; Sunoco Inc (R&M) refinery in Philadelphia (Gerard Point), PA cap 355000 bpd, or in Westville (Eagle Point) Closed, NJ: cap. 152000 bpd (Energy Supply Logistics).

[14] From the Panther Modern polycarbon suits down to Case's Hosaka, this world is still built by oil in the form of plastics. Indeed, a key word search reveals the word plastic is used 47 times in the novel.

In an interview, William Gibson has indicated that part of the thought experiment of *Neuromancer* was to imagine a future that was not American (Wallace-Wells, 2011). The United States is non-existent in the novel, having become little more than a network of corporate entities, while Japan is obviously a key hegemonic player on the world stage. It is interesting, then, that Case and Molly travel to Turkey. Tony Myers argues that in Gibson's novel, 'Turkey occupies the position of other in capitalism's cultural imaginary' (2001: 892). He quotes the novel describing Turkey as 'a sluggish country' and situates this sluggishness as a part of its use of 'antiquated technologies' (2001: 892). But, what if the novel describes Turkey in these terms because it has not yet fully transitioned away from fossil fuels? When Case and Molly arrive in Istanbul, the narrator says, 'The pavement was uneven and smelled of a century's dripping gasoline' (2001: 88). More to the point compare how the two mentions of hydrogen cells in the novel replay this comparison: first, in Turkey, '[Case] watched a dull black Citroen sedan, a primitive hydrogen-cell conversion, as it disgorged five sullen-looking Turkish officers…' (1984: 84) and then in Freeside, 'Condensation dribbled from the hydrogen-cell exhaust as the red fiberglass chassis swayed on chromed shocks' (1984: 140).[15] I take Myers's point, yet I would extend it. The disdain that the characters show towards Turkey in *Neuromancer* is not unlike the hypocritical attitude of North Americans in recent years to the news that major Chinese cities have more smoggy days per year than clear ones (even though the province of Ontario in Canada only stopped burning coal in the last few years).[16]

Moreover, when Molly and Case go to catch Riviera the description of the alleyway attributes the substance a life of its own: 'The junk looked like something that had grown there, a fungus of twisted metal and plastic' (Gibson, 1984: 48).

[15] Like Babbage's initial plans for the computer, the idea of the fuel cell comes from the early 19th century. Humphry Davy first demonstrated the concept in 1801 and William Grove proved that breaking a hydrogen atom could produce an electric current in 1842. Since then working fuel cells have been used on tractors, in vehicles for use in outer space, and, as early as 1966, in road vehicles. While General Electric worked on developing fuel cells, in the 70s and 80s they were mostly limited to space applications. Today, car manufactures are slowly beginning to sell fuel-cell vehicles commercially.

[16] These are some of the effects of smog in Ontario from around fifteen years ago: 'In 2000, for example, the OMA detailed, there were 1,925 premature deaths, 9,807 hospital admissions, 45,250 emergency room visits, and over 46 million minor illnesses engendered by increased Ontario smog levels' (Scharper, 2013).

Here, I find an iteration of Michael Ziser's provocation about fossil capital's global face recast in the novel to mean something sinister. Ziser writes:

> During the same period that the production of oil was taking on a foreign and primitive cast, its consumption in the United States was becoming the site of an alternately ecstatic and apocalyptic *jouissance* accelerated in the postwar period by huge national investments in the interstate highway system and by the accompanying white flight to car-dependent suburbs. (2011: 322)

Ziser makes petroleum's double character apparent: in the US oil drives exuberance and 'apocalyptic *jouissance*,' while abroad it generates machinations and cabals. *Neuromancer* deploys a similar logic, although it implies a different, West-justifying reason for its attitude towards the Middle East. In the novel, Turkey is described as backwards not because of how it uses oil, but because it still uses it at all. The Sprawl, though massively energy consuming, is not fossil-fuel powered—recall that 'Power, in Case's world, meant corporate power' (1984: 203) even though even the metaphoric slippage that corporate power implies must also be premised on technological breakthroughs in both hydrogen cell manufacture and nuclear fission. *Neuromancer* reflects the fossil relations of its post-OPEC, oil glut moment in a distorted mirror that works to justify the high-energy life of North Americans even as it looks across the pacific to the rise of Japan.[17]

What is clear is that, with or without fossil fuels, the world of *Neuromancer* is energy-rich and must be dependent on a complex energy generation and distribution system. This becomes apparent when one moves from considering transport to think through the data-transfers on which cyberspace is based in the novel. When Case and Molly return to the Sprawl, the narrator says:

> Program a map to display frequency of data exchange, every thousand megabytes a single pixel on a very large screen. Manhattan and Atlanta burn

[17] Gibson's novel fetishizes Japan, the county that Giovanni Arrighi names as the one that looked most likely to be the inheritor of the USA's global hegemonic status in the 1980s (see 2010).

> solid white. Then they start to pulse, the rate of traffic threatening to overload your stimulation. Your map is about to go nova. Cool it down. Up your scale. Each pixel a million megabytes. At a hundred million megabytes per second, you begin to make out certain blocks in midtown Manhattan, outlines of hundred-year-old industrial parks ringing the old core of Atlanta... (1984: 43)

This description, unlike so much of the novel, does not rely on the metaphoric to convey the intensity of data transfer in the information age. Instead, it deploys real figures, telling the reader in imperative second person to map the data spatially across time. Here the figurative language, 'go nova' and 'Cool it down,' describes the visceral experience one might have when dialling in a meaningful visualization—something not unfamiliar to those working on data now, either in the tech industry or as researchers. As Jameson puts it in a later essay, '[t]he distinction of *Neuromancer* thus lies in the form itself, as an instrument which registers current realities normally beyond the capacity of the realistic eye to see, which projects dimensions of daily life we cannot consciously experience' (Jameson 2015: 237).

Yet, this description of data visualization needs to be placed in the technological context of 1984. The very idea that gigabytes of data could be transferred in the blip of a second made for a startling proposition in the early days of computing, before the internet was a part of everyday life. In terms of the sheer quantity of data usage, a vast gulf separates Gibson's science-fictional internet from that of the present day. Facebook, the social media giant, provides a good example of the kind of data bandwidth used in current computing. A blog post about Facebook's data warehouse claims, 'At Facebook, we have unique storage scalability challenges when it comes to our data warehouse. Our warehouse stores upwards of 300 PB of Hive data, with an incoming daily rate of about 600 TB' (Vagata and Wilfong). Wait. I know what a terabyte (TB) is, but I had to look up petabyte (PB). A good ol' gigabyte (GB) is one-thousand megabytes; a TB is roughly one-million megabytes; and a PB is one-billion megabytes. To illustrate: Netflix, the video streaming service, set to display in HD uses 2.4 GB per hour ('Netflix') which is equivalent to 650 MB per second for a single Netflix user. If 10 million people were watching Netflix at a given time

(about ten percent of total subscribers) the data transfer from Netflix servers to all these users would be at a rate of about 6 PB per second. In Gibson's terms, that is 6.5 billion megabytes, which does not even account for other social media websites, streaming services, standard browsing of the internet, cat GIFs, auto-tuned political debates, or the NYSE which has its own mega-high-bandwidth infrastructure.[18] Today, a visualization of the same region would involve a scale closer to PB per megapixel (a million pixels). But the point here is not to adjust Gibson's vision to our own reality; instead it is to realize that data requires and is today's dominant form of electricity usage.[19] To make this seem a little more manageable, I can reduce the scale. The average Google search involves a comparable amount of energy as boiling a kettle of water (around 3 kj).[20] So, if the kind of data transfers Gibson imagines in the above paragraph would require vast amounts of real-world energy, then the capacity of a novel, let alone an infographic, to figure the energy levels currently consumed by cloud computing remains unfathomable. *Neuromancer* projects a future where cybernetics, in Matteo Pasquinelli's words, 'transforms the economy into an ecology of feedback loops,' controlling social unrest through a marriage of 'the Turing machine with the thermodynamic engine' (2017: 318, cf. 315). The discrepancy in data storage and energy use between Gibson's novel and the present can be read as the result of a more elegant relation between computation and social

[18] Referred to as Secure Financial Transaction Infrastructure (SFTO) the NYSE and other exchanges, have their own communications infrastructure.

[19] '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 farms or warehouses require the energy output of thirty nuclear power plants because, whether in use or not, the information housed in these warehouses remains online (Glanz, 2012). According to Pierre Delforge of the Natural Resources Defence Council, 'Data center electricity consumption is projected to increase to roughly 140 billion kilowatt-hours annually by 2020, the equivalent annual output of 50 power plants, costing American businesses $13 billion annually in electricity bills and emitting nearly 100 million metric tons of carbon pollution per year.' And because most 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' (Diamanti, 2016).

[20] 'Google said that 100 searches are equal to a 60-watt light bulb burning for 28 minutes. "Specifically, we currently use about 0.0003 kWh of energy to answer the average search query," Google said. "This translates into roughly 0.2g of carbon dioxide"' (Albanesius, 2011).

relations there. For in the real world, as Pasquinelli argues, capitalism has instead expanded its fossil-fuel use and generates rapidly-accreting databases, 'feeding itself on the industrial and energetic surplus that it was supposed to measure and control' (318). What *Neuromancer* so nimbly yet unconsciously grasps is that fossil capital and cybernetics are two parts of a larger whole, though with information ascendant and consistent in its siphoning increasing substantial amounts of energy. Here the retrograde character of Asimov's essay becomes abundantly clear: it can process what might happen in a future without fuel, but cannot imagine, in the way that *Neuromancer* does, a cyberfossil capital future. Because it cannot project that science-fictional image, it is thus unable to ask what *the nightmare life without computers* might look like. For instance, without climate data and weather models, how might humans know a typical storm from an atypical one? The impasse that *Neuromancer* so vividly anticipates is one in which the tools of ecological destruction may also be the ones that make humans capable of imagining (and enacting) an energy transition.

The Cultural Logic of Late Fossil Capital

In the first chapter of *Postmodernism*, Jameson uses technology as a placeholder for the mode of production. He describes the fetish character attendant on capitalist development as 'an alienated power … which turns back on and against us in unrecognizable forms and seems to constitute the massive dystopian horizon of our collective as well as our individual praxis' (1991: 35). Jameson means human labour here, that which seems to vanish in the neon glow of the postmodern moment, but what if one were to reread this passage in terms of the vanishing of energy from the equation? One could read Jameson's words as a description of path dependency, a term that identifies techno-scientific advances with an exponentially growing dependency on the technologies developed and the amount of energy required to sustain them. This conceptual connection, from human labour to abstract energy, bridges both imagined futures discussed above. In Asimov's nightmare, fossilized urban remains and infrastructural skeletons provide resources for a desperate humanity. In Gibson's the wealth of fossil fuels in the real world contributes to the mirage of an energy-rich vision of the future, still bound to the technological dependencies and energy suck

of late fossil capital. Asimov writes explicitly about oil and futurity, Gibson does so circumstantially—*Neuromancer* cannot help but think energy in an imagined world that uses so much of it. So, in the face of my separation of them as explicitly and implicitly energy-focused, both texts bear traces of Yaeger and Macdonald's energy unconscious and both constitute the 'massive dystopian horizon' for collective social life and ecological flourishing or dying of the Earth. Even alongside Asimov's and Gibson's texts, Jameson's pronouncements only hint at the formative role energy regimes play in relation to the mode of production. The possibility of detecting, and it is only a possibility, the massive electrical currents of late fossil capital lies in a dialectical reading of science fiction's energy unconscious.

For Marx, the development of machines occurs as the result of the development of capital—a development considered in stages by Ernst Mandel in *Late Capitalism*:

> The fundamental revolutions in power technology—the technology of the production of motive machines by machines—thus appears as the determinate moment in revolutions of technology as a whole. Machine production of steam-driven motors since 1848; machine production of electric and combustion motors since the 90s of the 19th century; machine production of electronic and nuclear-powered apparatuses since the 40s of the 20th century—these are the three general revolutions in technology engendered by the capitalist mode of production since the 'original' industrial revolution of the later 18th century. (Mandel, 1972: 118)

Mandel and Jameson both figure the role of fossil fuels in the development of capital. Jameson goes so far as to say that his tripartite schema—realism, modernism, postmodernism—maps on to Mandel's three stages. Yet postmodernism, as a distinct moment in capital's dominant cultural logic, comes *before* the recognition of the energy-ecology deadlock in late fossil capital.

Andreas Malm characterizes Mandel's long waves of capital's development, following his later, five-part schema from *Long Waves of Capitalist Development: A Marxist Interpretation* (Mandel, 1995): first water-powered industry (1780–1848), then steam-powered industry and transport (1848–1896), and then the electrification

of industry, transport, and households (1895–1945). The fourth and fifth waves are of particular interest here. The fourth wave (1945–1992) is characterized by the motorization of transport and other parts of the economy with automobiles, aircraft, refineries, petrochemicals, oil, and gas; and the fifth wave (1992–?) is characterized by the computerization of the economy with computers, software, telecom equipment, and microprocessors (Malm, 2018). Gibson's novel fits between the fourth and fifth waves, and I would argue that it is precisely because of its absolute contemporaneity that it can be seen as a novel of late fossil capital. However: I am not only interested in correctly locating the real ground of *Neuromancer's* energy unconscious; and have sought to illuminate the deadlock of the world that fossil capital builds and the impression the latter has on how sf can imagine the future.

Fossil capital's long waves rise with the charged boom of development and fall with the resounding crash of crisis. From 1973 on oil is increasingly the source of economic, social, and environmental volatility, but it also shores up capital and provides a means for continued profitability. For a time, the exponential rise in the use of fossil fuels could actually explain the delay in the fall of the rate of profit, but today it cannot. To be sure, fossil fuels are still culturally and economically dominant, not to mention environmentally catastrophic, but with the twin recognition that the Holocene is over and that fossil capital is the driver of that end, humanity sits on the cusp of a different condition of ends than the one opened up in the 1970s and that Jameson and Gibson so attentively tracked. I am not trying to argue that cyberpunk, or Gibson's novel for that matter, provide the form capable of grasping the cultural logic of a new global formation, but that at this 'unexpected biospheric dusk' (Malm, *Fossil Capital* 290) *Neuromancer* provides dialectical thinking with something worth considering: the future imagined from within fossil capital pushes at the limits of what kind of energy transition is truly possible.

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