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Energy Ontologies: Wind, Biomass, and Fossil Transportation

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Abstract: This article uses literary sources to draw ontological distinctions among three distinct energy sources: wind power, biomass, and fossil fuels. The primary aim is to demonstrate how radically our fossil fuel regime has changed human ontology in the last two centuries during which we have entered the Anthropocene. Because this radical transformation contains myriad elements, this article will focus on transportation: the speed, quality, and quantity of travel permitted by successive energy sources. To consider the comparative literatures of energy as they relate to transportation, we will begin with wind, then consider muscle-driven biomass giving way to coal locomotion, and conclude with the highest octane fuel, petroleum. The central interest is in how the fuel depicted in literature illuminates historical moments in which the interfaces between self, society, and nature are configured by specific energy regimes. By using literature as a source text, we may arrive at an emotionally and philosophically more robust synthesis of energy history than the social and natural sciences, relying upon objective accounts and statistics, are able to provide. By re-reading literature through the lens of the Anthropocene, we gain perspective on how earlier insights into the relationship between energy and experience can inform our explorations of today's ontological reality. Energy literature instructs us out of the fossil fuel mindset of world domination and back to a physical realm in which we are small actors in a world guided by capricious forces. Such a reality requires hard muscular work and emotional immersion to restore an ethic of care and sustainability.

Keywords: energy in literature; human ontology; industrialism; ecocriticism; anthropocene; climate change; biomass energy; renewable energy; fossil fuels; transportation

1. Introduction

Put a tiger in your tank! So exclaims the marketing metaphor of Exxon in a move that slips a naturalistic, sleek, predatory vehicle into the place of a mundane, mechanical tenor: the internal combustion engine pulsing petroleum. The ubiquity of petroleum-based power in the last century has guided every aspect of lifestyle in developed countries. The metaphorical tiger roars within our food system, our residential and business infrastructure, our entertainment and information media, our patterns of desire and consumption. Most evidently, the tiger skulks within the transportation network that has come to define the American experience of moving as highly individualistic, freely elective, and superhumanly rapid. It has not long been this way.

This article uses literary sources to draw ontological distinctions among three distinct energy sources: wind power, biomass, and fossil fuels. The primary aim is to demonstrate how radically our fossil fuel regime has changed human ontology in the rapidly-paced two centuries during which we have entered the Anthropocene. Because this radical transformation contains myriad elements, this article will focus on transportation: the speed, quality, and quantity of travel permitted by successive energy sources. Secondary insights emerge from the comparative literatures of energy: how time and space are subjective perceptions guided by energy regimes; how evolved behaviors are excited,

exhausted, and frustrated by the superhuman forces unleashed by coal and petroleum; how industrial energy regimes cultivate nostalgia and psychasthenia for a lost biomass world; how a low-carbon future made necessary by climate change and ushered by international agreements like the Paris Accords of 2015 might approach both dystopian and utopian forms. In-depth analysis of these latter issues is beyond the scope of this article, but the content here is meant to invoke these important valences of the energy humanities. Most scholarship to date has been devoted to fossil fuel culture, for good reason, in the works of scholars including Stephanie LeMenager, Barbara Freese, Bob Johnson, David Nye, Vaclav Smil, and E.A. Wrigley. However, it is myopic to consider energy ontology without involving the biomass and renewable sources that have guided the majority of human history.

Literature has long downplayed energy's material nature as fuel while propping up the social construct of human energy, epiphany, and triumph. Because literature, as a human practice, is inherently anthropocentric, it might seem to be a weak or misleading source material for an ecocentric study of energy through history. However, the rich and under-explored vein of fuel materiality helps the sensitive reader get closer to an understanding of how energy ontology—the nature of surviving, working, and consuming—changes according to particular eras of history and under specific fuel regimes. By looking at pre-industrial and “innocent” industrial literature from our position in the Anthropocene, we can re-read its action and emotion with a circumspect view of the implications and effects of living through particular kinds of energy. The ecocritical turn to ontology has generated critique that high-theory metaphysics frivolously replaces more grounded work in the ethics, politics, and cultural relativities of eco-literary thought that has characterized the last decade, at least, of critical scholarship. However, far from eliding the nexus among culture, nature, and economy that guides the vastly diverse global experiences of a lived environment, this foray into energy ontology is aimed at more specifically capturing how the material and cultural contexts of particular historically-embedded energy sources have intrinsic effects based on class, race, geography, gender, and justice. Energy ontology is less about the abstract musings of the empowered sitting atop a pile of fossil-fueled privileges, and more about conducting revelatory contextual scholarship that places the Anthropocene consumer in an enlightened history of evolving energy regimes. An essential aspect of that history hinges on the lives of laborers, producers, and bystanders, who often bear the brunt of environmental injustices based on socio-economic disparity.

In using the word ontology, I do not mean to invoke the metaphysical definition of the study of the kinds of entities that exist in the universe, which held sway in Ancient Greek philosophy. Instead, my meaning partakes of the more recent tradition, beginning with Husserl and Heidegger, of calling on fundamental ontology to define the social nature of human existence: its qualities and quantities, its community, its physicality, its environment, and its ethics. Within his ontology Heidegger locates the figure of *Dasein*, which in John Haugeland's words is “a way of life shared by the members of some community” ([1], p. 423). Our shared way of life in the early twenty-first century is starkly different from the shared way of life experienced in the eighteenth century, mostly due to the primary cause of fuel sourcing. Secondary and tertiary effects reflect back on the primary one: higher population levels (there are 10 people on the planet now for every 1 in 1750) are supported by industrial agriculture, mechanical construction, and modern medicine; occupations have shifted from biomass to fossil-fuel based work, from farmer and hostler to truck driver and computer engineer; entertainment that used to be self-generated, such as community dances and folk music, is now most often the product of industries that entertain passive consumers. When we binge on Netflix, we are consuming the fossil fuels poured into every stage of the process: development, writing, production, distribution, marketing, and of course, the petroleum-wrought device (computer or television) and its power. With renewable energies like solar and wind rapidly becoming economically competitive, in time we will see the fossil-fueled load redistributed to these renewable sources, but the paradigm of a fossil-fueled ontology remains largely unchallenged. Fossil fuels cultivate a paradox of ferocious passivity.

Since energy ontology is intimately linked to fuel source, energy scholars in the humanities regularly use the concept of ontology to generate insights related to the industrial human condition.

For example, Stephanie LeMenager describes artistic reactions to the BP oil spill of 2010 by suggesting that these protests “locate the human, as an ontological category, within industrial-era infrastructures that may be not only in the throes of failure but also predetermined to destroy basic conditions of (human) living, such as water systems” ([2], pp. 105–6). Fuel does not lie in the background or in abstraction; fuel sourcing actually designates the human experience of local and global, slow and fast, boring and exciting, sustainable and thanatopic. The more energy dense the fuel source (read: petroleum), the closer energy ontology lies to the second of these parallel terms: global, fast, exciting, and driving toward death.

Incredibly, our industrial culture has mostly forgotten what it was like to exist in a biomass world: sustainably, locally (even parochially), and slowly—no faster than a horse’s gallop. To consider the comparative literatures of energy as they relate to transportation, we will begin with wind, then consider muscle-driven biomass giving way to coal locomotion, and conclude with the highest octane fuel, petroleum. My interest is in how the fuel depicted in literature illuminates historical moments in which the interfaces between self, society, and nature are configured by specific energy regimes. By using literature as a source text, we may arrive at an emotionally and philosophically more robust synthesis of energy history than the social and natural sciences, relying upon objective accounts and statistics, are able to provide.

A society’s fuel source opens a landscape of possibility for the kinds of ideas, ambitions, and evolutions in which the culture can engage. At this point in geo-global history, the Anthropocene, we must consider how the type and supply of fuel available have an essential role in carving out the infrastructure, social relations, values, and impacts that characterize different fuel cultures through time. Collective self-questioning enables both emotional and technological evolution away from destructive routines, namely, the fossil-fueled routine that drives climate change, and toward a frontier of sustainability that will characterize the low-carbon future.

Consider briefly our fossil fuel ontology. Without coal, there would be no steam engine-driven industrial revolution, and therefore no mass production, no culture of compulsive consumerism, and much less climate change. Without oil, not only would our living landscapes look entirely different—probably organized around steam-driven railways and muscle power—but our cultural values, ambitions, fetishes, and fantasies would shift as well. Without oil, not only would cars and highways shrink or vanish, but also we would be living in a highly diminished, if not unborn internet age, revoking as well its paired twenty-first century culture of viral self-absorption. Oil ontology gives each individual consumer the illusion of being superhuman, in terms of speed, strength, access to information, and communication. Oil is an emancipation from the severe limits of a biomass world: it is a form of apotheosis. It transforms our physical body from bio-muscular to techno-mechanical, which affords superhuman capabilities. Your car can exert forces a hundred times stronger than a traditional pair of carriage horses, and a thousand times stronger than your spindly legs. We are masters of oil’s raw power, but we have signed a contract that works in reverse, too: because of our reliance on it, oil masters us. The implications of this energy codependence extend into new media studies and internet culture, which would be difficult to imagine in its current form without the input, energetic and material, of coal- and natural gas-fired electricity and petroleum-based plastics at all stages of the process: design, manufacture, marketing, and consumption.

Fossil fuels have such power and allure that it has become difficult to see what came before them: two distinct pre-industrial worlds. The first was characterized by itinerant human cultures that hunted and gathered food and built mostly ephemeral, locally-sourced structures for the vast majority of our 200,000+ year history as a species. These ancestors lived in a world of biomass energy. Plant and meat calories fed muscles that performed work mostly by walking and hand-processing raw materials. The second paradigm of agriculture came about more recently, only about 14–12,000 years ago, and these agricultural systems were also mostly biomass-powered. Since agriculture required fixed settlement and generated more calories from domesticated grains, animals like horses and cattle lent their muscles to work in exchange for food, and the farmyard also provided new culinary

amenities like eggs, milk, and tender meat. Still, all was biomass: solar energy stored in plants and converted into muscular work in sustainable, annual cycles. Culture bobbed along with its nose just above the energy line. Gradually, agricultures innovated harnesses for ambient sources of energy like wind and water. A long time after the advent of agriculture, the technologies of sailing ships, water wheels, and wind mills would generate energy to help shoulder the load (about 5000 BC, 300 BC, and 100 AD, respectively).

2. Results

2.1. Elemental Energy: The Wind

In addition to water mills and their cousin, windmills, one other source of primary energy had an indelible effect on the growth of pre-industrial civilization: wind over water, captured in the full sail of the ship. Societies built upon navigable waterways with access to the ocean have been historically dominant—from the Egyptians, Greeks and Phoenicians of antiquity, to the Spanish and Portuguese in the Age to Discovery, to Britannia ruling the waves in the Age of Empire. Wind on water made a global economy possible. Wind on water fueled the exchange of raw natural resources for finished goods, and it also supplied labor to the shores of production, most infamously in the Middle Passage between Africa and the Americas, which consigned tens of thousands of Africans to their deaths on the high seas, and millions more to slavery. Sailing ships opened the world first to intercontinental discovery, to colonization, and to the exchange of goods across the globe. Sailing ships were our first power tool, lending a sense of how we might live as superhumans, liberated from the meager means of our animal muscles. By the apogee of the sail, the eighteenth century, the most efficient clipper ships were able to capture more than 200 times the power from wind in exchange for the muscle power that operated them (200:1 is still meager next to the 500:1 exchange of a coal miner) ([3], p. 18). With superhuman power comes all the avarice and cruelty, all the wanderlust and gumption, which have marked expansionist societies since the Ancient Egyptians first lashed planks together into a hull and set sail on the Red Sea five thousand years ago.

Aeolus is the god of the wind and its keeper. In some Greek myths, he is the son of the ocean god Poseidon, as the wind and the sea had a close relation in the Greek mind. The second oldest piece of Western literature—Homer's *Odyssey*—gives Aeolus an essential role in deploying wind energy in order to assist the world-weary Odysseus as he meanders the seas traveling back to Ithaca. Living a contented life among his large and incestuous divine family, Homer's version of the wind god does not embody the restless power of his device. Aeolus feasts Odysseus and his men on his eponymous floating island and, hearing their plight, grants them the best present the globe has to offer: a steady West Wind directly conveying them back to their native shore. This being an epic, Aeolus complicates the benediction by also giving them a Pandora-like wind-bag, literally "a wallet, made of the hide of an ox of nine seasons old, which he let flay, and therein he bound the ways of all the noisy winds" ([4], p. 120). Aeolus secures his treacherous present "fast in the hold of the ship with a shining silver thong, that not the faintest breath might escape," and he sends the ship's crew on their pregnant-sailed way west, to Ithaca ([4], p. 120).

For ten days Odysseus holds three sheets to the wind (quite soberly), trusting no other hand to do the actual sailing. This work tires him out, and as they sight Ithaca, with its welcoming beacon burning brightly onshore, the hero falls into a luckless slumber. His sailors take this opportunity to satisfy their curiosity about the gold that may lurk in Odysseus's purse, going below decks and piercing the wind-bag: "And the violent blast seized my men, and bare them towards the high seas weeping, away from their own country...the vessels were driven by the evil storm-wind back to the isle Aeolian, and my company made moan" ([4], p. 121). Petty avarice unleashes a cosmic fury. Odysseus receives no comfort or understanding from Aeolus, who observes that a man so little under control of his hands is "the most reprobate of living men. Far be it from me to help or to further that man whom the blessed gods abhor!" ([4], p. 121). Odysseus must be cursed, if the winds of north, south, and east conspire

against his course true west. In *Ulysses*, James Joyce adapts this “epic fail” to modern times in his Aeolus chapter, set in the Freeman newspaper offices. Joyce evokes the wind-bag in its more familiar metaphorical sense by having the characters mock the inflated rhetoric of various speechifiers.

In Virgil’s *Aeneid*, Aeolus is a god who keeps the winds enchained in a deep cave, acting as both jailor and counsellor. Aeolus whispers to them, “softening their passions, tempering their rage: if not, / they’d surely carry off seas and lands and the highest heavens, / with them, in rapid flight, and sweep them through the air.” Virgil’s metaphor for the wind’s contained power comes from his audience’s closest acquaintance with force: the horse. Aeolus knows how to “tighten or slacken the reigns” to deploy wind energy to his advantage, and he does so when Juno promises him possession of her daughter Deiopea, the “loveliest in looks,” in exchange for a devastating storm that would destroy the sailing fleet of the Trojan Aeneas. The furious, choreographed storm leaves Aeneas wishing he had perished on the shores of Illium with Hector, rather than suffer the tumult of water, sand, and wind that scuttles his fleet. Happily for Aeneas, the gods have monumental egos and Neptune is displeased that his ocean is disordered by the Aeolean winds, which he orders back to their cave in the lonely mountains. Neptune paternally soothes his seas and the bedraggled fleet of Aeneas finds what remaining winds it can to “tack towards the Libyan coast,” the closest land, where they may “stretch their brine-caked bodies on the shore.”

These early invocations of the wind indicate an extension beyond a material resource into the realm of luck and fate, ministers of the gods. Mortals contend with an entity that cannot be captured and controlled in the way that land resources might be. The wind is all-powerful and ineffable; it is subject to control only in the small measure of a sail’s breadth; like rain, it is summoned by supernatural intervention rather than scientific study of the material world. The wind behaves as a physical force that might help or hinder mortals, but it simultaneously represents an augury. To do work in this pre-industrial world, to move heavy objects through space, requires a benediction of wind rather than a methodical use of an available resource. It requires prayer and supplication. It also requires knowledge, technique, and savvy to navigate an indifferent wind by tacking and harboring, along with tolerance of mystery, vagary, and misfortune. This mindset of being laid open to the fortunes of an equivocal cosmos is quite foreign to the industrial world, with its ready stores of reliably intense fuel feeding hungry engines that are under the complete control of humans. In the wind-world, progress is not inevitable; it is fortuitous. When fortune blows the other way, one must sit and wait, and perhaps even contemplate the futility of ambition in a world of self-cancelling forces. The sailor beneath the sail always understands the limits of his autonomy; the sailor beneath the steamship’s smoke-stack often does not. When coal-driven steamships took over in the nineteenth century, much of the pantheistic lore of the seas died along with the sail, and navigators looked into their machines for the essence of power. Coal energy was able to supersede nearly any unfavorable condition, and we became as gods: autonomous, irreverent, and self-absorbed.

In many early literary uses, the wind is an engine of divine will. In effect, the wind acts as a physical indicator of something inscrutable—it makes the hidden will of the gods known to man. Even if unjust, capricious, and cruel, this blustery force unites the supernatural with the natural and maps out the human place in the cosmos. The un-reason of divine will translates directly into our rational perception of physical phenomena, supplanting agency and justice with fact and effect. My ship faces a headwind: the gods must be angry. If not rational, this dynamic is at least perceptible and was highly influential in literary history. The topos of wind literature lingers in purely metaphorical grounds, where the poet likens his condition to the bewildered mariner’s plight. Early modern writers were fond of using the chagrin of the luckless sailor to capture the emotional pains of the lost, disfavored, and unloved poet. Sir Thomas Wyatt, that famous lamenter who modified the Italian sonnet for English use in the sixteenth century, shows how the wind can fill an extended metaphor. His sonnet is titled by its first line:

My galley, chargèd with forgetfulness,
Thorough sharp seas in winter nights doth pass

'Tween rock and rock; and eke mine en'my, alas,
 That is my lord, steereth with cruelty;
 And every owre a thought in readiness,
 As though that death were light in such a case.
 An endless wind doth tear the sail apace
 Of forced sighs and trusty fearfulness.
 A rain of tears, a cloud of dark disdain,
 Hath done the weared cords great hinderance;
 Wreathèd with error and eke with ignorance.
 The stars be hid that led me to this pain;
 Drownèd is Reason that should me comfort,
 And I remain despairing of the port.

The galley, a ship most often propelled by muscle power using oars, is here a vehicle that carries the poet's grief across deep fathoms worried by uncertain winds. Emotion imposes all the violence of a god-stirred angry sea. Wyatt crosses hopeless love ("mine en'my" and "my lord") with sea-nature, translating the adventure-crisis into an existential one: the literal voyage exists only to draw out a metaphorical one. Likewise, the "endless wind" that "doth tear the sail apace" is a colorful way of imagining emotional adversity and bewilderment, as the poet suffers from stellar disorientation ("the stars" were a Renaissance conceit for a lady's fine eyes). This is a poem about heartache, but its entire imaginative structure is built upon wind power, and specifically our inability to make earth's elemental energy work in our favor.

Shakespeare's famous sonnet 116 ("Let me not to the marriage of true minds") describes a very different journey: Love "is an ever-fixèd mark / That looks on tempests and is never shaken; / It is the star to every wandering bark, / Whose worth's unknown, although his height be taken." In the two sonnets, the same elements assemble to opposite effect: for Shakespeare, love defies an adverse wind; love is a North Star that keeps the voyager on course. These poets were employing the tools available to their time in history and their culture. After the British navy defeated the Spanish Armada in 1588, it was acknowledged as the world's mightiest and maritime pride pervaded British culture. However, the 130 Spanish ships were less devastated by the English fire-ship attacks than they were by a fierce North Atlantic storm that roared for two weeks and scuttled many on the Scottish and Irish coasts ([5], p. 13). Elizabeth I gave thanks to a Protestant God for delivering England from the Catholic Spaniards, and had a medal minted with the words *Flavit Jehovah et Dissipati Sunt*—God Blew and They Were Scattered. The so-called Protestant Wind made a legend of the Virgin Queen and strengthened the Protestant cause across Europe. The action of the elements was taken to represent divine will; luck was interpreted as destiny. Some modern scholars attribute this vicious weather pattern in 1588 to the accumulation of polar ice in the North Sea caused by the Little Ice Age ([6], p. xvi). Far from supernatural, the Protestant Wind was a tantrum thrown by an unbalanced climate, the kind of anomaly that is familiar in our intemperate times.

Still, giving winds have a magical quality about them, as if summoned from good spirits and operating on the level of incantation rather than meteorology. In the middle of that pirate-infested, sea-shanty century, the eighteenth, Olaudah Equiano wrote his narrative of the African Prince who was kidnapped by privateers and taken across the Middle Passage. Having never seen a ship before, Equiano "asked how the vessel could go" and was told by captors about the mast and the ropes, but also he perceives "some spell or magic they put in the water" to control navigation. Samuel Taylor Coleridge's "Rime of the Ancient Mariner" brings these supernatural qualities to the wind, and his reckoning with the elements results in a parable of virtue and transgression in the natural world. In such a famously weird, haunted poem, it is easy to forget that ships like the Mariner's, leaving from British ports in the eighteenth century, had mandates for trade or exploration. The fanciful winds, in league with other uncontrollable forces like weather and disease, were read as a text that indicated some divine opinion on the enterprise, just as the Greeks had read the winds. Favorable winds literally

carried the voyage across the seas and figuratively enclosed the ship in a bubble of supernatural favor. In Coleridge's superstitious poem, as soon as the Mariner commits the inexplicable sin of killing the albatross, the sailors start their close reading of the wind to see what judgment might ensue. At first "the good south wind still blew behind," escorting the ship from cold Antarctic waters, through the Torrid Zone towards the equator. This good omen merely tricks the sailors into league with the sinful Mariner, and once they all are of a bird-slaying mind, "Down dropt the breeze, the sails drops down, / 'Twas sad as sad could be; / And we did speak only to break / The silence of the sea!"

The ocean seems to die around them; the sun desiccates the living: "Water water everywhere, / Nor any drop to drink." They enter a thirsty purgatory, trapped on a wind-less ocean so still it seems petrified. The only remaining element is the damning sun hammering down upon their misery. Meanwhile, personified "Death" sails on a windless ocean; she pulls broadside their becalmed vessel and parts souls from bodies. However, the original sinner, the Mariner, must stay on board until he is absolved for his act of wanton destruction, after he blesses the sea snakes. Once the sea snakes receive that blessing, nature breathes life into slack sails: "And soon I heard the roaring wind: / It did not come anear; / But with its sound it shook the sails, / That were so thin and sere." Here, Coleridge chooses to move entirely into the supernatural element while leaving the literal wind behind. The roaring wind dissipates and no breeze ensues, yet "Slowly and smoothly went the ship, / Moved onward from beneath." By disinvesting the metaphor of the wind from its connotation of divine benediction, Coleridge makes the ship's progress suspect and the Mariner's fate equivocal, as the zephyrs whisper "The man hath penance done, / And penance more will do." The riddle of the wind extends through the poem, evading any neat explanations while cultivating a sense that the elements in this poem are choreographed by equivocal fates. The sails, "thin they are and sere," like dead leaves, are no longer the powerhouses of a weighty British enterprise, they are tattered ghosts flitting above the decks of a cursed vessel. Estranged from their design and purpose, the sails signify a complex human failure not only to control the elements, but even to understand the exchanges between act and fate in a super/natural world. Coleridge tempts us with Homeric clichés of the benedictory wind, but all that remains in the end is an empty vessel of a man uttering the tag line, "He prayeth best, who loveth best / All things both great and small." Liberated from the moral machinations of judgment and favor, the wind in the "Rime of the Ancient Mariner" signifies indissoluble mystery and a secret life of nature that transcends humans, a Romantic zephyr indeed. Within Coleridge's lifetime, the wind would become superfluous to the world of trade and travel. Humans no longer needed divine favor to drive across the seas; we needed only coal.

As the sail made way for the steam-driven propeller, many of the aesthetic qualities of being at sea changed. The expertise required to cross safely lapsed, replaced by a new set of engineering skills far removed from traditional wind aptitudes in tacking, beating, reaching, and running. Because the source of energy moved from external to internal power, the crew's attention shifted from the natural elements to the machine working within its hull. Stellar and coastal orientation gave way to instrumentation. The ship's range became not a question of skill, season, and prevailing winds, but a calculus of fuel efficiency. Like many of the analogous changes in transportation brought by fossil fuels, abandoning wind power implied leaving behind an acute perception of the cosmos in favor of an infatuation with internal engine-works. This involves more than devoting our time to industrial machines instead of hauling yards under the suggestive, twinkling stars. It is truly an ontological shift in which the nature of our existence changes from a relationship between humankind and nature to a relationship between self and mechanism. The world shrinks down from a global cosmos of tumult and calm in which nature is a character in its own right, to an egocentric negotiation between humans and their gizmos. Natural conditions become merely a stage for human/machine action, a device for heightening the drama in a storm or dressing up romance in a sunset. Sailing ships sink because of battering external conditions; steam ships often sink because their massive internal energy can cause trouble. The essence of failure or success depends upon the design of the contraption and the competence of the people trained to operate it. The Titanic sank from a primary cause of its own

coal-fired velocity ordered by a captain thirsty for fame; the iceberg floating on calm seas merely provided the means of destruction.

2.2. Horse and Rail—The Nineteenth Century Shift

The coal-fired steam engines of stationary industry led to the reorganization of the workplace in the early nineteenth century, but steam engines drove an even more sublime revolution in transportation industry soon after. If stationary industry changed cities, moving industry changed everything in between. The channels along which people travelled by land shifted from muddy, pocked turnpikes to smooth rails, and by sea from meandering trade winds to shortest linear crossings. The manifold advantages of this revolution of moving industry included time saved, more accurate schedules, larger and heavier hauling capacity, and a broader access to transportation across social classes. The disadvantages directly correlated to the advantages: the psychological vertigo from the rapid pace of commerce, the imposition of a merciless time grid blind to diurnal and seasonal cycles, greater demand for consumable goods and the raw materials that make them, and the inundation of remote natural places as the new middle class earned vacations and exercised their upward mobility by travelling.

Before the railway, the fastest anyone could travel by land was at the galloping speed of a horse—about twenty-five miles per hour—and this speed was unsustainable for much more than a mile. A more realistic pace in the horse-and-carriage days was about five miles per hour, with a total daily distance of fifty to seventy miles if the whole day was dedicated to moving. A speedy mail-coach might travel over one hundred miles in a day over long hours with several changes in horses while carrying a few thousand pounds of riders and cargo. The fuel was hay and oats—classic agrarian biomass. The locomotive and its coal fuel initiated an absolute paradigm shift. Within a generation, anyone from commoner to Queen could experience speeds of over fifty miles per hour, and could traverse all of England within a day. Not only were locomotives moving steam-engines fired by coal, but also steam-engines that transported coal, traveling from the British midlands to industrial textile centers like Birmingham and Leeds, and population centers like London.

By 1825, locomotives were hauling coal and passengers on the 26-mile Stockton and Darlington Railway in northeast England. This modest installation was soon succeeded by the more important Liverpool and Manchester Railway, which also started as a coal-hauling enterprise but soon turned by popular demand to people-moving. By mid-century, over 7000 miles of rail traversed England and Scotland. In 1830, the Tom Thumb steam engine was running rails in Maryland, the first stretch of the great American railway that would span from the Atlantic to the Pacific, Canada to Mexico, by century's end.

The first woman to ride the passenger railway in 1830 left an enduring account of the sublime new feeling of rapid transport on the Stockton and Darlington line. Referring to the locomotive as a "curious little fire-horse," the actress Fanny Kemble composed an extended metaphor that attempts to link the locomotive to its predecessor:

She goes upon two wheels, which are her feet, and are moved by bright steel legs called pistons; these are propelled by steam, and in proportion as more steam is applied to the upper extremities (the hip-joints, I suppose) of these pistons, the faster they move the wheels; and when it is desirable to diminish the speed, the steam, which unless suffered to escape would burst the boiler, evaporates through a safety-valve into the air. The reins, bit, and bridle of this wonderful beast—a small steel handle, which applies or withdraws the steam for its legs or pistons, so that a child might manage it. The coals, which are its oats, were under the bench, and there was a small glass tube affixed to the boiler, with water in it, which indicates by its fullness or emptiness when the creature wants water, which is immediately conveyed to it from its reservoirs. There is a chimney to the stove, but as they burn coke there is none of the dreadful black smoke which accompanies the progress of a steam-vessel. This snorting little animal, which I felt rather inclined to pat, was then

harnessed to our carriage, and Mr. Stephenson having taken me on the bench of the engine with him, we started at about ten miles per hour.

George Stephenson the engineer is in Kemble's eyes "the master of all these marvels," and she is "most horribly in love" with his clipped northern accent and the dour aspect of the Romantic hero. His passenger appreciates the sensations of rail travel, the "flying white breath and rhythmical, unvarying pace" of the strokes down the line. Kemble notes the engineering surrounding the iron horse, including the path along "rocky walls, which are already clothed with moss and ferns and grasses...great masses of stone had been cut asunder to allow our passage." She implies that the incision of rails into the skin of the landscape is soon healed with a pleasing secondary greenery that softens the cut rocks, a symbiosis of built and natural landscapes. The railway is not smoky, and it is green. The fifteen-mile journey crosses a swamp and a deep valley which had presented monstrous engineering challenges. The line was laid by filling the swamp with tons of hand-hewn rocks supporting a rail platform, and a grand stone viaduct leapt across the Skerne river valley. Eventually Stephenson opens up the engine to

its utmost speed, thirty-five miles an hour, swifter than a bird flies (for they tried the experiment with a snipe). You cannot conceive what that sensation of cutting the air was; the motion is as smooth as possible, too. I could either have read or written; and as it was, I stood up, and with my bonnet off "drank the air before me." The wind, which was strong, or perhaps the force of our own thrusting against it, absolutely weighed my eyelids down. When I closed my eyes this sensation of flying was quite delightful, and strange beyond description; yet, strange as it was, I had a perfect sense of security, and not the slightest fear...[as] this brave little she-dragon of ours flew on.

Carried away from any mundane ideas of mere transportation, Kemble's account revels in a sense of supernatural wonder at the miraculous technology. Even her bonnet is drunk on the sensation of moving. It is the alchemy of modernity, and Stephenson holds the philosopher's stone. Out of the heavy, dull elements of iron and coal come the floating, sparkling impressions of a woman in flight, defying gravity, rocky obstructions, and time itself as she hurtles through space and into the future with "a perfect sense of security." She is blinded literally by the wind velocity, but also blinded in enchantment by the force and speed of the "she-dragon" and the machine's stern maker. The slow biomass plod has no place in the new rail-running world.

Enthusiastic first impressions like Kemble's were part of the pro-rail rhetoric of the early nineteenth century. Young Queen Victoria arranged for her own Royal Train to transport her from Windsor Castle to London in 1842, and in 1901 the then-ubiquitous train bore her body out of London for burial. Still, the magnificent iron horse did not ride onto the scene unopposed. Debates in Parliament in the first half of the nineteenth century included irrational fears that the cows would cease to give milk, hens would go off-lay, and useless horses would go extinct ([7], p. 1050). The debates also voiced the rational fear that the process of laying down a rail network would irrevocably alter the landscape and a deep-seeded, pastoral way of life as hundreds of new stations shuffled people by the millions between city and country. With the railway, commerce was no longer confined to the industrial centers, but could cluster around every station on the line—a dream for developers and the underemployed, and a nightmare for the culturally and environmentally conservative thinkers of the day, like William Wordsworth.

Coal-driven trains enabled the first long-distance commutes between cities and the country, but they also opened the portal to far-flung tourism and could carry the masses more effectively than the travelling chaise-and-four. In the pre-locomotive England of *Pride and Prejudice*, for example, Elizabeth Bennet's "tour of pleasure" to the Lake District with her uncle and aunt Gardiner is curtailed by time: due to Mr. Gardiner's demanding business schedule, the original month-long trip is shortened to three weeks. It is serendipity: they only go as far as Pemberley in Derbyshire. The difference in distance seems trivial to our fossil-driven sensibilities: it is about 130 miles from the Bennet home in

Hertfordshire to Derbyshire, and about 250 miles from Hertfordshire to the Lake District. The greater distance could be traversed easily in a day using coal or petroleum. However, Elizabeth, traveling on the power of oats and roadside grasses, could not manage such a round trip in three weeks, since they could travel on average only about thirty miles per day. She owes her chance reunion with Darcy to the limitations of biomass, and the sexy comedic ending of *Pride and Prejudice* might have been an old-maid tragedy had the novel been set a generation later. (Then again, a Victorian-era Elizabeth might have met a wealthy young industrialist of no particular family, as Margaret Hale beguiles the new age Mr. Thornton in Gaskell's *North and South*.)

The railway skeptic Thomas DeQuincey, in 1849's "The English Mail-Coach," uses the bodily effort of the horse to draw an ontological distinction between stagecoach and railway travel. The railway boosters boast of the velocity of the trains, the super-animal speeds and distances they attain. However, DeQuincey, a loquacious narrator, argues that their chatter misses the point.

...seated on the old mail-coach, we needed no evidence out of ourselves to indicate the velocity. On this system the word was not *magna loquimur*, as upon railways, but *vivimus*. Yes, "*magna vivimus*"; we do not make verbal ostentation of our grandeurs, we realise our grandeurs in act, and in the very experience of life. The vital experience of the glad animal sensibilities made doubts impossible on the question of our speed; we heard our speed, we saw it, we felt it as a thrilling; and this speed was not the product of blind insensate agencies, that had no sympathy to give, but was incarnated in the fiery eyeballs of the noblest amongst brutes, in his dilated nostril, spasmodic muscles, and thunder-beating hoofs. The sensibility of the horse, uttering itself in the maniac light of his eye, might be the last vibration of such a movement; the glory of Salamanca might be the first. But the intervening links that connected them, that spread the earthquake of battle into the eyeballs of the horse, were the heart of man and its electric thrillings—kindling in the rapture of the fiery strife, and then propagating its own tumults by contagious shouts and gestures to the heart of his servant the horse.

The simple pleasure of muscular strain is transferred from the galloping horse to the thrilled rider, who at eight miles per hour feels more alive than the rail-rider at fifty. DeQuincey celebrates the empathy between horse and human, feeling the fire and light of the body electric, an affinity that is impossible to cultivate between human and machine.

But now, on the new system of travelling, iron tubes and boilers have disconnected man's heart from the ministers of his locomotion. Nile nor Trafalgar has power to raise an extra bubble in a steam-kettle. The galvanic cycle is broken up for ever; man's imperial nature no longer sends itself forward through the electric sensibility of the horse; the inter-agencies are gone in the mode of communication between the horse and his master out of which grew so many aspects of sublimity under accidents of mists that hid, or sudden blazes that revealed, of mobs that agitated, or midnight solitudes that awed. Tidings fitted to convulse all nations must henceforwards travel by culinary process; and the trumpet that once announced from afar the laurelled mail, heart-shaking when heard screaming on the wind and proclaiming itself through the darkness to every village or solitary house on its route, has now given way for ever to the pot-walloping of the boiler. Thus have perished multiform openings for public expressions of interest, scenical yet natural, in great national tidings,—for revelations of faces and groups that could not offer themselves amongst the fluctuating mobs of a railway station. The gatherings of gazers about a laurelled mail had one centre, and acknowledged one sole interest. But the crowds attending at a railway station have as little unity as running water, and own as many centres as there are separate carriages in the train.

The heart of a collective human purpose is severed from animals by the culinary pot-boiling of the steam locomotive. For DeQuincey, the fellowship between horse and rider is a sublime alliance in

line with the high points of animal intimacy. Travel and delivery by horse offers irregular rhythms in a variable ratio of reward. It is not slotted into an industrial scheme that shrinks the distance between London and Edinburgh into a numbered cell on a time-table. Likewise, the rider and the people at his destination have “one centre” and “one sole interest,” whereas the crowds on the railway platform embody the anonymity and oblivion of a million self-interested atomies in continual dissolution. The horse has gravity; the locomotive, repulsion. DeQuincey’s florid style exaggerates to the point of eliding the similarities between horse and steam-engine in the modernizing transportation system. By the nineteenth century an improvement in roads through macadamizing meant that stagecoaches and mail-coaches were on strict timetables that rivalled the efficiency of the train, and passengers in a coach were just as likely to ignore one another as those on a railway carriage. The “electric sensibility of the horse” was often neglected in preference for a practical and often cruel extraction of maximum labor from an animal that was easily replaced when exhausted. We look to DeQuincey for the spirit of the idea, more than its reality in the early industrial era. The competition between horse and rail travel promoted a speed-based incentive among coach drivers, which has never since diminished in industrial-era transportation. The mid-nineteenth century coach industry showed a familiar adaptation to the coming paradigm shift: it became as much like the new technology as possible, thus sacrificing many of the characteristics that had defined it in earlier ages. As detailed in Anna Sewell’s *Black Beauty*, horses were treated like machines, and the care and intimacy of the horse-and-rider relationship faded into an earlier biomass era, into the realm of nostalgia.

2.3. Gas-Powered: The Road in the American Century

The single most potent symbol used in the rhetoric of American freedom is the open road. Though Americans spend most of their driving time in local traffic, the frontier-piercing highway continues to work powerfully on the national psyche. Equally powerful emotions of frenzy and animosity weigh heavily in American driver’s seats as the open road turns to the exurban imbroglio. These petro-propelled emotions are a psychological correlative to the fuel itself, the fantastically powerful fluid that contains, in a single liter, the same energy a man would need five weeks of hard labor to exert. This superhuman energy was made quotidian by its cheap availability and the rapid transformation of civil infrastructure to accommodate its vector, the car. With such power at our fingertips, it is not surprising that petroculture quickly adopted ideals of speed and power in its machines. The interstate system, the legacy of President Eisenhower, is the most celebrated investment, but the entire twentieth century offers a similar history of conquering space and time with convenience and speed, and suppressing wildness with a tarmac of interconnected roads over the land. This highway lattice represents the creation of a new dimension of being—one in which origin and destination are fused, not by the prairies or mountains that actually exist, but instead by a quintessential petro-cognitive dimension that feeds on speed and self-absorption.

The American road trip is fundamentally about discovering one’s self in relation to nothing in particular—or at least, nothing lasting. The road traveler’s shadow pitches over a hundred different scenes, a mile or more per minute, traversed with such ease that the places are little more than sketches of themselves, forgotten as soon as the next frame comes into view. The only vestige the visitor leaves behind is the imprints of her credit card and carbon dioxide. Echoing DeQuincey’s equine delight, American road literature shows a persistent confusion that equates driving with being alive, with being powerfully embodied by the prosthetic automobile ([2], p. 80).

Jack Kerouac’s autobiographical novel, *On the Road*, describes one ennui-filled station of life in which Sal Paradise and Dean Moriarty acquire a 1947 Cadillac limousine. This car was six feet tall, nineteen feet long, seven feet wide, weighed over 5000 pounds, and was propelled by a 5.7 liter V-8 engine of unknown (and unspeakable) mileage-per-gallon. What a car for a romp from Denver to Chicago, blitzing across those monotonous plains and racing recklessly through sleepy farm towns! This kind of car makes no apologies, it makes impacts. Sal’s account of the trip demonstrates how this oil-driven existence is at least as much cognitive and ontological as it is physical:

In no time at all we were back on the main highway and that night I saw the entire state of Nebraska unroll before my eyes. A hundred and ten miles an hour straight through, an arrow road, sleeping towns, no traffic, and the Union Pacific streamliner falling behind us in the moonlight. I wasn't frightened at all that night; it was perfectly legitimate to go 110 and talk and have all the Nebraska towns...unreel with dreamlike rapidity as we roared ahead and talked. It was a magnificent car; it could hold the road like a boat holds on water. Gradual curves were its singing ease.

'You and I, Sal, we'd dig the whole world with a car like this because, man, the road must eventually lead to the whole world. Ain't nowhere else it can go—right?'

"The road" has become an access path to "the whole world"—the twentieth century American need not exit his vehicle to see it all. Added to the spatial conquest is a temporal one: Nebraska seems to be unrolling from Sal and Dean's future straight into their past. At 110 mph, each foot of ground occupies only 0.0062 seconds of their lives. A mile that would take twenty minutes to walk passes by every 32.7 seconds. Time-space is contracted from our evolutionary standard of walking down to about 1/40th of its original size. My, those Great Plains seem miniscule, on petroleum! Not only has the world shrunk, but it has also abstracted, transformed into a surreal picture-show in which an old-fashioned (probably diesel) locomotive falls behind the car's pace under the light of the vanishing moon. In his dream-reverie Dean, at the wheel, imagines himself much larger because the world appears so much smaller; it is barely memorable because it has never really been perceived. Nebraska is a flat, fast, darkness.

Sal and Dean have an idea of space, an impression of time, which the gods might share as they gaze down from Olympus. Their nectar is petroleum, their lightning bolts are eight valves punching power to the wheels, and Dean, with his frenzy of power and caprice, is Zeus. The liberty from space and time made possible by fossil fuels carries with it a sensual ecstasy that frequently blends with manic madness: it is a road fiction that imagines how it feels to live, and to die, by automobile ([2], p. 91). Dean and Sal use the car as a way to chase *thanatos*, the death-drive that is thrilling because of its inherent risks. The physical experience of raw power and momentum far beyond the body's limits had previously belonged to a world of dream and fantasy, but the carbon-borne experience grants us a mighty prosthetic ([8], p. 52). From Charles Lindbergh's wings high above the Atlantic to Kerouac's maniac wheels belittling the Great Plains, the modern, oil-borne body is a cyborg that trains muscles to maintain machines. Our bodies no longer end at our toes and fingers, but somewhere further—the wheel, the pedal, the petrochemical pavement.

Such flights of altered consciousness, the psychic and erotic highs, do not last. Space and time do eventually run out and wrestle the flesh-body to the ground. The next day, the rest of humanity returns, and Dean's night of petro-ecstasy turns into zombie-like withdrawal. Sal recalls:

I went to sleep and woke up to the dry, hot atmosphere of July Sunday morning in Iowa, and still Dean was driving and had not slackened his speed; he took the curvy cornfields of Iowa at a minimum of eighty and the straightaway 110 as usual, unless both-ways traffic forced him to fall in line at a crawling and miserable sixty. When there was a chance he shot ahead and passed cars by the half-dozen and left them behind in a cloud of dust.

Great horrors that we were going to crash this very morning took hold of me and I got down on the floor and closed my eyes and tried to sleep. As a seaman I used to think of the waves rushing beneath the shell of the ship and the bottomless depths thereunder—now I could feel the road some twenty inches beneath me, unfurling and flying and hissing at incredible speeds across the groaning continent with that mad Ahab at the wheel. When I closed my eyes all I could see was the road unwinding into me. When I opened them I saw flashing shadows of trees vibrating on the floor of the car. There was no escaping it. I resigned myself to all. And still Dean drove, he had no thought of sleeping till we got to Chicago.

The too-fast-too-furious scene shifts from a celebration of Dean's prowess to Sal's rising horrors at the terrible forces commanded by a maniac. The double-edged sword of Sal's fear is sharpened by the forces of physics—the multi-ton car and its velocity, $F=ma$ —but also the force of Dean's petro-personality. Dean is bent on annihilating everything between himself and the white whale of Chicago, and killing Chicago once they find it. The weapon is also the road itself, “unwinding into” Sal like a lance, threatening to pierce his prone body at every turn. The car roars, the continent groans, and the battle hastens toward its conclusion at Chicago, with a tamed half-continent left in their dust. Overnight they have performed a remarkable feat, overtly in terms of velocity, but ontologically in the fact that they have traversed space, prairies, rivers, towns, without perceiving anything but their own pleasure and fear. On petroleum, the whole world is magically packed into the brain case, a feat of egotism.

Kerouac's account of the ferocious arc of fuel consumption is among the more famous car trips in literature, a classic vignette of the exhilaration and horror enabled by oil. But the car also infiltrated the scenic byways of textured land, from the intimate folds of Appalachian valleys, to the quilted plains, to the miles-high mountains, to the coasts, rocky and sugar-sand. Prospectors graded and paved centuries-old wagon and hoof roads, and surveyed and laid thousands more *ex nihilo*. These byways were designated spots of beauty to be collectively enjoyed and tax-supported; their paths changed forever the character of the map itself and the places the roads opened to traffic.

Ralph Seager's 1959 poem, “Owed to a Country Road,” is an elegy for the dirt-top tracks lost to the era of paving. The aesthetic of the highway was changing from the organic meander of old dirt tracks laid by centuries of feet and wagon wheels, towards an engineered efficiency based upon least distances. Seager's first sensual accounting of the loss is based on color and light. He misses the “shadowed breeze” on his skin, his feet on the “quiet, cool, receptive clay,” and the woods “crowded in / to watch with green eyes what was going by.” Embedded in the animate woods, the old country road intimately touched the feet and hooves of travelers. The winding route allowed for surprise, the “unexpected view / of doe and fawn, or Paisley pheasant's brood / to grace and color rural solitude.” These intimate encounters between passing individuals were being replaced by bright impersonal vistas arranged by planners to make the road scenic, attractions for car-borne vacationers who perceive only “road and open sky.” Seager notes the violence brought upon the country to convert it into a modern thoroughfare serviceable to long-distance travelers. One packed iambic pentameter line identifies the perpetrators: “Bulldozers gouge and steel blades cut straight through,” and the final effect of the development is one of death by engineering: “I see my hills knocked down, my valleys spanned / Where roads once fitted kindly to the land.” Seager's poem updates the Romantic traditions of Wordsworth and Ruskin, who protested the incursion of rails into places that had been preciously rough; not wildernesses uninhabited by humans, but landscapes in which a long-evolved synergy between nature and culture had engendered unique locales. This protest tradition decries the vulgar homogenization of space, the straightening of organic form into mechanical precision, and the loss of connection, aesthetic, sensory, and ethical, with a landscape.

3. Conclusions

Energy density drives us to dissonant emotions, as prominent energy critics have noted. The desensitization and even comfort Frederick Buell allies with living in an era of apocalypse is intimately related to the pace of fossil fuel culture [9]; Stephanie LeMenager's idea of “petromelancholia” describes a twenty-first century psychological condition that develops as we lose cheap, easy oil extraction methods of the twentieth century and confront loss, failure, guilt, and fear into our repertoire of a shared culture of oil ([2], pp. 102–3); and Tim Morton defines the ecological elegy as a lament, not for something already dead, but for “something that *will have passed* given a continuation of the current state of affairs” that is not the environmental other, but is an ailing ecological body inseparable from ourselves ([10], p. 254). Though these scholars point to the elegiac aspects of energy ontology, there is also a wealth of satire and wry amusement that emerges from

our contradictions, as seen in films like *Idiocracy* and *WALL-E* and cli-fi novels like Atwood's *Oryx and Crake* and Bacigalupi's *The Windup Girl*. Distinct as they are, these ideas all point to the negative aspects of the fossil fuel ontology we experience in the early twenty-first century. Internal, personal conditions like petromelancholia correspond with the external eco-cultural realities of Anthropocene existence: living through the early decades of climate change, mass extinction, and resource depletion. To remind ourselves of the pleasurable aspects of a fossil fueled culture, we need only turn on the TV or browse the commercial internet: images of mighty trucks, frigid air conditioners, new clothes, and diverse foods flung across the world immediately wash us in a promise of abundance.

Perhaps it is this daily tension between the bravado of capitalist production and the ghostly presences of climate change and depletion that causes the most ontological stress in this Anthropocene life. All three paradigms of transportation surveyed in this article exhibit emotional stress. The sailor worries about capricious divine favor; the horseman laments the loss of physical, animal connection and the mass anonymity of rail-riding; the manic car driver caterwauls through his song of rapture and dread. Though they are all innocent of the elusive Anthropocene quality of our own 21st century personal involvement in a global shift toward a new climate that is erratic and inhospitable, they are by no means obsolete worldviews. By re-reading literature through the lens of the Anthropocene, we gain perspective on how earlier insights into the relationship between energy and existence can inform our explorations of today's ontological reality. Energy literature instructs us out of the fossil fuel mindset of world domination and back to a physical realm in which we are small actors in a world guided by capricious forces. Such a reality requires re-inhabitation of our evolved body and emotional immersion to restore an ethic of care and preservation. Employed in this way, literature may provide deep insights into the project of dismantling the egotism that stirs the cauldron of climate change.

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