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King Coal

The paradigm shift is at hand. Earth's most abundant fossil fuel, coal, powered the dynamos of the Industrial Revolution beginning in the eighteenth century. The union of coal with steam engines changed the world. Their synergy required mutual, enabling innovations between the mining and mechanical sciences, which developed rapidly over the eighteenth and nineteenth centuries in Europe and North America. In the wake of this union of fuel with machine, global ecology and human society shifted into a new industrial era. Natural resources conserved by the limits of a low-energy world could be exploited on much larger scales, and the agricultural labor required to produce goods like cotton, which supplied textile mills in England, grew proportionally.

Instead of transportation guided by natural conditions like seasons and weather, coal-fired engines worked human society into strict timetables, largely indifferent to adversity. Our conception of distance expanded from local foot-and-horse reach to regional and global networks of trade and leisure travel. The hard physical work required to produce raw goods, which tended to pay poorly or not at all, continued apace, while the owners of the new industrial architecture shifted to cognitive and managerial roles: the division between blue- and white-collar work. Fueled by coal, a new high-energy economy fostered the capitalist mentality of competition and innovation, and also the degradation of older social networks based on local production, neighborly support, and barter exchange. It would be accurate to replace statesmen's faces on money with lumps of coal: coal built the modern economy and its ideals of production and consumption. All of these fossil-fueled shifts ripple into revolutions in our energy ontology.

Figure 5.1 Oak Creek Power Plant on Lake Michigan, Wisconsin, USA, 2016. Image by the author.

I Workhouse workhorse

The revolution of steam-driven industry began with stationary engines that pumped water out of coal mines to allow deeper and more continuous operation. Out of necessity, coal had been burned with some regularity for hundreds of years before it was brought into the mine and factory in the 1700s, but this coal was generally gathered from easy-access surface deposits and along the coast, where the ocean eroded cliff faces and coal was jetsam gathered like seashells.

Once steam engines were deployed to drain the soupy depths of mines, a self-generating, positive feedback loop was in place: the engines drained the mines to open deeper coal deposits, which fed the engines that drained the mines that opened the deposits, which fed the engines in the factories, and eventually fueled locomotives and steamships that accelerated global trade. Rather than a fully determinist argument that would elevate the technology itself, the steam engine, as a historical actor that caused specific changes, this self-generating coal-driven economy is a blend of technology and historical context. The British were not dragged into an industrial era with their cravats snagged on a locomotive;

their society made a series of choices that favored innovation by fostering competition and rewarding productivity (Nye 3). John Henry aside, the muscles of an organic economy could not compete with the pistons of a fossil-fueled one. There was nothing inevitable about industrialization in the nineteenth century, but once the wheels set down on an even track, the momentum carried its own self-justifying tone.

Despite the Roman and Victorian vogues of wearing coal as jewelry, “jet jewelry,” coal has always brought with it a clutch of negative connotations, most popularly Santa’s judgment of bad children. Before the Industrial Revolution that coal made possible, it was perceived as a noisome annoyance associated with disease, death, and the devil (Freese 27–8). Anthracite, a hard form of coal, shares its Greek root with anthrax because the latter is a bacterial disease that consumes the skin in boils that resemble burning coal. Coal itself resembled the buboes, the swollen lymph nodes that wracked European bodies during the bubonic plague of the fourteenth century.

Coal smoke is generally perceived as noxious in odor and color, and long-standing miasmatic theories of disease associated its smoke with sinister health effects. In 1257, Queen Eleanor of England complained of the lung-searing coal smoke surrounding Nottingham Castle. When it was used to cook, coal tainted the taste of food and beer (Brimblecombe 8–9). By the time of Queen Elizabeth I, there was a clear lower-class association with coal that her successor King James I sought to dispel by introducing low-sulfur anthracite coal from mines in his native Scotland (Brimblecombe 30). Anthracite coal burned hotter and cleaner (though only relatively so), making it admissible to higher-class hearths. His advocacy for the use of coal was a success, though its effects demonstrated the divergent paths of economy and ecology that endure to this day. By the eighteenth century, coal smoke was inherent to the ambience of British cities, and it colored the sun, rain, fog, and snow with its murk.

The first recorded use of coal was during the Han Dynasty in China, between 200 BC and AD 200. In Belgium, coal was mined in the High Middle Ages, the early twelfth century. By the early fourteenth century, England exported coal to France, and it had opened up most of its coal fields by the middle of the seventeenth century (Smil 187–8). By the eighteenth century, most western European countries suffered an acute shortage of good timber for fuel wood, naval and civil construction, and charcoal. Some statistics point to a much earlier energy crisis from deforestation in the time of Elizabeth I, when cheaper coal increasingly substituted for timber and charcoal (Cipolla 232–3). The English chronicler Edmund Howes observed in 1631: “There is so great a scarcitie of

wood through the whole Kingdom, that not only the Citie of London, all haven-towns [ports] and in very many parts within the land, the inhabitants in generall are constrained to make their fires of sea-coal or pit-coal, even in the chambers of honorable personages, and through necessitie, which is the mother of all arts, they have very late years devised the making of iron, the making of all sorts of glasse and burning of bricke with sea-coal or pit-coal” (qtd. in Cipolla 271).

Coal saved England from economic ruin caused by deforestation, and propelled it to the leading position in the race to industrialize (Eberhart xv). Other factors were important in England’s success in industry, such as innovations from steam engineers Thomas Newcomen and James Watt, and slave-based labor that steadily supplied raw cotton for textiles. But no engine can be designed without a fuel source in mind, and no factory can be established without a labor force to yoke. Historians have argued that England’s industrial victory was not especially due to its clever innovation, but to the sheer luck of its coal-bearing geology. Robert Allen’s deterministic conclusion is that “there was only one route to the twentieth century—and it traversed northern Britain” (275).

With coal-driven steam, England led global civilization into a complex industrial order, the implications of which are difficult to exaggerate, so comprehensive have been their effects on the biosphere. The conversion from biomass fuel to fossil fuel in the eighteenth and nineteenth centuries is the single most important shift in the human history of fuel sourcing. These two slender centuries saw a tenfold gain in total energy usage in England, a tremendous leap in consumption compared to the relative stability of per capita fuel consumption for the previous millennia (Smil 187–8).

Along with the huge gains in consumable energy that came with coal, there was a shift in the conception of the nature of energy. The machinists who designed powerful new engines brought a materialist theory of energy that could convert any fuel source—grass, wood, coal—into a calculated work potential based on calories. No longer was food sustenance that flowed transcendently through the working body; food became fuel, quantifiable and fungible. And the new machines ate coal, as the cows ate grass, as the worker ate the cow; these equivalencies meant, for example, that the calories in the meat of a half-ton steer were equivalent to about ninety pounds of coal.

This calculation sounds rational to the modern reader: conversions exercise control over disparate elements of a diverse world. But it reflects a signal shift in our perception of nature, from unique elements and diverse creatures to a categorical stockpile of natural resources, which would have seemed weird to denizens of a muscular, biomass world (Johnson 44). The literature of this

industrial era reflects the sense of exhilaration and vertigo imparted by coal-fired modernity, on one hand, as well as its reductive thermodynamic calculus on the other. Coal literature both extends and qualifies the modern declensionist narrative of nature from an imaginative construct of sublime mystery to a measured standing reserve of natural resources. The positive feedback loop between technical advance and evolving energy ontology enables reductive technical tallies of resources as well as the philosophical reviews of our shifting cultural ideas of what nature is.

Coal use evolved through three distinct innovation cycles. In the first industrial cycle, c. 1787–1814, coal-fired stationary steam engines powered textile mills and pumps. The second cycle, c. 1843–1869, brought with it mobile steam engines, locomotives and steamships, and advances in the efficiency of iron metallurgy. During the third cycle, the industrial world was electrified: between 1898 and 1924, coal was introduced into commercial electricity generation in London and New York, it charged electrical motors in factory production, and brought the first electric motorcars onto the roads (Smil 240).

By the mid-nineteenth century, before the widespread discovery of petroleum and natural gas, coal had a tremendous impact on every facet of society, especially in western Europe and the northeastern United States, which were early to industrialize. It directed urban settlement patterns (dense and largely unplanned), labor practices (unvarying gray hours in factories, which replaced the work-by-daylight schedule and the seasons of agricultural life), the labor force (lamentably including children and slaves), demand for raw materials (often from slave-worked colonies near the equator), the makeup of the wealthy (factory entrepreneurs succeeded landed aristocrats), the units of exchange (from barter to the cash nexus), the atmosphere (soot, smog, and black rains), the landscape (sprawling industrial cities, depopulated countryside), transportation (the railroad and steamships permitted faster transportation on strict timetables), architecture (slender glass-and-iron structures replaced heavy masonry and wood), and interior design (dark-patterned Victorian wallpaper hid coal soot), to name just a few. The infusion of massive amounts of fossil energy from coal was the catalyst of all this bewildering change, a social and economic revolution often cited as the most comprehensive transformation of human existence in our quarter-million-year history.

Philosophers of the early industrial era could not have fully realized the array of implications of global coal burning, which liberated society from the privations of a muscle economy. Historian E. A. Wrigley points out that

most Victorian-era essayists failed to recognize coal as a nonrenewable and potentially climate-altering fuel; instead, essays expounded on the invigorated methods of production and distribution or the changes seizing the laboring classes: “Pandora had no prior experience of the irreversible changes which would result from the opening of the jar. For contemporaries the same was true of the Industrial Revolution. Only the generation of Marx, Toynbee, and Jevons was able to gain an understanding of what had taken place” (51). The revolutionary literati of that era, however, often grew nostalgic as the sweeping changes of industrialization took hold. The British Romantic writers are not easy to categorize, but a common thread is that they were political and social revolutionaries but ecological reactionaries. The Romantics looked at the personal freedoms of the past century’s naughty coterie courtiers and saw not liberty, but shackles in their oligarchy of finery and philandering. Virtue dwelled with the commoner, and meritocracy was in the air of the new industrial century.

There was more in the air than a spirit of equality. The other revolution that the Romantics witnessed was the “dirty and dusky” revolution of industry, as Byron put it. Compared to their liberal attitudes toward the French Revolution, the Romantics were much more conservative about the revolution that turned the rustic into the machine hand. By the millions, the English poured into cities and factories, and the consequences to landscape, air, and water have been dire and long-lasting. Political revolution and new conceptions of social equality helped facilitate this industrial paradigm shift, since it was seen not only as acceptable but also as desirable for men of no particular birth to use their natural talents to invent machines, develop products, and start companies. The eighteenth-century coterie of gentlemen, generally an underproductive bunch, was eclipsed by a community of citizens hungry for wealth and recognition. Nine thousand miles of new railway in ten years is not the legacy of gentlemen fox hunting on country estates. The new economy was urban, innovative, competitive, crowded, unregulated, and powered by coal.

The Romantic William Wordsworth, leader of the Lake Poets, was a bit of a turncoat when it came to political revolution, turning Tory as heads began to roll during France’s Reign of Terror. But he was no apostate when it came to the Industrial Revolution, because he was never an industrial revolutionary in the first place. His *raison d’être* as a poet centered on reclaiming the old ways of peasant life, using the “language really used by men” rather than courtier fanfaronade, and advocating an abiding relationship with nature, antipode to the city.

Wordsworth wrote mostly in blank verse, a capacious narrative framework for epic poems, but he also expanded on his poetry with prose-based accounts. In his recollection of the 1814 poem *The Excursion*, he notes:

What follows in the discourse of the Wanderer upon the changes he had witnessed in rural life, by the introduction of machinery, is truly described from what I myself saw during my boyhood and early youth, and from what was often told me by persons of this humble calling. Happily, most happily, for these mountains, the mischief was diverted from the banks of their beautiful streams, and transferred to open and flat countries abounding in coal, where the agency of steam was found much more effectual for carrying on those demoralising works. Had it not been for this invention, long before the present time every torrent and river in this district would have had its factory, large and populous in proportion to the power of the water that could there have been commanded. (344)

Not only did coal prevent devastation of the remaining English forests, but here we see that its mass adoption into the “demoralising works” of machine-driven industry saved the mountains and streams of the Lake District from hydropower. The “power of the water,” often invoked in the emotional passages of his poems that discuss the rivers of that region—the Derwent and the Severn—would have been commandeered by factory owners had not coal been available to fire Midlands furnaces. With factories would have come people to work them, and Wordsworth’s happy valley of Grasmere might have become another crowded factory town like Leeds and Sheffield. The old generation loses everything to industrial progress in the overtly pastoral poem “Michael”: land, home, livelihood, son. Wordsworth’s sentimental hero is drawn as a poignant symbol of sacrifice, though his piteous inability to adapt to changes borders on bathetic sentiment.

Victorian engineers and scientists like Michael Faraday and W. R. Grove adopted a Romantic trope by figuring the technology of the steam engine as essentially organic, merely another medium for the vital, living forces inherent in the natural world (Ketabgian 121–2). After all, the energy that powers a plant and the energy that powers a steam engine have the same ultimate source: the sun. Their thinking influenced Victorian novelists, especially George Eliot, whose scientific acumen was exceptional. Naturalizing coal and the steam engine was one way to neutralize Romantic protests of the adulteration of organic form by suspect mechanical contrivances. By blending man’s mechanical genius with the vast organic powers that animated the earth, industrial mechanisms became living, evolving beings that elevated civilization to, and above, nature’s level. The

many troubling implications of this paradigm include its logical inverse that, if machines are organic, then living beings must also in a sense be machines that can be understood by reduction and dissection. If so, then factory and field workers can be made to labor unrelentingly like machines, as we saw in *Black Beauty*.

The blending of human invention with nature's evolved forms also implied that men could be as gods, using the vast stores of fossil fuel to defy the basic limitations that gravity and time and raw materials placed on production. By seeing the Industrial Revolution's fuel and machines in a continuum, rather than a rupture with the past, Victorian philosophers dressed their era in the appealing organic, vitalist clothes of nature's processes. The rise of the coal-fired steam engine encouraged a wave of "steampunk" science fiction in which the dazzling agencies of the complex machine enabled superhuman feats like time travel. H. G. Wells's *The Time Machine* is an excellent example of a flight of imagination enabled by contemporary ideas of mechanical force, evolution, and organic change inspired by steam power. Charles Babbage's Analytical Engine was steam-driven and designed to perform computer calculus that would eliminate the risk of human error.

The coal-fired Industrial Revolution brought about other major changes in literature. The contrast between urban and rural settings became more pronounced, and many novelists explored the dynamic between these two spheres, such as Charles Dickens in *Bleak House* and Elizabeth Gaskell in *North and South*. The novel of the urban industrial proletariat was born. Thomas Hardy documented shifts in agrarian living as machines came into industrial capitalist agriculture, and the hedgerows were leveled to accommodate the massive upscaling of mechanical farming.

Charlotte Brontë ends her industrial novel *Shirley* with the entrepreneur's prophecy: "The rough pebbled track shall be an even, firm, broad, black, sooty road, bedded with the cinders from my mill" (480). His prediction is fulfilled within a page: "The other day I passed up the Hollow, which tradition says was once green, and lone, and wild; and there I saw the manufacturer's daydreams embodied in substantial stone and brick and ashes—the cinder-black highway, the cottages, and the cottage gardens; there I saw a mighty mill, and a chimney ambitious as the tower of Babel" (481–2). Prominent in these grim depictions of industrial progress is the pollution of air, soil, and water from coal emissions; it is integral to the aesthetic of the nineteenth-century British novel. Not knowing how to neatly interpret these bewildering changes, and torn between the Luddite's lament and the capitalist's crow, Brontë ends her work with a shoulder

shrug: “The story is told. I think I now see the judicious reader putting on his spectacles to look for the moral. It would be an insult to his sagacity to offer directions. I only say, God speed him on the quest!” (482).

Thomas Hardy often set his novels in the preindustrial past, or outside the sphere of urban industry, dropping along the way subtle clues of a hulking threat on the horizon. Hardy’s rural accounts show how industry was not confined to factory towns, but insinuated itself into the kingdom’s remotest locales. Hardy’s farmhand Tess suffers in the transition from grass-powered to coal-powered harvests, as new machine threshers transform what had been quiet handwork into a jittering melee: “The hum of the thresher, which prevented speech, increased to a raving whenever the supply of corn fell short of the regular quantity ... The incessant quivering, in which every fibre of her frame participated, had thrown her into a stupefied reverie in which her arms worked on independently of her consciousness” (362). Machine-driven work has a scary reverse alchemy of turning living flesh into heat and base metals: namely, the fire and the iron of the steam engine. Tess and company lose their individuality, their communion, and even their minds, to the smart city engineer’s gizmo. The futurist is right in claiming that these machines saved labor, including the arduous, repetitive, body-wearing work of agriculture, which requires frenzies of activity around planting and harvesting time. But the machine introduced a new kind of tedium. Tess’s Victorian-era generation would have been among the first to experience the somatic shift from the evolved body’s desire for conviviality, variety of work, and freedom of movement, to the modern body’s dedication to assisting machines at the greatest possible efficiency and speed, the kind of strategy that Henry Ford perfected in his stream-driven assembly lines as he judged his employees with the creed, “the work, and the work alone, controls us” (Johnson 57).

The penny press riffed on the classical pastoral by adapting the traditional love ballad to industrial times. Instead of the shepherd and his lass under a shade tree, industrial-era ballads used the salacious potential of steam-driven friction to entertain the urban poor. In an anonymous street ballad c. 1830, “The Steam Loom Weaver,” an engine driver is called in to attend to his lass, “And soon her loom was put in tune / So well it was supplied with steam” (ll. 31–2). The high-energy, clipping cadence of industrial manufacture lends itself well to doggerel:

Her loom worked well the shuttle flew,
 His nickers play’d the tune nick-nack,
 Her laith did move with rapid motion,
 Her temples, healds, long-lambs and jacks,

Her cloth beam rolled the cloth up tight,
 The yarn beam emptied soon its seam,
 The young man cried your loom works, light
 And quickly then off shot the steam.

(ll. 41–8)

Though factory work was often a combination of stultifying and horrific in a time before regulation, the energy infused into daily life and machine metaphors reinforced the popular rhetoric of social improvement and wealth gained through industry. Educated writers not obliged to work in factories posited dire trends of physical and moral degradation, but the workers themselves were more often diverted by the shouted slogans of opportunity, upward mobility, and emigration. And, as ever before and since, by sex and drugs. Escapism was also common: the Pre-Raphaelite artists, working in a time of the most intensive burning of coal seen in history, chose to explore medieval subjects like the King Arthur, and painted in an early Italian Renaissance style. Their technique relied on layering bright colors over a glossy white background, explicitly rejecting the darker, bitumen-based painting that evoked Victorian England.

New coal mines provided fuel for steam engines and iron forges, which together built the iron skeleton of modern architecture. Though most of the iron resulted in utilitarian structures like bridges and factories, iron's ability to support weight with slender lines and organic shapes resulted in whimsical show buildings like 1851's Crystal Palace and 1889's Eiffel Tower, both built to show off metropolitan modernity in world exhibitions. The Crystal Palace's designer, Joseph Paxton, owed his ingenuity to the structure of an exotic water lily at Kew Gardens, the *Victoria regia*. Paxton placed his infant daughter on one of the floating leaves, and instead of sinking under her weight, the leaf proved strong and buoyant enough to support her on the surface (Christianson 79). Paxton deduced that the geometrical venation on the undersurface of the leaves could be recapitulated as transverse girders in an otherwise glass structure. His fusion of a slender iron skeleton with panes of glass became a triumph of modern industrial engineering and a symbol of imperial dominion. The palace housed botanical and cultural collections from the margins of imperial reach, becoming a microcosm of the world's ecologies and cultures.

Like the buildings in other exhibitions, 1848's extant Palm House at Kew Gardens is an elaborate case originally built and heated by coal, the solar energy stored in three hundred million-year-old tropical jungles. The Palm House's climate was supported by a smoke stack and boilers that were removed to a

Figure 5.2 Carl Blechen, *Das Innere des Palmenhauses*, 1832. Image courtesy of Wikimedia Commons. Public domain.

distance where coal delivery via railway and the sooty smoke of its combustion would not spoil the pristine aura of the glass-and-girder tropics. Victorian architecture exploited an aesthetic paradox in coal: this subterranean, filthy mineral was the energetic foundation of the most whimsical, weight-defying, light-loving innovations in modern design. While sunlight-sipping trees made

for heavy, dark buildings supported by oak half-timbers in the Tudor style, coal forged spines of iron and skins of glass that admitted the sky.

Its splendid usefulness did not make coal a sweetheart fuel in the nineteenth century, like petroleum in the twentieth century. Intensification of its use merely concentrated its effects and made them seem mundane. In 1830, England mined four-fifths of the world's supply of coal; in 1848 it manufactured more iron than the rest of the world combined; and between 1842 and 1856, the number of coal mines in England quadrupled (Freese 67, 69). Industrial cities became bowls of black fog that curtailed life expectancy due to lung ailments, rickets, and cancers. Coal required special low oxygen conditions to burn, so its fire was usually hidden in a furnace and failed to shed salubrious light. It was vented through narrower chimneys than wood fires needed, so cleaning those chimneys fell to small children, the chimney sweeps who became a symbol of industrial-era oppression.

Also oppressed were the coal miners, whose livelihood depended on daily toiling in a cramped, dark space where there was a continual threat of death from asphyxiation, crushing, burning, and drowning. The mine walls held ghostly, perfect imprints of ferns, reptiles, and even mammals captured in their death poses in a long-extinct habitat, a glimpse of millions of years past that made no sense to the pre-evolutionary worldview of the miner. High demand for coal and the nasty realities of its extraction created new rifts between classes. Though they provided an essential commodity, colliers were often segregated in their own settlements near mines, and this abject social status nurtured solidarity among miners and some of the earliest organized labor movements in the industrial era (Freese 45–6).

Long before mountaintop mining began filling Appalachian valleys with the spoilage of blown-up ridge ecosystems, tunnel mines filled the land with heaps of slag, or spoil tips, which gradually displaced towns. In one dramatic case in 1966, a spoil tip smothered a school in Aberfan, Wales, killing 144 people, including 116 children. Tunnel coal mines routinely crush and gas workers, while surface coal mines deface ancient mountain ranges and cause downstream contamination by salts and metals. Mining coal causes toxic air pollution linked to respiratory ailments and cancer, while burning coal causes the most greenhouse gas emissions of any fuel source. Burning coal causes climate change; the resultant sulfur dioxide causes acid rain.

There is plenty to lament about the deleterious effects of coal. The damage it does to the people who mine and burn it only underscores how terrifically useful it is; we would not keep it an intimate part of our daily society if there were a ready substitute. Coal is so abundant, so cheap, and so energy rich compared to biomass, that it continues to this day as the most important fuel for electricity

and stationary industry in most developed countries. This duplicitous promise of coal, its dual convenience and menace, inspires pitched battles between opposed advocacy groups, capturing the postmodern late-capitalist clash between consumption and conservation. Pro-coal lobbies have based their positions not only on claimed economic advantages of coal, but also on various religious and quasi-scientific justifications: God planted coal in the ground to help humans go forth and prosper; the atmosphere is presently deficient in carbon dioxide, and coal acts as an airborne fertilizer needed by hungry staple crops like corn (Freese 191–2). As hydro-fracking has rapidly made natural gas a better economic and, perhaps, environmental alternative to coal, the coal lobby has lost its logical basis and appeals to mining history and culture.

Coal fueled our fires for centuries before there was any conception that its mass combustion could change the global atmosphere. Instead, its smoke served as an indicator of atmospheric patterns, acting as a kind of air-dye that revealed wind and rain movements, the scattering of light, and chemical cycles through soil, air, and water (Freese 166). The carbon long packaged in underground coal veins, liberated by mining and burning, has shifted the carbon dioxide concentration in the air from a preindustrial 280 parts per million to a current 410+ ppm. Most coal today is burned for electricity generation. Coal releases about one kilogram of carbon dioxide into the atmosphere for every kilowatt hour transferred to the electrical grid, to our toasters and laptops. This is about twice the amount of greenhouse gas per watt of natural gas, about twenty times that of solar panels and geothermal sources, and about fifty times that of biomass and nuclear sources (Moomaw et al.).

With its dominant role in industry and its heavy pollution, coal must be considered the most important fuel in the Anthropocene mindset. As we look back on the literature of coal, we have a greater understanding than the authors did of both its enabling energy and its pernicious effects, local and global. But the writers of coal literature are no longer innocent of its role in history. The affect and aesthetics of coal literature show a nascent awareness of the ontological shift into a modern mentality of consumption and pollution, labor and oppression, and the shrinking of time-space into a fossil-powered vehicle.

II The Big Smoke and Auld Reekie

In preindustrial 1659, diarist John Evelyn observed London enveloped in “such a cloud of sea-coal, as if there be a resemblance of hell upon earth, it is in this

Figure 5.3 Joseph Pennell, *The Coal Mine*, 1916. Image courtesy of the National Gallery of Art. Public domain.

volcano in a foggy day: this pestilent smoak, which corrodes the very yron, and spoils all the moveables, leaving a soot on all things that it lights: and so fatally seizing on the lungs of the inhabitants, that cough and consumption spare no man” (qtd. in Allaby 65). Evelyn blamed the pollution on manufacturers rather than the citizens as he observed the “few funnels and Issues, belonging to only *Brewers, Diers, Lime-burners, Salt and Sope-boylers*, and some other private trades, *One of whose Spiracles* alone, does manifestly infect the *Aer*, more, than all the chimnies of London put together besides” (qtd. in Ackroyd 49). Evelyn’s contemporary Margaret Cavendish poetically imagined an early version of the sulfuric acid discovered in coal smoke. She wrote that coal’s volatile salts were formed of sharp atoms that corroded all the matter it touched, from lungs to building façades (Brimblecombe 46–9).

Because of its industrial production and the Thames valley’s bowl-like effect, London was destined to live under a pall of coal smoke for centuries to come. It was nicknamed “The Big Smoke.” Lord Byron’s early nineteenth-century image of London from *Don Juan* captures the aura of coal, in contrast to the bright cerulean skies of the hero’s native Spain:

A mighty mass of brick, and smoke, and shipping,
 Dirty and dusky, but as wide as eye
 Could reach, with here and there a sail just skipping
 In sight, then lost amidst the forestry
 Of masts; a wilderness of steeples peeping
 On tiptoe through their sea-coal canopy;
 A huge, dun cupola, like a foolscap crown
 On a fool's head,—and there is London Town!

(10.9–16)

St. Paul's besmirched dome, then barely a century old, sits atop Ludgate Hill, brooding over its foul nest at the highest point in the old city. The steeples might still be peeping out of the canopy of coal smog, but the parishioners trapped below were asphyxiated by the smoke. In 1810 Louis Simond likened the falling soot to filthy snowflakes that alight on pedestrians in the street: "You just feel something on your nose, or your cheek,—the finger is applied mechanically, and fixes it into a black patch!" (Adkins and Adkins 96). The long century that followed would bring nearly constant coal pollution to London, culminating in the Great Smog of December 1952 that killed twelve thousand people.

The smoke's oppressiveness may show most clearly in its exceptions. Approaching London by carriage on a warm summer day in 1802, William and Dorothy Wordsworth marveled at the clarity afforded when the chimneys were at rest. Dorothy noted how "The city . . . made a most beautiful sight as we crossed Westminster Bridge. The houses were not overhung by their cloud of smoke, and they were spread out endlessly" (Adkins and Adkins 96). William wrote an eponymous sonnet that holds a series of praises for the city's beauty, which "doth like a garment wear / The beauty of the morning . . . / All bright and glittering in the smokeless air" (ll. 4–6). For the moment, William even prefers the scene over his beloved wilds in the north of England: "Never did sun more beautifully steep / In his first splendour, valley, rock, or hill; / Ne'er saw I, never felt, a calm so deep!" (ll. 9–11). The Wordsworths find pleasure in the world's largest city and industrial center as a "mighty heart . . . lying still," where peace is conflated with death, complicating the light images of the thirteen previous lines (l. 14). To William, often oppressed by the city din, a pause in coal-fired industry inspires inner peace, even if it implies the death of its inhabitants.

However suffocating, the smoky effluent of coal was undeniably atmospheric. In the right frame of mind, it was close, cozy, and colorful, perhaps more suggestive to the imagination than a halcyon day in Cadiz. At the beginning

of the twentieth century, T. S. Eliot in “The Love Song of J. Alfred Prufrock” memorably captured the “yellow fog” in the form of a cat:

The yellow smoke that rubs its muzzle on the window-panes
 Licked its tongue into the corners of the evening,
 Lingered upon the pools that stand in drains,
 Let fall upon its back the soot that falls from chimneys,
 Slipped by the terrace, made a sudden leap,
 And seeing that it was a soft October night,
 Curled once about the house, and fell asleep.

(ll. 15–22)

In addition, and opposition, to this cozy and dozy treatment of smoke as a pet, pollution also indicated modernity, productivity, and employment—preferable to the outworn pleasantries of the clear-aired but torpid pastoral. Always adaptable, some denizens of the smoky nineteenth century indicated fondness for these dense, redolent spaces. Edinburgh was nicknamed “Auld Reekie” in honor of its cozy, smelly smoke.

Charles Lamb’s 1818 essay “The Londoner” excuses the city’s “deformities,” namely, its shoddy “gauds and toys” that prey on the avarice of rich and poor alike, because they represent satisfied human appetites (163). Consumer satisfaction comes from industry, and so the self-aware lover of products must in turn love their by-products: “I love the very smoke of London, because it has been the medium most familiar to my vision . . . Where has spleen her food but in London—humour, interest, curiosity, suck at her measureless breasts without a possibility of being satiated. Nursed amid her noise, her crowds, her beloved smoke—what have I been doing all my life, if I have not lent out my heart with usury to such scenes?” (163). Lamb’s delight is playfully economical, in step with his surroundings. His sympathetic heart gains interest as he loans it out in order to perceive the tussle of these business streets. His occupation is of a heart loaner, preserving and enriching the humanity of the factory city in his writings.

Unlike the common hypocrite who wishes to consume industrial goods without suffering the industrial atmosphere, Lamb embraces the “beloved smoke” and the smoking machines of industry. Charles Dickens lampoons the hypocrisy of wealthy consumers who delight in the money and “elegancies of life” provided by industry but, as with Mrs. Gradgrind in *Hard Times*, “could scarcely bear to hear [Coketown] mentioned” (26). Lamb and Dickens have marked the era when self-involvement in the greater industrial project bifurcated into those who take accountability and those who discard it. They write some of the first

fictional critiques of the NIMBY (not in my back yard) hypocrisy of industrial environmentalism.

Lamb's "multitudinous moving picture" included such lugubrious sights as the thousands of child peddlers living in the shadows of city streets. Children made meager careers sweeping street crossings, selling vegetables, and peddling baubles. The rapid shift from rural agrarian to industrial urban life meant there were few social services to protect vulnerable children, many of whom were orphaned due to the high risk and health impacts of factory work and waves of typhoid and cholera that spread virulently in urban slums. Lamb the Londoner wrote proudly, "I was born (as you have heard), bred, and have passed most of my time, in a *crowd*. This has begot in me an entire affection for that way of life, amounting to an almost insurmountable aversion from solitude and rural scenes" (162). Quite unlike his Romantic contemporaries who usually found their subjects among rural people and wild scenes of nature, Lamb celebrated the "mob of happy faces crowding up at the pit door of Drury-Lane Theatre" and found his hypochondria deterred by immersion in the crowds on the Strand, where "I fed my humour, till tears have wetted my cheek for inutterable sympathies with the multitudinous moving picture, which she never fails to present at all hours, like the shifting scenes of a skilful Pantomime" (162–3). Lamb's essay "In Praise of Chimney-Sweepers" demonstrates the empathetic eye with which he viewed the urban children that were part of a new industrial work force. "Chim chimminy Chim chimminy Chim Chim cheroo"; the cheery melancholy of urban England was on its way to mainstream entertainment, first through novelists like Dickens and then in the twentieth-century nostalgia of Disney's Mary Poppins.

Charles Lamb's view of the city is unusually laudatory among Romantic accounts of London in the nineteenth century. Leigh Hunt, Lamb's contemporary, would observe the "yellow atmosphere of money-getting" as a dual ecological and economic symbol of the times (qtd. in Edgecomb 29). In 1846, the American poet and traveler J. Bayard Taylor published *Views Afoot*, which details the unique and surreal qualities of industrial London's weather. The gloom frustrates any aesthetic study, since "no light and scarcely any warmth can penetrate the dull, yellowish-gray mist, which incessantly hangs over the city" (306). The occasional "sickly gleam of sunshine" is "soon swallowed up by the smoke and drizzling fog. The people carry umbrellas at all times, for the rain seems to drop spontaneously out of the very air, without waiting for the usual preparation of a gathering cloud" (306). While these conditions are depressing and disgusting, they also stimulate the morbid imagination in a way that Charles Dickens and

Arthur Conan Doyle would come to appreciate. According to Taylor, November in London “resembles the gloom of Hades. The streets were wrapped in a veil of dense mist, of a dirty yellow color, as if the air had suddenly grown thick and mouldy. The houses on the opposite sides of the street were invisible, and the gas lamps, lighted in the shops, burned with a white and ghastly flame” (306). The general darkness pierced by an unnatural gas-fueled light reminds Taylor of “Satan resting in the middle of Chaos” (383). Taylor’s narrative of *The Big Smoke* was a familiar one among foreign travel writers visiting the industrial capital of the world. Nineteenth-century London was cloaked in coal smoke, but also bejeweled with the products of its success: the dizzying plethora of consumer goods. Coal brought to the world an unprecedented collision between economic success and eco-social oppression, a tension that tended to resolve itself by further social stratification.

Friedrich Engels published his classic *The Condition of the Working Class in England in 1844* just a year after recording his observations, but it was not translated into English for half a century because of its searing indictment of industrial labor. Engels lends an outsider’s view of England where the initial impressiveness of the scenes, “hundreds of steamships dart rapidly to and fro,” is merely the bustling surface of the deeper reality of “the human suffering which has made all this possible. [The visitor] can only realize the price that has been paid for all this magnificence after he has tramped the pavements of the main streets of London for some days and has tired himself out by jostling his way through the crowds and by dodging the endless stream of coaches and carts which fills the streets . . . The restless and noisy activity of the crowded streets is highly distasteful, and it is surely abhorrent to human nature itself” (64). Rather than Lamb’s engaged sympathy and affinity, Engels sees a flow of automatons who “rush past each other as if they had nothing in common”—an observation close to DeQuincey’s distaste for railway stations (64). This crowd rush is driven by coal and its steam power, which obscures the natural vicissitudes of day and night, summer and winter, with the staring clock face and its inexorable hands.

Engels’s point of engagement with the “whirlpool of modern industrial life” is the suffering of the working class, whose “wages are so low that they can hardly keep body and soul together” (58). Manchester is “the most important factory town in the world” because it clearly exhibits, on one hand, “the degradation into which the worker sinks owing to the introduction of steam power, machinery, and the division of labor” and, on the other hand, “the strenuous efforts of the proletariat to raise themselves from their degraded situation” (57). The city is built on coal, “blackened by soot,” and filled with the “helots of modern

civilization”—the industrial serfs striving to improve their condition in an unjust social order (79). Though Engels is generally focused on people, a contemporary reader can also identify the manifold negative environmental impacts of coal-driven industry in his description of the river Irk: “At the bottom the Irk flows, or rather, stagnates. It is a narrow, coal-black, stinking river full of filth and rubbish which it deposits on the more low-lying right bank. In dry weather this bank presents the spectacle of a series of the most revolting blackish-green puddles of slime from the depths of which bubbles of miasmatic gasses constantly rise and create a stench which is unbearable even to those standing on the bridge forth or fifty feet above the level of the water” (78). The “rookeries” of the poor teeter at the cliff edge of the river in the shadow of the workhouse, which is “built on a hill and from behind its high walls and battlements seems to threaten the whole adjacent working-class quarter like a fortress” (80). This formative experience in Manchester directed Engels’s radical advocacy of workers’ rights, and the very next year, 1844, Engels met Karl Marx and they began their triumphal collaboration on behalf of the proletariat.

North and South, Elizabeth Gaskell’s novel of the industrial Midlands, records the economic treadmill of factory production enabled by an easy supply of coal fuel. “At Milton the chimneys smoked, the ceaseless roar and mighty beat, and dizzying whirl of machinery, struggled and strove perpetually. Senseless and purposeless were wood and iron and steam in their endless labours” (418). Mimicking the tireless machinery, the workers become robots to keep their positions despite constant threats of replacement “but the persistence of their monotonous work was rivalled in tireless endurance by the strong crowds, who, with sense and with purpose, were busy and restless in seeking after—What?” (418). Gaskell captures the sense of modern capitalist ennui setting in, where time is reduced to a changeless gray limbo, and enterprise drones through seasons and years without ever arriving at a promised goal. The only goal is to produce more, more cheaply, and not to be outcompeted. It ends only when a company goes out of business.

Unique to the industrial period, this feeling of overstimulation, exhaustion, and monotony was made possible by the continual supply of fuel to the factories. Before fossil fuels, biomass required seasonal vicissitudes where cycles of growth, gathering, processing, and burning offered a modicum of change. Seasonal variation was preserved in sowing and reaping, and years were distinguishable from one another based on the fortunes of the harvest. To an industrial worker, these changes were experienced only as price variations—the cost of a loaf of bread based on the wheat harvest—and the consequent struggle of feeding a

family on a fixed income. In a textile mill, the mainstay of the British industry, the factory work itself did not change from summer to winter, beyond sweating or shivering. There was either more of the same work, or destitution.

Victorian writers repeatedly turned to toxic urban fogs for emotion-inflected settings. This trend indicates an increasingly acute concern among writers in the second half of the nineteenth century. The trope of apocalypse, still fashionable in the twenty-first century, is the gesture of the powerless writer to “imagineer” the overthrow of a corrupt world order. When Richard Jefferies imagined industrial society literally sinking into its own filth in *After London*, his postapocalypse hero Felix learned of the hazards of the lingering toxic fog from the flight patterns of instinctual birds. These toxic fog works suggest that the greed and vice of getting and spending was closely related to the pollution of Victorian England. Nature actively corrected this industrial egotism, with a vengeance. The same desire to overthrow the corrupt world order operates in today’s eco-apocalypse genre. Eco-apocalypse writing imagines biosphere-level alteration of climate to be the driving force of global housecleaning, rather than localized pollution from industry.

The Victorian essayist John Ruskin was a perceptive critic of the arts. His observations of the bewildering changes reflected in art, such as the smoggy aura of J. M. W. Turner’s paintings, led Ruskin to make social and moral commentary on his age. His definition of merit in art is that the greatest artist “has embodied, in the sum of his works, the greatest number of the greatest ideas” (*Stones of Venice* 92). Far from the fancies of the pure aesthete, Ruskin’s favorite pieces are social, political, and historical. Instinctively nostalgic, Ruskin continually turned to the values of slow time and the celebration of the soul inherent in preindustrial handcraft, endangered in the nineteenth century by anonymous factory mass production. His concerns extended from the fate of the craftsman’s soul to the conversion of nature into a technological medium for modern production: “How much of it do you intend within the next fifty years to be coal-pit, brick-field, or quarry?” (*Works* Vol. 3 337). Imagining their success, Ruskin draws an image: “From shore to shore the whole of the island is to be set as thick with chimneys as the masts stand in the docks of Liverpool: that there shall be no meadows in it; no trees; no gardens; only a little corn crop grown upon the housetops, reaped and threshed by steam” (*Works* Vol. 3 337). In our contemporary view, we might assume Ruskin is concerned about habitat degradation and species extinction. However, Ruskin is principally worried that “beautiful art can only be produced by people who have beautiful things around them” (*Works* Vol. 3 338). Instead of pastoral beauty, Ruskin sees “the furnaces

of the city foaming forth perpetual plague of sulphurous darkness; the volumes of their storm clouds coiling low over a waste of grassless fields, fenced from each other, not by hedges, but by slabs of square stone, like gravestones, riveted together with iron" (*Works* Vol. 3 339).

Beautiful art did come out of this coal squalor. Turner, Ruskin's favorite artist, turned from pastoral landscapes to industrial ones later in his career in paintings like "Rain, Steam, and Speed." Monet's richly smudgy views of industrial London are among his most admired works. Without urban pollution, what would Dickens have written about, and where would it have taken place? Coal smoke permeates his work from London to Coketown. Though it has its moments of menace, especially works like *Hard Times*, coal smoke is most often something that envelops his characters in an ambience of ambiguity, mystery, sympathy, and perseverance. The working classes would have no work and no story without coal smoke. In *Bleak House*, the atmosphere is onerous, but Dickens's signature humor makes the scene almost cheery: "Cook's Court was in a manner revolutionized by the new inscription in fresh paint, PEEFFER AND SNAGSBY, displacing the time-honoured and not easily to be deciphered legend PEEFFER only. For smoke, which is the London ivy, had so wreathed itself round Peffer's name and clung to his dwelling-place that the affectionate parasite quite overpowered the parent tree" (154). Parasitical, perhaps, but in a loving way smoke adorns buildings and gives the city character. Like Charles Lamb, Dickens perceives that coal smoke is the urban aesthetic counterpart to the natural ivy that adorns the structures of Oxford and Cambridge, and the city worker, lacking university education, may still find evidence of his work by observing coal smoke clinging to the walls. Smoke is industrial society's baby, the grandchild of ingenuity, ambition, raw material, and fossil fuel.

Though coal is most famous for blackening The Big Smoke and Auld Reekie, it also produced the opposite effect: bright light. Deriving coke from coal allowed the black rock to replace charcoal in blast furnaces, thus forestalling further catastrophic deforestation. This invention had a second virtue: a by-product called coal gas was useful for illumination. Coal gas, a synthetic form of natural gas, was a Victorian segue fuel used between the long era of darkness, window candles, and oil lamps in city streets, and the modern era of electricity that came to major cities by the start of the twentieth century. Gas street lamps first appeared in 1812 in London, and the last oil lamp in modish Grosvenor Square was replaced by gas in 1846 (Picard 66). The reign of coal gas did not last long: the first electric lamps in London appeared on the Embankment in 1878 (Nead 83).

Gaslight appeared ghostly. Its likely etymology dates back to the Dutch *geest*, meaning spirit (Gordon 20). At first a source of bedazzlement, coal gas lamps within a few decades came to seem lurid and filthy compared to the newer alternative in electricity. Still, this brief reign of gas illumination made an imprint on literature. Its concentrated use during the Victorian era provided a unique ambience that can be described in artistic terms as a living chiaroscuro: spots of blanching light surrounded by deep pools of shadow. Aesthetically, we could compare the Victorian experience to our current distinctions between harsh fluorescent and warm incandescent light bulbs. Newer LED technology is greatly invested in the aesthetic quality of its light, continually innovating toward wide dispersal and warm tones.

Gaslight was bright and its resource was abundant, but those virtues were also liabilities in lived experience. Like the exchange of open wood hearths for closed iron coal stoves in the domestic space, the rise of coal gas lamps brought to the streets a luminary shift that directly translated into an emotional one. As with the steam-driven technologies enabled by coal, the coal–gas visual aesthetic is a feedback loop between the states of two Victorian arts: the technology of fuel combustion and the philosophy (ontology and aesthetics) of writers living in the glare. The warmer, dimmer tones of candles and oil lamps were overwhelmed by the interrogatory glare of the white gaslight. As Romantic revolutionary literature succumbed to the straightened, proud morality of the Victorian era, the Romantic reign of candlelight and whale oil died of exposure to Victorian coal gas.

In the Victorian literature of coal gas, the very fuel that was to bring safety and orientation to the night streets ironically became associated with secrecy, evil, and irrationality (Nead 83). For example, the first glimpse of Stevenson's diabolical Mr. Hyde comes by gas lamp, when he tramples a small child in the midnight streets of London. The witness describes walking at "about three o'clock of a black winter morning, and my way lay through a part of town where there was literally nothing to be seen but lamps. Street after street, and all the folks asleep—street after street, all lighted up as if for a procession and all as empty as a church—till at last I got into that state of mind when a man listens and listens and begins to long for the sight of a policeman" (6–7). The character Enfield is experiencing the uncanny in his 3 a.m. ramble: that crossroads between mind and space in which repetition leads to disorientation, as the physical body's displacement blurs the mental boundaries between the dream and waking world. Once confounded in dream, perceptions take on the symbolic and monstrous qualities of the supernatural, so a grid of well-lit streets transmutes into a maze in which brightness only excites confusion.

No cop appears to reorient him; instead that strange chimera Hyde further perturbs his perception by stalking onto the scene and committing an act of coded violence against a child. Enfield's story casts a spell over the lawyer, Utterson, who becomes the main investigator of Hyde's crimes. That night Utterson has a nightmare featuring a cinematic "scroll of lighted pictures" that swirls toward vertigo as the dreamer moves "the more swiftly and still the more swiftly, even to dizziness, through wider labyrinths of lamplighted city, and at every street-corner crush a child and leave her screaming. And still the figure had no face by which he might know it; even in his dreams, it had no face" (39). The lamps obliterate the perpetrator Hyde's face with garish light.

A leitmotif of cold, unnatural illumination continues throughout the story: wind perturbs the light and shadow patterns in a way that seems to bring alive malfeasant energies in the city. The lamps "glimmer like carbuncles" through a fog that seems to drown London's pedestrians (52). Soho's "lamps, which had never been extinguished or had been kindled afresh to combat this mournful re-invasion of darkness, seemed, in the lawyer's eyes, like a district of some city in a nightmare" (48). When Hyde comes to the point of confession, his recollection of the joy of murder is again dressed in the invasive light of the lamp: "A mist dispersed; I saw my life to be forfeit; and fled from the scene of these excesses, at once glorying and trembling, my lust of evil gratified and stimulated, my love of life screwed to the topmost peg. I ran to the house in Soho, and (to make assurance doubly sure) destroyed my papers; thence I set out through the lamplit streets, in the same divided ecstasy of mind, gloating on my crime, light-headedly devising others in the future, and yet still hastening and still hearkening in my wake for the steps of the avenger" (87). Hyde/Jekyll is here both pursuer and pursued, and the lamps illuminate the wide-ranging city and make it available to a creature of the night who stalks an alternative, nightmarish territory totally foreign to its sunlit counterpart. The story does more than just show an antagonism between night and day; Stevenson is clearly using his firsthand experience of the modern gothic of coal-lit streets to elaborate an uncanny, violent environment enabled by the rise of the gasworks.

The novel's tensions between good and evil, overttness and secrecy, revelation and ignorance continually play off the actual spectacle of white-black gaslight. Rather than extirpate violence from city streets, gaslight seems to illuminate a stage for immoral behavior and threatening surreality. Gaslighting was associated with civic improvement because it extended hours of trade and permitted extravaganzas like the Cremorne Pleasure Gardens of the 1860s, when the nighttime city was laid bare under nearly half a million streetlights.

But it also had the effect of revealing, in lurid detail, the cloak of coal smoke on buildings inside and out, the flaws in beloved faces, the sleights of hand among shopkeepers, gristle in meat and bruises on the fruit of street markets (Naed 88). These paradoxes embody the visual complexities of coal-fueled cities, where the atmosphere is deepened into literal layers of pollution, figurative layers of morality, and the subjective feud between ugly and alluring.

III In depth: *Wuthering Heights* and *How Green Was My Valley*

Urban landscapes were most clearly marked by coal and most often explored by writers, but the economy and ecology of coal-producing regions also merited literary study. That dark and dire Victorian classic, *Wuthering Heights*, has a subtle vein of coal running through the text. Emily Brontë's novel takes place in Yorkshire, England's largest county, known in her time for its productive coal mines. It was also close to rising industrial cities like Sheffield, Leeds, and Rotherham, the locales that led the world in textile manufacturing. Brontë knew of what she wrote: her home in the vicinity of Haworth, in west Yorkshire, included a remote farmhouse named Top Withens, which was thought to be the inspiration for the brooding bulk that housed Heathcliff.

Wuthering Heights and its environs are a clear metonym for their master. The Romantic hero Heathcliff, with his blend of smoldering intensity and chilling callousness, stands in stark contrast to his refined rival, Edgar Linton, who lives at the contrasting abode, Thrushcross Grange. (A Monty Python sketch uses semaphore flag language, the kind used by beach lifeguards, to capture the dualism in absurdity: characters communicate from Heights to Grange with emphatic flag waves.) Brontë makes the land-to-man contrast overt when Catherine is courted by Edgar Linton: "Doubtless Catherine marked the difference between her friends, as one came in and the other went out. The contrast resembled what you see in exchanging a bleak, hilly, coal country for a beautiful fertile valley; and his voice and greeting were as opposite as aspect. He had a sweet, low manner of speaking, and pronounced his words as you do: that's less gruff than we talk here, and softer" (70). Heathcliff's landscape name directly evokes his character: bleak, hilly, coaly. Linton's name is not analogously pastoral, but it echoes "lintel," the decorative horizontal block that spans the gap in a doorway and a fireplace. It is an essential structural element that evokes entrance, support, shelter, and hearth fire.

Nelly's characterization of Heathcliff as coal country and Edgar as a fertile valley comes from Catherine's own sense of the two men. Catherine tells Nelly: "My love for Linton is like the foliage in the woods: time will change it, I'm well aware, as winter changes the trees. My love for Heathcliff resembles the eternal rocks beneath: a source of little visible delight, but necessary. Nelly, I *am* Heathcliff!" (82). Her deciduous love for Edgar is a season's passing, leaves falling without any promise of a returning spring, but Heathcliff is the bedrock and, in Yorkshire, the coal contained in the "eternal rocks beneath." Like the fuel, Heathcliff excites little delight but is essential to the life of this coal country. Heathcliff is racially other, described as dark and gypsy (though he may be Earnshaw's bastard son); he is cast into a role of toil and dirt by the family; slowly, inexorably, he gains control over the economy of the Grange and the Heights by sheer determination. Heathcliff is cold coal, sparked to flame by Catherine and, suffering her loss, he smolders down to embers and burns everyone who encounters him.

At Wuthering Heights, the hottest coal fires cannot warm the ambience of the troubled domestic space. At the beginning a curious Mr. Lockwood, tenant of Thrushcross Grange, is repelled from his nest by an inept "servant-girl on her knees surrounded by brushes and coal-scuttles, and raising an infernal dust as she extinguished the flames with heaps of cinders. This spectacle drove me back immediately" (9). This humble scene captures the daily inconvenience of living with coal as a domestic fuel, even in a pleasant valley house managed by servants. Lockwood is the fortunate one who has a choice to retreat from the choking dust, and he sets out for the clear-aired heath and Wuthering Heights.

Chilled by his journey, Lockwood seeks shelter under his landlord's roof and, after being sauced about by Joseph and Hareton, enters the main living room: "We at length arrived in the huge, warm cheerful apartment, where I was formerly received. It glowed delightfully in the radiance of an immense fire, compounded of coal, peat, and wood; and near the table, laid for a plentiful evening meal, I was pleased to observe the 'missis,' an individual whose existence I had never previously suspected. I bowed and waited, thinking she would bid me to take a seat. She looked at me, leaning back in her chair, and remained motionless and mute" (10). Despite the seeming welcome of light and heat from the multi-fueled fire, Lockwood finds no warmth in the company. Young Cathy's hearth burns like an inferno rather than a domestic scene of refuge from an outside snowstorm. Mistaking her for Heathcliff's wife rather than a despised embodiment of the union between Edgar Linton and Catherine, Lockwood mistakes the relationships in the hilltop house just as he misreads the "warm

cheerful apartment” that “glowed delightfully in the radiance of an immense fire.” His misses are soon corrected by her blank coldness. Not even an inferno driven by three distinct fuels can melt the chilly presence of Heathcliff, the antihero with a penchant for hanging puppies.

At Wuthering Heights, hearth fire is hellfire. After spending a night huddled in the kitchen, Lockwood enters into this inner chamber once again, “where the females were already astir. Zillah urged flakes of flame up the chimney with a colossal bellows; and Mrs. Heathcliff, kneeling on the hearth, reading a book by the aid of the blaze. She held her hand interposed between the furnace-heat and her eyes, and seemed absorbed in her occupation; desisting from it only to chide the servant for covering her with sparks, or to push away a dog, now and then, that snoozled its nose over-forwardly into her face. I was surprised to see Heathcliff there also. He stood by the fire, his back towards me, just finishing a stormy scene to poor Zillah” (30). Though everyone, even the dogs, have gathered around the fire for its warmth, it annoys with excessive heat and sparks. The fire is scarcely differentiated from Heathcliff himself, who spews his animosity with the blaze as his background.

Later, Isabella Linton, the immiserated wife of Heathcliff, remarks on her first visit to her new home: “There was a great fire, and that was all the light in the huge apartment, whose floor had grown a uniform grey” (138). Soon the master’s stationing repeats itself when Heathcliff “took his stand on the hearthstone, near me, and began to put questions concerning Catherine” (146). The master has no qualms about degrading his new wife at the expense of the woman he truly loves, and his open dictates of disavowal are made more forceful by his position “on the hearthstone,” the symbolic heart and literal power station of the house. Time passes, and the rage abates as his change toward a final happy imbecility approaches. He talks to Nelly of the dead and haunting Catherine: “His eyes were fixed on the red embers of the fire, the brows not contracted, but raised next to the temples; diminishing the grim aspect of his countenance, but imparting a peculiar look of trouble, and a painful appearance of mental tension towards one absorbing subject” (291). His anger, passion, torment, and obsession are united in embers of the coal fire.

These hellfires are Heathcliff’s animus. Another, more leisurely time, the narrator Nelly encounters the servant Joseph, who “seemed sitting in a sort of Elysium alone, beside a roaring fire; a quart of ale on the table near him, bristling with large pieces of toasted oat-cake; and his black, short pipe in his mouth” (236). Joseph takes unkindly to being interrupted from his moment of peace amid the general violence of Wuthering Heights—his Elysium recalls the

pleasure of hearth fires under normal conditions. Soon the violent fires in the hearth will abate with Heathcliff's death, and Wuthering Heights will return to a pleasantly ghost-free space where innocent young love may kindle.

As Lockwood approaches the Heights in this final scene, "both doors and lattices were open; and yet, as is usually the case in a coal district, a fine, red fire illumined the chimney: the comfort which the eye derives from it renders the extra heat endurable. But the house of Wuthering Heights is so large, that the inmates have plenty of space for withdrawing out of its influence; and accordingly, what inmates there were had stationed themselves not far from one of the windows" (307). At last, with the death of Heathcliff and his interment next to Catherine, their bones rest amid the fossil coal seams of their homeland. The living left behind are released from the spell that was cast with Heathcliff's arrival, and these home fires are not the old diabolic infernos, but a quality of "fine, red fire" that gives comfort even on a summer night. Rather than jailing inmates clustered around a too-hot fire, Wuthering Heights now expands into a continuum with its pleasant surroundings, windows open, issuing welcome to approaching strangers.

Heathcliff may be a coal fire, but a coal fire is not always Heathcliff. By the end of the novel, the harsh landscape of Wuthering Heights is resolved and softened by its loving tenants, so the coal itself can transmute from a holocaust to a comforting red fire well-aired by the capacious house. The stark dualisms that drive the novel, headed by the opposing abodes of Heights versus Grange, drain away into a gentle continuum between house and landscape, the kindling of comforting coal. It is a symbol that unifies Brontë's entire novel and serves as a leitmotif of the nineteenth century: how to transform diabolical energy into a fuel that is salubrious and productive, a creative rather than destructive force. Coal is inherently both.

In figuring Heathcliff through a metaphor of fuel, Brontë deploys the natural resources of her native Yorkshire by invoking them as human energy. This figurative use of "energy" became popular in marketing in the twentieth century. Human energy, say the petroleum companies, is mighty enough to supersede our challenges with the limited supply and pollution of *actual* energy, fuels like petroleum. Brontë's metaphor works in the opposite rhetorical direction, convincing readers that Heathcliff is diabolical by using the vehicle of coal—too hot, smoky, sparky, and ash-dusty. Heathcliff's energy might burn the Heights to the ground. It's not a vague promise of a bright, innovative future, but an embodiment of a devilish present. Jane Austen used wood fires to characterize the generosity of heroes like Bingley, but she never implied that Bingley *was*

a warm, bright wood fire. Here, half a century later at the height of industrial expansion in England, we see Bronte taking that step of imagination in which people *become* fuel. This is a much more radical assertion than simply placing characters within historical and social conditions; it asserts a changed ontology of the Anthropocene. We *are* the fuel that we consume—our brains and bodies are continuous with the machines and infrastructure that characterize a world of fossil fuels. Coal's energy and our energy are indistinguishable.

By the early twentieth century, coal mines had opened nearly every available seam in Britain, and the industry grew in America's Appalachian valleys along with increasing class disparities between rural miners and urban consumers. D. H. Lawrence's father was a coal miner, and his book *Sons and Lovers* may indicate his alienation from his father and lament for his intellectual mother's lost opportunities. Towns existed only to produce coal for the industrial and domestic markets, like Richard Llewellyn's Welsh valley town in his 1939 novel *How Green Was My Valley*, which takes place mostly in the 1890s. Llewellyn's account of the lives of miners came largely from his residence at Gilfach Goch ("Red Nook"), a mining village in South Wales nestled in a valley between pastoral hills. His narrator Huw Morgan's *bildungsroman* is shadowed by the mine's slag heap, the pile of waste rock and shale excavated by mining. Though on the surface the story involves Morgan's development, exhibiting the passions, pleasures, and struggles of a stripling, a darker vein runs through the tale, showing the trials of the workers and the mine's gradual despoilment of the valley.

Spoken in a lyrical Welsh dialect, the novel gives a traditional patriarchal account of Welsh mining life. The hardworking men see their livelihoods, village society, and subsistence in nature collapse as the coal industry chugs toward the twentieth century. The novel never leaves this Welsh valley, except by imagination. London merits frequent mention, two of the brothers emigrate to America, the sons sing for the ancient Queen Victoria, and one of the Morgan sisters moves with her husband to South Africa during the Boer Wars. But Huw, the most scholarly son in the family, by choice stays to work in the mines and inherit the kingdom of slag and ruin.

There is no mention of the slag heap until a hundred pages into the five-hundred-page novel, when Huw steps out of his retrospect into the present tense:

The slag heap is moving again.

I can hear it whispering to itself, and as it whispers, the walls of this brave little house are girding themselves to withstand the assault. . . . for those months

the great bully has been beaten, for in my father's day men built well for they were craftsmen. Stout beams, honest blocks, good work, and love for the job, all that is in this house.

But the slag heap moves, pressing on, down and down ... Soon, perhaps in an hour, the house will be buried, and the slag heap will stretch from the top of the mountain right down to the river in the Valley. Poor river, how beautiful you were, how gay your song, how clear your green waters, how you enjoyed your play among the sleepy rocks. (102)

Like generations of Victorian writers before him, Llewellyn plays the pastoral scene against its aesthetic antipode, the industrial wasteland carved out by coal production. His images prefigure the spoil heaps tumbled into river valleys by modern mountaintop removal practiced in Appalachia. The slag heap rears itself over the story slowly, and is mentioned only sporadically. But in the end, it topples and suffocates Huw's world. The crushed craftsman's cottage is a symbol of the dedicated work of former generations literally interred in coal spoil. Their lives are crushed by their livelihood. It is a scene of primary pollution—the impacts of mining at the source—rather than the secondary air pollution that comes from coal burning. As a personal account, the novel testifies about the often-hidden effects of mining practiced in small communities far removed from the population centers that provide the coal market. The novel engages no discussion of the reason coal is being mined, where it goes, who consumes it, for what purposes; the only concern is the nature/culture of this coal nook.

Llewellyn develops the dialectic between nature and spoil through time. As the slag heap grows, nature adorns the waste with its flowers and grasses, but the pace of human production far outstrips nature's restoration:

That way [by the river], I had to pass the two heaps of slag that had grown and grown till they looked half as big as the mountain. Even grass was growing in some places, as though to take pity on us and cover the ugliness of them. The river running between was drying up, so sick it was of the struggle to keep clean, and small blame on it.

Farther on, past the last of the cottages, green grass grew again, and happy it was to see a flower growing after all the brute sadness, though the river was still running black and the plants and reeds dead and dying on both banks. (171–2)

The engines pipe bilge directly into the river, and the slag pile that started by the mine entrance slugs its way uphill through the village streets. Solid and liquid pollution are killing the ecosystem, which had existed in harmony with the village gardens and fishing spots. The valley is becoming uninhabitable for

everything but the mine spoil, so Huw calls it a “bully” that pushes more delicate forms out of its heavy way.

Huw’s disgust for the waste of coal mining and the harshness of the work itself does not sow hatred for the miners or the valley they live in; in fact, Huw’s love deepens as he finds solidarity with the other workers in the middle of hardship—a solidarity so palpable in present-day coal mining communities. Though he excels in school and has the opportunity to go into white-collar work, he stolidly chooses the mineshaft with his brother and father. There he learns the toil:

For hour after sweating hour, bent double, standing straight only when we were flat on our backs, we worked down there, with the dust of coal settling on us with a light touch that you could feel, as though the coal was putting fingers on you to warn you that he was only feeling you, now, but he would have you down there, underneath him, one day soon when you were looking the other way. . . . I always thought I saw a face in the glitter of the coal face, and never mind how much Ivor cut from it, it always seemed to be there. (373)

Coal miners’ bodies have to adapt to an array of weird, unevolved conditions by physical repression of the natural needs for light, air, and space (Johnson 64). In Huw’s charmed imagination, he has conversations with inanimate things: the cottage, the river, the slag heap, the face of coal itself. He is haunted by destiny, clearly perceiving that his fate is to be crushed by coal or slag—he seems to acquiesce. His brothers (other than Ivor) fled from the valley to seek other lives, ones that consumed coal rather than produced it. But Huw, his brother Ivor, and his father Gwilym stay at the pick. As their picks do violence to the coal seam, the face in the coal bears witness to their debt. The glittering black face mimes: death is near. The anxiety and melancholy of this mind-space is typical of miners. Their bodies have already become denizens of a coal world, with blackened skin, dusty lungs, and the mole’s motions. They are the ancestors of Morlocks, H. G. Wells’s underworld post-humans whose adaptations have made the bright, airy surface world sensually intolerable.

With his family thinned out by emigration and fatality, a final ominous move comes from the slag heap. With no room left in the valley for spoil, the mine company sends it by conveyor belt to the top of the mountain where it piles around the rim of the valley. To Huw’s protest, the worker explains, “‘If you want to work, the slag must come out. If it comes out, it must have a place to go. So there, you, and here it is.’” Ever gentle-minded, Huw thinks, “No use to blame him,” and returns to his family cottage cowering beneath the waste mountain.

The novel concludes with a conflation of wild nature and the man-made mine, which had been opposed:

There is patience in the Earth to allow us to go into her, and dig, and hurt with tunnels and shafts, and if we put back the flesh we have torn from her and so make good what we have weakened, she is content to let us bleed her. But when we take, and leave her weak where we have taken, she has a soreness, and an anger that we should be so cruel to her and so thoughtless to her comfort. So she waits for us, and finding us, bears down, and bearing down, makes us a part of her, flesh of her flesh, with our clay in place of the clay we thoughtlessly have shovelled away. (497)

Llewellyn depicts nature as an injured mother taking revenge for her violation. The slag is her hammer coming down in verdict. This active characterization is a shift from the narrator's earlier views of despoilment, where nature was passive to man's activities and Huw's shame for the pollution and his pity for nature were just liquid emotions easily diverted by the mine machine. In the end, Huw the old man feels culpable for the work that ruined the valley; with satisfaction he imagines nature's crushing reprisal. At least it is a victory for something living, rather than an apotheosis of waste.

How Green Was My Valley shows a struggle between mine and nature, worker and owner, which was prescient of future losses. Llewellyn's fiction of the crushing slag heap came true in a 1966 disaster in Aberfan, Wales, when a mine spoil tip slid into the valley town and killed 144 people, 116 of them children in the local school. In this case, the waste pile on the mountain slope was built on top of natural springs that fed into a heavy slurry that surged downhill. The second most deadly landslide from coal waste occurred in Buffalo Creek Hollow, West Virginia in 1972. Half a million cubic meters of black waste slurry broke through an impoundment dam and surged downhill, suffocating everything in its path. The disaster killed 125 people and left several thousand residents homeless.

The literature of coal has become a trope that reflects social inequality based on unequal access to the goods and revenues coal energy made possible. The most enduring symbol of the promise and trauma of modernity, coal narratives evoke the dualism of imprisonment and freedom held within the chemical bonds of this material afterlife of ancient sunlight (Johnson 82). The dual nature of coal reverberates as social bifurcations between oppressed producers and empowered consumers, the respective habitats of a crushing underworld and a rapid-transit surface world, and the collective conscious of a people split between public pride

of modernity and a private, often suppressed horror at the tolls exacted on the modern mind and body.

IV Do the locomotion

The coal-fired steam engines of stationary industry led to the reorganization of the workplace in the early nineteenth century, but steam engines drove a more sublime revolution in transportation industry soon after. If stationary industry changed cities, moving industry changed everything in between. The channels along which people traveled by land shifted from muddy, pocked turnpikes to smooth rails, and by sea from meandering trade winds to shortest linear crossings. The 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

Figure 5.4 Joseph Pennell, *The Flying Locomotive*, 1917. Image courtesy of the National Gallery of Art. Public domain.

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 pristine natural places as the new middle class earned vacations and exercised their upward mobility by traveling.

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. 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.

The first true steam-engine railway journey took place in 1804 at an ironworks manufactory in Wales, which soon became the center of high-pressure steam-engine innovation. The leading spur to the innovation of railways was not originally passenger transport, but hauling coal from mining districts to waterways and manufacturing centers. Pit owners often paid egregious sums to wealthy landowners whose tracts lay between pitheads and nearby rivers. The railway's advance required land purchases that led to legal imbroglios when frequent objections came from those lords benefiting from wayleave. By 1825, locomotives hauled coal, and passengers as well, on the twenty-six-mile Stockton and Darlington Railway in northeast England on a route that carefully avoided the Earl of Darlington's fox holes. The industrial era's iron skull was butting up against the jeweled crown of feudal entitlements.

The modest Stockton and Darlington Railway was soon succeeded by the more important Liverpool and Manchester Railway, which also started as a coal-hauling enterprise but soon turned to passengers. By mid-century, over seven thousand 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 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 wrote in 1830:

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. (Qtd. in Adams 10)

The engineer George Stephenson, a gruff man by reputation, 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 (qtd. in Adams 13). His passenger appreciates the sensations of rail travel, the “flying white breath and rhythmical, unvarying pace” of the strokes down the line (qtd. in Adams 11). 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” (qtd. in Adams 11). She implies that the incision of rails into the skin of nature is soon healed with a pleasing secondary naturescape of 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 that 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 (Wolmar 15). 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. (Qtd. in Adams 12–13)

Carried above mundane transportation, Kemble’s account revels in 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” (qtd. in Adams 13). 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 is instantly forgotten in the new rail-running world.

The September 1825 opening of the Stockton and Darlington received worldwide attention, and though some Luddite journalists questioned why anyone would want to ride in “a coal wagon, along a dreary wagon-way, and to be dragged, for the greater part of the distance, by a roaring steam-engine,” other newspaper editors accurately envisioned the economic significance of the invention (qtd. in Wolmer 12). The editors of the *Newcastle Courant* saw that the railway would “open the London market to the collieries of Durham as well as facilitate the obtaining of fuel to the country along its line” (qtd. in Wolmer 24). With access to fuel came industry, civic development, and exponential increases in the population of the rural hamlets neighboring the rails.

First impressions like Kemble’s formed 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 (Henderson and Sharpe 1050). The debates also voiced the rational fear that the process of laying down a rail network would irrevocably alter the landscape and the deep-seeded 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 a nightmare for the conservationists of the day.

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 traveling chaise and four. In the pre-locomotive England of *Pride and Prejudice*, for example, Elizabeth Bennet's pleasure tour to the Lake District with the Gardiners is curtailed by time: due to Mr. Gardiner's demanding business schedule, the original month-long trip is shortened to three weeks. Their itinerary becomes serendipity, as 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 three hundred miles from Hertfordshire to the Lake District. The greater distance could be traversed easily in a day using coal or petroleum. But Elizabeth, traveling on the power of oats and roadside grasses, could not manage such a circuit in three weeks on an average of 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 serious young industrialist of no particular family, as Margaret Hale beguiles Mr. Thornton in Gaskell's *North and South*.)

The Gardiners' original vacation plans follow a well-worn path in Austen's time. In the early days of industry, William Wordsworth lamented that his picturesque home in the Lake District was overrun by tourists. In the 1800 poem "The Brothers" he writes,

THESE Tourists, heaven preserve us! needs must live
A profitable life: some glance along,
Rapid and gay, as if the earth were air,
And they were butterflies to wheel about
Long as the summer lasted: some, as wise,
Perched on the forehead of a jutting crag,
Pencil in hand and book upon the knee,
Will look and scribble, scribble on and look.

(ll. 1–8)

To mock the diversions of the seasonal peripatetic was easy enough; the modest and hard-won lifestyles of native farmers, shepherds, and tradesmen stood starkly against the silly pleasure seeking of this "Son of idleness" floating atop the "profitable life" of city commerce. Samuel Taylor Coleridge lampooned

the cycles of the “Gold-headed cane on a pikteresk toor,” though both poets were themselves strongly influenced by William Gilpin’s philosophy of the picturesque, and had conducted their own tour in the autumn of 1799. To the serious young poets, these new tourists had embarrassing accents, conspicuous baubles, and airy heads to match the cloud-blown scenery reflected in the lakes. Jane Austen was also amusingly annoyed by this vogue of picturesque tourism, and protected Elizabeth Bennet from such silliness by alluding to her cultural awareness: “Lakes, mountains, and rivers shall not be jumbled together in our imaginations; nor when we attempt to describe any particular scene, will we begin quarreling about its relative situation. Let *our* first effusions be less insupportable than those of the generality of travellers” (*Pride and Prejudice* 160).

Wordsworth held out his no-tour stance for several more years before he agreed, in 1810 when he was strapped for cash, to write an introduction and narrative for Joseph Wilkinson’s *Select Views in Cumberland, Westmoreland, and Lancashire*. By 1820, Wordsworth had published his own *Guide to the Lakes* to profit from the new-money urbanite’s hunger for natural scenery at the beginning of industrial-era ecotourism. They might refer to his *Guide* for Lake District superlatives (it is superior in beauty to the Alps and Scotland); for suggestions of picturesque walking and carriage paths; and even for self-chastening commentary on the changes in landscape imposed by the flow of tourists. Even before locomotives opened up the channels of mass transportation in England, stationary industry generated disposable income that buoyed a new industry of pleasure travel to the former backwaters of the kingdom.

Count William Wordsworth among the ambivalent. He did not like commerce, the “getting and spending” that he called a “sordid boon,” and which he coped with primarily through escapism. His lifelong infatuation with preindustrial nature, worried mainly by glowering cliff faces and ransacked hazelnut bowers, would be tested acutely in his later adulthood as the railway made inroads to the Lake District. Before he became an elderly poet laureate in 1843, the middle-aged Wordsworth attempted to cultivate a positive perspective on the incursions of coal-driven transportation. In “Steamboats, Viaducts, and Railways,” written in 1833, his begrudging acceptance is evident: “Motions and Means, on land and sea at war / With old poetic feeling, not for this, / Shall ye, by Poets even, be judged amiss?” (ll. 1–3). We might paraphrase that clipped tercet: “I withhold judgment on my belligerent adversary.” He continues:

Nor shall your presence, howsoe’er it mar
The loveliness of Nature, prove a bar
To the Mind’s gaining that prophetic sense

Of future change, that point of vision, whence
May be discovered what in soul ye are.

(ll. 4–8)

These first eight lines, an Italian sonnet's octave, establish the war of the abstract "Motions and Means" against poets, their feelings, and their subject, nature. The negatives, nots and nors, are aporias designed to hold together his senses so that rage does not obliterate the higher mind's capacity to gain a vision and a sense of the beastly machine. He grants the possibility that the industrial future has a soul, though incomprehensible to the old-souled nature poet. Now blind, he hopes eventually to see. The sestet, a hopeful volta, turns to new terrain in the poem itself and its subject:

In spite of all that beauty may disown
In your harsh features, Nature doth embrace
Her lawful offspring in Man's art; and Time,
Pleased with your triumphs o'er his brother Space,
Accepts from your bold hands the proffered crown
Of hope, and smiles on you with cheer sublime.

(ll. 9–14)

Space, and what it contains (the beauty of nature), have been scarred and defeated. Still, as he often said in *The Prelude*, man is a child of nature, so the arts of man can be naturalized by the self-excusing logic that has enabled so much of industrial development to proceed unfettered. Everything a child of nature does must be "natural." And time, that hooded lunatic with a terrifying scythe, thinks it is wonderful that the next generation can obliterate space. People rushing here and there across three dimensions are less attuned to the passage of the fourth, though they may be more strictly aware of the current position on the clock face. Time is crowned with hope, a dangerous positive emotion, and his smiles are sublime, the most awesome of aesthetic conditions. Sublime is not cheery, it is fear-y.

By 1844, there had been plenty of time for the mind to gain "that prophetic sense" of what was to come. Railway mania had arrived and the bubble was high. Coal fields in the Midlands poured their fuel onto waiting cars. The new queen chose the railway over her father's equipage. The railway was coming to the Lake District via Kendal and Windermere. This time it was personal. Wordsworth was an anointed laureate and his voice spread across the kingdom via the pages of the *Morning Post*: "Is then no nook of English ground secure / From rash assault?"

(ll. 1–2). He bemoans the “blight” that will kill his “Schemes of retirement sown / In youth, and ’mid the busy world kept pure” as so many flowers spoiled on “his paternal fields at random thrown” (ll. 2–3, 8). In this protectionist stance, satisfied with its own sense of paternal dominion against the claims of the wider, and presumably sullied, interests of the nation, he bemoans the “false utilitarian lure” of industrial progress that threatens custom with “ruthless change” (ll. 7, 6). The sestet following this bile-filled octave invokes wild nature to rebel against the arts of man:

Baffle the threat, bright Scene, from Orresthead
 Given to the pausing traveller’s rapturous glance:
 Plead for thy peace, thou beautiful romance
 Of nature; and, if human hearts be dead,
 Speak, passing winds; ye torrents, with your strong
 And constant voice, protest against the wrong.

(ll. 9–14)

The station is set to be built at the bottom of Orrest Head, a hill that offers a fine prospect of Lake Windermere. Admirers of the picturesque, part of an industry that Wordsworth helped to create with his *Guide to the Lakes*, merely pause in rapture at the scene, and then move on. A walking tour of it is described minutely in the 1846 edition of the guide. The strict timetables of rail travel allow only a superficial glance, and the next batch of glancers will soon arrive on the next train. Pleading for prosopopoeia, Wordsworth asks the scene itself to baffle, plead, speak, and protest the laying of the rail. Ironically, the more the valley displays its value in beauty, the more enticing the new line that would bring city-weary workers out into the country. Wordsworth wants industrial blight to remain confined to the cities, along with their workers. But Wordsworth’s *cri de coeur* was ignored. Royal assent to construct the railway came in 1845, and by 1847 the line ran swiftly past the banks of Lake Windermere carrying hordes of travelers past the natural treasures they had never seen before.

Pleasure travel by train modified itineraries according to rail routes, greatly extended ranges, and welcomed poorer and working people. It also changed conceptions of space, time, and perception. In his inquiry on “The Moral of Landscape,” John Ruskin suggests that rapid rail travel is “a mere passing fever” for the childish mind (*Works* Vol. 3 439). To Ruskin, the self-aggrandizing conquest of space is just another indication of a society that is losing touch with value in preference for sensation. True perception requires depth, not breadth: “No changing of place at a hundred miles an hour will make us one whit stronger,

or happier, or wiser. There was always more in the world than man could see, walked they ever so slowly; they will see it no better for going fast. The really precious things are thought and sight, not pace.” The industrial optimist might see broader horizons thanks to rail-borne travel, which brings access to more of the world. Ruskin sees a world miserably contracted by rapid transit: a world not just smaller but also shallower. The power-seeking fool perceives space and time as inconveniences he wishes to “shorten” and even “kill”; the wise man wants “first to gain them, then to animate them” (320).

Venice, Ruskin’s jewel of architecture, is endangered by this time-killing mentality. Noting the Victorians’ “impotent feelings of romance” that “gild” the forms of earlier ages, modern tourists liberated by rail travel see only the surface of things (*Stones of Venice* 4). They miss both the depth of the city’s degradation and the ecstasy of its enduring beauty:

Although the last few eventful years, fraught with change to the face of the whole earth, have been more fatal in their influence on Venice than the five hundred that preceded them; though the noble landscape of approach to her can now be seen no more, or seen only by a glance, as the engine slackens its rushing on the iron line; and though many of her palaces are for ever defaced, and many in desecrated ruins, there is still so much of magic in her aspect, that the hurried traveller, who must leave her before the wonder of that first aspect has been worn away, may still be led to forget the humility of her origin, and to shut his eyes to the depth of her desolation. They, at least, are little to be envied, in whose hearts the great charities of the imagination lie dead, and for whom the fancy has no power to repress the importunity of painful impressions, or to raise what is ignoble, and disguise what is discordant, in a scene so rich in its remembrances, so surpassing in its beauty. But for this work of the imagination there must be no permission during the task which is before us. (4)

Ruskin was tremendously wrong when he suggested that train travel and the telegraph were temporary fancies of an over-energized fossil-fuel society still in its childish stage. Arguably, he was also wrong in claiming that rapid travel stifles “seeing” a landscape—it opens more landscapes to be seen, but only to the properly attuned traveler who exits the vehicle. In this late stage of industrialism, fossil fuel is the central commodity of society, fueling a global airline industry that reduces the earth to a forty-five-hour circumference, unites regions with highways and rails, and charges the smart phones obsolescing in the pursuit of profit. Ruskin’s philosophy of slow time and deep place is still cultivated in the bioregionalism and slow food movements; these countercultures exhibit an alternative ontology to the industrial pace race.

Coal-chuffing locomotives were perhaps most notable for their proficiency in opening rural and wild districts to the influx of commerce. Manufacturing and tourist industries had bewildering effects on the formerly quiet provinces, which were cut through with rails joining productive cities. The first train horn ringing the hills was an aural symbol; once it was heard, change was irrevocable. Because of the stunning single-generation shift in the countryside from a deep medieval past to a modern industrial future, other landscapes altered by moving industry get less attention. Urban spaces were also changed by coal-fired transportation. Citing the destructive construction of the London and Birmingham railway, which opened in 1838, Charles Dickens describes the ruin brought upon London's Camden Town that he knew as a boy. In *Dombey and Son*, he writes of a "great earthquake" that "rent the whole neighborhood to its centre" as though railway construction were a kind of primordial chaos:

Houses were knocked down; streets broken through and stopped; deep pits and trenches dug in the ground, enormous heaps of earth and clay thrown up; buildings that were undermined and shaking, propped by great beams of wood. Here, a chaos of carts, overthrown and jumbled together, lay topsy-turvy at the bottom of a steep unnatural hill; there, confused treasures of iron soaked and rusted in something that had accidentally become a pond. Everywhere were bridges that led to nowhere; thoroughfares that were wholly impassable; Babel towers of chimneys, wanting half their height ... piles of scaffolding, and wildernesses of bricks, and giant forms of cranes, and tripods straddling above nothing... Hot springs and fiery eruptions, the usual attendants upon earthquakes, lent their contributions of confusion upon the scene. Boiling water hissed and heaved within dilapidated walls; whence, also, the glare and roar of flames came issuing forth; and mounds of ashes blocked up rights of way, and wholly changed the law and custom of the neighborhood.

In short, the yet unfinished and unopened Railroad was in progress; and, from the very core of all this dire disorder, trailed smoothly away, upon its mighty course of civilisation and improvement. (68)

Dickens's absurdly over-constructed image of deconstruction derides the diminishing returns of industrial "improvement." With the verbal equivalent of an earthquake, Dickens shows the violence of retrofitting an ancient city with a modern railway. His invocation of chaos and hell, volcanoes and earthquakes, and Babelian miscommunication counters the progressivism of railway boosters. Their project annihilates past and present, "law and custom," in its singular purpose to lay a straight track to the future. Quite the opposite of Fanny Kemble's ode to the railroad, which celebrates a rapid, smooth, fragrant,

green, mossy path into the future, Dickens's contemporary voice cries havoc and wastage. Sublime heaps of history lie in rubble along the future's survey route.

Dombey and Son was published in 1846. By 1854, Dickens saw fit to write a book that concentrated entirely on the cruelty of industrial thinking and disgust for the living conditions in industrialized England. In *Hard Times*, the hapless factory workers of Coketown live "by the railway, where the danger-lights were waning in the strengthening day; by the railway's crazy neighbourhood, half pulled down and half built up; by scattered red brick villas, where the besmoked evergreens were sprinkled with a dirty powder, like untidy snuff-takers; by coal-dust paths and many varieties of ugliness" (155). Echoing Engels's account of Manchester's environment, Dickens extends the industrial pariah from stationary to moving industry; proletariats suffer in the shadow of both steam engines.

Not so for the barons of Coketown, the "national cinder-heap," who are the first generation of suburbanites fleeing the pollution and crowds of the city via subsidized public transportation: "Mr. Bounderby had taken possession of a house and grounds, about fifteen miles from the town, and accessible within a mile or two, by a railway striding on many arches over a wild country, undermined by deserted coal-shafts, and spotted at night by fires and black shapes of stationary engines at pits' mouths" (192, 157). The land surrounding Coketown is strangely used: it is undeveloped, but already degraded by the disused shafts and ongoing pit mine operations signaled by puffs of coal smoke. Bounderby's suburban estate turns its backside to those dirty associations that make its existence possible. His house looks instead toward the mellower "rustic landscape, golden with heath, and snowy with hawthorn in the spring of the year, and tremulous with leaves and their shadows all the summer time" (157). This pastoral idyll, conveniently accessed by rail to the remunerative city, foreshadows the suburban settlement pattern distinctive to the mid-twentieth century, where every day a city worker could travel back in time to the illusion of a pastoral existence. Mr. Bounderby's unctuous companion Mrs. Sparsit, catching the train from town to country, "was borne along the arches spanning the land of coal-pits past and present, as if she had been caught up in a cloud and whirled away" (195). Like Fanny Kemble, the imagination of Mrs. Sparsit takes flight while traveling the grand spans of the railway, sheltered from the unhappy realities—such as coal—that are conditions of its existence. "It afforded Mr. Bounderby supreme satisfaction to instal himself in this snug little estate, and with demonstrative humility to grow cabbages in the flower-garden" (158). In Dickens's sarcastic "humility," the decidedly modern and urban Bounderby gently tends cabbages like a peasant in

order to unwind after hours of rancor in the factory. He has the privilege to live two lives, and a railway that links them together.

In *Hard Times*, Dickens allows the poor workers to use the railway for fleeting afternoons of leisure as well. Since it is an instrument of social equality, affording transportation to anyone with fare, the workers play the idyll for an afternoon: "It was customary for those who now and then thirsted for a draught of pure air, which is not absolutely the most wicked among the vanities of life, to get a few miles away by the railroad, and then begin their walk, or their lounge in the fields" (245). Sissy and Rachael ride out to a station halfway to the master Bounderby's estate, and their escape is possible on a Sunday, since the Coketown soot climate is not yet universal. Nature abides as if nobody had ever heard of mass-produced tweed: "Though the green landscape was blotted here and there with heaps of coal, it was green elsewhere, and there were trees to see, and there were larks singing (though it was Sunday), and there were pleasant scents in the air, and all was over-arched by a bright blue sky" (245). The women gain perspective, literally. They see "black mist" in the direction of Coketown, hills in another direction, and in the third a gilded horizon lighting on the ocean (245).

The scene is quiescent and atavistic; they have stepped backward in time: "Engines at pits' mouths, and lean old horses that had worn the circle of their daily labour into the ground, were alike quiet; wheels had ceased for a short space to turn; and the great wheel of earth seemed to revolve without the shocks and noises of another time" (245). What is pleasant at first becomes creepy as they traverse the abandoned countryside, which appears as a ghost land in the wake of population flight to urban manufacturies. Ghost pastoral turns to sublime disaster zone as they discover Stephen Blackpool fallen into a "black ragged chasm hidden by the thick grass" aptly named the Old Hell Shaft (246). The holes in the countryside are not only the vacancies left by the lost economy and society of rural England but actual fissures in a landscape stripped of coal and left unrestored. Blackpool's life ends in his eponymous place, swallowed by the mine, a sacrifice to fuel.

The death that Dickens designed for Stephen Blackpool is highly symbolic. The factory hand is bodily swallowed by the very tomb excavated to fuel his work. The worker is both a figurative and literal food gobbled up by the industrial system. Coal's physical advantages as a fuel are cancelled out by the social and natural conditions it creates: bloated taskmasters, winnowed workers, and the shoddy morality of industrialism's ethos of the self. This lugubrious economic order is built upon the seeming absurdities of filth-filled cities, coal country riddled with death holes, and a modern train flying over the squalor on

a whimsical viaduct bearing its master to his idyllic estate. The tragedy is that the absurd is a true reflection of coal's Victorian reality.

More measured novels of the industrial Midlands, like Gaskell's *North and South*, take account of the opportunities opened by hard-working industrialists as well as the ugliness of that new world. Like Dickens, Gaskell overtly compares manufacturing centers with bucolic backwaters, and crafts a woman's happiness out of her disavowal of the old rural life in preference for the industrial nexus. Margaret Hale would not be able to perceive the relative virtues of north (industry) and south (agronomy) without her seat on the railway. She not only finds her husband among the machines; she finds her own proactive place in a world that permits some new opportunities for women: she advocates between workers and mill masters.

The whole novel is in sync with the railway table as characters come and go from far-flung locales, and the cinema version depicts the first kiss between the betrothed couple in public on a train station bench, before they retreat to the privacy of a jostling train car. Coal transportation created the modern sense of the world as small and accessible, permitting an egocentric mastery over time and space coupled with the voyeuristic eye of the passenger gazing through a picture window. It empowered the individual body to move at superhuman pace through space.

Inversely, and simultaneously, coal disempowered millions of workers from the East and West Indies to western Europe as its new world order demanded raw materials produced by slaves and textiles produced by proletariats. It was also an ingenious shifting-scene-maker for writers: the train car trumped the horse-drawn carriage as a new setting for mischief. Patricia Highsmith would unite murderers in her 1950 novel *Strangers on a Train*, and Agatha Christie in the 1957 novel *4:50 from Paddington*. With the train car as an unreliable, shifting location, writers could play tricks with time and space and attenuate the nature of witness. From a solid, Newtonian world of predictable movement there emerged the more harrowing experience of relativity, with fast-running trains putting into question the physical nature of simultaneity and the observer's frame of reference.

The railroad was arguably even more significant to the development of North America than it was in England. With much more and much wilder terrain, less infrastructure, greater natural resources, and lower population density, the building of the great American railway was needed to unify the vast territory. Its construction was generally viewed with less controversy because, west of the East Coast plain, the railway created the possibility of large-scale settlement and

trade. In England, everything had to be retrofitted over deep-seeded properties and traditions. In America, the new rails shot through vast unpopulated areas, and preexisting cultures endangered by its advance—namely, Native American tribes—had already been decimated and marginalized by the middle of the nineteenth century. In 1869, the line from San Francisco met the line from New York midway at Council Bluffs, Iowa, completing the first transcontinental railway and forever changing the aura of wilderness in North America. The frontier was bisected.

In American literature, the locomotive is generally an object of reverence. Walt Whitman's *Song of Myself* captures this spirit of celebration of the technology and fuel that enabled the opening of the American continent. Always embodied and frequently sexual, Whitman's poetry echoes the bawdy ballads of industrial London. In "To a Locomotive in Winter," the machine is a "fierce-throated beauty" whose fire and song dispel the cold-closing night:

Thy in thy panoply, thy measured dual throbbing, and thy beat convulsive;
Thy black cylindric body, golden brass, and silvery steel;
Thy ponderous side-bars, parallel and connecting rods, gyrating, shuttling
at thy sides;

Thy metrical, now swelling pant and roar—now tapering in the distance;
Thy great protruding head-light, fix'd in front;
Thy long, pale, floating vapor-pennants, tinged with delicate purple;
The dense and murky clouds out-belching from thy smoke-stack;
Thy knitted frame—thy springs and valves—the tremulous twinkle of thy
wheels;
Thy train of cars behind, obedient, merrily-following,
Through gale or calm, now swift, now slack, yet steadily careering:

(ll. 3–12)

The machine is sensual and superhuman in size and power. Its dragon-like might shrinks vast distances, cuts through the cold, and brings people and goods "merrily" along on this great modern ride. Fanny Kemble's delight at moving thirty-five miles per hour is upgraded to epic speed and distance in any weather; Whitman sings the locomotive as a new archetype of modern agency. Whitman explodes the old literary comforts—"No sweetness debonair of tearful harp or glib piano thine"—to sound his barbaric yawp on behalf of the mighty engine, "Type of the modern! emblem of motion and power! pulse of the continent!" (ll. 21, 13).

The industry-friendly encomia of Kemble and Whitman have been recuperated in contemporary environmental arguments for the new roles of the railway in

a low-carbon industrial world. There is irony in hailing that prime mover of yesterday's industry as tomorrow's environmental savior, as the solution that will replace the private car and reunify sprawled communities along a corridor. After all, fed on coal, the locomotive was first used to haul coal from mines. Within a few decades it also disgorged the masses into environmentally delicate locales; facilitated mass consumerism by hauling freight between remote factories and urban retailers; and elided the distinction between access and exploitation, as it opened the American and British colonies to the demands of the metropole for natural resources like timber, minerals, and game animals. The rail corridor became a vector for invasive species that were sometimes dropped as seeds by the leaky metal cars, but more often crept out of endemic locales to grow along the disturbed habitat of the trackside (Revill 222–3).

How could the locomotive be framed as an environmental advantage? The main answer, both sensible and short, is that the railway is stunningly more efficient in its use of fuel per weight transported. On average, a train can move one ton of freight 473 miles using one gallon of fuel, and the Association of American Railroads claims that trains are about four times more efficient than the standard trailer trucks that fill the highways ("Environmental Benefits" 1). Their wider adoption would ease road congestion from truck traffic, presumably allowing greater access for private cars (but that is not the point, right?). Modern railways present themselves as people-friendly, too: digital-age white-collar workers are attracted by Wi-Fi access, space to work and socialize, and freedom from the stresses of car ownership and the road rage of rush-hour driving. The railway's long, skinny habitat can be cultivated as a multiuse terrain for biking, animal migration, wildflower habitat, and even small-scale gardening. Railways are enjoying a renaissance amid an aging and overcrowded highway system. Their appeal is at once nostalgic and chic-futuristic, practical and fantastical.

In the infatuation of modern train love, it should not be forgotten that their original purpose continues to be a major part of their work. Trains haul coal to the power plants that generate electricity. Trains haul crude and shale oil to refineries, and recent spectacular disasters like the one that killed forty-seven people in Lac-Mégantic, Quebec in 2013, underscore the danger of dragging vats of fossil fuel along the iron road. Down to its belly, the boiler, the locomotive is an industrial beast of burden continually beholden to fossil fuels. The railway is more efficient than the highway, but its very efficiency tends to exacerbate carbon emissions by linking the producers of fossil fuels with its worldwide consumers.

Coal walked on water as well. Steamships proved their commercial viability nearly as early as the steam-powered locomotive: in August 1807, the steamship *North River* (aka *Clermont*) first navigated up the Hudson River from New York City to Albany, leaving dozens of hard-tacking sailing ships in its wake. Regular passenger service began the next month, in September 1807, and the ferry service turned an immediate profit. The steam-powered ocean liner is an ideal figure for the divergent fortunes of the industrial social classes: onboard were perpetuated the old distinctions of rank that were deployed on shore, based upon conditions of transport—like foot versus horseback, hackney coach versus barouche, and third versus first class on the railways. Whether biomass or fossil fueled, passengers got what they paid for. The ocean liner mapped these social divisions onto the geography of the ship, with the highest payers on their posh decks, above the rest of the passengers, and the poorest voyagers sardine packed in steerage, between the cables controlling the rudder and below water level.

As in the ceaseless toil of stationary industry, the workers shoveling coal in the steamship were conscribed into a machine-like existence, forever filling the rapacious maw of the great engines that carried thousands of tons across the oceans. Rather than figuring these men as post-human cyborgs, both man and machine, modernist literature often responded to fears of biological degeneration by capturing them in atavistic forms: coal tenders became apes made bestial by their work. Evolutionary theory had created a discourse of atavism and degeneration, as the world came to see human history in continuum with other animals rather than in static separation from them. The unforgiving task of shoveling coal created an anachronistic savage man adapted to the industrial jungle of the boiler room.

Eugene O'Neill called this man the "hairy ape," and unsubtly fixed him in an eponymous play (1922) where the human ape, Yank, begins the action flush with pride as a prime mover in industrial society. After a fleeting encounter with a delicate heiress, whose curiosity about the conditions of the working class lead her to the engine room of a great ocean liner, Yank's rage at her horror of him leads to series of failures to integrate into groups: laborers, socialist workers, and prisoners. He ends up dying in the crushing arms of an ape in the zoo. Part of the resemblance comes from the physical nature of the work in an age when the working classes performed repetitive machine-driven tasks that led to hypertrophied physiques. Yank and his compatriots have, in O'Neill's stage directions, a "natural stooping posture which shoveling coal and the resultant over-development of back and shoulder muscles have given them. The men themselves should resemble those pictures in which the appearance

of Neanderthal man is guessed at. All are hairy-chested, with long arms of tremendous power, and low, receding brows above their small, fierce, resentful eyes" (2). Their overdeveloped bodies dominate their underdeveloped brains, and their lack of humanity is located in a cognitive-emotional deficit of kinship: the hatred of the abject man. O'Neill's play explores how the subaltern bodies of fossil-fuel workers were disproportionately taxed in order to provide privileged classes with fossil-fueled liberation (Johnson 57). In this order of things, the hysterically feminine heiress enjoys the mind-body pleasure of modern power, which extends her own modest form beyond fleshly bounds to the prosthetics of the mighty ship and the laboring, lumbering bodies that make it go. Yank is a social inferior, stigmatized by social Darwinism into a merely animal, muscular organ; his body itself is owned and used up by her class of consumers—he might as well be coal.

Yank is the most exaggerated of a team of laborers who maintain some individuality based on nostalgia and collective social activism. The elderly Irishman Paddy recalls the bygone work of sailing ships in a celestial symphony of pure air, sun, stars, and exotic coasts. "A warm sun on the clean decks. Sun warming the blood of you, and wind over the miles of shiny green ocean like strong drink to your lungs. Work—aye, hard work—but who'd mind that at all? Sure, you worked under the sky and 'twas work wid skill and daring to it. And wid the day done, in the dog watch, smoking me pipe at ease, the lookout would be raising land maybe, and we'd see the mountains of South Americy wid the red fire of the setting sun painting their white tops and the clouds floating by them!" (18). Like Ishmael, Paddy is eloquent on the idealisms of preindustrial labor lost, but none of these sailing pleasures are afforded the coal scuttlers on the New York to Southampton line. Paddy perceives "black smoke from the funnels smudging the sea, smudging the decks—the bloody engines pounding and throbbing and shaking—wid divil a sight of sun or a breath of clean air—choking our lungs wid coal dust—breaking our backs and hearts in the hell of the stokehole—feeding the bloody furnace—feeding our lives along wid the coal, I'm thinking—caged in by steel from a sight of the sky like bloody apes in the Zoo!" (18). The socialist, Long, blames their desperate labor conditions on an oppressive capitalist system: "We wasn't born this rotten way. All men is born free and ekal. . . . them lazy, bloated swine what travels first cabin? Them's the ones. They dragged us down 'til we're on'y wage slaves in the bowels of a bloody ship, sweatin', burnin' up, eatin' coal dust! Hit's them's ter blame—the damned capitalist clarss!" (19).

Unwilling to perceive himself as a victim of uncontrollable circumstance, Yank ignores old men and socialists, pigeonholes his pride in the engine room, a synecdoche of the great forces of coal-powered industry of which he considers himself master.

Sure I'm part of de engines! Why de hell not! Dey move, don't dey? Dey're speed, ain't dey? Dey smash trou, don't dey? Twenty-five knots a hour! Dat's goin' some! Dat's new stuff! Dat belongs! But him, he's too old. He gets dizzy. . . . Everyting else dat makes de woild move, somep'n makes it move. It can't move witout somep'n else, see? Den yuh get down to me. I'm at de bottom, get me! Dere ain't nothin' foither. I'm de end! I'm de start! I start somep'n and de woild moves! It—dat's me!—de new dat's moiderin' de old! I'm de ting in coal dat makes it boin; I'm steam and oil for de engines; I'm de ting in noise dat makes yuh hear it; I'm smoke and express trains and steamers and factory whistles; I'm de ting in gold dat makes it money! And I'm what makes iron into steel! Steel, dat stands for de whole ting! And I'm steel—steel—steel! I'm de muscles in steel, de punch behind it! (21)

His displaces his anger in aggression toward the coal heaps. Yank's tragic pride plays out in his hubristic narrative of laborer as world maker, the Atlas supporting a ponderous and oblivious globe. Though Yank's speech is at once noble and farcical, it is the truth of his self-vision that testifies to the sheer magnitude of the forces unleashed by coal workers. A coal miner who consumes 3,500 food calories to produce five hundred pounds of coal in a day achieves a stunning gain in energy: he produces five hundred heat calories from coal for every calorie of food burned (Wrigley 206). Yank is a fireman, not a miner, so his nexus falls between the cold lumps and the searing boiler flames, with thousands of calories scuttling from every shovel heave. Though Yank's physique and exertion resemble his ancestors with their shoulder to the plow, his work unleashes the energy of a superhuman by calorie comparison. No wonder Yank feels personal pride despite his imprisonment in the system. He is at once inmate and wizard.

His narcissism is a mirror cracked when the gaze of the steel heiress, Mildred, settles on him in his labor pit. Her stupefied incomprehension of Yank's world reveals to him the great chasm between the benefactors of coal and its slaves. Mildred is coal's paradoxical daughter: translucent white skin, gauzy white dress, weak, protected, and tepid. Yank is coal's prodigal son: massively muscled, arrogant, ignorant, and destined to dig his own grave. The coal world protects its oblivious mistress, and shows no mercy toward its plebeian. Still, the encounter

between them in the ship's diabolical engine room is the moment of traumatic awakening for Mildred. Her worldview of universal, easy pleasure ruptures with the knowledge that not only Yank exists, and toils in a coal hell, but that her own life stands on the brutal oppression of the underclasses (Johnson 99). The horror of her epiphany sprawls beyond this memorable scene into O'Neill's maturing twentieth century, where collective middle- and upper-class guilt and anxiety undergirds, and ironically energizes, consumer appetites.

Literature is filled with tales of rich sheltered ladies and mucky laboring men, of their romances and mischances, but O'Neill's play is a modern American romance of hatred, ignorance, fear, and powerless fury. He eschews realism to attain the industrial sublime, his ship seared by white furnace light, shadowed by hulking forms and their unnatural soot dress. Between the antipodes of Mildred and Yank there is a wall built of coal, preserving unequal class distinctions as effectively as the outworn European class system based on land and titles.

V Horizon gone: Mountaintop removal mining

Mountaintop removal mining (MTR) blasts the tops of mountains and fills adjacent valleys with the spoil. Traditional mines opened in the bottoms and amassed spoil at the top. With mountaintop removal, gravity is on the side of the massive earth-moving machines that shove the land above the coal seams, the "overburden," down into the river valleys. Bulldozers skim off the exposed coal, other large trucks and trains haul the product to its markets, and the need to employ miners is greatly reduced from traditional shaft-mine techniques. This technique has refigured the Appalachian landscapes of Ohio and West Virginia most drastically. Advocates of mountaintop removal sketch out a pleasant pastoral future for the sacrifice of the steep forested hollows. By planting grass seed in the valley fill and grading the slope to be flatter, mining engineers envision high meadows that would support game species like elk, deer, and turkey, and with them new hunting areas. They also point to several golf courses built upon reclamation sites. A grassy version of Lake Powell, the water body created by flooding Glen Canyon, this post-mining meadow is a terra-formed landscape. The authors are downright giddy about the environmental benefits of mountaintop removal: "It is clearly evident from the development taking place in the Appalachian region, which is creating jobs, living spaces and recreation for future generations, that this is one of the best examples of sustainable

development, not only in the United States, but in the world” (Gardner and Sainato 55).

Ecologists reject this happy depiction of the after-scapes of MTR operations. The chemical impacts on land and water are so fundamental that every living thing that exists in these diverse hollows is affected, and often killed or sickened. The effects are measureable from the smallest phyto- and zooplankton, the base of the food chain, right up through communities of plants and animals, to the humans who have often dwelled for generations in the deep slopes of Appalachia. On a higher level of landscape aesthetics, the evolved fabric of the ridge-and-hollow is torn apart and hastily replaced with a flat pile of rock shambles and overburdened waste lagoons. Or, depending on your perspective, open land for new hunting parks and golf courses.

MTR is now nearly half a century old, with the first operations beginning in the early 1970s. Ann Pancake’s novel *Strange As This Weather Has Been* (2007) tells the story of a community in southern West Virginia whose three generations have lived with MTR since its inception. Pancake based her fictional book on interviews and events that occurred in coal communities over the past several decades. She alludes to the Buffalo Creek disaster, still memorialized by long-suffering West Virginians whose lives are ruled by coal: it is, on one hand, their history, tradition, and livelihood and, on the other, coal is the cause of intensifying medical, social, and ecological degradation.

Figure 5.5 Flashdark, Valley fill—Mountaintop Removal Coal Mining in Martin County, Kentucky, 2006. Source: Wikimedia Commons. Public domain.

The balance between jobs and quality of life in these Appalachian hollows is tipping, however, toward the worse. Traditional shaft mining employed thousands of workers, providing them with steady jobs and even union representation through most of the twentieth century. Pancake's novel takes place in the late 1990s, when MTR is replacing shaft mining, which kept the surface environment and communities intact. The title is an allusion to climate change in which Pancake links coal burning with "global weirding"—the scrambling of the seasons evidenced in changes to temperature, rain, and cloud cover:

This year it seemed the seasons were running backwards. The summer strangely cool and wet following a warm snowless winter, that winter following the worst drought summer in sixty years. . . . too much water or too little, the temperature too high or too low. "Strange as this weather has been," people would say, or, "With this crazy weather we've been having." And I knew Lace believed the weather was linked to the rest of this mess, but I wasn't sure how. (101)

The local weather implies global climate shifts, so Pancake's perspective remains locked within the community. The local Yellowroot Mountain has been bought by the mining company, and the citizens living in its shadow have no power to change the permitting, the MTR technique itself, or even be employed by the company doing the work. They are merely horrified bystanders. The novel depends upon the visual outrage and visceral disgust that surrounds MTR sites, from the bottoms straight up to the truncated peaks. First, from the communities in the bottoms, the floods strip the surface of reformed mountain:

For a couple hundred yards, it was just the same hollow it had always been, except for the flood mess on the creek. . . . The creek water itself still colored like creamed coffee left for weeks on a counter. . . . The sides of the hollow, as we got further in, more naked and scalped, more trees coming down, and up above, mostly just scraggly weeds, the ground deep-ribbed with erosion, and I told myself, yes, this is where the floods come from. From the busted ponds and the confused new shape of the land. From how the land has forgot where the water should go, so the water is just running off every which way. (15–16)

The old slope has been transformed into a mess of organic death and man-made trash caught in a welter between insistent gravity and disrupted watershed dynamics. The floods of muck and poison that inundate the community become as commonplace as the rains themselves, and the protests of the people are met with calculated corporate obfuscation. So the people—like the Luddites of

old—break laws and locks, hop gates, and duck security to have a look at the source of the degradation. They find an ecocidal scene:

The top of Yellowroot was just plain gone. Where ridgetop used to be, nothing by sky. . . . Then it dawned on me exactly what I was standing under—Yellowroot Mountain, dead. I knew from Lace and Uncle Mogey that after they blasted the top off the mountain to get the coal, they had no place to put the mountain's body except dump it in the head of the hollow. So there it loomed. Pure mountain guts. Hundreds of feet high, hundreds of feet wide. Yellowroot Mountain blasted into bits, turned inside out, then dumped into Yellowroot Creek. (19–20)

The daredevil son, Corey, loves machines and violence. He sees in the mine site an adult-sized playground to show off his ATV tricks. His father Jimmy defends the coal industry, parroting the conventional reasons of jobs and culture, and stays too close to his TV to ever glimpse the new lay of the land. But once Lace, Bant, and Avery break the law to get a glimpse of the violated mountain, they cannot un-see the scene.

Pancake figures the destroyed mountain as a living creature beheaded, drawn, and quartered. Rather than a single death, though, this guillotine is just the beginning of a reign of terror in the community. Those loyal to the coal industry fight with the insurgents against it, causing a schism in the small town. The historical background of meager education and underemployment is exacerbated by losses in property and health problems, as well as the general malaise of living in a place with continual earthquakes from the blasting, and noisy traffic from the heavy machines. The redeeming value of MTR, its coal, condemns the community to oblivion. It generates a little business for gas stations, restaurants, and hotels due the “scabs” that come from out of state to work the operation—but little else. What about the pastoral landscape promised in its wake? Pancake's description of MTR is nothing at all like the brochures of its boosters; in fact it is dystopian:

He climbs past the first series of terraced ponds, the water as opaque as mustard and colored like the inside of a sick baby's diaper. The only growing thing left up here in the head of the hollow is the grass covering the pond banks, no doubt the same stuff they've genetically engineered for reclamation. Grass that can grow on asphalt. Besides the grass, everything is dead, the hollow an amphitheatre of kill, and the grass itself isn't even green. (213)

When the palimpsest of biodiversity is blown away and the sky looks down on rubble, characters representing three generations—old Mrs. Taylor who predicts

God's apocalypse, Lace the enduring mother/gatherer, and Bant the inquisitive teenager—testify to the human ecological toll of our need for fuel. Mountains are ground down to burn and turn turbines, and what is sacrificed is the fabric, mesh, and web of life that evolved for the five hundred million years since the Appalachians rose out of the crunched-up North American craton. Pancake's novel remains trained on a single community in one hollow, but the implications of this real-life fiction spans the entire region of eastern Kentucky and Ohio and southern West Virginia, where MTR is presently most active. The result, piled on top of all the other things discarded by the industry, is utter disorientation:

The hardest thing of all about living through this, hasn't been the blasting or the dust or the flooding or the fires or how they broke the community. It's looking up there each morning, at a landscape you had around you every day of your life.

And seeing your horizon gone. (309)

Pancake's novel brings attention to abject people and natural landscapes that have long been neglected by the modern narrative of progress that features the emancipation of the consumer. The Polyanna narrative neglects accounting for the class and cultural isolation of coal-producing regions, and even sympathetic liberal environmental writing more often relies on privileged subjects, like urban gardening and farmer's markets, read by the bourgeois, rather than attending to the social and environmental traumas suffered in coal-producing regions. Such cultivated myopia about the costs of this fuel are psychologically explicable due to its continuing contributions to the modern life, from domestic heat and electricity to the global manufacture of consumer goods using coal.

The inconvenient truths about coal, like climate change, are traumas suppressed in the cultural conscience that permit the continuing division between coal producers and coal consumers (Johnson 94). This plays out in political spheres, with antienvironmental politicians appealing to coal region voters who feel affinity, economic and cultural, to the working-class narrative of sacrifice and perseverance, even at the cost of their health and habitat. Whether that political story results in steady work or more layoffs due to MTR's low demand for labor is lost in a class-charged imbroglio. The Kentucky writer Wendell Berry has concisely summed up his position on MTR in his region with the holler, "Compromise? Hell! ... Most of us are still too sane to piss in our own cistern, but we allow others to do so, and we reward them for it... those who piss in our cistern are wealthier than the rest of us" (*Compromise* 155). Ironically, MTR's practice may be endangered not by the entrenched regional opposition or environmental regulation, but by fuel economics. In the United

States, hydro-fracking is making natural gas a cheaper and cleaner alternative to coal, and coal's market is dwindling.

Though the richest veins of literary coal run through the nineteenth century, accounts of air pollution continue to be relevant in the twenty-first century. The miasma has drifted from retrospective industrial England to the developing world's intensive industrial locales, most notably modern China's numerous manufacturing cities, which are choking on coal pollution. London, Manchester, Sheffield, and Leeds have become Beijing, Lanzhou, Guangzhou, Xingtai, Shijiazhuang, Baoding, Handan, Hengshui, and Tangshan. Spirits of the cleansing rain in Swift's "Description of a City Shower," China has the world's most advanced and carefully guarded research on seeding clouds to wash away the smog in its industrial centers. These cities consume coal in order to drive the factories that manufacture consumer goods for the global market, but air pollution cannot be exported, it can only be washed away. China's state-run media has announced that in 2015 the country will begin manufacturing rain to clear away smog using 6,902 cloud-seeding artillery guns and the catalysts of dry ice, silver iodide, and salt powder (Wan).

Gemstone to carbuncle, coal is multitudinous in character and unparalleled in its impact on industrial history. Coal is lead author of the Anthropocene. As literature is a body of ideas and propositions that tends to critique the hegemony, our survey of coal in fiction and poetry more often highlights the sacrifices inherent in our adoption of high-energy economies and lifestyles than it acts as impresario for the miracle of fossil fuels. For the speed, energy, consumables, and infrastructure gained, indeed an entire paradigm shift in human ontology from agricultural craft societies to industrial ones, literature takes a counterpoint account of the mass losses of life and landscape. Still, it preserves some of the wonder inherent in the superhuman experience of movement beyond animal capabilities, a wonder we've mostly lost because of its quotidian nature. What was miracle has become mundane. What was freedom has become fetters—of urban crowds, debt-ridden consumerism, pollution. This cultural evolution from early industry into middle and late forms of industrial capitalism follows a parallel arc along coal's cousin fuel: petroleum.