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Charcoal: Firing Early Industry

I The collier

Charcoal is the biomass fuel closest to a fossil fuel. It looks and behaves quite like its fossil counterpart, coal: black, brittle, smeary, dusty, and energy dense. Charcoal is a slightly more concentrated fuel than bituminous coal, containing about a third more millijoules per kilogram, and it has twice the energy density of well-dried wood (Smil 12). It is processed by slow anaerobic burning of wood, or pyrolysis: literally a “separating fire” that eliminates water as it preserves the vasculature of the wood (its veins) so that a light, porous fuel remains. This distillation of wood energy was the first true chemical process developed by humans in the Bronze Age (Kelley 3). Charcoal burns hotter, longer, and with less smoke than wood, and it can be used where wood cannot: in high-temperature hearths, industrial furnaces, and in gunpowder. It is the black in “black powder” that fuels the explosion.

Charcoal has been essential to the production of metal since the Bronze and Iron Ages, beginning 5,500 years ago. Prior to the widespread adoption of coal-derived coke in the nineteenth century, charcoal was the only fuel with enough concentrated energy to fire bloomeries and blast furnaces in ferrous metallurgy. Iron-making technologies supported great advances in human civilization: the iron plow that supported stationary rather than itinerant agriculture, the advances in armor, weaponry, architecture, and machinery enabled by wrought iron, cast iron, and eventually steel. Charcoal can readily drive a fire up to a searing thousand degrees Celsius, a temperature that fuses sand, limestone, and soda ash to form glass. Charred wood is resistant to decay in swampy conditions, so it was used extensively in the foundations of heavy structures built by the Greeks and Romans (Kelley 3). Considering its preeminence in fueling preindustrial metal and glassworks, charcoal was the essential platform fuel between the

biomass wood fire in the *Homo erectus* camp more than a million years ago, and the coal-fired furnaces of the Industrial Revolution only two hundred years ago.

Effective charcoal production requires an enduring knowledge tradition. The charcoal-making process essentially speeds up the geological time required to transform forests into coal. It has historically been handmade in isolated pockets of deep woods by colliers who work in long, slow rhythms, enveloped by smoke and indifferent to season. It rewards patience, experience, and artistry in its alchemy from raw biomass to ripe fuel. Talented charcoal colliers can produce their goods with 90 percent efficiency, losing little of the potential energy contained in the wood fiber while smoldering out its water and impurities. Since charcoal weighs only about 15 percent of the raw source wood, it made sense to carry the charcoal long distances, not the wood, particularly when muscles were the movers. The architecture of charcoal work achieves mythic proportions: the smoking pile is a peaked dome with a diameter longer than the standing height of the trees packed inside, and with a height twice or thrice that of its collier. Stacks of cordwood and kindling provide the endoskeleton of an energy hive, and its skin is a sealing mash of turf, clay, and mud.

This giant nest of slow fire is designed to allow the proper minimal circulation of air to the innards of the pile. After first ignition with burning coals, it smokes through the flue at the top like a volcano, and through myriad little holes poked in patterns around the swell of the dome. The collier titers the air holes in

Figure 4.1 Adolf Ledebur, *Meule à charbon de bois*, 1895. Image courtesy of Wikimedia Commons. Public domain.

response to the smoke: blue smoke implies too much oxygen and the collier plugs up some holes; white steamy smoke is perfection—the fire expunges water without burning much of the chemical energy. The collier lives minimally in a conical hut alongside the pile to keep up the conversation over the week or more it takes to make a hill of charcoal from a mountain of wood. Vigilance is key: the wrong kind of combustion, caused by a number of factors like inadequate mud sealing or a breeze buffeting the pile, could quickly ruin many weeks' work. Charcoal burning is traditionally a summer and autumn activity, with the burners becoming woodcutters in winter when trees hold the least sap (Kelley 8). Some colliers settled in one locale and contracted out their goods, some worked nomadically for various woodland landowners. Though charcoal burning has its privations, particularly exposure to the elements, the occupation was important in pre- and early industrial societies and usually paid the skilled burner respectably. Charcoal colliers in England before the First World War earned twenty to thirty shillings a week, a level just below the wages of skilled artisans like smiths (Kelley 8).

Their practice harkens back to Europe between the fourteenth and nineteenth centuries, when iron was required by farmers, blacksmiths, and builders, and forests were stressed to yield enough wood to meet the charcoal demand. An English law of 1558 prohibited the felling of wood for charcoal, citing the nuisance of voluminous smoke by hundreds of colliers, and the fears of scarcity, since wood was also essential for building and ship construction. Since coppice wood was insufficient and England needed iron, this law seems to have been mostly ignored and the forests diminished further. The disparity between wood resources and the fueling of Britain's eighty-five or more blast furnaces, each of which used as much as five tons of charcoal every week, continued through the sixteenth century (Kelley 11).

Some relief to the devastation came during the eighteenth century, when Abraham Darby developed an efficient technique for using coke from coal to replace charcoal in blast furnaces. By 1788, two-thirds of the furnaces in England were fired by coke (Kelley 12). In France, charcoal-fired industries consumed even more forest due to naval and civil building projects. Eighteenth-century French forests were managed and cut at prescribed intervals of ten to fifteen years, which may have made metal-smelting industries reasonably sustainable in that part of Europe at that time (Graham 27–8). Nonetheless, charcoal production and its associated iron-making industries had a ruinous appetite for wood, and the resulting deforestation in Europe and elsewhere wrought major changes at the macro-ecological level, from the Roman-era Mediterranean

to seventeenth-century Ireland to modern-day Haiti and Mozambique. Fuel historian Vaclav Smil has remarked on the cumulative pocking effect of charcoal making through history: “When a single furnace could strip each year a circle of forest with a radius of about four kilometers, it was easy to appreciate the cumulative impact of scores of furnaces over a period of many decades” (151). Bob Johnson notes that a single ton of wrought iron required the energy of the annual yield of a twenty-four-acre coppice, a forest land managed to produce the quick growth of small timber (24).

The collier in the European tradition lives a hermetic, esoteric life in literature. He sends inscrutable smoke signals to passersby, interrupting the green cover of deep woods with sudden smoke-filled clearings, working alone with primal fire to create the fuel for bustling urban industries. His work is oxymoronic: rural/industry, smoky/purification, passive/action hermit/entrepreneur. As an independent contractor, he maintains contact in the cities with his buyers, whom he visits at appointed times with the latest haul of energy packed in sacks.

There are surprising similarities between the charcoal collier and the shepherd: both figures work with alternate activity and passivity to assist in the energy transfer from the sun to plants to usable fuel. The shepherd drives his flock to the rich meadows, then sits passively while they graze biomass and make meat. The charcoal collier gathers wood and builds his smoldering hive, then sits passively while it slowly transforms biomass into pseudo-mineral. Both are the conductors of chemical energy conversions with long hours to contemplate. Like shepherding, charcoal burning in the age of fossil fuels seems anachronistic. Coal and coke are cheaper for industrial uses, and their widespread availability from the nineteenth century forward undercut the demand for charcoal.¹

As an alchemist of fuel, there is an element of wizardry in the collier’s work: he feeds forges, intensifies hearth fires, and, since charcoal was a component of gunpowder, fills the barrels of rifles and cannons. There is also an element of idleness in his work; he is necessarily a patient man who watches over a process that completes itself. He is the conductor, quite passive in contrast to the fire’s furious activity. Robinson Crusoe, who has all the time in the world to tinker with his abodes, his flock, his food, and his fire, comes upon charcoal by serendipity as he burns wood fires, and discovers its utility as a low-smoke fuel

¹ “Charcoal” briquettes of the Kingsford variety commonly used in barbeques are actually stamped nuggets of wood by-products with various chemical additives to aid adhesion and burning. Some barbeque purists still use “lump charcoal” that went through the old conversion process from real wood because it burns hotter, leaves less ash, and foregoes the skulking chemicals that make mass produced pseudo-charcoal so cheap and easy. It costs about eight times more in the American market, so old-school purity comes at a yuppie price.

that does not signal to the cannibals that fill his imagination. His strategy is to process fuel wood in his inland cave, where the smoke would raise less attention, and carry the finished charcoal to his “castle,” which is in a pleasanter but more exposed location. For some, the wood smoke signal means safety, but for Crusoe the recluse, it is the clean fire of charcoal that is a promise of security.

The elements of obscurity, method, and filth often combined with the collier’s effect on landscape to produce a menacing figure in literature. The large-scale felling of trees to satisfy the keen industrial appetites guaranteed that the charcoal burner was a central figure in environmental concerns about in early modern England. A 1622 poem by P. Hannay records the dual diabolical and racial associations applied to colliers by the residents of Croydon, a town now long engulfed by sprawling London:

In midst of these stands Croydon, cloth’d in blacke,
 In a low bottome sinke of all these hills;
 And is receipt of all the durtie wracke,
 Which from their tops still in abundance trills,
 The unpav’d lanes with muddie mire it fills
 If one shower falls; or, if that blessing stay,
 You may well smell, but never see your way . . .

And those who there inhabit, suting well
 With such a place, doe either Nigros seeme,
 Or harbingers for Pluto, prince of hell;
 Or his fire-beaters one might rightly deeme;
 There sight would make a soule of hell to dreeme,
 Besmear’d with sut, and breathing pitchie smoake,
 Which (save themselves) a living wight would choke.

These, with the demi-gods, still disagreeing
 (As vice with virtue ever is at jarre)
 With all who in the pleasant woods have being,
 Doe undertake an everlasting warre,
 Cut down their groves, and after doe them skarre
 And in a close-pent fire their arbours burne,
 Whileas the muses can doe nought but mourne.—

The other sylvan, with their sight affrighted,
 Doe flee the place wherease these elves resort,
 Shunning the pleasures which them erst delighted,
 When they behold these grooms of Pluto’s court;

While they doe take their spoiles, and count it sport
 To spoil these dainties that them so delighted,
 And see them with their ugly shapes affrighted.

(Qtd. in Steinman, 6–7)

This obscure poem powerfully invokes an early modern angst about the evacuation of a virtuous sylvan spirit world at the hand of industrial spoilers. Comparing colliers with Pluto, god of the underworld, Hannay features their filth, blackness, subterranean workings, and materialist motivations in a style that would become featured in environmental literature by the nineteenth century. The poetic muse was shifting from biomass, a mourning sylvan dryad, toward processed industrial fuels with equivocal but beguiling aesthetics, such as the coal that would foment the Romantic vision.

William Blake witnessed firsthand the loss of old-growth, Druid-worshipped oaks on the Surrey Hills south of his home London. The trees were burned by charcoal burners supplying fuel for blast furnaces involved in metallurgy, a crucial industry for weapons supply during the extended war with France (McKusick 99). In his prophetic poem *Milton*, Blake fuses his living experience of tree burning with a vision of global revolution catalyzed by equivocal fiery forces:

The Surrey hills glow like the clinkers of the furnace: Lambeths Vale
 Where Jerusalems foundations began: where they were laid in ruins
 Where they were laid in ruins from every Nation & Oak Groves rooted
 Dark gleams before the Furnace-mouth, a heap of burning ashes.

(Plate 6)

From his vantage point in fast-growing industrial London, Blake viewed history played out on the landscape. In his poem *The Four Zoas* he casts his character Luvah “into the furnaces of affliction & sealed / And Vala fed in cruel delight the furnaces with fire” (Plate 25). Luvah is, in effect, iron that is refined by the blast furnace, “cruel” though necessary work. The sublime of these charcoal furnaces was glowingly visual, and also aural: the air roared as it was forced into the sealed furnace by water bellows, invoking a spirit of suffering (Stevenson 326). Blake was at the leading edge of a literati enthralled with the dark energies of industry, and charcoal is a particularly powerful crux between old wood and new coal, a symbol of biological life sacrificed for the chemical fury of concentrated fuel. The conversion is explicit, unlike underground mines and wells for fossil fuels made of organisms that died in previous epochs. With charcoal, the conversion takes place in open air: forests are thinned and pocked with clearings, smoke wafts a

miasma as the wood is purified, and the charcoal burner stands at the center of the sylvan holocaust, meditative by the pyre. Charcoal making is a funeral and a new beginning, a crucial medial element in energy history's paradigm shift from biomass to fossil sources.

Blake eschews the nostalgia of the preindustrial sylvan man, such as the one that Wordsworth alludes to in 1798's "Lines ... Tintern Abbey" in the opening sequence that abuts sublime forms with pastoral ones. The "steep and lofty cliffs / ... on a wild secluded scene" neighbor "plots of cottage-ground" and "pastoral farms / Green to the very door"—cozy farms that reveal themselves within the deep woods by the "wreaths of smoke / Sent up, in silence, from among the trees, / With some uncertain notice, as might seem, / Of vagrant dwellers in the houseless woods, / Or of some hermit's cave, where by his fire / The hermit sits alone" (ll. 5–6, 17–23). Wordsworth's subtle metaphorical shift in the phrase "as might seem" confounds the inviting dwellings, farms and cottages, with the more ominous and open signifier of houseless smoke within the "houseless woods." Vagrants and hermits live on subsistence using their knowledge of the woods, and at the end of the eighteenth century the woods sheltered marginalized people: soldiers dismissed from the Britain's war with France, dispossessed families, religious solitaires, and charcoal burners.

Their fires are poetically "uncertain" to the tourist Wordsworth, serving as objects of mystery and excitement for his meandering contemplation. These hermits contribute to the picturesque intrigue of a forest haunted by unheard stories, textured and scented with idle wafts of smoke. The charcoal collier is one of them; though he is not a refugee from the vicious whims of history and society; he is a recluse by trade. The "uncertain notice" of smoke columns could indicate the idleness of the loitering vagrant or the productivity of the master collier. If the latter, Wordsworth's ambivalence of the smoke brings a surprising industrial element to his lyric masterpiece of Romantic immersion. Nature is all-encompassing, guiding the features even of human constructions, but something mischievous is afoot in the woods. The trees are burning. Characteristically uncurious about the fine details of the scene, Wordsworth stays on the high road and leaves uncertainty to work its faintly repellant force on the reader's mind.

His fire-breathing, sooty aspect and dwelling on the margins of society do not always make the collier a menacing figure. He lives happily in children's literature, for example in A. A. Milne's short lyric in his 1927 book *Now We Are Six*:

The charcoal-burner has tales to tell.

He lives in the Forest,

Alone in the Forest;

He sits in the Forest,
 Alone in the Forest.
 And the sun comes slanting between the trees,
 And rabbits come up, and they give him good-morning,
 And rabbits come up and say, "Beautiful morning . . ."
 And the moon swings clear of the tall black trees,
 And owls fly over and wish him good-night,
 Quietly over to wish him good-night . . .
 And he sits and thinks of the things they know,
 He and the Forest, alone together—
 The springs that come and the summers that go,
 Autumn dew on bracken and heather,
 The drip of the Forest beneath the snow . . .
 All the things they have seen,
 All the things they have heard:
 An April sky swept clean and the song of a bird . . .
 Oh, the charcoal-burner has tales to tell!
 And he lives in the Forest and knows us well.

(ll. 1–21)

Milne's collier is the natural man, living outdoors through the seasons with a lively society of his animal neighbors. Rather than the fell deforester, he is a sylvan in harmony with the forest ecosystem and becomes its interpreter and translator; he looks, he thinks, he tells. He has a better celestial perspective because of the clearing where he burns; the opening surrounded by tall black trees frames the sun and moon. The seasons efface the evidence of burning by way of snowy drips and spring breezes, so the natural architecture of his space is lofty and clean, rather than low, secretive, and grimed. The charcoal burner has tales to tell to children because, like Snow White, his friends are the humanoid animals that town-bound people lack the patience and perception to know. His gift, aside from the charcoal itself, is the susceptibility to small signs of beauty and gentle dwelling. Where Wordsworth's "vagrant dwellers" carry a repulsive anxiety, Milne's poem ushers children toward the charcoal burner, ambassador of the deep woods. Milne's nostalgia shows the obsolescence of the charcoal burner and his rural dwelling, eclipsed by giant urban industries fired first by coke and coal, then by natural gas and electricity. By the nineteenth century, the charcoal burner was an endangered species in the European woods, and the forge fires were fossil-fueled.

John McPhee describes charcoal burning in the New Jersey Pine Barrens as a major occupation until the Second World War. The first European people

to occupy the Barrens were seventeenth-century woodcutters who founded a charcoal industry for the growing cities east of Appalachia. Their best charcoal was hauled by eight-horse teams across the sands specifically to fire the Philadelphia mint. Much of the rest was transported in dozens of schooners up the coast to New York City (45). Pine Barrens charcoal fueled a major industry in pig iron that carried the local economy for decades during the late eighteenth and early nineteenth centuries. Like the whaling industry, and at about the same time, the charcoal industry went into decline in the mid-1800s when raw supplies grew scarce and, perhaps more importantly, coal from western Pennsylvania emerged as a cheap and functionally infinite supply of fuel. Coal and its derivative, kerosene, replaced, respectively, charcoal and whale oil; it was cheaper as both industrial fuel and as illuminant. Within twenty years, the major furnaces of the Barrens—with names like Batisto, Martha, and Atsio—were closed, as the land could no longer supply the thousand acres of woods per year it took to fire them. Charcoal burning shrank down to a small local business again (38).

Thereafter charcoal burning in the Pine Barrens remained one occupation among others, as part of a local economy that included the gathering of sphagnum moss in the early spring (a natural sponge, decoration, and antiseptic), wild blueberries in the summer, cranberries in the fall, and cordwood and charcoal in winter (43–4). Charcoal burners were known to set forest fires so as to damage trees and make them good for nothing but charcoal, thus they could be purchased at a discount price (115). The Barrens bear the scars of their nearly four-hundred-year investment in charcoal burning: the area is pocked with pit clearings that form cul-de-sacs at the ends of sand roads, a maze-like geography that has flummoxed many a visitor. Now that charcoal burning is virtually obsolete in America, these ghost pits evanesce into closed forest as the years pass.

The United States had the advantage over Europe of being able to preserve vast tracts of forest through the adoption of coal; western Europe had endured centuries of forest stress from the manufacture of charcoal, among other uses, before coal assumed the burden of firing metallurgy. In retrospect, conversion to coal in the United States saved what remained of the mighty, diverse forested lands, and may deserve credit for the preservation of wilderness within the monumental park system (Johnson 23). The ancient, subterranean forest saved the extant, solar one.

Small industries involving charcoal endure as industrial subcultures to this day. The Italian documentary film *La Quattro Volte*, “The four turns,” ends on an extended sequence of the collier’s process, from the harvesting and arrangement

of the burning pile, to its maintenance, and finally to the delivery of sacks of charcoal to picturesque whitewashed doorways in hilly Calabria. From there, the viewer imagines, it will fire home ovens that roast tomatoes and brown focaccia. The only element in the film that is not medieval is the charcoal burners' use of a tiny truck cart rather than a beast of burden. The fifteen-minute sequence is unnarrated, contemplative, and closely focused, transporting the (urban industrial technocrat) viewer to a premodern world characterized by slow timeworn traditions of knowledge and basic subsistence. It says, this is fuel, and fuel is more than a gas tank or an outlet: it is a small sack of black rubble in a doorway; it is the afterlife of an Italian forest. Small-scale charcoal burners like these continue to supply markets throughout the developing world.

II Selling charcoal

After the fuel was produced in the forest, colliers then became salesmen in the city. Singing the toils of the plebian charcoal seller, the American writer John Townsend Trowbridge, a friend of Mark Twain and Walt Whitman, published a poem in 1869 on "The Charcoal Man." Trowbridge walks the nostalgic path seen in Milne's children's poem, with a conventional good soul concealed beneath layers of honest work, whose toil is duly rewarded. Trowbridge's scene depicts the urban side of the business: rather than conversing with nature, this charcoal man sings the call-and-response of the northern industrial city.

Mark Haley drives his cart through snowy streets bellowing "Charco'! Charco'!" while the city sings back "Hark, O!" Street boys mock his cart with "Ark, ho!" his wife greets him with "Mark, ho!" and even his baby responds with "Ah-go!" The cheery music ringing around the besmirched roughneck is in harmony with his inner purity, and Trowbridge sings a populist message: "Thus all the cold and wintry day / He labors much for little pay; / Yet feels no less of happiness / Than many a richer man, I guess / ... The hearth is warm, the fire is bright / And while his hand, washed clean and white, / Holds Martha's tender hand once more, / His glowing face bends fondly o'er / The crib wherein his darling lies" (ll. 23–7, 44–8).

Hale Mark embodies the right honest tradesman patient of his labor and its hardships, rewarded with a faithful loving wife, a cooing baby, and, thanks to his surplus, an especially warm and bright fire. Trowbridge's (at best) simplistic moral is to honor the romanticized poor man: "Though dusky as an African, / 'Tis not for you, that chance to be / A little better clad than he, / His honest

manhood to despise" (ll. 46–9). Trowbridge's idealism seems to be free of the irony that marks Blake's "Chimney Sweeper" from the Songs of Innocence, who similarly cries "'Weep! weep!'" and lives in racially ambiguous skin because of his sooty trade. Both figures are peons, but Blake's boy, like his slaving African counterparts, questions his status and worries about his physical and spiritual health.

Mark Haley is above disdain because he is not truly "dusky as an African"; his hands are "washed clean and white" and his manhood is "honest" (whatever that means). The implicit racism here is derivative of centuries-old imagery rather than a forward-looking post-Civil War fresh leaf. It shows the indelible stigma of dirty work in an age turning toward white-collar business, law, and stock speculation that would within a decade become the Gilded Age in America. Mark Twain and Charles Dudley Warner coined the term "Gilded Age" in their 1873 satire of that period of corrosive general poverty, thinly covered by the gold gilding that signified the extremely wealthy few and their conspicuous consumption. (Edith Wharton and Henry James would make a career in gilded portraits.) Trowbridge seemingly begs the oblivious reader to acknowledge the existence of this dirty, honest, happy, simple fellow who fills the hearths of the city. However, Mark Haley's repetitive music is the jingle of the trite commercial. Milne's charcoal-burner has wisdom and keeps the secrets of the woods, but Mark, the city charcoal man, is allowed no inner life. His book is just its cover, illustrated in the Rockwell style.

An intriguing counterpoint to this charcoal man is a holler of the same name by the journalist Lafcadio Hearn that dates from the 1880s. Hearn was a newspaper correspondent based in New Orleans who published accounts of the Creole people, their cuisine, and their voodoo practices. Just like Trowbridge, Hearn remembers the charcoal man by his oral presence in the city streets, and the poems both read as joyous music that lightens the load of those who barely subsist by selling charcoal. Where Mark Haley sang in a tight loop ("Charco! Charco!"), Hearn's Creole crier continually innovates his song:

Char-coal, Lady! Char-coal! Chah-ah-coal, Lady!
 Black—coalee—coalee!
 Coaly—coaly; coaly-coaly—coal—coal—coal.
 Coaly—coaly!
 Coal—eee! Nice!
 Chah—coal!
 Twenty-five! Whew!
 O Charco-oh-oh-oh-h-oh-lee!

Oh—lee—eee!

(You get some coal in your mout', young fellow, if you don't keep it shut!)

Pretty coalee—oh—lee!

Charcoal!

(ll. 1–12)

Hearn celebrates the crier breaking the constraints of grammar and syntax, finding a form of infinity within repetition that continually creates new sounds within and outside known language. Romanticists would recognize this revolutionary music in the poetry of William Blake, who sought to unlock language from its repressive old-world fetters or, as William Wordsworth said, to break out of a world “cased in the unfeeling armour of old time” (Rothenberg and Robinson 707). Hearn's found poem is experimental, improvised, and performed—it is a predecessor of slam poetry—and its free verse arrives at a free place, transcending the formal conventions of blank verse, sonnets, and Trowbridge's tetrameter couplets. It looks to the future, to the twentieth century, when actual sound recordings of these songs became possible, and it looks to cultures beyond the Anglophone hegemony of American culture. The charcoal man continues:

Charbon! Du charbon, Madame! Bon charbon? Point! Ai-ai!

Tonnère de dieu!

Cha-r-r-r-r-r-r-rbon!

A-a-a-a-a-a-aw!

Vingt-cinq! Nice coalee! Coalee!

Coaly-coal-coal!

Pretty Coaly!

Charbon de Paris!

De Paris, Madame; de Paris!

(ll. 14–22)

As he slips from English into a similar riff in French, the charcoal man yells out his punctuation (“*Point!*” indicates full stop or an exclamation point), and calls in God's thunder, “*Tonnère de dieu!*” as another exclamation or invocation of the power of the fuel he sells. At twenty-five (“*Vingt-cinq!*”), an unknown volume in undeclared currency, the holler is both precise and elusive. The charcoal man's pitches are aimed at women who tend the domestic fires of the city and make the essential purchases, so his song is also a flirtation, wherein the charcoal takes on the features of his buyers—black, pretty, nice. The humble charcoal, the “*Charbon de Paris,*” becomes exotic by its association with the City of Lights: stylish Paris

flickers in the imaginations of Creole New Orleans, which empties its pockets in response to the call.

In both of these thoroughly different charcoal poems, the singing salesman sketches an aural cityscape in a call-and-response, where hecklers join in the song (both men sass roguish youths), and implied buyers may respond to the holler with their clanking coins. But it is mostly a soliloquy of charcoal, the hot-burning wood of the urban hearth. These are ghostly cries that haunt our cities, along with the songs of ice and milk that were commonplace before the advent of electricity. A few decades into the twentieth century, once most houses possessed a means to fire and freeze via electricity, the salesmen faded away and the fuel, most often coal, burned obscurely in electric plant furnaces. To the modern consciousness, fuel became an electric bill, and its performances vanished.

III Blow it up: Gunpowder and fireworks

Every musket and cannon fired in every war before the nineteenth century, every rifle shouldered by a hunter, every firework blooming over celebrations, owes its bang to charcoal. It was the only workable incendiary available before coke, from coal, became widespread in the nineteenth century. Charcoal, sulfur, and saltpeter (potassium nitrate) are the three ingredients of basic gunpowder. The charcoal used for gunpowder needs a bit more care in preparation: the alder and willow trees most commonly used as the raw material had to be cleaned of all bark, and all the grit had to be hand removed after carbonization, before the charcoal could proceed to the powder works (Kelley 10–1). English soldiers first used gunpowder in 1346 at the Battle of Crecy, where they were outnumbered two-to-one, but the English cannons and crossbowman made for heavy losses on the French side, and an English victory (Kelley 10). Guy Fawkes owes his death and immortality to gunpowder that never caught fire, though since then fireworks have exploded every November 5 in his dubious honor.

William Shakespeare and John Milton witnessed the execution of Guy Fawkes and his conspirators in 1605. Some argue that Shakespeare's *Macbeth* alludes to the Gunpowder Plot; Milton is more explicit in *Paradise Lost*, where, in book six, Satan and his minions make the machines of modern warfare—cannons and gunpowder—to battle with God's angels. Satan does not come to his dastardly machinations lightly. He has been gravely injured by Michael's two-handed sword of Divine Justice, which "deep ent'ring shear'd / All his right

side” (6.326–7). Satan finds that “pain is perfect misery, the worst / Of evils, and excessive, overturns / All patience,” and thus is inspired to destructive cleverness (6.462–4). To the rebel angels, he observes the beauty of heaven, “With Plant, Fruit, Flow’r Ambrosial, Gems and Gold,” and notes that these pleasant dressings conceal a more potent cache of natural wealth underground. Transferring his imagination from heaven to the hell he would soon occupy, Satan describes

materials dark and crude,
Of spirituous and fiery spume, till toucht
With Heav’n’s ray, and temper’d they shoot forth
So beauteous, op’ning to the ambient light.
These in thir dark Nativity the Deep
Shall yield us, pregnant with infernal flame,
Which into hollow Engines long and round
Thick ramm’d, at th’ other bore with touch of fire
Dilated and infuriate shall send forth
From far with thund’ring noise among our foes
Such implements of mischief as shall dash
To pieces, and o’erwhelm whatever stands
Adverse, that they shall fear we have disarm’d
The Thunderer of his only dreaded bolt.
Not long shall be our labor, yet ere dawn,
Effect shall end our wish.

(6.478–92)

Satan’s science, geology and pyro-chemistry, are figured as the evil contrivances of a cunning devil. This cunning contrast the pure justice of the right angels, who work with simple weapons (swords and arrows), blessed by God’s grace. Explosives are not only naughty, they are also the arms of the lazy. “Not long shall be our labor,” Satan opines, as they dig:

Sulphurous and Nitrous Foam
They found, they mingl’d, and with subtle Art,
Concocted and adusted they reduc’d
To blackest grain, and into store convey’d:
Part hidd’n veins digg’d up (nor hath this Earth
Entrails unlike) of Mineral and Stone,
Whereof to found thir Engines and thir Balls
Of missive ruin; part incentive reed
Provide, pernicious with one touch of fire.

(6.512–20)

Mixing volatile and smelly compounds, the work is dirty, “concocted” or cooked, and “adusted”—a medical term that meant that the compounds were finely ground (Hughes, note p. 335–6). Satan is a cunning chemist who mixes burnt trees with the minerals sulfur and saltpeter in order to make gunpowder. The rebel angels are duly impressed with this weaponized fuel at their disposal. They hasten to the next day’s battle and put fire to the fuse:

Immediate in a flame,
But soon obscur’d with smoke, all Heav’n appear’d,
From those deep-throated Engines belcht, whose roar
Embowell’d with outrageous noise the Air,
And all her entrails tore, disgorging foul
Thir devilish glut, chain’d Thunderbolts and Hail
Of Iron Globes, which on the Victor Host
Levell’d, with such impetuous fury smote,
That whom they hit, none on thir feet might stand ...
Foul dissipation follow’d and forc’t rout.

(6.584–92, 598)

Milton portrays this nasty warfare using body-based descriptions of throats, bowels, and entrails. He figures the new battle tactic as a disgraceful, vomiting, diarrhea-cursed illness. *Real* angels would never fight in this felonious way. These Satan-angels are dirty birds, suspect in their cunning, sinful in their concoctions. Still, Michael’s pure two-handed sword needs upgrading, so the right angels regroup, join the arms race, and start their own devastating counterattack. They throw down the “Rocks, Waters, Woods” and the very mountains on the rebels. God approves of this zealous reply, which nevertheless results in heaven “gone to wrack, with ruin overspread” (ll. 645, 670). The scorched earth warfare allows his son, the Messiah, to condemn the Satanists to hell, and take his seat “at the right hand of bliss” (l. 892).

Quite unlike the gentle wise forest collier, Milton’s memorable contribution to the literature of gunpowder points to the ruinous efficacy of charcoal chemistry. Gunpowder is a weapon in the hands of the devious clever man, both archetypally and literally Satan in this case, whose schemes challenge but fail to overthrow the imperious God. Satan’s character was admired by the British Romantics as embodying, in Coleridge’s words, the “dark and savage grandeur” so often seen in historical despots from “Nimrod to Bonaparte” (364). To the Romantics, Satan is admirable in his revolutionary zeal, his singular purpose, and the rebellious personality that enables such stunning insubordination without regard to the means employed. His temerity puts the justice of God’s autocracy into question.

He helps his case with eloquent soliloquies that reveal his ambition and his agony. The British Romantics saw the value of an unscrupulous revolutionary willing to take on a despotic ruler (for them, Kings George III and IV), but they also admired the audacity of Satan's methods. Coleridge names his "outward restlessness and whirling activity; [his] violence with guile" as elements of an admirable character (153). Percy Shelley, declaring that Satan is ennobled as the loser of the war in heaven, finds that his weapon, the "sleepless refinement of device to inflict the extremest anguish on an enemy" is "venial in a slave" (127). However, the gunpowder plot is pardonable for Shelley because God is a tyrant, and so the revolution is just.

In the century following the publication of Milton's classic, Daniel Defoe would cite gunpowder as an element of basic survival in *Robinson Crusoe*, when the castaway manages to recover a wet cask of powder from his foundered ship. Crusoe has many guns that are utterly useless without the powder, so he is delighted to discover, in his twenty-third year of solitude, a large cache of gunpowder in a cask that had been soaked during the shipwreck. Crusoe reports: "This was a very agreeable discovery to me at that time; so I carried all away thither, never keeping above two or three pounds of powder with me in my castle, for fear of a surprise of any kind; I also carried thither all the lead I had left for bullets" (140). Crusoe lives in continual fear of cannibals visiting the island, so the powder has less of practical applied use than it does as a psychological buoy for his schemes to blow the "savages" away. Friday's arrival complicates Crusoe's prejudices, but the powder remains fodder for Crusoe's bloody fantasies, though never a reality.

Soon after Defoe, Jonathan Swift would deploy gunpowder as an element of an advanced and powerful civilization—not the tool of the revolutionary, but of the hegemon. In *Gulliver's Travels*, the hero repeatedly astonishes neophytes, tiny and towering, with the pow of gunpowder. It lends him the luster of superhuman agency regardless of his relative size to the people he visits. It sparks Swift's searing satire of the ubiquitous violence and warfare of his day due to superficial religious and cultural differences. Swift's explosive descriptions also remind the reader of the dreaded destructive potential of gunpowder, which had become mundane due to its common military use beginning in the fourteenth century. The wee Lilliputians search him and find his pistol, which, when shot, causes hundreds of the tiny people to fall down as if "they had been struck dead; and even the emperor, although he stood his ground, could not recover himself for some time" (45). Gulliver advises the emperor of Lilliput to spare the pouch of powder from his fire, "for it would kindle with the smallest spark, and blow up

his imperial palace into the air” (45). Like Swift’s countrymen, the Lilliputians are combative, mechanical, profit-oriented, and full of admiration for the ruinous potential of gunpowder.

Gulliver is homesick during his stay in Brobdignag, the land of the giants. He finds the relative isolation of the Brobdignagians the primary cause of their “narrowness of thinking” and, to show “the miserable effects of a confined education,” he regales the king with the wonders of gunpowder:

I told him of an invention, discovered between three and four hundred years ago, to make a certain powder, into a heap of which, the smallest spark of fire falling, would kindle the whole in a moment, although it were as big as a mountain, and make it all fly up in the air together, with a noise and agitation greater than thunder. That a proper quantity of this powder rammed into a hollow tube of brass or iron, according to its bigness, would drive a ball of iron or lead, with such violence and speed, as nothing was able to sustain its force. That the largest balls thus discharged, would not only destroy whole ranks of an army at once, but batter the strongest walls to the ground, sink down ships, with a thousand men in each, to the bottom of the sea, and when linked together by a chain, would cut through masts and rigging, divide hundreds of bodies in the middle, and lay all waste before them. That we often put this powder into large hollow balls of iron, and discharged them by an engine into some city we were besieging, which would rip up the pavements, tear the houses to pieces, burst and throw splinters on every side, dashing out the brains of all who came near. That I knew the ingredients very well, which were cheap and common; I understood the manner of compounding them, and could direct his workmen how to make those tubes, of a size proportionable to all other things in his majesty’s kingdom, and the largest need not be above a hundred feet long; twenty or thirty of which tubes, charged with the proper quantity of powder and balls, would batter down the walls of the strongest town in his dominions in a few hours, or destroy the whole metropolis, if ever it should pretend to dispute his absolute commands. (161–2)

Gulliver openly delights in the melee, for how could a proud Englishman explain the defeat of the Spanish Armada or the Battle of Blenheim without reference to the almighty cannon? The king of Brobdignag, however, is horrified by the “terrible engines” of destruction Gulliver describes, and lashes Gulliver—an “impotent and groveling insect”—with his disdain for the Europeans’ inhuman weapons (162). Brobdignag is a land far removed from the endless bloody squabbling of Europe, located somewhere in the American Pacific northwest, and it is governed by the values of sense, justice, and simplistic reason. Like most utopias, Brobdignag is horribly boring. Gulliver would spark no fireworks

there. The obscenity of eighteenth-century warfare becomes a leitmotif in the travels, and Gulliver's avid descriptions of munitions warfare repeatedly offend his audience. To the equine Houyhnhnms, who take pride in their hooves and teeth as tools of destruction, Gulliver describes the rumpus of English battle:

Being no stranger to the art of war, I gave him a description of cannons, culverins, muskets, carabines, pistols, bullets, powder, swords, bayonets, battles, sieges, retreats, attacks, undermines, countermines, bombardments, sea fights, ships sunk with a thousand men, twenty thousand killed on each side, dying groans, limbs flying in the air, smoke, noise, confusion, trampling to death under horses' feet, flight, pursuit, victory; fields strewed with carcasses, left for food to dogs and wolves and birds of prey; plundering, stripping, ravishing, burning, and destroying. And to set forth the valour of my own dear countrymen, I assured him, "that I had seen them blow up a hundred enemies at once in a siege, and as many in a ship, and beheld the dead bodies drop down in pieces from the clouds, to the great diversion of the spectators." (291–2)

Observing the dubious conflation of violence with fun, Gulliver's audiences can hardly disguise their moral repulsion as he puffs the power of the powder, testing their admiration of English values. To the wise Houyhnhnm, the ability of humans simultaneously to possess both reason and bloodlust is evidence of moral corruption; the Houyhnhnm concludes that rather than reason, humans disclose the capacity for clever cunning, which inflates and distorts their self-image and drives them to build such sad, horrific, weapons. No such warfare would be permissible, let alone celebrated, in a true age of reason. In *Gulliver's Travels*, the little men are violent and querulous, the big men are passive and imperious, and the horses are wise beyond all men. The position on gunpowder is a moral litmus test in each of the visited worlds.

One last excursion into charcoal-fueled literature comes from Russell Hoban's 1980 novel *Riddley Walker*. Nuclear warfare has cast civilization into a neo-Iron Age a few thousand years in the future. Hoban speculates on the renewed value of pre-fossil-fuel sources and the preserved wisdom of cultish charcoal burners who are, in effect, skilled workmen performing a crucial task in a fuel-starved world. The charcoal burners are alchemists who rediscover gunpowder, in effect repairing the historical loop that had been torn by nuclear apocalypse. Once the future-primitive world has gunpowder, it is back in the arms race that hastens inevitably to muskets, heavy munitions, and eventually the bomb.

With human belligerence still alive and well, the society set in southeast England consists of a ring of rival bands racing to rediscover weapons as they scrape out survival in a dismal ecological dystopia. The culture is tied together

with a series of oral myths transmitted through doggerel poetry and, farcically, a Punch and Judy roadshow that preserves the knowledge of the bygone industrial civilization that self-destructed by detonating the nuclear “1 Big 1.” Charcoal is the heart of the wood (“hart of the wud”); it lies at the center of the mythology and oral history of Riddley Walker’s society. Charcoal burners manage coppices of alder trees for a raw fuel source, which they cut at six-year intervals. Alder is an appropriate tree not only because it produces high-quality charcoal, but also because it is a fast-growing species that grows on marshy ground and can tolerate the tainted low-nutrient soil that carpets this nuclear winter-scape. The burners dress ritually in cloth dyed red from the sap of cut alder branches. They are comparatively well fed and safe because they are fuel providers, but the charcoal burners have greater ambitions than to warm hearths.

Riddley Walker is written in a decipherable post-English dialect. A charcoal burner, Granser, says:

There wont be no 1 Big 1 for us Abel we aint got the cleverness for it but befor there ben the 1 Big 1 there ben the 1 Littl 1 and wil be agen. Which weare waiting for the day and ready ... Ready with 2 of the 3 aint we and ben ready this long time and keeping ready and til it comes never mynd how long it takes the chard coal burners wil be wearing red and keeping ready. (188)

The “burners” hold the knowledge of how to make gunpowder, so the “1 Littl 1” will be possible again once the third ingredient—sulfur—is discovered. They call it “the yellorboy stoan.” They already have saltpeter (“Saul & Peter”) and “chard coal,” so they keep a vigil built on alchemy and superstition waiting for this yellow stone. Without knowing its significance, Riddley Walker has rediscovered it in the coastal town Fork Stone (Folkestone), and brought it back to the charcoal burner’s roost at The Auders, near Cambry (Canterbury), which was ground zero for the nuclear explosion of yore. Riddley delivers the yellow stone to Granser:

He wer pounding the yellorboy stoan to a fine powder. Then he done the same with some chard coal. Done it with a boal and pounder. He had the Saul & Peter all ready that were kirstels like salt. He took little measurs and measuring out yellorboy and chard coal and Saul & Peter. Mixing them all to gether then and me watching. It wer like the 1st time I seen a woman open for me and I wer thinking: This is what its all about then. Granser singing to his self wylst he mixt the 3 of the 1:

Wewl make such a noys
Such a noys

Such a noys
 Wewl make such a noys
 My good old boys

(193)

This esoteric chemistry is erotic to Riddley because it is a sacred union of diverse elements, the essence of power–pleasure in an enervated world. Granser sends Riddley away to the river as he performs the final incantation, the “fissional seakerts of the act,” and then

WHAP! there come like a thunner clap it wer like when litening strikes right close it eckowit up and down the rivver. There come up a cloud of smoak from the fents it wernt the regler blue smoak it were 1 big puff of grey smoak and things wer peltering down out of the trees like when you shake down nuts. . . . Granser he wer like throwt a way on the groun he lookit emty like when you take your han out of a show figger. His head wernt with the res of him his head wer on a poal. The gate a way from the river it had a hy poal on each side of it and Gransers head wer stuck on the point of 1 of them poals jus like it ben put there for telling. (194)

Granser’s head poling is an omen of the hazard of being “clevver”—the kind of thinking that in the past led to nuclear war and the near extinction of humanity. The gunpowder is on a continuum with nuclear fusion, morally equivalent and only distinguished by the sophistication of the society that supports the research. In all of these gunpowder texts, the use of fuel to destroy is central to moral indictments against any society that squanders energy in this way. Gunpowder foreshadows the appearance of nuclear energy in literature; in both cases, the cautionary principle is strong against a military hegemony.

Early modern Europeans found a nonviolent and diverting outlet for charcoal in fireworks displays. In early modern technical manuscripts, the machinery of warfare and fiery spectacles for public occasions were often similar in design, though functionally antithetical. The sixteenth-century Italian metallurgist Vannoccio Biringuccio noted that “artificial fires” have a “happy and pleasing effect” despite their potential for “harm and terror” and effects that might become “deadly and very injurious to all living things” (Wolfe 236–7). Natural philosophers, chemists, and artisans with applied handwork skills collaborated to take a Chinese invention of the seventh century and make it better: brighter, more colorful, bursting higher, and taking symbolic shapes. Early fireworks were used only for warfare, but beginning in the late sixteenth century there was a

flurry of investment in pyrotechnics in England, France, Italy, and Russia that aimed to cash in on the pleasure, edification, symbolism, and patriotism that fireworks might instill (Werrett 10–16).

The first fireworks evoked the sun, moon, and planets, meant as special effects in the theatre of the universe. Accounts of fireworks tended to distinguish the calm masterful appreciation of the courtiers from the superstitious horror of the commoners, a classist spin on the fact that fireworks have always had the sublime power to inspire both fear and delight. Firework displays suggested models of the cosmos and nature to scientists like Isaac Newton, Johannes Kepler, and Robert Boyle, and provided zesty food for thought for philosophers Gottfried Leibniz and Rene Descartes (Werrett 12). Under the purview of national academies, they became “rational recreations” deployed to educate the middle classes about natural philosophy (Werrett 15). In absolutist states, fireworks were used to buoy the authority of the monarch, as when French sycophants wrote that the element of fire was under the control of the miraculous King Louis XIV (Werrett 14). They ingratiated the squeamish masses to Peter the Great’s military ambitions by making the violence of munitions warfare more palatable and playful for the people (Werrett 13). Chemistry, a fashionable science, helped differentiate colors in fireworks, producing stunning reds, yellows, greens, and blues by experimenting with the effects of various volatile metals, salts, and charcoals. When electricity became the object of universal enthrallment in the eighteenth century, fireworks inspired some of the first (inaccurate) theories on the nature of “electric fire,” based on the idea that electric sparks were pyrotechnic and that thunder and lightning involved combustion (Werrett 16).

James Boswell had “little doubt” that Dr. Johnson had written the 1749 article in *Gentleman’s Magazine* that described the chemistry, manufacture, and aesthetic philosophy behind these sublime “sky-rockets.” The challenge, the ghost writer explains, is to tightly pack the gunpowder so that it burns rather slowly rather than exploding all at once. Also “by varying the proportions of the brimstone and charcoal, not only the duration of the flame, but its colour and appearance may be considerably changed” (56). The artisan increases the proportion of “grossly powdered” charcoal to brimstone when he desires “an extensive train of fire.” Johnson favors the rocket as the “most ingenious, and (if the artificial sun be excepted) the most beautiful of all pyrotechnical representations,” and he goes on to describe its aesthetic merit based on the “largeness of the train of fire it emits, the solemnity of its motion (which should be rather slow at first, but augmenting as it rises) the straightness of its height, and the height to which it ascends” (56). Johnson estimates this height to be about 1,500 feet, but

he encourages “all gentlemen of leisure and curiosity” to experiment with the composition of rockets and measure the heights they can attain, which “might furnish us with a more certain theory of those motions . . . and would be attended with many practical and philosophical advantages” (56). The English seldom let pass an opportunity to smother childish fun with practical erudition.

In Johnson’s mind, the only rival to the splendor of the rocket is the pyrotechnical sun that was displayed at the Triumphal Arch in Green Park in April 1749. The fifty-foot diameter fire-sun, with 180 cases of incendiary mixed with steel dust (a brightener), arranged in a circle, “will all be fired at the same instant, they will compose a body of the most brilliant light . . . will be strongly distinguished with the appearance of rays, after the manner in which the glory round the heads of saints is usually drawn by painters, and will on the whole, afford the grandest and most striking appearance hitherto invented by human art” (56). In true Enlightenment hubris, Johnson concludes, with a touch of sarcasm, that the sublimity of the pyrotechnic sun threatens to outdo the glory of the real thing. Alas, in the cold light beyond human egocentrism, a packet of charcoal, saltpeter, and sulfur ultimately pales in comparison with the sun, a spherical storm of hot plasma and magnetic fields 330,000 times the mass of earth.

Fireworks continue to provide the mass ceremonial spectacle that they have for hundreds of years. They are skyborne incendiary rhetoric that still reinforces hegemony, especially as they are deployed in Independence Day celebrations and baseball games. They fuse power with beauty, and danger with technical control. Instilled as they are in global culture, fireworks displays now get the most attention when they go wrong or cause problems. On July 4, 2012 the city of San Diego’s entire seventeen-minute show exploded within one blinding, deafening minute due to a corrupted file in a computer program. On the Chinese New Year day in 2014, fireworks were suppressed so that their burning didn’t contribute to the already oppressive coal smoke and petroleum exhaust that plagues today’s Chinese cities. The editors of *China Daily* newspaper said “it should be common sense” that revelers celebrate the new year “without coughing and spluttering on the after-effects of fireworks” (Rochan). With Chinese meteorologists joining in the anti-firework campaign, the Beijing Consumer Association recommended flowers as a substitute. Their suppression in China is particularly poignant: the Chinese discovered fireworks in the seventh century, long before they were known in Europe, and quickly adapted the displays to ceremonial and symbolic uses. Their loss is an indication of the power of fossil fuels, especially coal, to dominate a culture’s pollution quota in the name of industrial production.

As it was in eighteenth-century Europe and nineteenth-century America, charcoal production is a modern environmental concern in developing countries, where charcoal remains a primary fuel source. A Greenpeace investigation into the production of charcoal in the Amazon makes it relevant to industrial consumers (“Driving Destruction in the Amazon”). Deforestation in the vast Carajás region of Brazil is driven by the global demand for pig iron, an ingredient of steel in the supply chain of several car manufacturers: Greenpeace names Ford, General Motors, BMW, Mercedes, Nissan, and John Deere (3). Remote charcoal camps supply fuel to the world’s largest iron mine, which produces pig iron from raw iron ore. (The ore mine itself is mostly fueled hydroelectrically by the Tocantins River via the Tucurí Dam.) The charcoal camps can be moved rapidly to avoid detection and regulation, and to exploit fresh supplies of raw timber from rainforests, often on protected or indigenous lands. Economics drives the industry toward illegal logging: rainforest timber costs about one-tenth the cost of plantation-grown timber, and the charcoal that fuels pig iron furnaces represents as much as 35 percent of the cost of iron production (5). It is estimated that one-third of the timber felled for charcoal production in Carajás is illegally harvested, and the cleared land usually becomes pasture and soy farms rather than reverting to forest (8).

The case here illustrates the complex relationship between numerous fuel sources used to produce goods in the global economy. The sun (renewable) energizes trees (raw biomass) that are harvested for charcoal (processed biomass); together with raw iron ore (mined using renewable hydropower and fossil fuels), charcoal fuels the production of pig iron, which is shipped using petroleum bunker fuel (fossil) to steel manufacturers, who fire their furnaces with coke derived from coal (fossil). If the end product of the steel is a car, it rolls around fueled by, and partially composed of, petroleum (fossil). The wood grain interior in a fine Mercedes is a ghostly shadow of Amazonia, burned down to provide the steel in the car body.

Wood fuel is the original source of the controlled human fire. Its rituals are stamped on our DNA and our phenotype, adapted as we are to chew and digest cooked foods. Its critical importance in human prehistory, the radiation out of Africa, the energy to clear land for agriculture and other exploits, the courage to traverse wintery expanses cradling hot coals, makes the wood fire the most evocative of preindustrial fuels. The physical subsistence offered by the wood fire goes in hand with the cultural significance of burning wood, rituals of seasonal preparation and survival, appearances of wealth and resourcefulness, fears of shortfalls. Grass and fodder are the all-important animal fuels that have

supported hunting and agricultural groups in the form of perennial cud. But regal wood is the human incarnation of biomass energy.

Wood's afterlife in charcoal greatly expands the potential of the sylvan trope. As the primary segue fuel for the industrial era, a premonition of the power of coal and gas, charcoal commands an amazing variety of roles. From the home fires of New Orleans Creoles to the blast furnaces of early industrial London, from plate mail and steel swords to iron bridges and delicate glass domes, from the fury of the cannon to the fantasy of the firework, charcoal is both diabolical and angelic. As Riddley Walker knows, it is the heart of the wood.