Scott, Heidi C. M. "Grass: Muscle Power." *Fuel: An Ecocritical History*. London: Bloomsbury Academic, 2018. 27–74. Environmental Cultures. *Bloomsbury Collections*. Web. 26 Apr. 2023. <<http://dx.doi.org/10.5040/9781350054011.ch-002>>.

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Grass: Muscle Power

For millennia before it was powered by steam, internal combustion, and nuclear fission, the human world ran on muscles. Initially we ran on our own muscles, powered by meat from hunting and tubers, nuts, and fruits from gathering. One of the bracing advances of the agricultural revolution was the extension of our own modest frames to the much stronger bodies of ungulates—animals that walk on hooves—like horses, oxen, and donkeys. These tip-of-the-toe animals run on rough biomass. Graminivores, especially ruminants, are marvelous alchemists that turn things inedible to us, mostly grasses, into power, speed, meat, and milk. (Horses are not ruminants, so they get less energy from grasses than cattle and require higher-calorie cereals in their diet.) Our association with these animate prime movers is difficult to overstate. They shouldered a series of revolutions in global human civilization: fixed settlement, plow-based agriculture, which led to a shift in human diet toward carbohydrates from cereals, huge population increases, the advent of the city-state, class-based hierarchy based on occupation, and beer. How now proud cow?

In a world presently so dominated by fossil fuels, it is easy to neglect all the sources of power that preceded it. Biomass and elemental energy crafted the civic human world from the raw elements of wilderness long before there were steam engines. Without the wind, no sailing ships that enabled preindustrial global exploration, imperialism, and trade. Without rivers, no mills grinding flour and gunpowder, and no lumber. Without strong animals fed on biomass, humans' ability to travel across land and make arable fields from forests by pulling out stumps, for example, would have been greatly reduced (Nye 19). Though fossil-fueled technology has transformed nature and society to a greater degree than any other force, it is myopic to neglect the impact of preindustrial sources of energy. Muscle power driven by biomass first enabled settlers and colonists to convert nature into natural resources, to translate ecology into economy, and to lay the ideological groundwork for an economic structure, capitalism, that views organic nature as a store of commodities.

By contracting out our muscle work to other animals, we humans were freed from certain burdens, such as transporting ourselves and our goods, but we were yoked to numerous others. Animals needed tending, feeding, shelter, breeding, and healing—thus the invention of the occupations of ostler, driver, groom, farrier, and veterinarian. With animal domestication came shared diseases. The beasts deposited nitrogen-rich dung, a boon and a pox depending on context: as agricultural fertilizer, a boon; as disease dish and source of pollution, a pox.

In spatial and ecological terms, rural animals trod more lightly than urban ones, who needed their food harvested and imported to the city, and liberally dropped dung in their cobblestone path. But the hard work of farm animals came at the cost of providing them with high-quality biomass fuel. Hay and straw provide stomach-filling fodder but not much energy for large animals. In order to work hard, horses needed wheat bran, oats, and legumes. The twenty-five million horses living in America in the first decades of the twentieth century required one quarter of all arable land to grow their grain feed (Smil 73). Because of this burden, only countries rich in agricultural land could afford to support a large population of working animals. A country's agricultural development depended upon the number of gaminivores its land could support.

There were always trade-offs between keeping animals for work (and fertilizer, milk, and meat) and maintaining a more energetically modest human-driven farm. Thinking of horses and oxen in terms of energy exchange helps us understand what Bob Johnson as called the “ecological cul-de-sac that defined the premodern economy,” and how fossil fuels meant liberation from the limits of the land (20). Again, as with automobiles for transportation, the arrival of coal and petroleum to power farm equipment represented a major relief from the demands of cultivating biomass to power muscles. The fact that these incredibly concentrated fossil sources were nonrenewable and produced a new kind of air pollution mattered little to the first industrial generations.

This chapter is devoted to the literature of biomass-fueled beasts and the world that was plugged into their muscles. Though we tend to think of journeys on horseback, teams of yoked oxen, and asses pulling wagons as long gone in the modern world, these animals continue their steady work in undeveloped locales across six continents. Livestock continue to be the stock holdings of family wealth, especially in regions where habitation would be impossible without the cow's milk and meat, as in the Kalahari Desert in southern Africa, or the Andean highlands of Peru, from which a large portion of alpaca wool originates. Ungulates well-adapted to earth's diverse grass and scrublands open niches for human existence in places with severe temperatures, low rainfall, extreme

elevation, or little arable land. The farmer leading his laden llama down to the regional market is benefiting from the energy of the sun: first stored in grasses, then converted to muscle and released, stride by stride, by the steadily working animal. The weaver turns solar-energy-made-matter into thick rugs and soft sweaters on her loom.

Living on biomass implies certain relationships with time and space now largely absent in fossil-fuel-driven industrialized society. Unlike machines, animals must be given reasonable working times and loads, and their range and speed are likewise set within physiological bounds. There are times in history when humans pushed animals to the brink of their endurance, such as the mail-coach days of mid-nineteenth-century England, when animals came into direct competition with the new technology of the locomotive. But these extreme and often cruel regimens are not the ones followed by a prudent steward, whose animal's well-being may represent the family's ability to survive. Living on biomass implies slower time, tighter range, deeper dwelling. It rewards theriophily—love of animals and appreciation of their essence—because skill, rapport, and affectionate care are foundations of a working synergy.

As Wendell Berry remarks in *The Unsettling of America*, agricultural skills suffered “radical diminishment” when farms flocked to machine-based (fossil-driven) labor, because with animals, “two minds and two wills are involved . . . success depends upon the animal's willingness and upon its health; certain moral imperatives and restraints are therefore pragmatically essential” (92–3). On the other hand, the machine is lifeless and without will, so the moral limits are drawn exclusively, and precariously, within the human sphere. Traditional biomass energy tends toward the preservation of nuclear families and small communities in steady subsistence; fossil energy tends toward the agglomeration and dispersal of massive systems of industry, transport, urbanism, and consumption. The reason for this basic distinction is biochemical: biomass accumulates seasonally in sun-knit grasses with modest annual totals; fossil fuels pour from the ground in millions of years of sunlight per haul. Dried grasses contain about one-eighth the energy per weight that petroleum does, and though engines waste about 70 percent of fossil energy, they are still more efficient than animal bodies at converting energy into work (Smil 12). The engine does not have a resting metabolism.

John Ruskin was one of many philosophers alarmed at the onslaught of steam-driven rapid transit in the nineteenth century. Seeing the shift from muscle-based work to a more intensive coal-fueled world, Ruskin warned of the replacement

of biomass ontology with fossil-fuel ontology, in which “a fool wants to kill space and kill time: a wise man, first to gain them, then to animate them” (*Works* Vol. 3 320). The animation of space-time is tied to the basic exchanges between sun and earth, vegetal photo synthesizers and herbivores. It is impossible for a skilled animal keeper to be entirely anthropocentric. Berry joins the Ruskin camp with his observation that machines replaced animals on farms mostly because of their greater speed: the ratio of amount of work completed over time. The speed creed has no morality beyond an economic one. But what is sacrificed, these pastoral philosophers argue, is restraint, skill, responsibility, and the balance between use and continuity—that is, the ability to provide for the future in one’s present actions (*Unsettling* 93). An animal laborer consumes the fodder of the present and deposits the dung of a fertile tomorrow. The tractor feeds on money, purchased fuel, and so the industrial farmer must concentrate on production and sale before provision and responsible use.

It is easy to be carried away by nostalgia for the cozy images of a preindustrial lifestyle characterized by silence and slow time, now obliterated by coal and petroleum. The neurasthenia caused by modern living seems to cultivate pastoral fantasies of a better time now past. Traditionally the pastoral is linked, by way of life, to senescence and death, but even death is a gentle ideal in biomass poems like Keats’s “To Autumn.” Warm bronzed hay may be appealing in a painting or poem, but what about the penury of a bad harvest or an extreme winter, when the annual store of biomass energy falls short? In effect, fossil fuels and machine-driven labor represented liberation from arduous, repetitive work within the severe confines of an energy economy driven only by the sun. Wary of the idealisms of pastoral literature, I have selected a range of pieces, idylls, rants, and elegies that more accurately cover the range of conditions in grass-powered lives. Since this biomass section serves as a counterpoint to the fossil-fuel hegemony, its preindustrial ontology should shed light on the industrial structures that have become invisible when dwelling within the world of coal, petroleum, and natural gas, as we do.

Biomass occupies a position in eco-cultural history nearly as important as the industrial transition to fossil fuels that we will look into in the next section. Biomass fostered a revolution in the eighteenth and nineteenth centuries in Europe and North America. From economies of rural subsistence, intensive cultivation of natural resources converted the rural sphere into a state of agrarian capitalism in which grass and grain and the animals they nourished became commodities of crops and livestock actively traded for financial gain. These commodities represented the actual and symbolic wealth of a growing,

modernized economy that further divided country from city, encouraged an exodus to urban factory jobs, and stimulated the era of capitalist consumerism that is a central feature of our lives. Though coal was necessary for these shifts to be ratcheted into the enduring cultural paradigm of industrialism, the history of biomass is a vital component of the narrative of modernization.

From fueling modest, feudal, subsistent, pastoral lives, biomass speaks to the moments when even renewable natural resources like grains were drawn up into the modern economy through the mediation of fossil-fueled machines. For all of the retrospective, pastoral perspectives on biomass, it is also a fuel with a future. Intensive research into renewable biomass energy from crop staples like corn produces energy from ethanol, which contributes up to 10 percent of the mixture we buy at the gas station. A second generation of biomass that neither competes with human food supplies nor requires intensive petroleum-based fertilizer is one of the major frontiers of renewable energy research. Perennial grasses like switchgrass, native to North America, may in the future fuel ethanol production on a large scale, while working to preserve prairie habitat so thoroughly degraded by over a century of intensive agriculture in the American Midwest.

A word on pets and pot roasts. This chapter covers the lives of the animals, humans and otherwise, whose energy comes from renewable biomass, which preceded the fossil-fuel driven modern industries that now feed our domestic quadrupeds and fatten our meat animals—particularly chickens, cows, and pigs. Using fossil fuels, we have created distinct categories of animals: wild animals, especially predators, for spectacle; domestic pets for companionship and amusement; replicate meat machines to fill our bellies. Outside of these categories lurks a time-honored, now rare, way of living with animals as equal parts companion, fellow laborer, and supper. The eighteenth-century poet Ann Yearsley held a pseudonym, Lactilla, indicating that she started her life as a milk-woman. The single line “Lactilla tends her fav’rite cow” celebrates an animal with an individual personality (she is “favorite” for a reason), an exchange value (milk), an influence strong enough to label her keeper (Lactilla—she who milks), who demands certain accommodation (she requires tending). The fav’rite cow might end life as a pot roast, but only after living a more textured existence than we now allow for wild predators, pets, and stockyard steer in the industrial state. By looking at the fuel of biomass, I hope to open out this animal ontology that has all but vanished in developed nations, and show how biomass designates a certain mode of respect, even equality, between working animals and their humans.

I The country: The pastness of the pastoral

Escorting his flock, the shepherd, hero of the literary pastoral, climbed atop the haystack of classical and early modern literature. Poems by Virgil and Theocritus, Spenser and Marlowe, are much more attuned to the aesthetics and emotions of an idealized rural society than they are to the energy sources of that world. I leave you to read the legions of scholarly tomes on the pastoral to gain an appreciation of the vogues, declines, satires, and imitations that fill literary history (see, for example, Paul Alpers's *What is Pastoral?*). For this book, we will remain trained on grass and oats, hay and horsebread. This is writing with “earth clinging to its roots,” to quote Thoreau. These vegetable origins of modernity are carbohydrate chains fixed in photosynthesis by solar power, “the force,” as Dylan Thomas imagined, “that through the green fuse drives the flower.” Biomass passed through the guts of animate prime movers to their muscles and fueled the agricultural society that was a radical departure from the previous two million years of Paleolithic culture. The domestication of animals was the first stage in the intensification of agricultural work, followed by the non-fuel-based advances in irrigation, fertilization, and rotation of crops. The well-bred horse could perform the work of six to eight humans, and could produce more total force for large tasks like pulling out stumps and dragging large plows (Smil 39–40, 49, 86).

Figure 2.1 Winslow Homer, *Making Hay*, 1872. Image courtesy of the National Gallery of Art. Public domain.

The pastoral is a distinctive genre and setting in literature. Aristotle was a scientific-minded pragmatist who thought that nature provided cattle for mankind, “both for his service and his food” (qtd. in McInerney 1). Celtic myths are filled with cow worship, even to the point of mythic warfare over ownership. Romantic poet John Keats, who shunned the industry that transformed his London, viewed a pastoral scene of “silence and slow time” on an urn in the British Museum and asked in his *Ode on a Grecian Urn*: “To what green altar, O mysterious priest, / Lead’st thou that heifer lowing at the skies, / And all her silken flanks with garlands drest?” (ll. 2, 32–4). The scene on the urn documents the essential role cattle played in classical Greek culture, since the animal provided meat, milk, and labor. The cow was so valuable to ancient cultures that they routinely conducted rituals of sacrifice to the higher powers in an appeal to keep the grass growing, the muscles going, the milk flowing.

To Homer, the cow was significant for its symbolic and exchange values, essential to the economy of marriage as dowries, and used as a way to display wealth and denote status among herd-holding families. These exchange values were acute enough to translate into a symbolic value in sacrifice, for assuaging, and gaining favor with, the capricious Greek gods (McInerney 2). To this day, the Greeks’ choice of fine cows as sacrificial animals shows their reverence for the value of the animal. They groom her hide until it resembles silk, and bedeck her in floral garlands—a ritual preserved well beyond the end of classical pastoral in works of art.

For instance, Keats continues on the urn: “When old age shall this generation waste, / Thou shalt remain, in midst of other woe / Than ours, a friend to man” (ll. 46–8). The ideals of beauty and truth conveyed by the silent urn are embodied by that lowing heifer, a symbol of the beauty of the animal and its importance to the culture and ecology of Greece. Though generations are cut down, the sacred, sacrificial cow endures as a symbol of the eco-cultural relations among working animal, human steward, and nature—or the gods that, in myth, controlled natural conditions. This basic relationship between agents and elements that constitutes agricultural survival has become more obscure since Keats’s time, but the Grecian urn reminds him and us that we are not in total control of our fate, and ritual is our gesture of deference to whatever *is*. Biomass involves looking to the skies with hope and fear—a condition of vulnerability. Once industrial societies adopted fossil fuels, the machine and the mine—internal, self-referential subjects—came to replace our sky speculations.

In the Roman Empire of the first century BC, the poet Virgil, in his *Eclogues*, defines the shepherd's happiness and his ability to survive according to the quality of his biomass:

So in old age, you happy man, your fields
Will still be yours, and ample for your need!
Though, with bare stones o'erspread, the pastures all
Be choked with rushy mire, your ewes with young
By no strange fodder will be tried, nor hurt
Through taint contagious of a neighboring flock.

(1. 58–63)

The vagaries of weather and disease that annually threatened the herder and his flock emerge as divine interventions—both as blessing and curse. The pasture is a metonym of divine favor, a blessing translated as ample, edible fields, rather than “strange fodder” that would sicken the sheep. When the gods smile, times are easy, the sun shines, the hay ripens, the flock fattens. This pastoral idyll can pivot rapidly to the opposite trope—that of apocalypse—evoked here in Virgil's *Georgics*:

Here from distempered heavens erewhile arose
A piteous season, with the full fierce heat
Of autumn glowed, and cattle-kindreds all
And all wild creatures to destruction gave,
Tainted the pools, the fodder charged with bane.
Nor simple was the way of death, but when
Hot thirst through every vein impelled had drawn
Their wretched limbs together, anon o'overflowed
A watery flux, and all their bones piecemeal
Sapped by corruption to itself absorbed.

(3. 478–87)

Under the “distempered heavens,” the stew of death filth is mixed by animals, domestic and wild, leading to a holocaust of “full fierce heat” that consumes itself. The source of death is the “fodder charged with bane” and the paradox of “hot thirst” and “watery flux”—thirst in life and oozy water in death—form a universal spongy mess, “corruption to itself absorbed.” Biomass is both nutriment and bane. Through it, the gods giveth and they taketh away. Virgil's famine verse recalls the delicate balance of conditions necessary to maintain the idyll. Elysium is one drought away from a wasteland; if the rains fail the grass dies first, and its grazers flee or die.

American ranchers—modern shepherds—are well-acquainted with the dire straits of a dry season, and in droughts they sell off cattle to wetter areas. In the 2014 drought in the American west, “fields that should be four feet high with grass are a blanket of brown and stunted stalks”—a modern-day life-or-death pastoral (Nagourney and Lovett). Despite the antiquity of the classical writers, their tales of natural disaster echo in our own times. The agency of apocalypse has shifted through time, however, from supernatural to natural to human. The ancients used pastoral literature to preserve their rituals of entreaty, begging the higher powers for high-quality biomass, and to record the effects of famine and pestilence when the gods failed to favor them. In the twenty-first century, when we experience extreme drought weather, we must turn to a shifting measure of agency between natural oscillations and anthropogenic climate change. Where classical literature turned to the gods, we are left, in fossil fuel ontology, in an indeterminate space between receiving the elements and clumsily conducting them ourselves. This shifting boundary between natural and industrial climate causes is a signal element of life experience in our time, and fringe groups have looped these causations back onto theological origins, with divine retribution acting as feedback for our pollution.

By the time of Queen Elizabeth I, England had a literate class that sought diversion and education through reading, and writers acquiesced by adapting old pastoral forms of literature from the Greeks and Romans. The pastoral turned from the hard work of the georgic farm labor to the more abstract and idealized fancies of the shepherd’s lascivious lingering. The Elizabethan pastoral is bursting with nature scenes, fresh seasons, frolicking maids, desire, and sex—or desire but no sex. It rarely alludes to the chemical energy that runs the scene: the grass, hay, and grain. Eschewing realism, the writers peopled their poems with an invented leisure class of peasantry that reflected and flattered the reading leisure class of courtiers and city dwellers. The idealisms of the pastoral became the source of literary fencing matches, as when Christopher Marlowe’s “The Passionate Shepherd to His Love” was parried by Sir Walter Raleigh in his “The Nymph’s Reply to the Shepherd.” Marlowe’s shepherd promises a natural jewel box of roses, posies, myrtle, ivy, coral, and amber, and Raleigh’s pragmatic maid responds:

The flowers do fade, and wanton fields,
To wayward winter reckoning yields,
A honey tongue, a heart of gall,
Is fancy’s spring, but sorrow’s fall.

Thy gowns, thy shoes, thy beds of Roses,
 Thy cap, thy kirtle, and thy posies
 Soon break, soon wither, soon forgotten:
 In folly ripe, in reason rotten.

(ll. 9–16)

Raleigh cleverly uses the seasonal pun of light-legged spring and stumbling fall to indicate that the lives of rustics take footing in the conditions that are good for growing grass. Shining sun, warm air, growing grass, fattening beasts, happy shepherd, and love. The autumnal opposite, the nymph points out, is both inevitable and predictable. Vernal boy has no plan to adopt when the earth pivots away from the sun. If the maid were more inclined toward his addresses, she might devise for him a rational autumn of mowing, curing hay, and a hearth fire well-fueled by split cordwood. The Christmas jingle “Let it Snow” draws out that wintery ideal. But this nymph is a contrarian, not a coauthor of a romantic alliance. Neither poem mentions the commonplace of grass, but the whole terrain of rural existence is carpeted in biomass, so, even in a poem of roses and posies, grass is bedrock.

Andrew Marvell, the near contemporary of Marlowe and Raleigh, composed a series of poems on Damon the Mower, a lovelorn young reaper meditating on the cruelty of his neglectful beloved, Juliana. This stanza from “The Mower’s Song” is representative:

My mind was once the true survey
 Of all these meadows fresh and gay,
 And in the greenness of the grass
 Did see its hopes as in a glass;
 When JULIANA came, and she,
 What I do to the grass, does to my thoughts and me.

(ll. 1–6)

Far from a literal meditation on biomass, the grass and Damon’s mowing serves as a metaphor for unrequited love, a popular subject at court. Eventually the grim reaper and death will populate Damon’s sad musings. Rather than being celebrated for its life-giving energy, here the grass-to-hay labor is a killing spree. Damon is literally the reaper, and figuratively his own quarry, the lopped grass. Juliana is the scythe. Marvell does not figure her as the sun that makes the grass grow, the rain that makes it supple and shiny, the breeze that causes it to dance. She shows Damon his mortality by severing his vitality—perhaps a very specific part of it.

The lovelorn lad appears again in Marvell's longer poem "Damon the Mower," this time with more details concerning his role in the rural network. The tetrameter couplets lend a light, ballad-like tempo to the verse that, by design, joins pairs of images into happy unions, like the dew on the daffodils:

I am the Mower Damon, known
Through all the meadows I have mown.
On me the morn her dew distills
Before her darling daffodils.
And, if at noon my toil me heat,
The sun himself licks off my sweat.
While, going home, the evening sweet
In cowslip-water bathes my feet.

What, though the piping shepherd stock
The plains with an unnumbered flock,
This scythe of mine discovers wide
More ground than all his sheep do hide.
With this the golden fleece I shear
Of all these closes every year.
And though in wool more poor than they,
Yet am I richer far in hay. . . .

How happy might I still have mowed,
Had not Love here his thistles sowed!
But now I all the day complain,
Joining my labour to my pain;
And with my scythe cut down the grass,
Yet still my grief is where it was:
But, when the iron blunter grows,
Sighing, I whet my scythe and woes.

(ll. 41–56, 65–72)

Damon is an active figure set against the shepherd's idle idyll, a worker who relishes the natural relief of morning dew, midday sun, and a footbath of flower juice. He covers a wider terrain than the shepherd to cut his "golden fleece" of hay, a commodity that he presumably sells or trades for necessities. Without his work, the sheep and other quadrupeds would not eat in winter; so, though he is a figure of late summer, Damon's reaping presages the dark months of the year. The transition—from a poem that describes actual work to a poem that fixates on the emotive figures of the lovesick—is as inevitable to English pastoral poetry

as the pouncing couplets. The thistles that dull his blade also barb his heart. Accepting that this kind of poetry was not primarily written to describe rural work or the collection of biomass to feed domesticated animals, early modern pastoral works nevertheless preserve an ideal version of a muscular way of life that has been annihilated by fossil-fuel-driven machines.

In his poetry, Marvell's contemporary, John Dryden, bypassed the tradition of the lovelorn rustic and went straight to the harvest party. Dryden's *Song* within the masque *King Arthur* flies on the voice of Comus, God of the bender and the hangover, using the hard labor of haymaking as an occasion for a party:

Comus: Your hay it is mow'd, and your corn is reap'd;
Your barns will be full, and your hovels heap'd:

Come, my boys, come;

Come, my boys, come;

And merrily roar out Harvest Home.

(ll. 1–5)

These farm boys are ready for the call-to-goblets. They echo Comus in their chorus: "Come, my boys, come; / Come, my boys, come; / And merrily roar out Harvest Home." With winter food for human and animal secured, the last fine days of the season may be spent in celebration of nature's bounty, an overflowing cornucopia trampled by drunken Bacchus. The pure animal pleasure of rest after hard work is an emotional acme of biomass literature, a state of somatic happiness that industrial humans rarely access. When we do feel this bliss, it is most often caused by the elective labor of exercise rather than the life-sustaining work of the harvest. That work is now mostly performed by fossil fuels in machines, so we turn to treadmills as a muscle-working but energetically counterproductive medium. Our dwellings are filled with two types of machines: the ones that use fossil fuels to "save" labor, and the ones that use fossil fuels to absorb it—a paradox stored side by side.

As the eighteenth century passed and urban industry drew waves of rural people into the cities, the depopulated country did not offer an easy alternative. On the contrary, bad weather caused a series of bad harvests in Europe in the 1780s, including the near-famine in France that fomented the great revolution of 1789. In England, the price of wheat was 66 percent higher in 1783 than it had been in 1780 (Archer 30). The British Romantic poet William Blake deploys the pastoral to evoke the Christian tradition of Christ the Good Shepherd, with the church as his flock, safe and secure, a mode of innocence to be both celebrated and questioned, since it coexisted with a world of rampant victimization. In

Blake's "The Shepherd" from his *Songs of Innocence*, the pleasure is simple and absolute:

How sweet is the Shepherd's sweet lot!
 From the morn to the evening he strays;
 He shall follow his sheep all the day,
 And his tongue shall be filled with praise.

For he hears the lamb's innocent call,
 And he hears the ewe's tender reply;
 He is watchful while they are in peace,
 For they know when their Shepherd is nigh.

(ll. 1–8)

Something tastes sour in the initial repetition of "sweet," implying that the shepherd's innocence in this short ballad is perilously idealistic. Blake lived at a time when the shift from biomass to fossil-fueled society was accelerating, and the lifestyles of rural and urban dwellers were drawn into sharper relief. The shepherd is watchful, hear-ful, and he strays all the day *sans ennui*. The language of the pasture is the mother ewe's babbling love speak, translated into eight gentle rhyme-embraced lines. The pragmatic business of grazing is overshadowed by the filial lovefest, for work itself is easy pleasure, a passive receptiveness to the bounty of the sun. Blake would revisit these themes in his *Songs of Experience*, but this *Innocence* poem has no clear counterpart as many of the others do (for example, "The Lamb" in *Innocence* is matched with "The Tyger" in *Experience*). One possible complement to "The Shepherd" is "The Chimney-Sweeper," a protest lyric about the oppression of young boys in London that will appear in our readings on coal. The two poems form the ultimate critical dialectic between country and city in Blake's Romantic-industrial poetics.

In "I Heard an Angel," Blake deepens his dialectic between innocence and experience by embodying these states in angels and devils. Blake does not believe in traditional oppositions of good and evil propounded by institutional religion. As explored richly in *The Marriage of Heaven and Hell*, this shorter lyric shows how devilish attributes create a more complex and ultimately richer human experience. Morality plays out on the stage of the pasture:

I heard an Angel singing
 When the day was springing
 Mercy Pity Peace
 Is the worlds release

Where joy's wild impulse swims
In one continued song.

(ll. 92–8)

Lovely, if a tad clichéd. It unites the components of an ideal evolutionary landscape: valley, forests, ponds, meadows. E. O. Wilson's *Biophilia* (1986) explores the idea of nature love as an evolutionary adaptation that informs our landscape aesthetics. The shepherd's idleness and "joy" are in pathos misplaced in nature rather than in a happy human perceiving nature. It is the poet's joy of imagination. At a time of mass land transformation, human migration to cities, and industrial pollution, Clare's verse shows the power of literature to lift the reader out of messy modernity by way of the nostalgic imagination. There is plenty of fragrant hay in store for the winter that, in this classical idyll, will never come. Clare's poems are full of these rhetorical idealisms; but the rural perfection he captures is also rhetorical, arguing for a dying way of life and an endangered landscape. Clare once said "I live here among the ignorant like a lost man," indicating that his experience of the pastoral was textured with melancholy, isolation, and long periods of mental instability (Bate 237). He was in and out of asylums for nearly thirty years in his later life, and died in 1864.

The 1840s–50s had witnessed particularly aggressive enclosure acts that advanced the centuries-long process of privatizing the English countryside to make for more homogenized, profitable agriculture that fed the urban industrial hordes, many of whom were compelled to the city because they were driven from subsistence on the old commons land. Enclosure paved the way for higher rents on tenants, payable to landlords who claimed to improve the land by crossing it with fences. With machines also displacing rural workers at a greater scale every year, Clare's lifetime was one in which hay and corn and the animal labor they supported greatly diminished from their former role as the nucleus of human life. Ironically, the modern "English Countryside" of crisscrossed fields is a product of the enclosure acts—so our perception of the pastoral is built upon the very structures that destroyed the classic pastoral of the commons.

Jane Austen riffs on the pastoral to poke fun at silly characters who put on airs with their ecstasies over picturesque prospects. There is not much real work in her novels, if one excludes the ruinous working-over of social cliques. *Mansfield Park*, though, glimpses at country work, if only as a setting to exhibit the self-absorption of the dangerously alluring Mary Crawford. Austen sagely chooses a pastoral instrument, a harp, that Mary has bought and requires fetching to

her house. She sees plenty of horses and carts in the country—why can she not engage one to do her bidding? Her cluelessness is on display to the hero Edmund:

“I am to have it to-morrow; but how do you think it is to be conveyed? Not by a wagon or cart: oh no! nothing of that kind could be hired in the village. I might as well have asked for porters and a handbarrow.”

“You would find it difficult, I dare say, just now, in the middle of a very late hay harvest, to hire a horse and cart?”

“I was astonished to find what a piece of work was made of it! To want a horse and cart in the country seemed impossible, so I told my maid to speak for one directly; and as I cannot look out of my dressing-closet without seeing one farmyard, nor walk in the shrubbery without passing another, I thought it would be only ask and have, and was rather grieved that I could not give the advantage to all. Guess my surprise, when I found that I had been asking the most unreasonable, most impossible thing in the world; had offended all the farmers, all the labourers, all the hay in the parish! As for Dr. Grant’s bailiff, I believe I had better keep out of *his* way; and my brother-in-law himself, who is all kindness in general, looked rather black upon me when he found what I had been at.”

“You could not be expected to have thought on the subject before; but when you *do* think of it, you must see the importance of getting in the grass. The hire of a cart at any time might not be so easy as you suppose: our farmers are not in the habit of letting them out; but, in harvest, it must be quite out of their power to spare a horse.” (46–7)

Mary mistakes the real work of country laborers for the picture show of the classical pastoral that she thinks she sees every time she looks out of her self-ornamenting “dressing-closet.” In the process of emerging from this harp-plucking dream, she offends everyone who labors to survive the coming winter. Not a single rattletrap cart, let alone an able horse, can be spared when there is a tight timeline on airing and storing the winter fodder. It is not a matter of money, it is one of survival. She justifies herself by noting the difference between city and country culture: “I shall understand all your ways in time, but, coming down with the true London maxim, that everything is to be got with money, I was a little embarrassed at first by the sturdy independence of your country customs.” The embarrassment is not for herself; it is a kind of disdainful pity for the farmers’ lack of deference. Since neither her charms nor her money can persuade the country people to meet her demands, she calls in a favor to her brother Henry, who plans to “fetch it in his barouche.” Some horses are fueled to work the harvest; others dutifully drag harps to distant ladies.

Where classical and early modern writers deployed the pastoral to record ritual and to entertain the privileged, Romantic writers and their descendants were faced with a more tortured task of challenging the great fuel shift into a fossil-driven world. If one of the key aims of this study is to identify when the consumption of fuels became reflexive, that is, recognized in art as a transition from one ontology to the next, the Romantics and Victorians are ground zero for overt representations of a new world order. Machines would arrive on the farm and transform the nature of rural labor by the mid-1800s when, for example, Thomas Hardy's *Tess* is shaken to pieces on a coal-fired corn rick.

Once the harvest was in, the Bacchanalia would follow. As Thomas Hardy captures in a short scene in *Tess of the D'Urburvilles*, biomass fills the air of the dance with a "floating, fusty *debris* of peat and hay, mixed with the perspirations and warmth of the dancers, and forming together a sort of vegeto-human pollen" (68). The workers are shellacked in their labor, a coating of biomass that translates by metaphor to the earthy spirit of the people. The "fusty" air is literally inspired by the dancers, who outpace "the muted fiddles [that] feebly pushed their notes, in marked contrast to the spirit with which the measure was trodden out. They coughed as they danced, and laughed as they coughed" (68).

In strong contrast to the air pollution of coal—an atmosphere familiar to the Victorian Hardy—this rural suffocating air is joyous. It is an incantation of earth and countryside, a hazy veil that obscures clear vision and enhances the romantic effect: "Of the rushing couples there could barely be discerned more than the high lights—the indistinctness shaping them to satyrs clasping nymphs—a multiplicity of Pans whirling a multiplicity of Syrinxes; Lotis attempting to elude Priapus, and always failing" (68). Hardy riffs on the erotica of the classical pastoral with his mythological revelers—an attempt to briefly reanimate the nostalgic genre—before history squelches it for industrialization.

Before long, *Tess* and her friends must return to the coal-powered hay trusser, where their labor is chained to a machine pace and they can no longer share conversation over the racket. *Tess*'s mechanized farm labor shows how the incursion of coal-fired steam power fatally disrupted the traditional methods of muscle labor and the evolved human experience of slow, steady work, along with the sensory redolence of the biomass-fueled farm. A new scheme of erotic joy, or at least release, would soon come into orbit around the urban environments built from the energy of coal and oil, starring the steam and thrust of the factory engine.

Half an industrial century later, Robert Frost shows that haymaking is endangered labor in America in his long poem "The Death of the Hired Man,"

written in 1905–6. It is winter, and a farming couple debate whether to shelter a former worker who left in the middle of hay cutting season and has now returned in a desperate state. The history of this man, Silas, emerges as the couple recalls his feud with another worker, a younger school boy enamored with his studies, particularly Latin. Using the two haymakers, Frost draws out the generational tension between the value of labor and that of abstract knowledge. Silas seems to be filled with regret for his former invective against Harold's learning, but he keeps his pride of work when he imagines a new encounter in the coming summer season: "He thinks if he could teach him [haymaking], he'd be / Some good perhaps to someone in the world. / He hates to see a boy the fool of books" (ll. 96–8).

As preordained in the title, Silas is flashing upon a future he will never see. We imagine Harold has gone on with his education and the upward mobility it enables, toward professional work and urban living supported by an industrial economy. His departure leaves haymaking to a dying generation doting on the labor practices of the diminished rural sphere. Silas is a cryptic character, out of grace with family and friends and dying a beggar's death. He is no farm-fresh paragon to set against the morally ambiguous white-collar classes: Frost's conflict is not bucolic versus bourgeois. The death of Silas is a symbolic extinction of preindustrial rural knowledge and, with it, any future interest in such knowledge, as the twentieth century turns toward fossil-fueled large-scale agriculture misnamed the Green Revolution. Silas and Harold had cut grass by hand and piled the hay upon a horse-drawn cart. Haymaking will soon be done by machines, and Harold will not be in the driver's seat. He will sit at a distant desk.

In Sarah Orne Jewett's poem of 1882, "A Country Boy in Winter," the boy belongs to Silas's generation, torn between rural and urban, pastoral and industrial. The long dark seasons of quiet time would be insufferable to fashionable people used to constant stimulation, but the boy finds ample company and cheer in the working animals he is responsible for. His care is the work of maintenance, but also of love, a union known as husbandry:

I like to hear the old horse neigh
 Just as I come in sight,
 The oxen poke me with their horns
 To get their hay at night.
 Somehow the creatures seem like friends,
 And like to see me come.
 Some fellows talk about New York,
 But I shall stay at home.

(ll. 41–8)

The fellows talking of New York choose an urban life, which depends on the work of faraway farms and mines and factories and fisheries. The city itself, its art and consumerism and parties, is the luxurious enclave of those who exploit the productivity of other people in other places. By contrast, the affection of the old horse and the oxen is pleasure gained from embeddedness, an evocative straw-and-urine version of life that masses of young people were leaving behind, but that this country boy continues to cherish. Like Clare's plaintive ode to the bucolic, Jewett's more realist poem preserves the old world order as America careened into the fossil future.

Frost's sonnet "Mowing," written about ten years after "The Death of the Hired Man," is immersed in the sensuous task of manual mowing. It preserves an old mode of existence: the mental and physical feel of cutting grass with a scythe, feeling the variable elements, observing the other dwellers in the meadow. Frost critiques the classical pastoral while at the same time preserving some of its more appealing traits: quiet thought, observation, and naturally good company:

There was never a sound beside the wood but one,
 And that was my long scythe whispering to the ground.
 What was it it whispered? I knew not well myself;
 Perhaps it was something about the heat of the sun,
 Something, perhaps, about the lack of sound—
 And that was why it whispered and did not speak.
 It was no dream of the gift of idle hours,
 Or easy gold at the hand of fay or elf:
 Anything more than the truth would have seemed too weak
 To the earnest love that laid the swale in rows,
 Not without feeble-pointed spikes of flowers
 (Pale orchises), and scared a bright green snake.
 The fact is the sweetest dream that labor knows.
 My long scythe whispered and left the hay to make.

(ll. 1–14)

The mower is "beside the wood" in the pasture, a productive space that yields the necessary hay for fodder, silent but for the sound of the scythe's slice across the hay grass. The mower hears a convivial conversation between blade and blade, perhaps about the original source of life, the all-animating sun whose light has been chemically translated into biomass. Heavy, productive biomass: enough to make a "swale" from the reaping, a landform of its own laid out in rows to dry, again by the sun's energy. The mower refuses to countenance pastoral exaggeration; he has no interest in "more than the truth," or a life involving "idle

hours” and “easy gold,” peopled by fairies and fantasies. These abstractions are a literary failure to convey the real love of hard work and the actual beauties of “pale orchises” and “a bright green snake” that dwell in this world. The mower kills and scatters them, too, but not without appreciating them first. The hay meadow is a habitat, a polyculture in which the weeds are sexy orchids sheltering suggestive snakes. From the mundane drudgery of the reaping, Frost has created a whispering, pulsing, productive and reproductive world without a single reversion to a half-clothed Dryad. And the mower has laid down the year’s harvest to cure, stored for the working animals behind the scene.

The aesthetic pleasure of Frost’s sonnet lulls the reader into a pastoral reverie, the kind of space that Keats so deliciously crafted in his ode “To Autumn.” But though the season of reaping may be “close bosom-friend of the maturing sun,” sumptuous literary visions of reaping contain auguries of deprivation and death as well. Jim Crace’s novel *Harvest* (2013) profiles a remote English village sometime in the long era of enclosure, the twelfth to the nineteenth century, when peasants were driven off the common lands so that private owners could pursue profitable industries like wool making and monoculture commodity farming.

Crace describes the collective synergy of feudal-style subsistence, where “the broadest shoulders swing their sickles and their scythes at the brimming cliffs of stalk; hares, partridges and sparrows flee before the blades; our wives and daughters bundle up and bind the sheaves, though not too carefully—they work on the principle of ten for the commons and one for the gleanings; our creaking fathers make the lines of stooks; the dun begins to dry what we harvested. Our work is consecrated by the sun” (6). Each individual has a place dictated by age or sex, but the places are equally important to survival. This warm-bellied passage does not lull the reader into innocent nostalgia for simpler times, however: Crace’s characters are skinny, sinewy, scarred, and usually cold. The narrator evaluates the year’s harvest: “I plunge my good hand into a half-filled sack . . . I’ve known better harvests, years when the barleycorn was fat and milky . . . And I’ve known hungry years when yields were fibrous and parched, and we survived the winter on dry bones. Today the grains are good enough, but only good enough. We will not starve; we will not fatten either” (72–3).

The narrator Walter Thirsk is a transplant from the city who might recognize an ode like Keats’s as a city man’s poem, since the hard work of harvest is impossibly performed by drowsy goddesses rather than straining muscles. Self-conscious of being an outsider, Thirsk wants to validate his presence by performing the physical effort that pastoral dwelling demands. That world is

endangered, however, by enclosure that would substitute one form of pastoral, the plowman's agriculture, for another: the shepherd's ovine pastoral. The latter is the classical, idealized, and often urban-written version of the pastoral; the former is a genre of georgic that commits itself to the hard work of agriculture. The defeated local master, Kent, resists his more powerful cousin's happy vision: "The commons will be cleared and privately enclosed. You're pasture now. These lands are grass. We'll never need another plow" (91). Kent surveys his farm land before it is appropriated, and marks the old way dying for the new to be born: "This land has always been so much older than ourselves ... not anymore" (174). When the commons are cleared, the land is reborn as alien: "That drystone wall, put up before our grandpa's time and now breeched in a hundred places, will be ... replaced either with an upstart thorn or with some plain fence, beyond which the flocks will chomp back on the past until there is no trace of it. We'll look across these fields and say, 'This land is so much younger than ourselves'" (175).

Kent imagines a temporality here between old and young, where agriculture is the old land, and grazing is the young land, as perceived by the stewards who have seen it evolve through time. His view suggests a return to the innocence of the shepherding regime, where the land itself is young. These two faces of the pastoral, grueling subsistence and leisurely flocking, preview the dualism of fossil fuels, which created a world divided between grinding factory labor and the flighty indolence of automation and leisure-giving wealth. In both cases, the fuel dualism is borne on a social hierarchy that first divides workers from masters, then producers from consumers. However, this parallel between biomass and fossil fuels is also perpendicular: with biomass, the peasant's labor is arduous because the system's energy is so meagre; with fossil fuels, the proletariat's labor is arduous because the system's energy is tremendous. The factory worker has to sprint to keep up with the steam-driven line.

The pastoral is often filled with vague, utopian locales and stock characters. It can, however, become notably particularized. For example, James Whitcombe Riley's late 1800s doggerel, "Raggedy Man," evokes rural Indiana and the Hoosier dialect, as it reveals a boy's fascination with the hobo who worked the farm:

O the Raggedy Man! He works fer Pa;
 An' he's the goodest man ever you saw!
 He comes to our house every day,
 An' waters the horses, an' feeds 'em hay;
 An' he opens the shed—an' we all ist laugh

When he drives out our little old wobble-ly calf;
 An' nen—ef our hired girl says he can—
 He milks the cow fer 'Lizabuth Ann.—
 Ain't he a' awful good Raggedy Man?
 Raggedy! Raggedy! Raggedy Man!

W'y, The Raggedy Man—he's ist so good,
 He splits the kindlin' an' chops the wood;
 An' nen he spades in our garden, too,
 An' does most things 'at *boys* can't do.—
 He clumbed clean up in our big tree
 An' shooked a' apple down fer me—
 An' 'nother 'n, too, fer 'Lizabuth Ann—
 An' 'nother 'n, too, fer The Raggedy Man—
 Ain't he a' awful kind Raggedy Man?
 Raggedy! Raggedy! Raggedy Man!

(ll. 1–20)

The exuberant cadence, its hollering and repetition, mimics the bellows of a farm boy. Raggedy Man fascinates because his uproarious bedraggled looks belie his competence; he does things “boys can’t do” but might wish to, such as climb high in a tree to shake down apples. He is the lowest on the social rung—he needs to ask permission even from the “hired girl”—but in his way he’s a prince of the pastoral, master of a series of can-do verbs: works, waters, drives, milks, spades, climbs, shakes. He’s goofy, spontaneous, energetic, and ready, a farm-clown counterpoint to the boy’s dour father. Riley’s verse became part of popular culture when the creator of the Raggedy Ann and Andy dolls, first sold in 1915 to accompany a series of illustrated books, named them after Riley’s character.

In “The Black-Faced Sheep,” contemporary poet Donald Hall explores the enduring ties between humans and the animals we keep—not as a relationship of subordination or dependency, but as kinship in an evolutionary journey. As with the earlier writers, the pastoral scene is replete and redolent with life-sustaining grass and grain:

I forked the brambly hay down to you
 in nineteen-fifty. I delved my hands deep
 in the winter grass of your hair.

When the shearer cut to your nakedness in April
 and you dropped black eyes in shame,

hiding in barnyard corners, unable to hide,
I brought grain to raise your spirits.

(ll. 24–30)

Hall's empathy for the sheep's grief invokes an existential kinship we hold with animals long involved in our survival. Sheep were among the first animals to be domesticated in the Fertile Crescent and northern Africa, and their wool and milk were essential to the development of stable settlements. Hall sweeps from today back to the origins of all pastoral literature:

Ten thousand years
wound us through pasture and hayfield together,
threads of us woven
together, three hundred generations
from Africa's hills to New Hampshire's.

(ll. 31–5)

The figurative fabric is woven of real hay and the wool it eventually produces, linking the global landscapes of animals at pasture through deep time. The thread of human–animal symbiosis ties to our traditions of husbandry, beginning long before humans had the ability to recall or record. Deep memory is also scripted into our genes: humans are selected by their ability to grow and cure ample fodder and care for animals, and sheep are selected to evolve into docile, noble, wooly mammals able to subsist on biomass we can't digest. The evolutionary ecology of animal domestication is an intimate marriage of equals who have wandered together across the globe. Industrial animal husbandry makes few ethical allowances for this biocultural codependence, but poetry takes up the project of recuperating it in the preindustrial pastoral.

With Virgil, we began looking at the origins of the pastoral as a study of rural human ecology, with the landscape as an indicator of the health and fortunes of the dependent shepherds. Virgil used the classical idyll not only to texture his poems, but also to boldly prophesy apocalypse—environmental disaster—as a drastic event that could occur in any earthly Elysium. Apocalypse has hardly ever gone out of fashion in literature. Readers have a macabre fascination with the nature of our own demise; we attribute the ruckus to mischance or retribution, and enjoy the spectacle of an ordered world devolved to chaos. The German writer Marlen Haushofer's contemplative, anxious novel *The Wall* (1968) flavors the pastoral with postmodern nuclear-age angst. It describes a postapocalyptic world of individual subsistence on preindustrial biomass. Our evolutionary

conditions have been mostly erased just two hundred years after the advent of industrial civilization. Haushofer reawakens them.

The wall itself is an anomaly that Haushofer does not explain. It is simply a clear, impervious membrane that one day surrounds a woman visiting a hunting lodge in the Alps. Everything outside a few hundred walled-in acres is frozen in time, petrified, suggesting nuclear winter. The novel focuses on the sphere of the living, using an epistolary narrative to tell the woman's tale of survival and her life shared with animals: a dog, cats, two cows, deer, and a fox. The woman—unnamed, so I'll call her Woman—grows from pudgy, dissatisfied, and middle-aged, to lean, purposeful, reverent, and despairing. Autonomous, increasingly competent, contemplative, propertied, she is a female Robinson Crusoe; she is Eve alone in a garden of strenuous labor.

Woman wanders her world looking for answers, and comes upon a dairy cow in a barn who she names Bella. This valuable animal is a blessing for its milk, but it is also a burden due to the care required: the cow is, on one hand, her property; on the other, her jailor. But the responsibility for Bella and her dog Lynx keeps her from attempting suicide amid her crushing loneliness. To maintain Bella, she scavenges for stored hay in the surrounding buildings, repurposes the car garage as a hay loft (a fuel reversal), and grazes the cow in the forest meadow. She learns by error and effort how to milk a cow manually, which results in a kind of conversation: "Sometimes she turned her great head towards me as if she were watching my efforts with amusement, but she stood there quietly and never kicked at me; she was friendly, often even a little bumptious" (29).

Through that first summer Woman gains strength and wherewithal; she plants potatoes and beans, learns to hunt deer, and migrates between the hunting lodge in the valley and the cottage in the high meadow. One essential labor is collecting and gathering timber to keep warm in winter. Splitting wood is difficult and dangerous—she cuts a menacing gash in her knee that aches when the weather changes. Stored wood is literal and emotional security, and she works herself to exhaustion to lay in her supply.

She learns, though, that her single hardest labor is haymaking. It takes three weeks to scythe the meadow by hand, to dry and cure it in the barn. By August, "I was so exhausted that I sat down in the meadow and wept. I was overcome by a wave of despair, and for the first time I understood quite clearly the hard blow that had hit me. I don't know what would have happened if responsibility for my animals hadn't forced me at least to do the most necessary things" (65–6). The "blow" that hit her is the shock of physical limitations in a biomass world—her

fossil-fueled body screams as it adjusts to the older regime. By the next summer's harvest, she does better: "By seven o'clock I was in the meadow by the stream, swinging the scythe . . . I scythed for three hours, and I found it went better than I'd thought it would . . . better than the previous year, when I had touched the scythe for the first time in twenty years and hadn't yet grown accustomed to hard work" (171). Physical pleasure translates to aesthetic immersion: "The sun cast its full brilliance on the slope. The fresh-cut swathes of hay already lay wilted and dull . . . The meadow was one great hum of startled insects. . . . I abandoned myself entirely to the buzzing, hot stillness" (171). After more labor, enduring the elements and the fears of a lonely imagination, she finishes the year's greatest task, the haymaking. She compares her labor to motherhood: "I couldn't remember having felt so much satisfaction since my children were little. Back then, after the strain of a long day, when the toys were cleared away and the children lay in their beds, bathed and dried, back then I'd been happy" (177). Her haymaking is a new form of motherhood, the meadow grass to be cleared and stored like her children's toys. In a biomass realm, working outdoors is embraced within a domestic sphere. Its burden is the work: constant energy staves off entropy; its reward is the milk, the meat, the offspring.

Yet she perceives Bella the cow not as her daughter, but as her mother: "When I combed Bella I sometimes told her how important she was to us all. She looked at me with moist eyes, and tried to lick my face. . . . Here she stood, gleaming and brown, warm and relaxed, our big, gentle, nourishing mother. I could only show my gratitude by taking good care of her." (163–4). Bella is a mother, she gives birth to a calf, but she also mothers all the survivors with her matronly heifer-ness, her ability to nourish them by turning the meadow into cream. The cream is a delicacy when Bella grazes in swaths of sweet wild herbs.

Woman finds her most comforting habitat in the high meadows, the place where the rhythms of her animals and the fecund wildness all around her comes into concert with her cognitive state. She rhapsodizes:

What I liked doing best was simply looking out over the meadow. It was always in gentle motion, even if I thought the wind was still. An endless, gentle ripple emanated peace and sweet fragrance. Lavender grew here. Alpine roses, cat's foot, wild thyme and a host of herbs whose names I didn't know; which smelt just as good as thyme, but different. . . . The meadow slowly went to sleep, the stars came out, and later the moon rose high and bathed the meadow in its cold light. I waited for those hours all day, filled with a secret impatience. . . . The great game of the sun, moon, and stars seemed to be working out, and that hadn't been invented by humans. (183–4)

She lives the life of the classical shepherd, with long days beneath the changing sky filled with meaningful interactions with the land and its animals, so different from the drudgery and ennui of her now-extinct industrial life. By dropping out and tuning in, Woman discovers a larger sphere of existence, beyond the world of competitive consumption ushered by fossil fuels. Now attuned to the cosmic ecstasy of life on earth, she pays closer attention to the details of her surroundings, to species known and unknown, and what they inspire in her awakened senses. She can now track and appreciate the intimate relationship between biomass, cow, and human—an intimacy that is missing from the anonymous production and distribution of goods in the modern food system.

The apocalypse of the wall yields a postindustrial pastoral idyll, though Haushofer is careful not to romanticize hard physical labor, the revulsion of isolation, and terror of the unknowable future. Written at a time of recuperation after the Second World War's hideous industrial genocide, when the nuclear specter loomed over transnational relations, Haushofer's novel participates in the earth-loving fashion of the 1960s while resisting its sentimentalities. It displays the extremes of pleasure and pain inherent to a biomass ontology, where physical work provides a deep sense of dwelling while bowing the mower's back deeper year after year.

Literature has identified an array of unique qualities in rural laborers and their work, especially as this kind of work has diminished in importance during the industrial era. Pastoral writers turn what is literally the growing, gathering, and consumption of biomass into an entire ontological sphere of existence that is tuned into the seasons, the cycles of day and night, and the physical rhythms of a life yoked to gravity, topography, and weather conditions. Pastoral writing is affectionate and protective, innocent of corruption but experienced in hard work, rewarded by rest. It is poignantly opposed in space to cities and in time to modern industrialism, where fossil-fueled machines annihilate the physics and aesthetics of the ambient, hushed biomass world.

Postapocalyptic novels like James Howard Kunstler's *World Made by Hand* envision a world re-pastoralized, with heroes discovering their latent talents for handicraft, community barter and support, and vigilante-style resistance of outside threats. Kunstler's peak-oil politics inform his ideal of a post-fossil civilization that works hard to attain a modicum of stability and comfort. His specific vision, however, reverts not only to muscle power but also to stifling traditional gender roles with a kind of "men used to be real men" swagger, leaving women passive, domestic, dependent.

His nostalgic patriarchal vision raises the interesting question of whether fossil fuels have assisted in the liberation not only of slaves in the American south but also of women from the domestic confine, and whether a new post-fossil world has enough margin to permit the freedoms that came with a cheap-energy civilization (Bergthaller 430). Or, does that future world have so meagre an energy margin that no hand, whatever the sex and race, can be spared from hard work? Haushofer's novel declares that laboring females, human and bovine, can orchestrate everything. Kunstler's novel treats females more like livestock: useful assets for subsistence, but not equal participants in the novel's title: *World Made by [Male] Hand*.

A more spectacular version of fuel regime change takes place in Paolo Bacigalupi's *The Windup Girl*, where a climate-changed Bangkok of the 2200s is endangered by food shortages caused by corporate control of agriculture, widespread crop failures, and rising sea levels. Most of the heavy labor is performed by a genetically engineered form of elephant called the Megodont, a beast who galumphs in circles winding "kink springs," which can then be deployed as a kinetic motor in an array of tasks, most notably in the scooters that have replaced fossil-fueled automobiles. In *The Windup Girl*, the Megodonts pace crumbling highways; cities built for fossil-fueled trade swarm with draft animals and schooling bicycles.

Biomass energy flows through massive Megodont muscles into the kink springs, which relieve human muscles of the work they would otherwise have to perform through a direct biomass conversion. Since human food is so limited, the Megodont's ability to digest rough biomass again helps humans survive a hostile climate, not unlike the ruminants that permit herding societies to thrive on marginal lands where arable land for agriculture is limited. In this Bangkok, the government's trade industry has control over the remaining resources and their regulation, and these officials are the only ones permitted to use fossil fuels—in this case, diesel derived from coal—to power conventional automobiles. The raw power at work is so strange to the commoner, its effect is nauseating. In a world that moves at foot speed, the body exposed to diesel energy feels the sublime—a mixture of awe and terror:

The exorbitant cost of turning this steel behemoth into acceleration. An extraordinary waste ... There is an ancient solidity to the thing, so heavy and massive—it might as well be a tank ... Claustrophobia swallows him ... The car accelerates, pressing Hock Seng into the leather seat. Outside the windows, ... crowds to sun-drenched skin and dusty draft animals and bicycles

like schools of fish. Eyes turn toward the car as it forges past. Mouths open wide and silent as people shout and point at his passage. The speed of the machine is appalling. (134)

This juxtaposition of biomass and fossil energy is temporal: though the two forms coexist in this oppressive world, the limousine glass that divides the haves from have-nots is also a barrier between past and present. We are accustomed to thinking of biomass as past and oil as present, but in postapocalyptic visions, it is oil in the past and biomass in the present. By reversing the coherent historical evolution of fuel sources from low energy toward high energy, Bacigalupi and Kunstler illuminate the chaos that ensues when societies are forced from energy-dense to energy-sparse regimes. Energy becomes a scarce resource controlled by those in power, rather than that enjoyed at will by the masses, and the entire infrastructure organized around fossil fuels is ungracefully retrofitted to accommodate the downgraded world order.

The pastoral is a powerful idea. It has long promoted Nature as a nurturing, stable mother who provides refuge from the ugliness and abuse of city life, and serves as an antipode to the masculine forms of ecocultural representation—urban and wilderness (A. Wilson 94). From its origins in working landscapes that fed productive animals, these variegated grassy scenes have translated into sprawling one-species grass lawns, especially in Europe and former colonies that inherited European landscape aesthetics. The idle lawn designates dominion, leisure, control, and wealth, which aristocrats have deployed for half a millennium to distinguish their dwellings from those of their subordinates. The energy involved includes not just the sun-infused grass but also the energy of countless laborers who cultivate this unnatural space and, more recently, the petroleum products that fertilize and mow millions of suburban lawns worldwide.

In postwar petro-America, white-collar work promoted mental work and physical exertion waned, so men living in new suburbs often turned to intensive “cultivation” of their plots, usually by wielding a lawnmower, while their wives turned to flowery forms of gardening aimed at keeping up appearances (A. Wilson 99). More on suburbs when we look into fossil fuels—but the thumbnail portrays a widespread madness driven by the physio-cognitive dissonance between our preindustrial evolution and our industrial condition.

Wild meadows remain grassy due to flooding, acidic soil, wildfire, or grazers. Humans have innovated on the pastoral by artificially selecting animal species to transform grass into milk, meat, wool, and labor. More recently, we have inserted alien forms of fuel, especially petroleum, into the pastoral scene. With such

outlandish alterations, the pastoral is no longer a celebration of our subsistence upon nature; it has become the mental playground of a leisure class, the profit base for industries ironically dependent upon machines and petroleum. The feminine origins of the pastoral helped justify masculine exertion and dominance of the landscape using machines (A. Wilson 96). The use of the pastoral as a mental playground has classical origins, but its usefulness as an escape only intensified with the alienations of industrialism. The pastoral profit motive, the deployment of the trope to sell grass seed and fertilizer, to recruit buyers to new subdivisions, to rebrand industrial milk and meat as “natural”—that species of pastoral is a bastard scion of fossil fuels.

II The city: Crosstown traffic

Cities are animal rookeries. Living densely, breathing the atmosphere of bodies steeped in the elements, the urbanite from the city-states of antiquity to the megacities of the early industrial era had extensive contact with animals. Biomass-eating ungulates served the majority of tasks in transportation and food. Authors of the urban dung heap, their prevalence created the living conditions—sight, smell, and sound—that characterized the preindustrial urban sphere. Rural animals fit much better into the nutrient cycle than urban ones, since their end products could reunite with the soil directly. The dung of grass eaters could also be dried in patties and burned as fire fuel, a valuable alternative to scarce timber. However, to feed beasts of burden and open arable land for tillage, forests were frequently converted to pasture and farmland. In the seventeenth century, the trees in St John’s Wood near horse-powered London were felled to make room for grasslands that produced two or three harvests of hay annually. In just two years in the 1820s, toll booths collected on twenty-six thousand loads of hay and straw entering the city (Velten 45). Fodder sold at the London locales of Haymarket, Smithfield, and Paddington steadily increased in supply until the peak demand around the turn of the twentieth century, when as many as seven hundred thousand working horses pulled the city’s wheels (Velten 43).

Jonathan Swift amusingly describes the London dust in his 1710 poem “Description of a City Shower”:

Not yet the dust had shunned the unequal strife,
But, aided by the wind, fought still for life,

Figure 2.2 Camille Pissarro, *Peasants Carrying Hay*, 1900. Image courtesy of the National Gallery of Art. Public domain.

And wafted with its foe by violent gust,
 'Twas doubtful which was rain and which was dust.
 Ah! where must needy poet seek for aid,
 When dust and rain at once his coat invade?
 Sole coat, where dust cemented by the rain
 Erects the nap, and leaves a cloudy stain.

(ll. 23–30)

The beleaguered poet shares a fate common to all inhabitants: Tories and Whigs, lowly seamstresses and gallant beaus. The rain mixes with smoke pollution and the animals' euphemistic "dust" to make plaster of Paris—well, of London—that shellacs them with the by-products of London's chimneys and working animals. To use animals, one must live intimately with them and endure the end effects of their rumination. A cow turning cellulose into sirloin may seem magical, but it is in fact earthy—it produces "earth." Other parts of the human–animal alliance

come out in this wash, too. The repugnant climax of the city shower is a flood of dismembered bodies:

Filths of all hues and odors seem to tell
 What street they sailed from, by their sight and smell.
 They, as each torrent drives with rapid force,
 From Smithfield or St. 'Pulchre's shape their course,
 And in huge confluence joined at Snow Hill ridge,
 Fall from the conduit prone to Holborn Bridge.
 Sweepings from butchers' stalls, dung, guts, and blood,
 Drowned puppies, stinking sprats, all drenched in mud,
 Dead cats, and turnip tops, come tumbling down the flood.

(ll. 55–63)

This amusing shit show reveals different quarters of the city by specialty: Smithfield is known for its cattle and meat market, St. Sepulchre's—opposite the infamous Newgate Prison—is the conjunction of high Anglicanism and low criminality. Into the Thames via Holborn flows the city's feces and cadavers. Humans cling together under the awnings while the lowering heavens sweep away the disgusting remnants of lives dependent on animal bodies. The poem's tone is one of comedic apocalypse: the dire spectacle of dirt and death in “the flood” literally washes the city of its sins, and after the end times comes a new beginning. The dung cycle renews.

The city is an ecosystem, too, and eighteenth-century Londoners welcomed rain and weather fronts to clear out the stalls and stables just as their nineteenth-century counterparts yearned for wind and rain to relieve the city of its coal dust. Rain has a marvelous power to absolve cities of their grimes. The pulse of water through the air and across the impermeable surfaces of the cityscape is a ready metaphor for renewal, one that Swift certainly employs here. But the metaphor is subordinated to the insistent adjective–noun listing of things literally washed into the Thames by the rain—stinking sprats, dead cats, and all. The rainy-day Thames is a toilet flushed.

Imagine the torrents of dung coursing down London streets, and you will cease to wonder that the horseless carriage was hailed as a clean alternative to the omni-sensory offenses of the rump. At the turn of the twentieth century in America, large cities like New York held a standing army of 120,000 horses, and even smaller cities like Rochester and Milwaukee—with several thousand horses each—were concerned that the annual pile of dung, 175 feet high and an acre in area, could breed sixteen billion disease-spreading flies (Tarr). What is a bit of

carbon monoxide from a tailpipe compared to that sublime mountain of poo? Some urban manure was collected and sold as fertilizer, but this by-product of biomass-driven muscle power was mainly a dreaded reeking dusty nuisance that helped pave the way for cars.

So what if the cleaner spirit of a preindustrial age is captured in horse-driven cities? Thomas DeQuincey, in 1849's "The English Mail-Coach," uses the bodily effort of the horse to draw a philosophical distinction between horse-drawn coach and railway travel. The railway boosters boast of the velocity of the trains, the super-animal speeds and distances they attain. But DeQuincey, a loquacious narrator, argues that their chatter misses the point.

Seated on the old mail-coach, we needed no evidence out of ourselves to indicate the velocity. . . . The vital experience of the glad animal sensibilities made doubts impossible on the question of our speed; we heard our speed, we saw it, we felt it as a thrilling; and this speed was not the product of blind insensate agencies, that had no sympathy to give, but was incarnated in the fiery eyeballs of the noblest amongst brutes, in his dilated nostril, spasmodic muscles, and thunder-beating hoofs. The sensibility of the horse, uttering itself in the maniac light of his eye, might be the last vibration of such a movement; the glory of Salamanca might be the first. But the intervening links that connected them, that spread the earthquake of battle into the eyeballs of the horse, were the heart of man and its electric thrillings—kindling in the rapture of the fiery strife, and then propagating its own tumults by contagious shouts and gestures to the heart of his servant the horse. (283–4)

The animus and emotive glory of being alive is transferred from the galloping horse to the thrilled rider, who, at eight mph, feels more alive than the rail rider at fifty. He celebrates the empathy between horse and human, feeling the fire and light of the body electric, an affinity that, to DeQuincey, is impossible to cultivate between human and machine.

But now, on the new system of travelling, iron tubes and boilers have disconnected man's heart from the ministers of his locomotion. Nile nor Trafalgar has power to raise an extra bubble in a steam-kettle. The galvanic cycle is broken up for ever; man's imperial nature no longer sends itself forward through the electric sensibility of the horse; the inter-agencies are gone in the mode of communication between the horse and his master out of which grew so many aspects of sublimity under accidents of mists that hid, or sudden blazes that revealed, of mobs that agitated, or midnight solitudes that awed. Tidings fitted to convulse all nations must henceforwards travel by culinary process; and

the trumpet that once announced from afar the laurelled mail, heart-shaking when heard screaming on the wind and proclaiming itself through the darkness to every village or solitary house on its route, has now given way for ever to the pot-walloping of the boiler. . . . The gatherings of gazers about a laurelled mail had one centre, and acknowledged one sole interest. But the crowds attending at a railway station have as little unity as running water, and own as many centres as there are separate carriages in the train. (284–5)

The heart of a collective human purpose is “disconnected” from animals by the boiling pot of the steam locomotive. For DeQuincey, the fellowship between horse and rider is a sublime alliance in line with the high points of human empathy. Travel and delivery by horse offers irregular rhythms in a variable ratio of reward. It is not slotted into industrial scheme that shrinks the distance between London and Edinburgh into a numbered cell on a timetable. Likewise, the rider and the people at his destination have “one centre” and “one sole interest,” whereas the crowds on the railway platform embody the anonymity and oblivion of a million self-interested atomies in continual dissolution. The horse has gravity; the locomotive, repulsion.

DeQuincey’s florid style exaggerates to the point of eliding the similarities between horse and steam engine in the modernizing transportation system. By the nineteenth century, an improvement in roads through macadamizing meant that stagecoaches and mail coaches were on strict timetables that rivaled the efficiency of the train, and passengers in a coach were just as likely to ignore one another as those on a railway carriage. The “electric sensibility of the horse” was often neglected in preference for a practical and often cruel extraction of maximum labor from an animal that was easily replaced when exhausted. We look to DeQuincey for the spirit of the idea, more than its reality in the traffic of the early industrial era. His spirit is tried by his times as he bears witness to the new steam-driven world and its standards of efficiency applied across the board. This kind of writing, characteristic of the Romantics and Victorians, marks the time in which society became self-aware of the implications of its fuel regimes and, in so doing, entered the ideology of the Anthropocene.

III In depth: *Black Beauty*

If we want to take it straight from the horse’s mouth, the voice of *Black Beauty* will give the best testimony of the nineteenth-century urban horse. Anna Sewall’s

novel has remained a perennial favorite since its publication in 1877. It reads as a form of slave narrative, where the horse's biography pulls the reader through a series of working situations, owners cruel and kind, companions separated by sales, and the long-term toll on health exacted from the body of the laborer. A work primarily concerned with animal welfare, *Black Beauty* pointedly protests specific forms of horse fashioning such as tail docking and the check rein that kept the heads of aristocrats' carriage horses unnaturally high.

I would like to examine three aspects of the novel that have received less attention: Black Beauty's relish of good food, his first-hand experience of the idyllic pastoral, and his musings on steam engines as a rival form of transportation. Turning the biomass of grass and grain into kinetic energy, our equine narrator views the great iron horse snuffing coal as an alien life form. But in the age of steam-driven long-range transportation, Black Beauty's body is too often mistaken for an iron machine.

He starts his story where many autobiographers do, in his infancy where his mother and her milk dominate his experience. That window of intimacy soon closes, for "as soon as I was old enough to eat grass my mother used to go out to work in the daytime, and come back in the evening" (1). Just like the human child of a working-class mother, Black Beauty admires his mother's energy and wisdom and has too little time to absorb her influence before he is sold into the laboring system. From then on, his evaluation of goodness depends upon decent treatment, nourishing food, and a healthy habitat with clean straw, fresh air, freedom of movement, and light. Sewell's rhetorical success depends upon the reader's empathy as they see that the pleasures of a horse mirror those of a human. He relishes "very nice oats," "very sweet apples," deep meadow grasses, and bran and boiled linseed mash (34). When he is recovering from overwork and abuse, oats play a large part in his mending, both physical and emotional. His companion Ginger shares an episode of abuse where fodder plays a major part in her recovery; kind food is inseparable from kind words: "The skin was so broken at the corners of my mouth that I could not eat the hay, the stalks hurt me. He looked closely at it, shook his head, and told the man to fetch a good bran mash and put some meal into it. How good that mash was! and so soft and healing to my mouth. He stood by all the time I was eating, stroking me and talking to the man. 'If a high-mettled creature like this,' said he, 'can't be broken by fair means, she will never be good for anything'" (34).

Even when physical mistreatment is not the problem, miserly stable keepers can ruin the health of the horse by withholding proper food. In one episode,

Black Beauty is owned by a kind but clueless man who is cheated by his hostler, who reserves expensive oats for his other business of fattening poultry and rabbits. “After awhile it seemed to me that my oats came very short; I had the beans, but bran was mixed with them instead of oats, of which there were very few; certainly not more than a quarter of what there should have been. In two or three weeks this began to tell upon my strength and spirits. The grass food, though very good, was not the thing to keep up my condition without corn” (152–3).

Black Beauty is stoic, but eventually his health fails and the owner’s perceptive friend notices the problem: “‘He is as warm and damp as a horse just come up from grass. I advise you to look into your stable a little more. I hate to be suspicious, and, thank heaven, I have no cause to be, for I can trust my men, present or absent; but there are mean scoundrels, wicked enough to rob a dumb beast of his food. You must look into it.’” (154). The owner’s friend gives the kind of acute perceptiveness here that DeQuincey celebrates in his human-equine union of mind and momentum. We are capable stewards when we focus our attention on the well-being of the animal, and ennobled in that pursuit. When the cheating hostler is found out, he is sentenced to two months in prison, a rare victory for the rights of the horse. The penalty is measured anthropocentrically in proportion to the crime—sabotage of another man’s property.

A working horse’s life story has a different trajectory than the classic bildungsroman; it is plotted on a sad, downward slope as the horse loses strength and spirit through a succession of hard jobs. Black Beauty suffers injuries enough to bring down his value from a fine carriage horse to a low cart hauler, and this job in his older years nearly ruins him. After a bad fall in the city street, his self-interested owner chooses to elevate Beauty’s resale value rather than shooting him, an option with minimal financial return for the meat and hide. So Skinner, out of avarice rather than kindness,

gave orders that I should be well fed and cared for, and the stable man, happily for me, carried out the orders with a much better will than his master had in giving them. Ten days of perfect rest, plenty of good oats, hay, bran mashes, with boiled linseed mixed in them, did more to get up my condition than anything else could have done; those linseed mashes were delicious, and I began to think, after all, it might be better to live than go to the dogs. When the twelfth day after the accident came, I was taken to the sale, a few miles out of London. I felt that any change from my present place must be an improvement, so I held up my head, and hoped for the best. (250)

This investment in high-quality feed is a success for all involved: Beauty is resold at a good price to a kind country man, who turns him out to pasture to knit his knees for a few months before landing his last job as a carriage horse for leisurely ladies. The carefully regulated and diverse diet of the working horse—oats, bran, linseed, apples, in addition to grasses—indicates the investment in biomass needed to keep the animal working in tasks that go beyond its evolved predilections. Wild horses would have eaten grain only sparingly as they grazed the seed heads of grasses; the complete nutrition of amino acids and calories was offered by the meadow alone. Working horses needed additional concentrated energy, and were often kept in climates that did not naturally provide fodder in winter. Stored hay and grains were the stopgap that preserved the domestic horse in the working stable.

The pastoral is powerful because it speaks to our evolved affinities for survivable landscapes, as well as the cultured aesthetic traditions that speak to stewardship, georgic knowledge, and the pleasure of holding land, a measure of wealth. We feel at ease in places with gentle variations, such as mixed woods and grasslands with available fresh water from a running stream or lake. These are the places most likely to provide fuel, shelter, and resources for hunting and gathering. Visual aesthetics of the pastoral show up everywhere from milk cartons to screen savers to street names in subdivisions because they tap into the ecological imagination and suggest health, fecundity, and security. Just as humans seek these locales, Sewell shows the pleasure of the horse in returning to his evolutionary landscape, the pasture.

It is a counterpoint to unhealthy places. The rumpus of London traffic requires an adjustment to modernity: “I had never been used to London, and the noise, the hurry, the crowds of horses, carts, and carriages that I had to make my way through made me feel anxious and harassed; but I soon found that I could perfectly trust my driver, and then I made myself easy and got used to it” (168). Labor as a coal-cart horse is unnatural and killing: “He was sold for coal-carting; and what that is, up and down those steep hills, only horses know. Some of the sights I saw there, where a horse had to come downhill with a heavily loaded two-wheel cart behind him, on which no brake could be placed, make me sad even now to think of” (146). Sewell settles her equines back into emotional and physical health by literally turning them out to pasture. Black Beauty explains: “It was a great treat to us to be turned out into the home paddock or the old orchard; the grass was so cool and soft to our feet, the air so sweet, and the freedom to do as we liked was so pleasant—to gallop, to lie down, and roll over on our backs, or to nibble the sweet grass” (27). The pasture offers freedom

from the yokes of labor and the choice of a comfortable place. Agency, the ability to choose one course over others, is available to the horses only at pasture. This affinity of ecological place is best demonstrated when Black Beauty (now “Jack” the London cab horse) spends a Sunday afternoon with his kind master in the country:

When my harness was taken off I did not know what I should do first—whether to eat the grass, or roll over on my back, or lie down and rest, or have a gallop across the meadow out of sheer spirits at being free; and I did all by turns. Jerry seemed to be quite as happy as I was; he sat down by a bank under a shady tree, and listened to the birds, then he sang himself, and read out of the little brown book he is so fond of, then wandered round the meadow, and down by a little brook, where he picked the flowers and the hawthorn, and tied them up with long sprays of ivy; then he gave me a good feed of the oats which he had brought with him; but the time seemed all too short. . . .

We came home gently, and Jerry’s first words were, as we came into the yard, “Well, Polly, I have not lost my Sunday after all, for the birds were singing hymns in every bush, and I joined in the service; and as for Jack, he was like a young colt.”

When he handed Dolly the flowers she jumped about for joy. (197)

Everything is present in this pastoral idyll: sun, shade, water, grass, grain, and even superfluous flowers that, by synecdoche, bring the country back to the London stable yard. The scene eases the modern ache caused by the industrialized, machine-driven, crowded life in cities by suggesting that these pleasure spaces coexist with the sphere of business and bustle, just outside the walls of human-centered productivity. The pastoral is the alternative, animated by imagination, ornamented by season, and accessed by animal muscles. The nineteenth-century countryside was refigured by industrial capital and machine transportation into a rural escape for the city-weary, fossil-fueled lives of masters and masses. Lush with sun-knit grass fuel, the pasture is the horse’s homecoming.

Black Beauty’s last gig—in front of a light gig in the country—is pure joy for a horse that has spent much of his life being mistaken for a machine, specifically a coal-powered steam engine. The source of much of Beauty’s suffering comes from the machine-age mentality that a prime mover needs only fuel and maintenance to keep at maximum output. In his experience, men treat horses as machines, and “ninety-nine persons out of a hundred would as soon think of patting the steam engine that drew the train” as the horse that draws their carriage (201). Sewell effectively, if sentimentally, conveys the horse’s need for

affection and appreciation, as well as fuel and maintenance. From this essential difference, Black Beauty gains perspective on the nature of the locomotive. At first alarmed by its smoky clamor, Black Beauty adapts to living alongside the railroad tracks and keeping calm in his circuits around the station. His initial reaction mimics the testimony of nineteenth-century people alarmed by the coming of the railways to their quiet countryside:

I shall never forget ... with a rush and a clatter, and a puffing out of smoke—a long black train of something flew by, and was gone almost before I could draw my breath. I turned and galloped to the further side of the meadow as fast as I could go, and there I stood snorting with astonishment and fear. ... I thought it very dreadful, but the cows went on eating very quietly, and hardly raised their heads as the black frightful thing came puffing and grinding past.

For the first few days I could not feed in peace; but as I found that this terrible creature never came into the field, or did me any harm, I began to disregard it, and very soon I cared as little about the passing of a train as the cows and sheep did.

Since then I have seen many horses much alarmed and restive at the sight or sound of a steam engine; but thanks to my good master's care, I am as fearless at railway stations as in my own stable. (13–14)

Desensitization aids Black Beauty's calm in this landscape of fuel transition. His quick adaptation captures the stunning capacity of animals to adjust to foreign sensations, and at this fulcrum between biomass and fossil worlds, animals of the field encapsulate the human experience of shifting fuel regimes. Where Thoreau in *Walden* called attention to an indelible change in the Concord, MA landscape with the first sounding of a train horn, Black Beauty is more civic minded. So long as the train did not bring him "any harm," it was easily disregarded.

Experienced in the elision between horse and machine, Beauty wisely seeks to educate ignorant boys, who "think a horse or pony is like a steam-engine or a thrashing-machine, and can go on as long and as fast as they please; ... I just rose up on my hind legs and let him slip off behind—that was all. He mounted me again, and I did the same. ... They are not bad boys; they don't wish to be cruel. I like them very well; but you see I had to give them a lesson" (43). Though there is comedy in this figure of the light-hoofed tutor, Beauty is steadily forced to face the reality that humans will continue to abuse his animal essence with mechanical expectations. He makes a caricature of people (class labelled as Cockneys) who employ the "steam-engine style of driving" because they are urbanites accustomed to rail travel, and with little experience of horses. They mistake a seat in a carriage for a rail ticket, and pay no attention to the vagaries

of weather, road condition, and topography, expecting “all the same—on, on, on, one must go, at the same pace, with no relief and no consideration” (143). His time as a horse-for-hire is nearly the worst, as “this steam-engine style of driving wears us up faster than any other kind. I would far rather go twenty miles with a good considerate driver than I would go ten with some of these; it would take less out of me” (144). Black Beauty suffers from the ignorance of a bourgeois expectation of service equivalent to money—a ticket that falsely signifies equal labor from inequivalent prime movers. Beauty’s era was fraught with confusion over the essence of energy from different engines using different fuel sources.

The ending of the novel is a gentle comedy when Beauty comes full circle back to his original owners, reclaims his name, and lives a pastoral idyll: “Mr. Thoroughgood, for that was the name of my benefactor, gave orders that I should have hay and oats every night and morning, and the run of the meadow during the day. . . . My troubles are all over, and I am at home; and often before I am quite awake, I fancy I am still in the orchard at Birtwick, standing with my old friends under the apple-trees” (254). His final repose allows him to be simply horsey, with the proper food in the right habitat. Beauty testifies to the anguish of ontological miscategorization—an animal used as a machine—but in the end is spared the death of the common animal in the industrial labor system.

Removed as we are from a close association with animals as transport, I wonder whether our natural affections, rather than being eliminated, have in the last two hundred years been transferred from animals to machines. An animal has a personality, a history, fortunes and misfortunes, and eventually dies. We often assemble the same narrative for our transportation machines, mainly personal cars, but also bikes, trains, and ships. Walt Whitman relocated his theriophily from the animal body—the recurrent subject of *Leaves of Grass*—to the machine body, in the poem “To a Locomotive in Winter.” He hails the locomotive as a “fierce-throated beauty” that is “glad, and strong,” with “madly-whistled laughter” (ll. 18, 20, 26). My own cars have been named and occasionally patted after a long journey. I have been concerned with their scratches, rust, noises, and their fate at sale—not in the avarice of resale value, but in a human concern akin to the suffering of a living creature. We replace oats and apples with Armor-All and premium gasoline. Perhaps we show mild derangement in our displacement of empathic concerns to machines, one of the symptoms of nature deficit disorder. Our sympathy for inanimate machines identifies a peculiar madness of industrial modernity. Human behavior evolved to be concerned for animals that helped us survive; removed as we are from these relationships, we self-deceive in order to fill an emotional void.

IV Borderline biomass: Peat and whale oil

Peat, or turf, is halfway between biomass and fossil fuel: it is undercooked coal. It comes from bogs, mires that gradually accumulate biomass, mostly sphagnum moss. Through time these wet, acidic moss heaps become carbon sinks. The captured carbon is released again in burning. Peat occupies different fuel categories depending on the monitoring agency. Because it is harvested at rates that far outpace its deposits of about 1 mm per year, it has long been considered a fossil fuel, slow to accumulate and extracted unsustainably. The Intergovernmental Panel on Climate Change (IPCC) defines it as a “slow renewable fuel,” a new category between fossil and renewable fuels. Its renewability should not be confused with environmental friendliness: its peat’s emission factor—carbon dioxide produced per energy released—is equal to shale oil, greater than all forms of coal, and about twice that of natural gas (Herold 12).

Because of their anaerobic conditions, bogs also preserve archeological relics like human bodies and tree trunks. Digging peat is excavating history, and many of the most informative discoveries about human cultural evolution in the Iron Age, as well as landscape transformation, have been a side effect of our need for fuel. Peat is culturally resonant in northern Europe, particularly in Ireland where the abundance of bogs and lack of timber make turf digging as essential to Irish domestic energy use as timber to Norway or coal to England.

When it burns in literary hearths, peat almost invariably designates class. It is a fuel of necessity rather than choice, and so it burns in lowly places, and often indicates not only poverty but also cultural identity. In the forgotten 1856 novel *The Daisy Chain* by Charlotte Yonge, the virtuous daughter Ethel means to improve her community by tutoring poor children. Her fastidious brother Norman disapproves of the mission, and the energy source that powers it. Ethel teaches in a small cottage, “a stuffy hole, full of peat-smoke, and with a window that can’t open at the best of times,” a situation that gives Norman a headache (208). By way of supporting Ethel, their physician father notes that his son’s head is more sensitive than his daughter’s, and he jokingly opines that “peat-smoke is wholesome” (209). In this little vignette the peat comes to symbolize Ethel’s economy and perseverance against the class-based prejudice of Norman, whose moniker represents Anglican domination. He would rather his sister spend her time learning Greek by the clean wood fires at home.

However, sometimes in writings of this period peat is stripped of its cultural stigma and merely demonstrates domestic economy based on available resources. In *Jane Eyre*, the desperately wandering Jane’s first impression of St.

John Rivers and his family comes as she spies through their window: “I could see clearly a room with a sanded floor, clean scoured; a dresser of walnut, with pewter plates ranged in rows, reflecting the redness and radiance of a glowing peat-fire” (Bronte 127). At this point in the novel, Jane is desperate for shelter, having fled the roaring wood and coal fires at Mr. Rochester’s house. Bronte uses peat to signify the Rivers’s prudence, the ecology of their neighborhood, and nothing more. They keep a warm, tidy home despite limited means. A peat fire can illuminate a clean-scoured cottage floor as well as the squalor of a hovel.

The poet Seamus Heaney pays homage to the bog as a locus of deep Irish history steeped in hard labor and the chilly damp dissipated by constant turf fires. Several of his most recognized works visit the bog in order to contemplate the fate of bog men and women, what their preserved deaths reveal about love and revenge, and about the secrets behind the ancient masks of bog-cured faces. The pleasure of hefting the waterlogged turf, of seeing it split by the insistent spade and steam in the sun, is a feeling of union with Irish generations past, Heaney’s father most immediately. In his early poem “Digging,” Heaney recalls his father digging potatoes and, before him, his grandfather. “My grandfather cut more turf in a day / Than any other man on Toner’s bog. / Once I carried him milk in a bottle / Corked sloppily with paper. He straightened up / To drink it, then fell to right away / Nicking and slicing neatly, heaving sods / Over his shoulder, going down and down / For the good turf. Digging” (ll. 17–24). The young man is settling his mind to a writer’s life. To access the soil of his ancestry, he fashions his pen into a tool as fit for digging as any other: it needs only a skilled handler. “Between my finger and my thumb / The squat pen rests. / I’ll dig with it” (ll. 29–31).

In the same 1966 collection, Heaney’s “Bogland” describes the terrain lovingly as “kind, black butter / Melting and opening underfoot, / Missing its last definition / By millions of years. / They’ll never dig coal here” (ll. 16–20). America’s prairies and England’s coal mines have no productive equivalent in Ireland, land of “unfenced country” where the Irish “pioneers keep striking / Inwards and downwards” (ll. 6, 23–24). Dwellers literally sink into their terrain as they excavate its resources. Heaney sculpts a macabre image of the Irish gradually ingested by the land, yet finding their ancestors—human, elk, and fir—alike undigested in the bog, as “every layer they strip / Seems camped on before” (ll. 25–6). They are gathering fuel, and along the way they become archaeologists of their history, paleontologists seeing the primordial past, philosophers spackled in the black butter of Irish energy. Where other countries

move across latitudinal frontiers, the Irish dig down into the past, and find a nether horizon in which “the wet centre is bottomless” (l. 28).

In the poem “Kinship,” part of a series of bog poems from the 1975 collection *North*, Heaney flows through a series of gentle images that invoke the sensuality of the space: “The bog floor shakes / Water cheeps and lisps / As I walk down / Rushes and Heather” (ll. 9–12). His journey is across the bog, but also down into time, where his imagination greets the primordial “Quagmire, swampland, morass: / The slime kingdoms, / Domains of the cold-blooded, / Of mud pads and dirtied eggs” (ll. 25–8). He has gone past Irish history back to the living ecology of future fossils, considering for a moment each of the forms of living this bog has sustained and swallowed: “Ruminant ground, / Digestion of mollusk / And seed-pod, / Deep pollen-bin” (ll. 31–4). For a fleeting moment he turns to the practical business of harvesting peat:

I found a turf-spade
Hidden under bracken,
Laid flat, and overgrown
With a green fog.

As I raised it
The soft lips of the growth
Muttered and split,
A tawny rut

Opening at my feet
Like a shed skin,
The shaft wettish
As I sank it upright

And beginning to
Steam in the sun.

(ll. 49–62)

Gathering turf is at once a practical and a symbolic process. Heaney’s mind continually turns literalities into metaphors, as in his description of the turf cart: “The cupid’s bow / of the tail-board, / the socketed lips / of the cribs,” an act of imagination that transforms the working man into an Irish god (ll. 101–4). No longer a laborer, the poet’s god is the archetypal “hearth-feeder” who is delivered “bread and drink” and on the roads is “saluted, / given right-of-way” (ll. 108, 111, 116). Heaney recalls his work as a boy-servant to the turf diggers, a place of privilege and pride that challenges the more celebrated Irish traditions of

servitude—and resistance—to Anglo squires. The turf digger's servant is nobler than the duke's butler; together, the boy and digger enact the eco-cultural labor of their land and liberate energy from its heavy bounty.

Unlike globetrotting oil and coal, peat is a regional fuel that evokes a specific locale. Grass is pastoral, often downright idyllic. Grass speaks to the present season, the energy of sunshine falling on the fields. Peat is swampy, at every slice and layer invoking an intimate past history that is still accessible to the present. A coal mine occasionally reveals primordial forms like fern prints, but they exist on evolutionary timescales less accessible to human empathy. Coal's alien forms tend toward abstraction. But peat holds elk horns, intact tree trunks, humans with skin and hair and clothes and identifiable death wounds. Bogs are books turned, leaf by leaf, downward into the folkloric past. This book is often tragic or disturbing. It always speaks of death and loss. But what remains for the present is a clear view of the human condition, squatting on the surface of an engulfing maw, preserving life by burning the half-decomposed bodies of a legible past. Peat's warmth is reluctant and smoky, but in the end it is sufficient. Like the two-thousand-year-old Tollund Man, Heaney and his poems are preserved in turf, "unhappy and at home" (l. 44).

Peat's Irish origins may lend a new perspective on the colonial history with England, since the natural resources found on each island form a poignant contrast. Ireland has bogs that make peat, and looks out on the open Atlantic. England has forests and thick deposits of coal, and its proximity to the European continent has always affected its status as a world power. England's geography, biomass, and fossil fuels push it toward the center of international affairs, with the slave ships made of oak and the revolution made of coal. Ireland's counterparts make it peripheral: a land, like the other colonial lands, that seemed to English ears to cry, "conquerable!" But the wildness of the Irish land, its geology of mucky layers and hidden histories, translates into the Irish resistance to English and, later, British, rule. Looking back on this history from an Anthropocene perspective shows how fuel sourcing can designate a series of cultural departures, by virtue of natural resources becoming cultural identities.

Like peat, which is biomass that behaves like a fossil fuel, whale oil is a tricky fuel to categorize. It is a biomass fuel, but its energy comes not from the strong cellulose fibers forged by plants using solar energy, but from the lipids stored from a whale diet of animals: krill, zooplankton, and sometimes bigger beasts like penguins and squid. In that sense, whale oil is a step higher on the food chain of fuel than the rest of the biomass sources: when we burn wood, the fire eats a vegetarian diet; when we burn whale oil, we are burning the flesh of a

carnivore. Predators are always the scarcest beasts in an ecosystem. Animal rights concerns aside, like peat and the forests that provide timber for charcoal, whale oil is a renewable fuel so long as it is harvested at the replenishment rate of whale populations.

Conservationists see in the history of whale hunting a prime exhibit of unsustainability, analogous to the deforestation of Ireland for the wood used in iron forges in the eighteenth century. It is likely a moot point now, because an international moratorium on whale hunting means that very little cetacean energy makes it into human economies anymore. But the history of whaling as an important source of fuel for illumination, and especially the intensive global industry in whale oil from the eighteenth to the mid-twentieth century, requires some consideration in our readings on fuel.

We might question whether whale oil can be considered “fuel” at all. Though whale steaks may have fueled a few human bodies starved of fresh meat on board the *Pequod* in *Moby Dick*, whale oil is not used to feed stock animals, or hearth fires; it does not fuel industrial manufacture, nor does it fill the tank of the moving machine. Whale oil is a specialist fuel that is very good at its appointed tasks: lighting and lubrication. Rather than going in the belly of the nineteenth-century steam engine, as a source of fuel, whale oil eased the friction of its moving parts and kept them lissome and clean. In the days before light bulbs and power stations, whale oil fueled the clearest, brightest, and most fragrant light available.

That pleasing glow came at a price: whale oil was expensive because its acquisition required mighty risk, effort, and sacrifice among its hunters, and its source was increasingly scarce by whaling’s heyday in the 1840s. Though it arrived at the docks in thirty-five-gallon barrels, it was sold fractionally in fluid ounces, drams, and scruples. Where coal saved a deforested England from economic ruin in the 1700s, just a bit later, after 1850, kerosene and manufactured gas derived from coal saved the whittled whale populations from the predations of Nantucket. A cornucopian would claim this history as a victory of the free markets, in which rising whale oil prices drove innovation toward another fuel source. Whatever the historical cause of kerosene’s arrival, for the sperm whale, kerosene cut down its only predator, the whaleman.

The literature of whale oil is dominated by that colossus, *Moby Dick*. Herman Melville’s urtext of whaling instructs in several areas regarding the whale hunt, but oil used as fuel emerges in only a few passages. The state-of-the-art *Pequod* has an onboard tryworks, a stove designed to render fresh whale flesh into liquid fats that could be stored in barrels below decks. When the ship kills and hauls

its quarry, the deck is inundated with the meat, guts, and blubber of the beast, and those flows of energy feed the micro-industry that springs up in the wake of the successful hunt. Whalemen cut the floating carcass into long strips of flesh and feed steaks of it into the tryworks pots, where they boil over a fire fed on “fritters”—crackling bits of oily meat—to spare the limited supply of kindling and coal on board.

Always instructive, Melville describes this abundant fuel: “Shriveled blubber, now called scraps or fritters, still contains considerable of its unctuous properties. These fritters feed the flames. Like a plethoric burning martyr, or a self-consuming misanthrope, once ignited, the whale supplies his own fuel and burns by his own body” (374). Stubb, the second mate and captain of the harpoon boat that captured the whale, orders a steak to be cut from the flank. By midnight, he “eats the whale by his own light”—the light of whale oil lanterns (271). Stubb chews to the brutal music of sharks devouring the floating carcass, and complains of the violent din as his own chewing echoes it. Simultaneously, Stubb’s belly, the many sharks’ bellies, the lanterns, the tryworks fire, and the storage barrels are filled with the fuel from the cetacean, a corporeal counterpart to the “gusher” of petroleum that would thrill the popular imagination in the twentieth century.

The superabundance of pure whale oil is one of the majestic aspects of the whale ship, which glows like a Christmas tree on the open ocean. Melville writes: “But whaleman, as he seeks the food of light, so he lives in light ... See with what entire freedom the whaleman takes his handful of lamps ... to the copper cooler at the try-works, and replenishes them there, as mugs of ale at a vat. He burns, too, the purest of oil, in its unmanufactured, and, therefore, unvitiated state; a fluid unknown to solar, lunar, or astral contrivances ashore” (377). These celestial contrivances are types of lamps that dispel the darkness of Victorian drawing rooms. The land-bound know only the expensive, processed oil found on the shelves of apothecaries, not its original most pellucid form still warm from the rendering fire. Though his work is arduous and filthy, the whaleman’s pleasure is the pure light of his raw material, an aesthetic of whaling that makes the practice seem almost divine or supernatural: an infinite supply of light to pierce the inky darkness of the open ocean. Thanks to its indigenous fuel, the *Pequod* is an earth star. But Ishmael scolds the land-locked reader “For God’s sake, be economical with your lamps and candles! not a gallon you burn, but at least one drop of man’s blood was spilled for it” (194).

These moments of quiet pleasure onboard ship are fleeting, for Captain Ahab’s ship is hell-bent on destruction, and an antipode to the ship-as-bright-star comes

just a few pages after the ode to spermaceti. “The rushing *Pequod*, freighted with savages, and laden with fire, and burning a corpse, and plunging through that blackness of darkness, seemed the material counterpart of her monomaniac commander’s soul” (375). The fires are not only the pure whites of lamps; the reds of revenge bleed into the aesthetic on this ship of fools. When they experience St. Elmo’s fire, Stubb the optimist likens the ship to a great candle saturated with its resource: “I take that mast-head flame we saw for a sign of good luck; for those masts are rooted in a hold that is going to be chock a’block with sperm-oil, d’y’e see; and so, all that sperm will work up into the masts, like sap in a tree. Yes, our three masts will yet be as three spermaceti candles—that’s the good promise we saw” (442–3). Beacon or omen, the glimmering *Pequod* and its captain occupy a place in Western cultural identity that red-flags obsession and hubris. Besides Ahab’s ambition, the reader swims in the fine details of whaling science, the nature of its fuel, and the little men who strived anonymously to illuminate a world before electricity.

Each form of biomass in this chapter has its own nobility and nastiness: the sweetness of dried hay or the putrid dung it becomes; the butter of peat or its suffocating sink; pellucid whale oil extracted from an enormous, suffering, bleeding mammal body. Beyond the aesthetics of the fuel, the literature surveyed here has uncovered other layers of nature culture. First, the pastoral is a construct of idealizing urban societies from the Greeks to the early modern courtiers to the Romantics, and acts as an escape from the social rigors of those spheres. In more recent, realist literature the pastoral exhibits the physical labor and finely tuned sense of dwelling that comes from cultivating land that supports working animals. Both versions of pastoral are romantic, involving love among shepherds, animals, and landscapes, and the fine-tuning between what the land and climate provide and what the culture cultivates. This nature culture is the heart of the texts’ emotional arcs.

Next, biomass literature, in common with other fuel sources, signifies social standing. As peat has been used to degrade its user’s standing, and coal is similarly stigmatized as compared to timber, petroleum, and natural gas; those who labor to produce animal fodder are members of the lower, laboring classes. But biomass presents a complication of this well-known stratification in both its romanticized and realist forms: laborers are personally ennobled by their hard work, their loyalty to animal and land, their genuine affections and enduring bonds. Though biomass cultivators may be flagged as the “salt of the earth” by the literati depicting them, readers can’t help but feel some admiration and even envy of the satisfactions, physical, emotional, and practical, of living within

the sustainable rituals of the steward. This admiration has become all the more fervent with the alienations of the industrial state, but it predates industry as well. Homer and Virgil, Marlowe and Raleigh, Clare and Blake, each honored the biomass laborer. From an Anthropocene perspective, writers like Haushofer and Kunstler had a clear view of the ideals of going retrograde, from fossil fuel and nuclear conditions to the neo-shepherds of a postindustrial condition.

Finally, biomass literature serves as a checkpoint at the border of the fossil-fuel era and the Anthropocene. The nineteenth-century literature that scrutinized this paradigm shift, including DeQuincey, Ruskin, Sewell, and several more writers to come in the next chapter, uses direct comparisons between old ways of transportation—the horse versus the steam engine—to show the skewed ideologies of energy that thrall the fossil-fuel consumer. These works are excellent reminders of the high-energy regime that has become almost invisible by virtue of its ubiquity. None of them means to place hay and fodder at the center of their action and emotion, but each is a thick palimpsest that supports bringing the lower layers into the light. Once enlightened, the contemporary reader can't help but marvel at the energy present that society takes for granted. Turning these elisions into overt and distinct ontologies helps us comprehend the magnitude of our investment in fossil-fuel culture, and marks a few strokes toward imagining an alternative reality. A future biomass regime is potentially both retrograde and progressive.