

“Eternity in the vesture of Time”: Carlyle, Thermodynamic Discourse, and

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I

In that Fire-whirlwind, Creation and Destruction proceed together; even as the ashes of the Old are blown about, do organic filaments of the New mysteriously spin themselves. (Carlyle *Sartor* 195)

Carlyle’s relationship to nineteenth-century science and religion is equivocal. He remained skeptical of them, though they show up routinely in his writings, suggesting, as it were, an anxiety regarding them. Although Carlyle is by no means religiously orthodox, the essence of religion, especially its celebration of mystery and the mysterious, becomes fundamental to his epistemology and discourse. Biblical phrases, entire passages, allusions, and references to the prophetic structure his discourse. His protagonist and autobiographical subject, Diogenes Teufelsdröckh in *Sartor Resartus* (1833–34), follows the Messianic trace, “a Baptist living on locusts and wild honey” (*Sartor* 23), a Melchizedek “without father or mother of any kind” (12). And scientific empiricism contributes to a loss of faith and collapse of the whole person: “The loss of his religious Belief

was” to him “the loss of every thing,” “feverish paroxysms of Doubt” caused by “Inquiries concerning Miracles, and the Evidences of religious Faith” (*Sartor* 121, 88). According to Avrom Fleishman, “Allegory, typology, and the broader mythic resonance attached to the first books of the Old Testament were part of the grain and tissue of [Carlyle’s] mind,” all of which can be found in *Sartor Resartus*, where “varied biblical references” become superimposed “over figures derived from classical and other cultures” (122).

Leading men of science and emerging scientific trends are repeatedly foregrounded in Carlyle’s writings by way of admiration, criticism, and parody. Still, his relationship to science, as Frank Turner suggests, is “ambiguous” (328), due in part to the still unsettled shift from natural philosophy to natural science, whereby the emergent discourse lacks what Carlyle himself calls “right Naming” (*Sartor* 69). Throughout the nineteenth century and despite the inroads made by science, natural philosophy with its historical ties to the religious resisted the emerging natural science. Many of the leading men of science seemed unwilling or unable to renounce the centrality of religion and faith from their life and work. For Clerk Maxwell, especially, “the complementary tasks of the natural philosophy professor and the minister of Christ were to facilitate that recognition” (Smith 240). He and his “fellow North British scientists of energy had not only embedded their new natural philosophy in the cultures of Presbyterianism but had also been ready to deploy that natural philosophy in the service of a Christianity suitable to the wants of Victorian Britain” (307).

Carlyle relishes what Gillian Beer calls the “shiftiness of discursive categories,” envisioning his “enterprise” as a “formative force in the Victorian search for synthesis and . . . taxonomic refinement.” So important is Carlyle to the Victorian scientific debate that Beer relies on him for her epistemic of “fields,” her term for the misprision across literature and science (*Open* 208–09). Yet, although Carlyle’s knowledge of science and use of its tropes have been acknowledged, largely untreated is his interest in “the constellation of *Physical Power*” (“Signs” 82), the emerging science of thermodynamics and the apocalyptic anxieties its second law spawned.¹ Science and religion are inextricably con-

nected in the nineteenth century, the two, as Herbert Spencer argues in *First Principles* (1862), dialectically or correlatively fundamental to any approach to symbolic reality and nescience. Spencer's search was for a "fundamental harmony" between science and religion, "two great realities" that "cannot be comprehended," responding as they do to "different aspects of the same Universe" (16, 17, 53). The inseparability of the science of energy from religion is something quite recognizable among Carlyle's fellow Scotsmen, such as Maxwell and P. G. Tait from the North British group of physicists and engineers largely responsible for the construction of "the science of energy" (Smith 1). This scien-

¹John Tyndall "does not use Carlyle for ornament"; rather, "Carlyle was an inspiration to Tyndall and many of his scientific contemporaries" (Myers 42). Charles Kingsley considered Carlyle's writings "instinct with the very spirit of science; that he has taught men, more than any living man, the meaning and end of science" and "would have made a distinguished scientific man. . . . Therefore, did I try to train a young man of science to be true, devout, and earnest, accurate and daring, I should have said--Read what you will: but at least read Carlyle" (248-49). Carlyle was "anything but ignorant of physical science" (Turner 328). Carlisle Moore points to his early training in mathematics, his five-year (1817-1822) study of physics, astronomy, geology, and mineralogy, and his plan up until 1827 to become a scientist (21, 32). Carlyle's interest in science led him in 1834 to apply for the Astronomy Professorship at the Edinburgh Observatory, for which he was rejected on the grounds that he had no observatory experience nor expertise in handling the valuable and sensitive mechanical instruments. It is therefore not at all surprising that James Clerk Maxwell in 1851 and 1855 read and recommended close reading of Carlyle's *The French Revolution* (1837) and 1824 translation of Goethe's *Wilhelm Meister* (1821) (Campbell and Garnett 154, 218). He later took a pilgrimage to the Carlyles' family home in Craigenputtoch. For a useful treatment of Carlyle's general attitude to science, see Herbert L. Sussman's *Victorians and the Machine* (1968); on Carlyle's scientific epistemology, see Frank Turner's "Victorian Scientific Naturalism and Thomas Carlyle" and Charles W. Schaefer's "Carlyle's Denial of Axiological Content in Science." More recently, George Levine's introduction to Bernard Lightman's *Victorian Science in Context* (1997) centers around Carlyle's theory of science. Carlyle's complaint with science, says Tyndall, was a protest against being "hemmed in" by science and expression of desire for a "larger area than that afforded by science for speculative action and its associated emotion" ("Personal" 387).

tific group, many of whom could not separate their science from their Calvinism or Presbyterianism, was key to the “discovery” of energy physics, important as it was to “the capitalist contexts of Victorian Scotland” (Smith 1, 3). The Scottish universities were home to the new energetics. William Thomson assumed a professorship at Glasgow in 1846, Maxwell the chair of natural philosophy at Marischal College, Aberdeen, in 1856, and Tait the chair at Edinburgh in 1860. As Crosbie Smith observes, “the science of energy” was “promoted as a natural philosophy in harmony with, though not subservient to, Christian belief” (172). The goal was to make energy a national science, accommodating it to the religious temper of the nation at a time when “the boundaries between science and its publics tend to be highly permeable” (3).

Energy, then, was the concern and project of the leading Scottish intellectuals of the nineteenth century. Much of the discussion about energy in the Scottish universities did not commence until the 1850s. Maxwell and Tait were born in 1831, and Fleeming Jenkin in 1833. But Carlyle came to the subject much earlier than they, establishing, as it were, the energy agenda. “Signs of the Times,” with its celebration of power, was published in 1829, and “Characteristics,” published two years later, switched from the concern with power to the concern with the vital—“the grand vital energy” (“Characteristics” 10)—which is to be found not in the conscious but in the unconscious. Both essays too insist on the dynamical in nature instead of the mechanical. Carlyle was obsessed with the fecund, organizational potential within chaos, which strikes at the heart of mid-nineteenth-century anxiety with the apocalypse, a “hearse-of-all night” condition (Hopkins “Spelt” l. 2), or what Michel Serres calls the “end of the *Odyssey*, amidst the corpses” (*Parasite* 252). If the apocalypse is the “transcendental condition of all discourse” (Derrida “Apocalyptic” 27), then thermodynamics is the science of transcendentalism. In thermodynamics, a doctrine that “asserts itself everywhere in nature” (Tyndall *Fragments* 2:181), and “a principle applicable to the whole universe” (Stewart and Tait 152), things cohere in an economy of equivalence. To a conservationist like Carlyle, the first law, defined by qualitative change without quantita-

tive loss, “undivided healthy force” he calls it (“Characteristics” 22), answers social miasma. Still, he finds entropy and its gesture to cultural dissolution particularly attractive, for apocalyptic closure inaugurates a new economy, the bringing of order out of chaos.

Carlyle’s utterances increasingly draw distinctions between the world as artificial (material) and the world as natural (spiritual), a system modeled after a machine or one conceived as a tree.² His scientific epistemology privileges the dynamic over the mechanical, change over stasis: “nothing is completed, but ever completing” (*Sartor* 197). But Carlyle’s discourse transcends the mere preference of “one set of metaphors for another” (*Sussman Victorians* 14).³ “Signs of the Times” shows his early affinity to a scientific system accommodating organicism. “Characteristics” employs key tropes of the new energetics—“dynamical,” “force,” “energy,” “action,” “vital,” “sacred fire”—and entire passages become energized by the new conservation talk:

²Thermodynamics essentially altered the conception of the universe from a Newtonian machine (a closed system of being) to a Carlylean *Igdrasil* (an open system of becoming). Ilya Prigogine and Isabelle Stengers refer to dynamics, the theory of fields and forces, as “the physics of being,” and thermodynamics, the theory of changeableness and conversion, as “the physics of becoming” (277).

³Metaphor is not solely the possession of literary discourse; it is as much a tool of science, for literary and scientific discourses are rooted in culture and reflect, through metaphor, the way culture thinks and operates. In fact, scientific theories are “metaphors which ultimately are inseparable from physical reality” (Jones 5). Unpacking scientific tropes in literature is “an essential part of the task of scientific inquiry”; the “primary encounter with any text, be it metaphysics, poetry or biology, is linguistic, for texts are made of language” (Boyd 362). Maxwell puts the matter similarly in his 1870 “Address to the Mathematical and Physical Sections of the British Association”: “The figure of speech or of thought by which we transfer the language and ideas of a familiar science to one with which we are less acquainted may be called Scientific Metaphor. . . . The characteristic of a truly scientific system of metaphors is that each term in its metaphorical use retains all the formal relations to the other terms of system which it had in its original use. The method is then truly scientific—that is, not only a legitimate product of science, but capable of generating science in its

The lightning-spark of *Thought* . . . fed also with *fresh fuel* and acquires incalculable *new light* as *Thought*, incalculable *new heat* as *converted into Action*. By and by, a *common store of Thought* can accumulate, and be transmitted as an everlasting possession. . . . Thus in all Poetry, Worship, Art, Society, as *one form passes into another*, *nothing is lost*: it is but the superficial, as it were the body only, that grows obsolete and dies; under the mortal body lies a soul which is immortal; which *anew incarnates itself in fairer revelation*. (11, 39, emphasis added.)⁴

“The new language of energy,” as Crosbie Smith observes, “was symptomatic of a series of profound conceptual shifts which resulted in a whole new scientific vision, with accompanying changes in scientific practice, quite unlike anything that had preceded it” (2). *Sartor Resartus* is foundational to nineteenth-century science, participating, as it were, in the same formative history as John Herschel’s *Preliminary Discourse on the Study of Natural Philosophy* (1830), which founded the British Association for the Advancement of Science, and William Whewell’s *History of the Inductive Sciences* (1837) and *Philosophy of the Inductive Sciences* (1840) (Levine 16–17).⁵ Carlyle’s most profound declarations about the science of energy came at a time when the subject was being hotly debated and argued.

Carlyle was not especially alarmed by the machine as “metaphor.” His anxiety, rather, was the condition created when metaphor,

⁴Existing studies of Carlyle and science attend mostly to Carlyle’s rejection of the machine and ambiguous attitude to rationalism, science, and naturalistic writers. Ignored entirely (even though Turner’s opening statement cites the “conservation of energy” as one of the tenets embraced by scientific naturalists [325]) is Carlyle’s keen attention to emerging thermodynamics, which Sussman’s *Victorian Masculinities* (1995) merely approximates. Pursuing some of the same arguments as Elaine Showalter and Richard Dellamora, Sussman connects the science to the technology of the self and applies the theory of conservation and waste to an economy of sexuality.

wrenched from referentiality, forfeited transcendental essence and became “sham,” a false signifier “deceptive[ly] bedizening” the signified (*Sartor* 57–58). In this condition, “the ‘foam hardens itself into a shell’” and becomes “a charnel-house with specters.” Lacking anti-reifying properties, science became spectral, an uncontrollable genie, indeed, a Frankenstein monster: “the shadow we have wantonly evoked stands terrible before us and will not depart at our bidding” (“Signs” 66). Most distressing to Carlyle was the way science, in its attempt to answer all the phenomena in the universe, usurped metaphysics, creating a skepticism (“chronic atrophy and disease of the whole soul” [*Heroes* 174]) which in turn bankrupted faith, banished mystery, and killed wonder. This, as he saw it, was “unwise science” (*Sartor* 3). Pursuing, then, “pure moral science” (4), Carlyle’s science originated in “the Dynamical nature of man” (“Signs” 70), where the natural world is laboratory/monastery and the scientist a religious meditant. Although Carlyle appropriates Newton to authorize his own scientific claims, Newton “must mount to still higher points of vision” (*Sartor* 197), attained by the likes of Kant, Goethe, and Watt, whose scientific assumptions preserve “the great deep sacred infinitude of Nescience” (*Heroes* 8). Carlyle’s is a science from the “mystic region,” what elsewhere he calls the “abysses of mystery and miracle” (“Characteristics” 40). His concern

⁵Nineteenth-century scientists felt authorized to offer critiques of literature, showing that the period had yet to experience bifurcation, discipline-specific boundaries. Maxwell, for example, offers a critique of *Villette* (1853), observing astutely that the Brontë heroine, Lucy Snowe, prefers “the station of an onlooker.” In the very next breath he turns to Faraday. He also advances an extensive critique of *Middlemarch* (1872), attributing Eliot’s plot to an intricately worked out solar mythology. “The whole thing is, and is intended to be,” he believes, “a solar myth from beginning to end,” whereby “all the characters are intended to be astronomical or meteorological” (qtd. in Campbell and Garnett 190–91, 386–87). In an essay on “English Hexameters” for the *North British Review* for May 1853, William Whewell finds the versification of Arthur Hugh Clough’s *The Bothie of Toper-na-Fuosich* (1848) “uncouth and licentious” to the point of repelling “the most indulgent reader.” He thinks the accent, phraseology, and imagery extravagant as though they were “part of the jest.” Still, the work, he feels, possesses “considerable charm”

with the “Vital Fire” of the soul—that all one does “springs out of Mystery, Spirit, invisible Force,” which is far stronger than “Material Force” (*Sartor* 137, 204)—accords well with Maxwell’s theologically informed vitalism (the spiritual essence of life force). Thermodynamics answers the threat mechanism posed, stultifying “individual endeavor,” “spontaneous growth,” “natural force,” and “mysterious relations” (“Signs” 59, 70, 74). Issues of management (reserve, expenditure, uncontrollable emission, waste), regardless of the economy (whether scientific or religious), remain the source of Carlyle’s anxieties. Tracing the apocalyptic in Carlyle, locating it in his theory of circulation, his economic metaphors and tropes, his discourse, and his hope that apocalyptic events will lead to societal reorganization and new re-combinations is instructive. Moreover, an apocalyptic condition, generated by the angst over energy dissipation, authorizes sage discourse. The apocalyptic and the prophetic follow similar trajectories. For energy dissipation “gave fresh meaning to the Christian perspective on beginnings and endings to the visible cosmos” (Smith 240).

II

The Second Scientific Revolution (1800 to 1950), as Stephen G. Brush calls it (1:35), witnessed the evolution of the theory of energy from the caloric theory to the wave theory and the ether and then to thermodynamics. Nineteenth-century thermodynamics almost single-handedly revolutionized England’s industrial power. Not surprisingly, the discussion at this significant moment in the history of European industrialism was over the nature, quality, and quantity of work, including how long the sun would continue its work, and could its energies be harnessed or conserved to ensure long continuance. Carlyle is important, if not central, to this argument because his is an economics of labor. Between 1832 and 1854, some twelve European scientists, following Jean Fourier in *Analytical Theory of Heat* (1878), non-simultaneously advanced the theory of energy conservation.⁶ Sadi Carnot in *Reflections on the Motive Power of Heat* (1824) argues the first law of thermodynamics, the mechanical, transformative equivalence of heat and work. In any caloric exchange, temperature remains constant and no heat is lost; the sum of energy therefore remains constant, what

Carnot calls the “re-establishment of equilibrium” (49). From industrial Manchester, James Prescott Joule pressed the equivalence between heat and work, theorizing that “wherever living force is *apparently* destroyed, an equivalent is produced which in process of time may be reconverted into living force.” Emphasizing sameness, homogeneity, and totalization, Joule stresses the coevalness of heat and living force: “The same quantity of heat will always be converted into the same quantity of living force” (269–71). The first law of thermodynamics argues for management of a store of energy through processes of transformation and conversion. This emerging science embraced industrial gains within a technological system governed by change, “the very essence of our lot and life in this world” (Carlyle “Characteristics” 39). A science “to regulate, increase and purify the inward primary powers of man,” the first law analogizes “the primary, unmodified forces and energies of man, the mysterious springs of Love, and Fear, and Wonder, of Enthusiasm, Poetry, Religion, all of which have a truly vital and *infinite* character” (Carlyle “Signs” 68–69).

Hermann von Helmholtz, to whom energy and life were “synonymous” (Schivelbusch 71), uses ontology of matter to propel the theory of thermodynamics from mere “human utility” to “a universal natural law” that “rules,” “embraces,” and “expresses” a “perfectly general and particularly characteristic property of all natural forces.”⁷ The universe, he reasons, “possesses, once for all, a store of force which is not altered by any change of phenomena, can neither be increased nor diminished” (“Conservation” 306–07, 316). To Thomson, later Lord Kelvin, unknown sources of energy exist in that “great storehouse of creation.” Thomson even quantifies “Time’s Arrow” (Arthur Eddington’s coinage), calculating that the sun must produce either more, or

⁶On that emergence, see Thomas Kuhn (323), George Basalla, William Coleman, and Robert H. Kargon (87), and Susan Faye Cannon (117).

⁷The connection of thermodynamics to values, order, and all forms of work is not “artificial,” for mid-nineteenth-century thermodynamics wielded a “powerful influence on the religious outlook of intellectuals” (Katchalsky 102). For twentieth-century manifestations of thermodynamics, see Jeremy Rifkin’s *Entropy* (1980): “Every single physical activity that humankind engages in is totally subject to the ironclad imperative expressed in the first and second laws of thermodynamics” (8).

not substantially less, than “20,000 years’ heat.” He speculates that the sun was created as “an active source of heat at some time of not immeasurable antiquity” and was “sensibly warmer one million years ago than now.” Positing energy dissipation as irreversible, Thomson warns, with a casual nod toward entropy, that earth’s inhabitants “cannot continue to enjoy the light and heat essential to their life, for many million years longer, unless sources now unknown to us are prepared in the great storehouse of creation” (391–93).⁸ Thomson, however, “kept open the possibility that God could endow nature with new gifts of available energy to allow continuation of the solar system beyond the time that the present law allowed” (Smith 173). To preclude apocalyptic panic, Helmholtz theorizes that “the present state of inorganic nature favorable to the duration of man seems to be secured, so that for ourselves and for long generations after us we have nothing to fear.” But the first law, he warns, does not ensure unlimited supplies of energy: “it permits a long but not an endless existence; it threatens it with a day of judgment, the dawn of which is still happily obscured” (“Interaction” 170–71). The apocalyptic expression “day of judgment” along with the even more frequently used text of Psalm 102 that the earth “shall wax old like a garment” (Ps. 102:26; Smith 110–11, 185, 254), becomes the discourse for energy dissipation. Balfour Stewart and Tait approach dissipation (that “seemingly frightful expenditure of the very life and essence of the system” [145]) differently. They accept its reality (“the visible universe must *certainly in transformable energy, and probably in matter,* come to an end,” a conclusion from which “[w]e cannot escape”) but restrict it to the visible world, not the invisible, which subsists by storing up lost/transferred energy and memory from the visible world. Simply put, “the principle of Continuity” demands “a continuance of the universe.” Thus, “we

⁸Balfour Stewart and Tait raise a similar question: “Are we not inevitably led to conclude that our present state cannot last even for a lengthened period, but will be brought to an end long before the inevitable dissipation of energy shall have rendered our earth unfit for habitation?” (144). Thomson theorizes that some solar heat derives from meteoric action. His unknown source of energy was later confirmed by the discovery that radioactivity replenishes

are forced to believe that there is something beyond that which is visible" (60).

Victorian apocalyptic anxiety was informed largely by the implications inherent in the second law, the measurement of "the degree of randomness or disorder in a system" with the "capacity to evolve irreversibly in time" (Coveney and Highfield 152). Carnot's cycle (heat/ work exchanges without caloric depletion) implies the second law, the so-called "heat-death" of the universe as the imagined end of all things, a veritable shutting down of the system owing to energy depletion, a turning off of the last lights (Hopkins "God's" l. 11). Heat is energy; thus its death is a cooling down. With every caloric transfer, Carnot holds, energy becomes degraded. Thus, "entropy," coined in 1865 by Rudolf Clausius to explain the relationship between conservation and reversibility, what he calls "transformation" (78), implies the directional flow of heat from warmer to colder bodies and with it the consumption of thermal energy: "In all cases in which work is produced by the agency of heat, a quantity of heat is consumed in proportion to the work done." It is not merely "concealed from our perception, but is *nowhere present*; it is *consumed* during the changes in doing work" (68, 70). The universe becomes exhausted when it reaches maximum entropy, when it literally runs out of energy. To Stewart and Tait, however, energy in *The Unseen Universe* (1875) is only mysteriously lost, "unseen," confined to what they call "empty space" (144). To "produce a certain amount of work," Clausius theorizes, "the expenditure of a proportionate quantity of heat is necessary" (77). Therefore, to claim heat-loss is really a fallacy because heat is a form of energy; heat and entropy are coeval. To Thomson, heat-loss is not merely "an engineering issue"; it is as much "a universal cosmological one with clearly defined theological support" (Smith and Wise 497).

III

Conservation and entropy (the first and second laws of thermodynamics, respectively) explore the organization of energy, what Brush calls "the kinetic energy of matter in motion" (1:61). Energy, "rehabilitated" in the nineteenth century both as "an operant physical concept" and as "an operant metaphysical concept" (Peterfreund 39), was imme-

diately appropriated into the cultural discourse, addressing progress and change in a world itself fluid, changeable, and progressive. An anonymous reviewer of Joule sees the emergence of “ENERGY” in the nineteenth century as “the beneficent rule of the rightful monarch” (qtd. in Smith 1). Energy, indeed, was king. “Changes, and the accompanying transformations of forces,” Spencer finds,

are everywhere in progress, from the movements of stars to the currents of commodities. . . . But these and multitudinous social activities displayed in the growth of towns, the streams of traffic in their streets, the daily issue and distribution of newspapers, the delivery of food at people’s doors, &c., are unquestionably transformed individual energies, and have the same source as these energies. (180, 197)

Even the relationship of energy to economic theories and tropes was not lost to Victorians. A discourse concerned with the way “human things circulate” (Carlyle *Heroes* 21) meant also that literature had to circulate, hence Carlyle’s leading role in founding in 1841 the London Library, a system whereby books circulated, albeit not freely.

Teufelsdröckh’s editor, Hofrath Heuschrecke, also wants the Entepfuhl Circulating Library to broadcast his fascicles, his “Select Beauties.” Carlyle extends the analogy to accommodate other forms of exchange, a “venous-arterial circulation, of Letters, verbal Messages, paper and other Packages going out . . . and coming in” (*Sartor* 196). Simply put, knowledge, like “streams of money and commodity exchanges” (Christensen 257), should be circulated rather than hoarded. Victorians were quite aware that blockage (“force purifying drains” [Carlyle *Past* 281]) contributed to an epidemic of disease; in other words, a relationship exists between circulation and health. Carlyle himself analogizes circulation to monetary health, however fearful he was of uncontrollable circulation: “How human affairs shall now circulate everywhere not healthy life-blood in them, but, as it were, a detestable copperas banker’s ink; and all is grown acrid divisive, threatening dissolution” (*Past* 67, 169). He also employs healthy circulation to analogize work, in which case idle

ness is disease, an “unrevolving man”:

How, as a free-flowing channel, dug and torn by noble force through the sour-mud-swamp of one’s existence, like an ever-deepening river there, it runs and flows;--draining-off the sour festering water, gradually from the root of the remotest grass-blade; making, instead of pestilential swamp, a green fruitful meadow with its clear-flowing stream. (197)

Thermodynamics and *laissez-faire* economics, both espousing theories of circulation (current/currency), conversion, and exchange, experienced simultaneous development. Thomson’s 1871 chairman address to the British Association for the Advancement for Science advances the analogy of intellectual capitalism:

Scientific wealth tends to accumulation according to the law of compound interest. Every addition to the knowledge of properties of matter supplies the naturalist with new instrumental means for discovering and interpreting phenomena of nature, which in their turn afford foundations for fresh generalizations, bringing gains of permanent value into the great storehouse of [natural] philosophy. (Qtd. in Smith and Wise xix)

Acknowledging what I. Bernard Cohen calls “creative transformation” between physics and economics (66), and what he himself sees as the “basic epistemology of standard economics,” “a self-sustaining circular flow between ‘production’ and ‘consumption,’” that “cannot go on without continuous flow,” Nicholas Georgescu-Roegen considers thermodynamics “a physics of economic value” and entropy “the taproot of economic scarcity” (4, 8–9). Physicists routinely employ economic tropes to talk about energy: “dowry,” “reserves,” “storehouse,” “capital,” and “deficit.” Capital, for example, constitutes “a stock of energy,” “an island of negative entropy” (Serres *Parasite* 171). Is there an adequate supply of energy? Is the earth exceeding its income? And, given its expenditures, will the earth at some future time experience a deficit? Helmholtz, in

line with the nineteenth-century fascination with alchemy and the shift from alchemy to chemistry, observes an alchemic relationship between work and wealth—the so-called Philosopher’s Stone: “A machine which could produce work from nothing was as good as one which could make gold” (“Conser-vation” 316). To Stewart, likewise, an economic theory and an energetic economy are one and the same; the “great capitalist” possesses “a great quantity of energy,” a substantial store of wealth. In this economy, disposal of income and deployment of force are concomitant. Similarly, if the sun is dispossessed of a reservoir of energy and must borrow from without, it is like a man whose “expenditure exceeds his income. He is living upon his capital” (26, 152).⁹ The major labor concern of the age, Carlyle rightly detects, is one over wages and work: “The Progress of Human Society consists even in this same, the better and better apportioning of wages to work” (*Past* 20). Like Carlyle’s “Signs of the Times” (59–60), Whewell’s *The Mechanics of Engineering* (1841) advances a labor economy on the wealth of nations:

Labouring Force is the labour that we pay for. In many cases the work to be done may be performed by various agencies; by men, by horses, by water, by wind, by steam. In these cases, that is the cheapest mode of doing the work which gives us the requisite labouring force at the smallest expense: and the price men are willing to pay . . . is proportional to the quantity of labouring force which they purchase. Labouring force enters into the prices of articles produced by man; as the wages of labour, so far as the labouring force is executed directly by man; as the reward for capital, so far as the labouring force arises from accumulated capital. But wages of labour are paid, not only for man’s labour, but for labouring force when arising from machinery. (Qtd. in Smith and Wise 286)

To Victorians, anxious about waste and ungovernable circulation, currency had to be carefully managed, controlled, regulated, distributed. Carlyle assigns the governing class management of the supply of en-

⁹As Smith points out, “the capitalist contexts of Victorian Scotland in particular justify the deployment of the language of the market place” (3).

ergy: “to preside over the Distribution and Apportionment of the Wages of Work done” (*Past* 171).

Carlyle also employs energy tropes to critique the traffic in bogus currency. Victorian culture, he became convinced, was trafficking in fraudulent wares, “imaginary culture,” but creating an appearance of wealth, a “fallacious semblance of performance.” He excoriates England’s political leaders (Gladstone and Disraeli, especially) and Exeter-Hall sympathizers (chiefly Mill), all proponents of “Do-nothingness in Practice and Say-nothingness in Speech,” wordmongers who fraudulently tender counterfeit signifiers. For Carlyle, credit is credibility:

If speech is the bank-note for an inward capital of culture, of insight and noble human worth, then speech is precious, and the art of speech shall be honoured. But if there is no inward capital; if speech represent no real culture of the mind but an imaginary culture; no bullion, but the fatal and almost hopeless deficit of such? Alas, alas, said bank-note is then a *forged* one; passing freely current in the market; but bringing damages to the receiver, to the payer, and to all the world . . . with huge costs. The foolish traders in the market pass it freely, nothing doubting, and rejoice in the dextrous execution of the piece: and so it circulates from hand to hand. (*Latter-Day* 179–80)

Bogus transmitters of a bankrupt culture resemble the “insupportably inaccurate” proponents of egalitarianism, “all as bank-notes, these social dignitaries, all representing gold;—and several of them, alas, always are *forged* notes.” Economic systems can withstand some counterfeit; but unchecked circulation pollutes the economy. With “[s]o many base plated coins passing in the market, the belief has now become common that no gold any longer exist,—and even that we can do very well without gold” (*Heroes* 12, 203). Happiness, to use another economic analogy, is a cheap expenditure, for its “wages” were soon “spent, eaten,” and “not a coin of it remains” (*Past* 156). Carlyle employs similar tropes in his critique of the French Revolution, a bankrupt sys-

tem circulating ideological wares unsupported by inward capital. It unleashed an anarchic spirit hostile to reserve:

A very fit termination . . . spend-thrift, fraudulent-bankrupt; gone at length utterly insolvent, without real *money* of performance in its pocket and the shops declining to take hypocrisies and speciosities any farther. . . . Whereby, in short, that Century [the eighteenth] is quite confiscate, fallen bankrupt, given up to auctioneers. (*Frederick* 12:9)

Similar metaphors describe Irish political bedlam, “fallen there into helpless downbreaks, into flat bankruptcy (*without* certificate).”¹⁰ Like Teufelsdröckh, one must be able to discharge one’s bills.

Circulation is vital to health, whether in a capitalist economy or in the body politic. And much of nineteenth-century science focused on theories of circulation. In fact, an article on “Circulation” in Dickens’s *Household Words* sees the origin of modern physiology coincident with “the discovery of the circulation of the blood, which marks the advent and accession of the moderns to scientific power and independence” (563–64). A healthy economy maintains an equilibrium between conservation and circulation, hoarding and spending, “careful regulation of the nation’s delicate circulation” (Alborn 186).¹¹ Carlyle’s angst, especially, was not flow but absence of control, ungovernable emission. Alborn observes in the Victorian banking system a condition rife with “problematic images of circulation.” Indeed, “[c]oins and bank notes circulated during much of the early nineteenth century in more or less healthy doses.” But these same notes

were viewed to be simultaneously necessary and threatening to the British economy. By economizing coin, bank notes facilitated a

¹⁰F48E3, Forster Collection Manuscript, used by permission of the Forster Collection, Victoria and Albert Museum, London.

¹¹Timothy L. Alborn further notes that “the fate of the joint-stock bank took a turn for the better only when circulating currency became subsumed by more centralized banking techniques on a macroeconomic scale, relying on noncirculating checks and other bookkeeping expedients” (177).

hitherto unimaginable volume of fiscal and commercial undertakings: from creating and funding England's national debt to assisting domestic trade. But by replacing the tangible commodities of gold and silver with the more flimsy promise of a financier's good word, bank notes also suggested dangerous levels of risks. (174-75)

Alborn's observation on the relationship between money and speech in Victorian culture illuminates Carlyle's alarm at the prospects of fraud.

In a culture of imperialism and annexation, economists, industrialists, and politicians discovered in thermodynamics the potential to maximize a nation's resources, secure domestic tranquillity, and chart expansionist policies, i.e., make war.¹² "The colonists' science projects were, first and last," Sandra Harding finds, "for maintaining Europeans and their colonial enterprises in those and other parts of the world" (44). Creating an equivalence between material reserves and political power establishes an hegemony around economics, with "the strong arm of capitalism" becoming the signature of "national power and prestige" (Houghton 209). Thus, Matthew Arnold links the Barbarians' "great means" to "credit and authority" (118). A relationship was forged in the nineteenth century between credit and credibility,

believability, personal power based on the confidence of others, and business trust. "Credit as credibility" here functions as an exchangeable commodity: credit can be shared, stolen, accumulated or wasted. . . . Credit as credibility is thus to be understood not

¹²On monetary exchange value and labor in nineteenth-century literature, see Kurt Heinzelman's *The Economics of the Imagination* (1980). Stewart and Tait believe that the parallels between physics and capitalism imply that "value, like energy, cannot be produced or destroyed, but only exchanged" (qtd. in Myers 56-57). And whereas income and heat or motion are transient concepts, capital and energy are "eternally conserved quantity" (Myers 56-57). Melvin E. Klegerman and Hugh J. McDonald find a connection between steam technology and war in Victorian thinking. Smith and M. Norton Wise offer the most thorough discussion of energy, economics, and empire. Finally, Stewart stud-

simply as monetary capital but . . . as symbolic capital. A cycle of credibility is created by the investment of symbolic capital in a project. (Smith 3)

Whether or not he recognized it, Carlyle's tropes were rooted in the emerging discourse relationship between economics and energetics, preoccupied as they both are with power and hegemony. This economic understanding inspired Thomson's industrial vision, advancing thermodynamics to realize the vision of shipbuilders determined to make "an economic reality of ocean steam navigation" (Smith and Wise 282). Similarly, his "national and economic concerns with the measure of work . . . went hand in hand as concerns with the wealth of the nation" (358). To be truly hegemonic, to call the shots, is to be a thermodynamic machine flaunting reserves, which derive from astute circulation of resources, what Carlyle calls energy. A science that radically revolutionized transatlantic crossings, thermodynamics increased speed, bankrolled nations, and appealed to Victorians anxious to carry out, according to Maxwell, the "subjugation" of "new regions" left undiscovered had science been satisfied with "the rough methods of her early pioneers" ("Introductory" 244).¹³ Science, and especially the science of energy, "was presented as a new programme for scientific practice, universal in its claims, but with an impeccable British pedigree" (Smith 14). Carlyle's own scientific agenda was militaristic; science was a "[t]orch brandished and born about," and any of its generals, like a Watt, "conquers the earth, and makes her man's" (*Sartor* 1, 63).

Never far from the Victorians' collective program for material culture is the marriage between industry and empire. It purported self-management, repudiated waste, and warned of the threat to reserve from social perturbation. English ingenuity and hegemonic, if civilizing, management of nature and the indigenous races work to transform "Waste desert-shrubs of the Tropical swamps" into "Cotton-trees" (Carlyle *Past* 169). Carlyle, like so many nineteenth-century industrialists, glosses

¹³See also Harding's *Is Science Multicultural?* (1998). Annette Marie Gilson dis-

over the scourge of slave labor in his aesthetic of industry beneficial mostly to British imperial governors:

here, under my furtherance, are verily woven shirts,—hanging unsold, undistributed, but capable to be distributed, capable to cover the bare backs of my children of men. . . . I have opened them from my secret rock-chambers, and they are yours, ye English. Your huge fleets, steamships, do sail the sea; huge Indias do obey you; from huge *New* Englands and Antipodal Australias comes profit and traffic to this Old England of mine. (169)

A contemporary of Carlyle in June 1854 voices a very nineteenth-century concern with “valuable natural resources” in undeveloped British colonies “left to rot and to waste” (“Waste” 393). The goal was through better circulation to reduce this waste by making raw material more commercially available. In all of this, labor was a significant factor, along with the hope that the current “conflicts of races” and the “great sacrifice of human life” in northern Europe and China may have the “compensating benefit” of “opening to us the pent-up animal and vegetable riches of our American and Indian territories” (393). In fact, as Smith points out, the concern with waste was at the heart of the thermodynamic project: “The great goal of Glasgow engineers and natural philosophers alike was therefore to minimize waste and maximize useful work, that is to attempt to approach the economic goal of a perfect thermo-dynamic engine through an understanding of the causes of waste” (154). As Wilhelm Ostwald would later put it in his *Energetic Imperative* (1910), “Waste no energy. Utilize it” (qtd. in Smith 306). Carlyle’s distrust of self-management applied mostly to the lower classes and racial subalterns, given their proclivity to uncontrollable eruption and the threat to social equilibrium. These disruptive groups needed stringent management in an economy of paternal governance. Put simply, energy needed to be managed properly by reducing waste, friction, and spillage. Victorian culture at large was to be that perfect machine.

The discursive content of Carlyle's imperialist politics privileges the first law. The second, however, proves problematic. Entropy, which threatens "to engulf [Teufelsdröckh] in final night," profoundly impressed Carlyle, who imagines a frigid, unpeopled, and disordered world: "waste-weltering epoch. . . . A world all rocking and plunging . . . the abysses, and subterranean and supernal deluges, plainly broken loose; in the wild dim-lighted chaos all stars and Heaven gone out. No star of Heaven visible, hardly now any man." The dust particles from such an eruption broadcast entropic closure. Carlyle, in part, welcomes the very catastrophe that informs his anxiety, for the events themselves generate prophetic utterances, proclamations of ends and of the end. "Great Men," he writes, are the "inspired (speaking and acting) Texts of that divine BOOK OF REVELATIONS" (*Sartor* 142).¹⁴

As mystagogue of "the imminence of a vision without concept" (Derrida "Apocalyptic" 12), Carlyle evinces the struggle to identify the apocalyptic envoi (I/Me/Voice/Motion/Appearance/Idea/Eternal Mind: "sure enough, I am; and lately was not" [*Sartor* 41]). Like John, whose Revelation structures *Sartor Resartus*,¹⁵ Carlyle struggles to determine the identity of the envoi, "the cunning eye and ear to whom that God-written Apocalypse will yield articulate meaning." He wants "the true Apocalypse of Nature, and Heaven Unveiled," "the new Apocalypse of Nature unrolled to him" (220, 116). But the very ambiguity of identity constitutes apocalyptic discourse, "uttered in all tones [and tongues] of jubilee and wail" (41). A skilled ventriloquist, Carlyle deliberately obfuscates the two voices, the oracular and the rational--the

¹⁴The "Sibylline leaves" are part of Teufelsdröckh's fascicles, as they were Carlyle's: "I am up to the chin in Sybilline paper-clippings," he told John Forster (MS F48E18, Harden Collection, used by permission of the Armstrong Browning Library). Victorians were obsessed with apocalyptic overtures, as suggested by Hopkins's poems, "That Nature Is a Heraclitean Fire" and "Spelt from Sibyl's Leaves," Swinburne's Proserpine poems, and Eliot's *Middlemarch* (1872), especially the section entitled "Sunset and Sunrise." See

voice/text of Jesus and that of John. In the “interlacing of voices and *en-vois*,” Derrida finds, “No longer is one very sure who loans his voice and his tone to the other in the Apocalypse; no longer is one very sure who addresses what to whom” (“Apocalyptic” 27). Carlyle’s voice of Jesus, it seems, utters: “Who am I; what is this ME? A Voice, a Motion, an Appearance;—some embodied, visualised Idea in the Eternal Mind?” Then Teufelsdröckh’s voice, it appears, responds: “Sure enough, I am; and lately was not” (*Sartor* 41), words that are historically Jesus’: “I am he that liveth and was dead; and, behold, I am alive for evermore” (Rev. 1:18). The true indicators of text aspiring to the condition of apocalypse are the inseparable identities of author and *en-voi*.

Carlyle’s most profound apocalyptic traces are “Signs of the Times,” *Sartor Resartus*, and *Latter-day Pamphlets* (1850). “Signs” takes its title from the New Testament book of Matthew, a text foundational to “the modern sense of epoch . . . and the modern distinction between times” (Kermode 48). *Sartor Resartus* is definitively apocalyptic, concerned as it is with time, vigilance, the city and falling cities, millennial discourse, and re-clothing. It is a work of unveiling, uncovering, discovery, and disclosure, and concerns what Derrida calls the “laying bare . . . of specifically apocalyptic unveiling, of the disclosure that lets be seen what to then remained enveloped, secluded, held back” (“Apocalyptic” 5). *Sartor Resartus* is a gesture of denuding, nakedness, about the world out of clothes, about stripping, peeling off, re-tailoring, affording sight—“the *apocalyptic* movement” (Derrida “Apocalyptic” 5). Apocalyptic or millennial discourse correctly understood is a science of “Affirmation and Re-construction” rather than one of “Denial and Destruction” (*Sartor* 14). Teufelsdröckh’s conversion experience, one might recall, begins with Teufelsdröckh “shut out from Hope” in *The Everlasting No* (*Inferno*), moves through the refining

¹⁵The book of Revelation is arguably the most prominent biblical text in *Sartor Resartus*: “and wipe away all tears from their eyes” (151; cf. Rev. 21:4); “whoso hath ears to hear let him hear [what the spirit saith unto the churches]” (9; cf. Rev. 2:7); “the Heavens and the Earth shall fade away like a Vesture” (58; cf. Ps. 102:26 and Rev. 21:1); “and I awoke to a new Heaven and a new Earth” (149; cf. Rev. 21:1).

fire, the “Baphometric Fire-baptism,” of the Centre of Indifference (Purgatory), and ends in The Everlasting Yea (Paradise) where he “awoke to a new Heaven and a new Earth” (149). Add to this divine comedy the importance assigned to laughter in the text and in Teufelsdröckh’s experience, an important “cipher-key wherewith we decipher the whole man” (26). *Latter-Day Pamphlets*, on the other hand, which Carlyle originally considered calling “The New Era,” addresses a society “now in birth,” implying that the work anticipates ideals of ending and beginning, closure and reopening, death and rebirth (*Collected Letters* 25:8), what in the full sense of the word used biblically Serres calls “Pentecost” or “Paraclete” (*Parasite* 40, 42) and Derrida “advent” (“Apocalypse” 24). Carlyle entertained other titles, “Tracts for the Times,” for one, a title made popular by Tractarians wanting to stave off the demise of orthodoxy, “the ruinous overwhelmed and almost dying condition” (Carlyle, *Alexander* 2:86). Of the many traits of apocalyptic writing, the most frequent are “prediction and eschatological preaching [*prédication*], the fact of telling, foretelling, or preaching the ends, the extreme limit, the imminence of the last” (Derrida “Apocalyptic” 20). But, Derrida warns, “apocalyptic ruses” must be analyzed and demystified to unveil the “political mastery” that “overdetermine the idea of power or mastery” of some “well-hidden” textual “*eucalyptus*” (23). While the trace of pathological dysfunctions exists in Carlyle’s eschatological utterances, it appears, at least on the surface, that his is normatively a discourse of re-genesis, an open tomb, but a tomb nonetheless.

Entropy, “the sunset of mankind” (Wells 27), introduces an irreversible trajectory toward simpler states, degeneration, disrepair, disintegration, and dissolution. Entropy is, after all, “a measure of *disorder*; the tendency toward increasing entropy is simply a tendency toward increasing disorder” (Brush 1:83). Carlyle sees society “as good as extinct . . . diabetic, consumptive . . . defunct . . . a World becoming dismantled,” for which those “spasmodic, galvanic sprawlings” are not to be considered life (*Sartor* 184–85). To most Victorians, concerned as they were with progress and development, the concept of “irreversible time” became untenable. Thus, they sought in the entropic stream new life

forms, new and complex emerging systems, an “infinity of heterogeneous finalities,” Jean-François Lyotard calls them (179), and so embraced “the existence of an eternal return” (Serres *Hermes* 71–72). Believing as they did in progressive transformation, Victorians considered themselves “innovators, giving new impulses to a stagnant culture” (Laqueur 6), whereby the old was divested, disgorged, making way for the new. In one version of this eternal recurrence, Carlyle’s “World-Phoenix . . . fancies that she must first burn out, and lie as a dead cinereous heap; and therefrom the young one start up by miracle, and fly heavenward” (*Sartor* 194–95). His obsession with the Phoenix, the “Death-Birth of a World,” lies precisely in its archetypal expression of “fire-consummation and fire-creation” (*French* 213). “[A]ll death,” as Carlyle puts it, “is but a phoenix fire-death, and new-birth into the Greater and the Better!” (*Heroes* 39).¹⁶

To Victorians whose “Apocalyptic Overtures” (Dellamora) are toward rebirth and recovery, closure presents some anxiety. Hofrath Heuschrecke wants to animate Teufelsdröckh’s cryptopoetics, so that “the character itself is known and seen.” But this “cheerful daystar of hope” becomes a false dawn, which “melts now, not into the red of morning, but into a vague, gray half-light, uncertain whether dawn of day or dusk of utter darkness” (*Sartor* 58). Carlyle’s dawn, however, rescues chaos and night: “In red streaks of unspeakable grandeur, yet also in the blackness of darkness, was Life. . . . A strange contradiction lay in me; and I as yet knew not . . . that spiritual music can spring only from discord set in harmony” (102). Teufelsdröckh entertains a similar vision beyond time, wanting to be so translated, to be in time and out of time simultaneously, that “ever-vexed Time, cannot thenceforth harm us any more.” In this condition, “Life is so healthful that it even finds nourishment in Death”; and “the Tomb is now my inexpugnable Fortress, ever close by the gate of which I look upon the hostile armaments, and pain and penalties of tyrannous Life placidly

¹⁶Northrope Frye’s theory of myths reads the phoenix as an important apocalyptic archetype, manifested, for example, in Moses’ burning tree, Southwell’s and Hopkins’s burning babe of Christmas, and Yeats’s Byzantium bird

enough, and listen to its loudest threatenings with a still smile” (85–86).

V

Carlyle remained a troubled conservationist, nostalgic in sentiment, ideologically feudal, but open to the implosion of the old if it meant preserving the vital in tradition. He aspired to the implications inherent in the first law above those that cohere in the second. And his angst was rooted to no small degree in entropy and the apocalyptic—signs of the times, latter-day inscriptions, and things coming to an end. In language consistent with the theory that when living force collides, it is not annihilated but redistributed, re-aggregated, he finds that the parts of that “exploded Past” which “continually gravitate back to us” are “reshaped, transformed, readapted, that so, in new figures, under new conditions, it may enrich and nourish us again? What part of it, not being incombustible, has actually gone to flame and gas in the huge world-conflagration.” Because the apocalypse can spell recovery, Carlyle saw the French Revolution as a “flame-image, at once veil and revelation” (*French* 3:103), “[a] true Apocalypse,” that might energize “this false withered artificial time” (*Heroes* 201). But Carlyle also saw the accompanying Reign of Terror as “an Angel of Death,” and the French National Convention as “a kind of Apocalyptic Convention” and the ushering in of “Death on the pale Horse.” This, he laments, is a state of “Dim dusk of Time,—or noon, which will be dusk; and then there is night, and silence; and Time with all its sick noises is swallowed in the still sea.” Still, it is not without “continual Twilight streaming up, which will be Dawn, and a Tomorrow silvers the Northern hem of Night; it wends and wends there, that meek brightness, like a silent prophecy, along the great ring-dial of the Heaven” (*French* 4:70–72, 283). In all of Victorian literature, this is arguably the most fascinating and clever appropriation of the book of Revelation as applied to contemporary historical events. An Old Testament sage divining the eschatological trace, and most poetic when most prophetic, Carlyle imagines that “days of universal death must be days of universal newbirth” (*Latter-*

Day 2). In their energy physics, Thomson and Tait offer a similar cosmological vision of the future, drawing from the Psalms and the Gospel of Peter:

We have the sober scientific certainty that heavens and earth shall “wax old as doth a garment”; and that this slow progress must gradually, by natural agencies which we see going on under fixed laws, bring about circumstances in which “the elements shall melt with fervent heat” [2 Peter 3:10]. With such views forced upon us by the contemplation of dynamical energy and its laws of transformation in dead matter, dark indeed would be the prospects of the human race if unilluminated by that light which reveals “new heavens and a new earth” [2 Peter 3:13]. (Qtd. in Smith 185)

Always pushing back further and further (“never to be perfect till that general Doomsday, the ultimate Consummation, and Last of earthly Days” [Carlyle *Past* 20]) what Derrida calls the “anticipatory assimilation of that unanticipatable entirely-other” (“Apocalypse” 23), Carlyle, like the evangelist John, becomes “the cunning eye and ear to whom that God-written Apocalypse will yield articulate meaning” (*Sartor* 41). Carlyle routinely saw himself as John the Evangelist. He described the solitude of life at Craigenputtoch as though it were “a Patmos, only that no revelation is yet forthcoming” (*CL* 5:104). To his brother John, he likened his manners as to “a wild monstrous Orsons among the people, and (especially if *bilious*) smash everything to pieces. The very sound of my voice has got something savage-prophetic: I am as a John Baptist, girt about with a leathern girdle, and whose food is locusts and wild honey” (*CL* 6:320; cf. Matt. 3:1–4). And convinced that “the depths of Eternity look thro’ the *chinks* of that so *convulsed* section of Time,” he saw himself as John at work on *The French Revolution* (1837), “the grand poem of our Time”: “why might not I too prepare the way for such a thing?” (*CL* 6:446). Carlyle, then, is the predictor of things “rushing swiftly on the road to destruction; every hour bringing us nearer, until it be, in some measure, done.” And he attempts to read the “physiognomy of a world

now verging towards dissolution, reduced now to spasms and death-throes" (*Past* 30, 87). His apocalyptic tone, however, emphasizes the need for personal accountability to rebuild the New Jerusalem. At the same time, he flirts with a kind of comic (as against the comedic) apocalypse which discloses, as Alter suggests, an absence of faith (62). What finally orders his world, preventing it from sliding into featurelessness, is not so much laughter or duty but a contemplative community, what Serres calls "an anthropology of exchange" (*Parasite* 45). Carlyle's was historically at war against social dissolution and dismemberment in order to realize the "vital articulation of many individuals into a new collective individual" ("Characteristics" 12).

This essay is dedicated to the Memory of David J. DeLaura and Kenneth J. Fielding (KJ).

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