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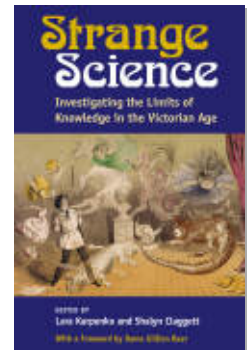
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CHAPTER 13

The Energy of Belief

The Unseen Universe *and the
Spirit of Thermodynamics*

Tamara Ketabgian

In the latter half of the Victorian period, new theories of energy predicted a future as bleak as it was exciting. Promising both the end of the world and its ambitious mastery through theory, this vision followed the contemporary formulation of the two laws of thermodynamics by scientists Hermann von Helmholtz, Rudolf Clausius, and William Thomson (later Lord Kelvin). The first law—of conservation—portrayed a redemptive world of unified, indestructible, and ever-convertible energy, often likened to the eternal power of the divine. The second law, however, was nothing short of apocalyptic, foretelling the path of all closed energy systems to entropy—to waste, disorder, and irretrievably dissipated heat, with the end result of cosmic extinction.¹ Critics Gillian Beer, Bruce Clarke, and George Levine have all eloquently addressed this “degenerative vision” of a finite, fallen universe—a godless world haunted by “terrors” of “death irrecoverable.”² The sun and earth would most certainly perish, as Thomson calculated in 1862; and, according to H. G. Wells, thirty million years hence, the sole remnants of life might well be only a few giant crabs, lichens, and liverworts.³ This chapter examines a particularly fanciful and controversial response to Thomson’s grim

thermodynamic scene: *The Unseen Universe, or Physical Speculations on a Future State* (1875), a work of polytheistic cosmic science that reimagines energy physics as a site of transformative spiritual consolation. In this surprisingly popular treatise, energy serves as a metaphor for belief itself, imagined as a physical force testing the bounds of multiple, invisibly linked worlds.

Coauthored by two established professors of physics, Balfour Stewart (1828–1887) and Peter Guthrie Tait (1831–1901), *The Unseen Universe* redeems the world’s wasted energy as evidence of a possible spiritual afterlife, located in an immortal and invisible beyond. Yet, above all, Stewart and Tait’s text is a determined exercise of rhetoric, in which the work of energy and persuasion are one and the same. Blending Christian apologetics with astronomy, thermodynamics, and a rather partial survey of world religion, their treatise uses the vast dimensions of modern physics—of cosmic breadth and finitude—to evoke a new affective landscape of religious conviction, speculation, and influence. Stewart and Tait thus revise the traditional clockwork view of natural theology to yield a more dynamic vision of the universe as a series of heat engines nested within the luminiferous ether.

While received enthusiastically by mystics and spiritualists, *The Unseen Universe* spurred widespread scientific criticism for its speculative fictions and “philosophical abstractions.”⁴ According to critic William Kingdon Clifford (1845–79), this text merely replaces one form of primitive faith—“the good old gods of our race—sun, sky, thunder, and beauty”—with another—the scientific natural concepts of “substance, energy, and life, under the patronage respectively of the persons of the Christian Trinity” (792). However, as Stewart and Tait argue in the case of vortex atoms, ether, and—of course—energy, many of these concepts are invisible to empirical human observation, and therefore must rely on imaginary representation, speculation, and, ultimately, faith. Through such models and analogies, adapted from natural theology, *The Unseen Universe* seeks both to accommodate the spiritual limitations of its readers and to critique agnostic, materialist scientists for their reliance on similarly abstract fictions. Neither fully provable nor refutable, this thermodynamic fantasy deeply questions the limits of knowledge, the legitimacy of evidence, the purpose of analogy, and the relation between modern science and modern belief.

Beyond its contemporary renown, Stewart and Tait’s treatise led a vigorous afterlife in the years following its publication. The conclusion of this chapter explores *The Unseen Universe’s* forgotten legacy: its for-

mative influence on both popular occult practice and still-urgent philosophical debate on scientific method and the psychology of belief. *The Unseen Universe* inspired enthusiastic citation by Helena Petrovna Blavatsky (1831–91), founder of the Theosophical Society and author of *Isis Unveiled* (1877), an exhaustive account of mystical energy transfer. Yet, aside from Blavatsky, *The Unseen Universe* was the crucial premise for philosopher William James’s (1842–1910) well-known exchange with Clifford on the ethics of faith—a topic that even now informs public discourse surrounding truth claims, scientific authority, and what James later termed “The Will to Believe” (1896). Still shaping how we argue about the unseen, this strange treatise allies scientific belief with the most ethereal of subjects: energy—its loss, its transfer, and the fantasy of its eternal return.

Invisible Worlds and Entropic Redemption

The Unseen Universe sold rapidly and consistently, appearing in no less than fourteen editions in thirteen years. Although its first three editions were published anonymously, its authorship was widely known within scientific circles.⁵ In the text’s first preface, Stewart and Tait claim their central object is “to show that the presumed incompatibility of Science and Religion does not exist.”⁶ Poised at the unsteady juncture between professional science and natural theology, their treatise insists on a method “absolutely driven by scientific principles.”⁷ Its actual procedure is more hybrid and eccentric, blending thermodynamic models of heaven with biblical citations that arguably also provide “trustworthy communication” of the universe’s “intelligent agency” (223–24). Even so, Stewart and Tait were hardly renegades from the evolving British scientific establishment. Solving the problem of entropy symbolically, with the creation of new, energy-filled worlds, *The Unseen Universe* reflects this establishment’s divided stance toward theistic science and its quasi-spiritual vestiges in natural law.

As theistic physicists from the “North British” energy school,⁸ Stewart and Tait held influential roles within mid- and late-Victorian natural philosophy. Both men came of age during the later years of this period’s “undisciplined culture”⁹ and were marked by its broad, predisciplinary mingling of art, science, and speculative theology. Stewart attended Edinburgh University, served as director of Kew Observatory, and then occupied a chair in physics at Owens College, Manchester, where he

earned the Rumford Medal for his research on radiant heat in 1868.¹⁰ A senior wrangler in mathematics at Cambridge, Tait became professor at Queen's College, Belfast, subsequently at Edinburgh University, and was recognized for his collaboration with Thomson on both thermodynamic theories of heat dissipation and their coauthored *Treatise on Natural Philosophy* (1867).¹¹ Like Thomson and other theistic colleagues, Stewart and Tait opposed the secular materialist worldview that John Tyndall so dramatically promoted in his 1874 presidential "Belfast Address" to the British Association for the Advancement of Science. *The Unseen Universe* pointedly responds to Tyndall's call to "wrest from theology, the entire domain of cosmological theory."¹² Tyndall claimed that life was nothing more than a "purely physical condition,"¹³ a simple conversion of energy that—as Graeme Gooday notes—distressed Stewart and Tait precisely because it left "no scope for the exercise of the soul or free will."¹⁴ To counter this restrictive determinism, their text offers an alternate "philosophy of nature,"¹⁵ whose Christianized physics supports the prospect of immortality in a "spiritual universe" that is "full of life and intelligence" (5).

Despite their staunch antimaterialism, Stewart and Tait share many common rhetorical strategies with their agnostic scientific critics, including practices from natural theology, a tradition of religious knowledge based both on the direct study of nature and, frequently, on a "discourse of design."¹⁶ For while we might assume natural theology lost favor after the rise of aleatory Darwinian theory and thermodynamics, the scientific writings of many late-Victorian agnostics still retain powerful vestiges of faith. As historian Bernard Lightman has shown, agnostics such as Tyndall produced a "new natural theology" through their emphasis on empirically observed natural law, order, and beauty.¹⁷ Similarly, many critics, such as John Hedley Brooke and Jonathan Topham, have traced the emergence of an alternate "theology of nature"¹⁸ in the period's professional scientific language, which extols the grandeur of the physical world. Even natural law yielded potentially religious effects, as Barri Gold recognizes in the "grand unified theories" of science that dominated the nineteenth century.¹⁹ Gold argues that the "development of thermodynamic concepts among physicists" supported powerful forms of "faith" and "faithlike" conviction, by reconceiving dissipated energy not as "loss" but as meaningful change.²⁰ Like these implicitly spiritual scientists, Stewart and Tait pose their own redemptive "grand theory" of heaven as a site of energy recycling, treating entropy not as a tragedy but as an opportunity for renewed belief.

Aside from this shared spiritual rhetoric, however, Stewart and Tait approach natural phenomena with a speculative openness that departs dramatically from the methods of their materialist peers. Throughout *The Unseen Universe*, they dwell on the massive spilt energy of our current “visible” world:

All but a very small portion of the sun’s heat goes day by day into what we call empty space. . . . Could anything be more perplexing than this seemingly prodigal expenditure of the very life and essence of our system? That all but a petty fraction of this vast store of high-class energy should be doing nothing but travelling outwards in space at the rate of 188,000 miles per second is hardly conceivable, especially when the result of it is the inevitable destruction of the visible universe. (197)

Instead of conversion into other productive uses, this lost power is a “perplexing” dead end in the form of stagnant and chaotically dispersed heat. Starkly apocalyptic, this wasted energy ultimately signals an “earth unfit for habitation” (196) and a universe fated to end. Yet, as a symbol, this scene of entropy also reveals telling distinctions between secular science and *The Unseen Universe’s* more byzantine project of spiritual interpretation. Whereas materialists marveled at the world’s waste as an affecting mark of its finitude, Stewart and Tait viewed this excess as a physical—and metaphysical—sign for which science must account. Unlike agnostics such as Tyndall, who treated physical laws and objects as sufficient consolations in and of themselves, Stewart and Tait regard these spectacles as expansive spiritual traces, betokening invisible correspondences beyond the reach of rational inquiry. Ultimately, their treatise suggests that privileged meaning does not lie in material forms, but in what these forms express in other transcendent registers.

In Stewart and Tait’s symbolic logic, waste paradoxically asserts the presence of its own hidden corrective: heaven. Lost power serves as evidence of a “state of intimate mutual relation” between “visible and invisible” worlds (248), thus signaling the existence of a fantastical “*paraspacē*”²¹ an alternate realm that doubles as a thermodynamic heat sink. For Stewart and Tait, this heaven-like site is “connected by bonds of energy with the visible universe.” This invisible world both “receiv[es]” and “transform[s]” our spent power, through acts of gradual transfer and absorption (199). Supporting new forms of spiritual insight, our leaky universe is invisibly linked to another, through redemptive bonds, “pulses,” “rents,” and “cracks” (198, 221).

More than proof of an alternate world, this pervasive energy transfer also reveals the immortal, miraculous, and infinite nature of heaven. In *The Unseen Universe*, death fuels immortal life, and the decline of our world will sustain the vitality of the next. Reversing the course of entropy, the resulting “invisible universe” will be “full of energy when the present universe is defunct” (200). The immortality of the human soul results from this same exchange, which will preserve the material “motions which accompany thought” (199) and, with them, both the mind’s “power of action in the present” and its “hold upon the past” through memory (200). For all the atoms that form matter, Stewart and Tait’s site is both the final end and original source of our present world’s power. As in a machine or other closed thermodynamic system, their unseen universe serves as the necessary “material antecedent” for “each transformation of energy” (184). Stewart and Tait thus follow popular nineteenth-century models of entropic creation, which, according to critic Helge Kragh, treat our world as a “finite-age, created universe” that “must have had a beginning.”²² Even miracles stem from “transmutations of energy from the one universe into the other,” governed by a “principle of Continuity” (vii)²³ that supports “an endless chain of events” (257–58).

While Stewart and Tait remain vague on the actual form and content of heaven, they base their vision on analogies largely from fluid mechanics. At first, both authors speculate on our world’s link to a single alternate universe, which is revealed through the irregular surface film of a greater ethereal fluid:

We may suppose our (essentially three-dimensional) matter to be the mere skin or boundary of an Unseen [universe] whose matter has *four* dimensions. And, just as there is a peculiar molecular difference between the surface-film and the rest of a mass of liquid—wherever such a surface-film exists, even in the smallest air-bubble—so the matter of our present universe may be regarded as produced by mere rents or cracks in that of the Unseen. (221)

This fluid model is in turn succeeded by a more rarefied field of many bubble-worlds, forming “four-dimension boundaries of the five-dimensional matter of a higher Unseen, and so on” (221), in an image that anticipates postmodern accounts of the multiverse in quantum physics.²⁴ Stewart and Tait thus imagine “an infinite series of Universes, each depending on another” and sharing among them both “an infinite

store of energy” (222) and a deity of sorts—an “intelligent developing agency” (221). Compared to bubbles, heat engines, and other linked yet contained systems, these multiple worlds arise within the fluid, invisible medium of the ether, another abstract scientific model that this essay will subsequently explore. Throughout *The Unseen Universe*, Stewart and Tait openly concede the obscurity of such models—and suggest that human limitations are to blame: our inability to grasp refined spiritual phenomena “explain[s] . . . how it is that so very little of the nature of the definite description of the Unseen is given” (221–22).

The Unseen Universe is a strange and often unaccountable work, claiming scientific authority while it defends its own obscurantism as necessary and inevitable. Yet, more than a spiritual apologetic or compromise formation, this text actively employs concepts from Victorian energy physics to support its unusual spiritual speculations. Through inventive analogy, Stewart and Tait rewrite the pivotal drama of fin de siècle physics—what philosopher Michel Serres has termed the birth of an “irreversible and irrevocable” view of “thermodynamic time.”²⁵ In this new image of a “closed-isolated” world, “energy dissipates,” “entropy increases,” and “time is endowed with a direction. It is irreversible and drifts from order to disorder,” and, finally, to death.²⁶ While other Victorians mourned this finite world of entropic closure, Stewart and Tait seek to reopen it with their own grand theory of a multiverse fueled by infinite energy and belief.

Natural Theology and the Energy of Persuasion

The Unseen Universe's emphasis on energy is deeply intertwined with its goals and structure as a work of natural theology. As an updated apologia of thermodynamics as divine law, this text reads the Book of Nature as a series of interlinked engines, defined both by the mechanical powers of life and the vital powers of the machine.²⁷ Following physicist Sadi Carnot (1796–1832),²⁸ Stewart and Tait compare the functions of the universe to those of a steam motor, defined by its conversion of force, its containment of pressure, and its enclosed chambers of hot and cold—all fueled by the heat of the sun. In their resulting geography of spiritual revelation, energy is harnessed and recycled in an extensive network of closed—and potentially open—systems. What is more, in *The Unseen Universe* this same irresistible energy is also that of persuasion, working toward the spiritual and thermodynamic conversion of readers. Stew-

art and Tait thus use a blend of mechanical and theological rhetoric—of analogy, accommodation, and divine design—to portray belief as a relentless force driven to transcend limits.

Treating their universe as a collection of subtly crafted devices, Stewart and Tait adopt William Paley's still-popular brand of late eighteenth-century natural theology, which compares natural objects to watches that display skill, artistry, and intrinsically mechanical design. As Paley stresses in his treatise *Natural Theology* (1802), the study of these objects will show that "there cannot be design without a designer, contrivance without a contriver, order without choice."²⁹ For Paley, this felt experience of "contrivance" is our closest access to the divine, offering a path to spiritual faith and wisdom through technical objects, narratives, and systems.³⁰ Grounded in a common discourse of design, this language of mechanical immersion is inseparable from natural theology and its allied narratives of divine intention and intelligence.

As figurative aids for spiritual persuasion, these mechanical forms follow the theological doctrine of "accommodation," which argues that "God adapts himself to human capacity in his revelation,"³¹ adjusting his "infinite mysteries" to our limited minds, souls, and senses.³² As Paley notes, "It is only by the display of contrivance, that the existence, the agency, the wisdom of the Deity, *could* be testified to his rational creatures" (38–39). He defines these contrivances as God's rhetorical exercise for humanity's benefit,³³ addressing our restricted "faculties [as] formed at present" (40). Indeed, Paley asks, otherwise "why resort to contrivance, where power is omnipotent?" (38–39). Life and the natural world thus serve as analogic, mechanical models of divine wisdom, purposely designed to aid people in their religious explorations. As viewed by Paley, analogy both spurs rational analysis and suggests an alternate spiritual realm, accessible only through "contrivance" and accommodation.

The Unseen Universe adopts a similar interpretive process, one rooted in the phenomenal experience of complex and often inaccessible technical objects—namely, the world's "vast heat-engine" (126), which is in turn populated by other engines both literal and figurative, both "animate" and "inanimate" (182). Invoking a Paleyan discourse of design, Stewart and Tait emphasize the delicacy, complexity, and obscurity of our world's "animate" machines. These living systems support more "sudden and violent . . . transmutation[s] of energy," much like a "rifle at full-cock, with a delicate hair-trigger . . . where the slightest touch from without may bring about the explosion of the gunpowder, and

the propulsion of the ball with a very great velocity” (183). According to our authors, a similar process may occur in human beings, where “a very small and obscure transmutation of energy in the mysterious brain chamber may determine some very violent motion” (185). The resulting actions may seem abrupt or irregular to our limited perceptions as viewers. However, as both physicists conclude, we are simply unaware of their delicate origins and the greater divine and mechanical causes that govern such unpredictable acts.³⁴

While *The Unseen Universe* stresses life’s obscure complexity for human viewers, it dwells most pointedly on the spiritual knowledge of its fallible and receptive readers. In general, Stewart and Tait suggest that *all* people require divine aid to amplify their restricted vision: like ants, human beings view the uprooting of their hill as a process “mysteriously perplexing, far transcending their experience, but *we* know, very well that the whole affair happens without any breach of continuity of the laws of the universe” (248). Yet, while all mankind is arguably antlike in this scenario, the authors address a more specific audience—the ambiguous and presumably more enlightened “we” of the passage. Stewart and Tait write neither for confident religious believers, nor for extreme scientific materialists (70–71), but for “honest doubters” (202), who “see strong grounds for belie[f]” yet have “deeply studied the scientific objections and do not well see how to surmount them” (71). This ideal audience is vital to the *Unseen Universe*’s success as an immersive experience of spiritual belief and interpretation.

Relying on the receptivity of its readers, this treatise resembles spiritualist experiments later conducted by the Society for Psychical Research and even analyzed by Stewart himself as a SPR council member and president seeking to document the empirical conditions for observing “psychic force” and telepathy.³⁵ Spiritualists commonly faulted skeptical materialist observers for disrupting the delicate environment required for experimental success, as when Tyndall undermined the necessary “mental and physical passivity” for a séance in 1864.³⁶ For such mediums, as for Stewart and Tait, the spiritual disposition of observers would crucially shape the success and authority of their efforts at persuasion. *The Unseen Universe* compares this task of reception to “a great steamer . . . carrying two sets of passengers”: religious thinkers on deck, concerned with the greater purpose and direction of their voyage, and scientific thinkers “remaining below,” who question how the steamer’s engines actually work (25). With its “honest doubters,” Stewart and Tait’s ideal audience ranges *both* above and below deck, dwelling both on broader

visionary theory and on more empirical practices, in a stance that combines abstract and material ways of seeing.

As Stewart and Tait show in the hybrid viewpoint of their reader-passengers, mechanical analogy serves as the ultimate vehicle for accommodation, inviting not only detailed technical interpretation but also speculation on realms beyond human analysis. Defined by philosophers and theologians as a specialized technology of perception, employing cognitive “correction and qualification,”³⁷ analogy uses comparison to bridge the gap between our ordinary sense of language and a more speculative sense where such language might apply to God. In his review of *The Unseen Universe*, William James notes precisely this process of spiritual immersion and extrapolation in readers who—through analogy—use their own “faith or fancy [to] . . . fill out [the] details” of Stewart and Tait’s models of mechanical natural law and “continuity.”³⁸ Here analogy supports the accommodation of limited human faculties, as a technical and rhetorical “contrivance” intended to aid spiritual exploration.

As a form of religious argument, analogy has long been faulted for falsely comparing (and conflating) its objects with a divine referent. Stewart and Tait recognize the figure’s fictive aspects and acknowledge their role in supporting similar forms of linguistic immersion and approximation. They concede, “We are to some extent constructors, and find analogies in nature which seem to us to throw light upon the doctrines of Christianity” (vii). As Stewart and Tait suggest, they seek to estimate and *simulate* scientific proof rather than to provide such evidence according to accepted empirical standards: “Although our evidence from analogy may not amount to proof, it is very strong. What we have done is to show that a future state is possible, and to demolish any so-called scientific objection that might be raised against it. Evidence in favour of the doctrine is not derived from us” (211). Aiming only to speculate on possibilities, they do not intend to prove the affirmative presence of the unseen universe but rather that it is *not impossible*: “There is nothing . . . to lead us to suppose that life is impossible after death” (10). Similarly, they argue, “We cannot deny the possibility of a future life” (6). As in many works of natural theology, this language of double negatives, conditionality, passivity, and constraint is also one of affective force—of emotional energy and the power of belief. Stewart and Tait “*feel constrained* to believe”; they “*are forced* by a purely scientific process to recognize the existence of an Unseen Universe” (6–7).³⁹ Their evidence from analogy is “strong” (211), affecting, and “absolutely *driven by* scientific principles” (5).⁴⁰ Ideally receptive, like the members of a spiritualist séance,

Stewart and Tait's readers are materially moved toward belief, through an unseen transfer of affective energy between the abstract tenor and technical vehicle of analogy. In effect, this transfer stages—both psychically and analogically—the same conversion and release of power that occurs between Stewart and Tait's invisible worlds.

The Unseen Universe locates this energy of belief in a cosmic geography of breadth and finitude—of barriers, breaks, and “grand avenue[s]” (16). For Stewart and Tait, our current visible universe is “a limited area bounded by an impenetrable wall, which, if we could only pierce it, would admit us at once into the presence of the Eternal” (96). This confined “area” evokes both the limits and possibilities of the period's newly evolving disciplines, including fields (physics) formerly housed in the more expansive realm of natural philosophy. Here the scientist seeks “to clear a space . . . from which all mystery shall be driven away” and where “nothing [exists] but matter and energy subject to certain definite laws which he can comprehend” (237). Yet, as Stewart and Tait suggest, this “little clearing” (viii) cannot address the greater spiritual mysteries “of the soul's domicile,” “of life and intelligence,” and “of God” (237). Grounded in empiricism, this limited “circle” (237) bars any speculation beyond its own visible and materially verifiable phenomena. Accordingly, the unseen “avenue” between physics and theology “has been walled up and ticketed with ‘[n]o road this way,’ professedly alike in the name of science at the one end, and in the name of the religion at the other” (272).

Despite these setbacks, *The Unseen Universe* still urges us to dwell closely on the limits of our small circle of knowledge. If we wish to grasp “the properties of the unknown lying beyond or at the boundary of our little ‘clearing,’” we must “go up to it and examine it often, with long continued labour, under great difficulties” (viii). For, as Stewart and Tait suggest, these sites of closure nonetheless contain significant breaks and anomalies, which “are in reality so many partially concealed avenues leading up to the unseen” (250). Like our world's “lost” energy, these breaks reveal a miraculous “universe within a universe, a portion cut off by an insurmountable barrier from the domain of scientific inquiry” (90). Moreover, the actual closure of this “barrier” even more powerfully signals the presence of the “Eternal” (96), in forms of vision beyond the literal and material. Throughout *The Unseen Universe*, these borders sustain intensity of faith through speculation born of confinement. Their very limits allow for the possibility of an infinite beyond, reconciling our universe's closed world with the open realm of divinity.

Confining one space in order to leave another unbound, *The Unseen Universe* performs the spatial and rhetorical equivalent of a double negative: its barriers *cannot negate*—and thus arguably affirm—the prospect of a mystical site that transcends scientific measure and method. For Stewart and Tait’s receptive readers, these boundary worlds restage the process of empirical observation as a capacious field of spiritual and mechanical extrapolation. Through these scientific fictions, analogies, and accommodations, *The Unseen Universe* enacts nothing less than a fantasy of breaching our closed world and reversing the relentless path of entropy and time. As a visionary blend of natural theology and thermodynamics, this text recasts systemic closure as a transformative avenue of openness and abundance.

Imaginary Science and the Ether

Testing the limits of different worlds, disciplines, and beliefs, *The Unseen Universe* uses boundary play to simulate an alternate realm of hypothetical scientific law. In effect, Stewart and Tait pose a form of “imaginary science,” to invoke theorist Istvan Csicsery-Ronay’s view of science fiction as a speculative genre that employs “an *image* of science, a poetic illusion disguising its illusionary status.”⁴¹ Like science fiction and, arguably, many works of natural theology, *The Unseen Universe* treats science as an immersive symbolic, speculative, and technically specialized mode of representation. Yet, as their successive prefaces and revisions show, Stewart and Tait are also clearly sensitive to attacks on their “imaginary” enterprise. Throughout *The Unseen Universe*, Stewart and Tait argue that Clifford’s charge—of abstract, fictive representation—could also be leveled toward all established science. For, as they repeatedly ask, when is science *not* fiction? How might we distinguish science from “imaginary science”—from speculative fancy or false analogy? These questions arise most pointedly in the case of atoms and the ether, as two conceptual abstractions that ground both mainstream late Victorian physics and *The Unseen Universe*’s more eccentric reflections.

Stewart and Tait openly recognize the provisional, statistical, and analogical role of scientific law and representation, especially in the field of thermodynamics. They argue that analogy and speculation *best* capture the shifting picture of this world, with its unexpected breaks and deviations. Promoting a more flexible approach toward scientific law as a figural representation, they argue for

a more complete and continuous explanation for the visible order of things than one which proceeds upon the assumption that there is nothing else. In this respect we may liken it to the hypothesis of atoms, or that of an ethereal medium, for neither of which we have the direct evidence of our senses, both of which have nevertheless been adopted as affording the best explanations of the phenomena of the visible universe. (74)

The Unseen Universe thus upholds speculative fiction over rigid statistical materialism. Its defense of analogy holds not only for its own invisible worlds, but also for any number of authoritative scientific hypotheses that are, at heart, conjectural.

Advocating imaginary science, Stewart and Tait fault the rigid authority of laws that “appear at first sight to hold exactly, or which, in other words, have the appearance of absolute truths” (98). They instead argue that “the laws of energy are rather generalisations. . . . There would be no permanent confusion of thought introduced if these laws should be found not to hold, or to hold in a different way, in the unseen universe” (210). This protest against homogenizing scientific law is indebted to the “counterfactual speculations”⁴² of their friend and fellow physicist James Clerk Maxwell (1831–1879)—and especially to Maxwell’s “Demon.” In an 1867 letter to Tait, Maxwell first mentions this “very small BUT lively being” as a thought experiment devised to “show that the 2nd Law of Thermodynamics has only a statistical certainty.”⁴³ Working against entropy, Maxwell’s being serves as an intelligent “valve,”⁴⁴ sorting the fast- and slow-moving molecules of a gas through a small trapdoor into separate hot and cold chambers, and thus defying the tendency toward uniform temperature that would otherwise result from thermodynamic equilibrium. According to critic Daniel Brown, Maxwell likely viewed *The Unseen Universe* as “an intemperate version of his own scientific efforts to understand the unseen by analogy with the seen.”⁴⁵ Nonetheless, as Brown notes, his demon shares with Stewart and Tait an emphasis on anomaly and theistic free will in the face of reductive scientific determinism.⁴⁶ *The Unseen Universe* repeatedly stresses these “very slight deviations from exactitude,” which we will inevitably discover in natural law “as time passes on, and our instruments become more delicate” (86).

Continually subject to such fine deviations, atoms and molecules arguably serve as one such statistical fiction in Victorian physics. For Stewart and Tait, atoms serve as prominent figures of natural theology: their “physical properties . . . form the alphabet which is put into our hands

by God,” as accommodating aids for reading “that Great Book which we call the universe” (238). As objects of divine design, molecules display what both Maxwell and John Herschel deem “the essential character of a manufactured article.”⁴⁷ Their “exact equality” and material consistency “preclude . . . the idea of [their] being eternal and self-existent”⁴⁸ and presumably reveal their creation from nothing, albeit through religious rather than mathematical generalization. More than a divine mystery, however, the single molecule also remains a profoundly unknown—and unpredictable—site in existing scientific law. Tyndall recognizes them as “mental image[s] of the ultra-sensible,”⁴⁹ and, as Maxwell warns, physical experiments can only address “millions of molecules”; we therefore “cannot . . . ascertain the actual motion of any one of these molecules” from “statistical information.”⁵⁰ The individual particle is thus a fertile realm of potential anomaly, much like *The Unseen Universe’s* own cosmic breaks and divergences. For, while the atom’s physical uniformity would apparently gesture to God—or at least to “the point at which Science must stop”⁵¹—its *departure* from the aggregate poses a different scientific challenge.

Yet beyond individual or multiple atoms, the ether forms the most powerful speculative frontier in *The Unseen Universe*, as a “continuous medium”⁵² that invisibly unites its recursive worlds while also allying Christian and scientific worldviews. Widely accepted in late-Victorian physics, this plenum is composed of material “of a different and higher order than that of ordinary matter.”⁵³ *The Unseen Universe* defines it as a viscous, semifluid substance, consisting of both closed vortex rings and vortex filaments⁵⁴ that transmit light, heat, and all other energy through their subtle “vibratory motion” (149). For Stewart and Tait in particular, the ether offers a powerful symbolic solution to the organization of matter, the structure of multiple worlds, and the mechanics of spiritualized energy transmission. Influenced by the philosopher Thomas Young, they craft this system as a recessive scale of vortex rings in the image of a divine Great Chain of Being.⁵⁵ In addition to fluid models of bubbles, Stewart and Tait compare its structure both to concentric smoke circles and to an infinite chain of nested knots, represented by the “symbolic monogram”⁵⁶ of a trefoil knot on the title page of their first two editions. These recursive worlds are ordered according to increasingly rarefied levels of substance, ranked from lower to higher matter and, respectively, from lesser to greater energy (219). In sum, they form “an infinite series of Universes,” together containing “an infinite store of energy” (222). This transfer and distribution of energy crucially exploits entropy in its

distinctive model of the ether as an imperfect fluid subject to minute amounts of friction. *The Unseen Universe* celebrates this fractional process of loss and absorption, through which all of “the available energy of the visible universe will ultimately be appropriated by the ether” (157) and reproduced in eternity.

Tellingly, Stewart and Tait stray from scientific consensus in their portrait of the ether. Treating this substance not as a perfect plenum but as a leaky fluid subject to waste and transformation, our authors imagine an imperfectly redemptive world, populated by lively demons, disorderly atoms, and invisible deviations. Baroque and eccentric, these speculative fictions challenge the deterministic rigidity of materialism, fueling a contest of validity that indelibly marks both established Victorian science and its imaginary complement in *The Unseen Universe*. In the resulting climate of debate, the ether wielded the authority of an active experimental site where “a whole order of forces was waiting to be discovered.”⁵⁷ As we shall see, *The Unseen Universe* skillfully exploited these undiscovered forces, in a narrative of energy transfer that inspired many emulators.

Afterlives of the Unseen Universe: Blavatsky and James

In his review of *The Unseen Universe*, Clifford fears for its future influence: “The alleged possibilities which [the authors] have opened up will not be used only in the way which they themselves could wish. Put ever so innocent a breadknife into the hands of a maniac or a murderer and it will be not one whit less dangerous because it was never intended to cut flesh” (781). Clifford believes this work will embolden spiritualists and fuel primitive superstition—if not worse. Directly addressing Stewart and Tait, he warns, “That which you keep in your heart, my brothers, is the slender remnant of a system which has made its red mark on history, and still lives to threaten mankind” (793). Shaped by Stewart and Tait’s Christianized physics, Blavatsky’s Theosophical Society certainly supports Clifford’s premonitions, although hardly in their most luridly violent form. Moreover, *The Unseen Universe* remains the surprisingly forgotten premise for ongoing debates in philosophy and the emerging discipline of psychology, including claims made by James both in an initial 1875 review and in his later essay, “The Will to Believe.” For James and Blavatsky, as for other thinkers who succeeded them, this thermodynamic fantasy continued to spur controversy as a limit case for scientific belief and spiritual persuasion.

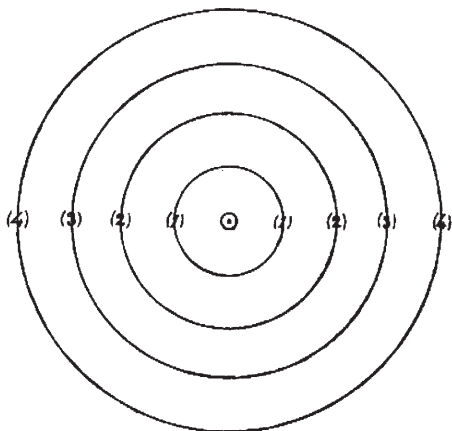


Fig. 13.1. Concentric circles, illustration in [Balfour Stewart and Peter G. Tait,] *The Unseen Universe, or, Physical Speculations on a Future State*, 2nd ed. (London: Macmillan, 1875), 171. (Public domain Google e-book.)

Untroubled by criticism of Stewart and Tait's methods, late Victorian mystics and occultists avidly cited *The Unseen Universe* as authoritative evidence. Especially vocal among these emulators was Blavatsky, who repeatedly invokes this text in her account of theosophy as a system of occult knowledge based on the ether's transmission of invisible spiritual forces and astral forms.⁵⁸ For, just as Stewart and Tait use the ether to challenge orthodox science, so too does Blavatsky question their privileged access to the topic in specialized professional circles. Brandishing *The Unseen Universe's* rhetorical breadknife, she asks, "If scientists [may] indulge in . . . speculations" on ethereal energy transfer, "why should occultists and spiritualists be refused the same privilege?"⁵⁹ Although Blavatsky quotes Stewart and Tait with appreciation, she also argues that occultists have long pursued such inquiry beyond the mantle of scientific authority. In *Isis Unveiled*, she notes, "What the intelligent explorers of the *Unseen Universe* speculate upon, [is] to the masters of hermetic philosophy familiar science. To them ether [is] not merely a bridge connecting the seen and unseen sides of the universe," but a "road" whose "mysterious gates" they have already unlocked and entered (*Isis* 189). Combining spiritualist practices with a "synthesis of Western esotericism and . . . primarily Buddhism and Hinduism,"⁶⁰ Blavatsky's Theosophical Society promises the acquirement of secret wisdom allied with "cabalist, neo-Platonic, and Hermetic" forms of thought.⁶¹ Even so, her writings most closely ally the movement with a vision of latent and universal energy, based on the validating language of thermodynamics and scientific law. In her *Key to Theosophy* (1889), Blavatsky advises all adepts "to



THE
UNSEEN UNIVERSE
OR
PHYSICAL SPECULATIONS
ON A
FUTURE STATE

— the things which are seen are temporal, but the things which are
not seen are eternal.

SECOND EDITION.



London
MACMILLAN AND CO.
1875.

Fig. 13.2. Trefoil knot from the title page, illustration in [Balfour Stewart and Peter G. Tait,] *The Unseen Universe, or, Physical Speculations on a Future State*, 2nd ed. (London: Macmillan, 1875), iii. (Public domain Google e-book.)

investigate the hidden mysteries of Nature under every aspect possible, and the psychic and spiritual powers latent in man especially.”⁶² These frequent allusions to spiritual force seek to legitimate theosophy as an authoritative form of science, grounded in the physical and metaphysical study of nature.

Through her mythology of traveling astral forms and thought-impulses, Blavatsky embraces Stewart and Tait’s redemptive fantasy of the universe’s latent and ever-abundant energy, as Bruce Clarke has extensively shown.⁶³ She describes astral souls as “centre[s] and engine[s] of force, fed from the universal supply of force, and moved by the same general laws which pervade all nature and produce all cosmical phenomena” (*Isis* 197–98). Once this astral “*perispit*” leaves the confines of its living human body, it moves through the ether, “alight[ing] at the threshold of the mysterious ‘bourne’” between seen and unseen worlds, where it “can look but through a chink” (*Isis* 159). Like the revelatory breaks of *The Unseen Universe*, this “chink” marks a site of spiritual transfer and conversion, promising greater mystical vision. In *Isis Unveiled*, the ether transmits these astral souls and influences as “thought-impulse[s]” carried “through the ever-interchanging currents of energy between the two worlds, the visible and the invisible, from one succeeding age to another, until it affects a large portion of mankind” (*Isis* 181). This ambitious vision of force and influence dominates *Isis Unveiled* and *The Unseen Universe*. For, as Clarke recognizes, both texts view the ether as an invisible and universal “medium of information storage and retrieval”—a “cosmic data bank”⁶⁴ that captures every thought and every action as transferred and recuperated power. These totalizing fictions of energy model the greater logic of *The Unseen Universe*, as a form of imaginary science supporting expansive symbolic systems of faith, persuasion, and consolation.

James’s review of Stewart and Tait’s text responds, above all, to this expansiveness. His essay for the *Nation* marvels at their treatise’s sheer “vastness of scale” (*Essays* 293)—its grandiose reshaping of thermodynamics into a cosmic geography of belief. Like Blavatsky, he views this text as inseparable from modern debate surrounding scientific authority and imaginative speculation. In fact, James notes, *The Unseen Universe* is entirely consistent with the “vast theories” of other established scientists, which remain as “unverified to-day . . . as any of the theosophies of the past” (*Essays* 115). Offering a nod to mystics and spiritualists, he argues that we must treat all grand speculators equally, leaving no room for scientific exception in our current “age of synthesis” (*Essays* 115). As

James therefore urges, grand unified theory should “be distinctly recognized for what it is—the mood of Faith, not Science” (*Essays* 115). James certainly shows ambivalence toward Stewart and Tait’s use of traditional religious rhetoric, which he faults as “precisely identical with those of the most primitive, ‘unscientific,’ and short-winded natural theologian” (*Essays* 293). Discounting the emotional effects of analogy and accommodation, he treats these rhetorical forms as serving “apparently no function but to keep up logical appearances” (*Essays* 293). Nonetheless, the philosopher commends the magnitude of Stewart and Tait’s greater vision. “It is,” he reflects,

only the incomparable superiority of the modern scientific imagination on its *quantitative* side that . . . give[s] our author[s’] speculations a different aspect . . . [Stewart and Tait] may enjoy the credit of having attacked the problem of natural theology (and solved it in [their] way) on a scale not unworthy of the grandeur of the theme’s dimensions. (*Essays* 293)⁶⁵

Indeed, James suggests that, as argument, the deep structure of *The Unseen Universe* lies in this massive spatial and quantitative scale, which uses the distinctive terms and dimensions of modern physics to model a new affective landscape of modern belief. For James, the *Unseen Universe* does *not* establish a satisfactory continuity between mechanical reasoning about facts and teleological reasoning about final causes. However, it still “widens the data and horizon which teleology receives from science” (*Essays* 294). For those reasons alone, *The Unseen Universe* should inspire trust in readers—if that trust makes a difference. Or, to use James’s own words, “We for our part not only hold that such an act of trust is licit, but we think, furthermore, that any one *to whom it makes a practical difference* (whether of motive to action on or of mental peace) is in duty bound to make it” (*Essays* 293–94). Here James promotes a stance of speculative receptiveness toward “trust” and allied forms of belief—as impulses crucially spurred by human interest, emotion, and, even, duty.

Critics have subsequently questioned James’s use of the term “duty” to describe this act of belief. In a later debate with the philosopher Chauncey Wright, James sought to retract the term for one reflecting a more “prudential,” rather than simply “moral,” obligation to believe.⁶⁶ Although James eventually replaced the term “duty” with “will,” biographer Ralph Perry argues that “his favourite replacement for it was ‘The Right to Believe,’”⁶⁷ presumably because “there was . . . an equal right *not*

to believe.”⁶⁸ Philosophers continue to debate how free or constrained James’s notion of belief is—and whether we should view it as a duty or a “liberty” that “we are *free* to choose.”⁶⁹ Notably, James emphasizes the context and consequences of such belief—that its pursuit might make “a practical difference.” In this respect, we are “duty bound” to believe *if* it benefits us. As critic James Wernham notes, James here ultimately supports an “ought to believe” or “foolish-not-to-believe doctrine”:⁷⁰ the double negative (we may not *not* believe) recalls Stewart and Tait’s own claims that they “cannot deny the possibility of a future state” (6). Like the authors of *The Unknown Universe*, James advocates for openness in the face of uncertainty and constraint.

Upholding receptivity and intellectual possibility, James’s review shaped his later renowned essay “The Will to Believe.”⁷¹ This lengthier essay argues “*in justification of faith, [as] a defense of our right willfully to adopt a believing attitude in religious matters, in spite of the fact that merely logical intellect may not have been coerced.*”⁷² Here, too, James supports the opportunity of belief, despite incomplete or inadequate proof. He urges us to resist our scientific fear of credulous belief—“the awful risk of believing lies” (*Will* 18)—an impulse that both Clifford and Tyndall openly state as motivating their empirical approaches. James even goes so far as to suggest that “science has organized this nervousness into a regular *technique*, her so-called method of verification,” which cares not “for truth by itself at all,” but “only truth as technically verified” (*Will* 21). He questions not only the defensive, technical aspects of scientific method but also—like Blavatsky—the double standard enjoyed by scientists free to speculate at will: these individuals “yield to the pleasures of taking for true what they happen vividly to conceive as possible” (*Essays* 115). Instead, James proposes an affective stance of openness and speculation that supports belief in the unseen, the uncertain, and the unknown. In the face of modern science and its battery of empirical limits and techniques, he dwells on questions of readerly disposition. Stressing the human costs and benefits of belief, James urges a receptivity that recalls Stewart and Tait’s accommodation of “honest doubters” (202), as well as the flexible, speculative form of their treatise itself.

James’s response to the rallying cry “believe nothing” may seem an obscure chapter in the mixed destinies of late Victorian natural theology and thermodynamics. Yet, as refracted through both his lens and that of occult practitioners, *The Unseen Universe* highlights still-urgent questions surrounding belief, persuasion, imagination, and, above all, speculation. As a form of modern spiritual and scientific consolation,

speculative openness is this text's—and, indeed, also James's—enduring stance toward a closed and finite world. For, absent truly positive evidence or revelation, Stewart and Tait suggest the best approach may simply be to maintain imaginative openness in the face of physical and intellectual limits. In *The Unseen Universe*, this speculative flexibility overcomes barriers through the sheer persuasive force of thermodynamic analogy in all of its vastness. Recasting limitation as a field of fanciful possibility, Stewart and Tait explore a baroque range of scientific fictions, theistic models, and rhetorical devices, ranging from atoms and the ether to bubble-forms and heat-engines. Nonetheless, energy and entropy remain its greatest source of imaginative transformation, spurring both this text's central dilemma—the end of the world—and its symbolic solution—alternate realms. Sustaining the leaky chain of cosmic conversion and redemption, this energy not only assumes the speculative structure of belief; it also tests the rival claims of science and belief themselves as a site of rhetorical convergence that intensely questions the limits of knowledge and the legitimacy of evidence. For, as James observes in “The Will to Believe,” in many cases of established scientific theory, the distinction between hard fact and speculative faith is nothing if not fluid: “Our faith is faith in some one else's faith, and in the greatest matters this is most the case” (*Will* 9). Beyond its traces in mysticism and theosophy, *The Unseen Universe's* most formative legacy lies in this ever-urgent debate surrounding the unstable and potentially fictive basis of scientific truth claims. As James, Blavatsky, and our two authors show, both orthodox science and *The Unseen Universe* share a deep mythic and speculative core, as immersive technical and symbolic representations designed—like natural theology—to evoke belief. Through Stewart and Tait's inheritors, this expansive spiritual vision still inspires and attends us today, in the fantastic abstractions of both imaginary science and its modern symbolic complement, science fiction.

Notes

I would like to thank Shalyn Claggett, Lara Karpenko, and Daniel Youd for their invaluable help in revising this chapter.

1. For an especially nuanced account of the first and second laws of thermodynamics, and of the corresponding literary imagination, see Barri J. Gold, *ThermoPoetics: Energy in Victorian Literature and Science* (Cambridge: MIT Press, 2010).

2. George Levine, *Darwin and the Novelists: Patterns of Science in Victorian Fiction* (Cambridge: Harvard University Press, 1988), 156; Gillian Beer, *Open Fields: Science in Cultural Encounter* (Oxford: Clarendon Press, 1996), 262.

3. H. G. Wells, *The Time Machine* (Harmondsworth: Penguin, 2005), 82.
4. W[illiam] K[ingdon] Clifford, "The Unseen Universe," *Fortnightly Review* 17, no. 102 (June 1875): 792. Hereafter cited parenthetically.
5. Cargill Gilston Knott, *Life and Scientific Work of Peter Guthrie Tait: Supplementing the Two Volumes of Scientific Papers Published in 1898 and 1900* (Cambridge: Cambridge University Press, 1911), 236–37. Arthur Schuster, Stewart's successor at Owen's College, believed Tait "played a very secondary role in the writing of the *Unseen Universe*. The work was largely Stewart's." See Schuster, *Biographical Fragments* (London: Macmillan, 1932), 214–25, quoted in Janet Oppenheim, *The Other World: Spiritualism and Psychical Research in England, 1850–1914* (Cambridge: Cambridge University Press, 1985), 472.
6. [Balfour Stewart and Peter G. Tait,] *The Unseen Universe, or, Physical Speculations on a Future State*, 2nd ed. (London: Macmillan, 1875), xi.
7. Balfour Stewart and Peter G. Tait, *The Unseen Universe, or, Physical Speculations on a Future State* (1901; New York: Cosimo Classics, 2007), 5. Hereafter cited parenthetically.
8. Crosbie Smith, *The Science of Energy: A Cultural History of Energy Physics in Victorian Britain* (Chicago: University of Chicago Press, 1998), 254.
9. Jay Clayton, *Charles Dickens in Cyberspace: The Afterlife of the Nineteenth Century in Postmodern Culture* (Oxford: Oxford University Press, 2006), 8.
10. Greg Myers, "Nineteenth-Century Popularizations of Thermodynamics and the Rhetoric of Social Prophecy," *Victorian Studies* 29, no. 1 (1985): 50; Robert Hughes Kargon, *Science in Victorian Manchester: Enterprise and Expertise* (Baltimore: Johns Hopkins University Press, 1977), 214–24.
11. Iwan Rhys Morus, *When Physics Became King* (Chicago: University Chicago Press, 2005), 140.
12. Knott, *Life and Scientific Work*, 236; John Tyndall, *Fragments of Science: A Series of Detached Essays, Addresses, and Reviews*, vol. 2 (New York: D. Appleton, 1898), 197.
13. Tyndall, *Fragments of Science*, 190.
14. Graeme Gooday, "Sunspots, Weather, and the Unseen Universe: Balfour Stewart's Anti-materialist Representations of 'Energy' in British Periodicals," in *Science Serialized: Representations of the Sciences in Nineteenth-Century Periodicals*, ed. Geoffrey N. Cantor and Sally Shuttleworth (Cambridge: MIT Press, 2004), 112.
15. P. M. Heimann, "The 'Unseen Universe': Physics and the Philosophy of Nature in Victorian Britain," *British Journal for the History of Science* 6, no. 1 (1972): 73.
16. Jonathan R. Topham, "Science, Natural Theology, and the Practice of Christian Piety in Early-Nineteenth-Century Religious Magazines," in Cantor and Shuttleworth, *Science Serialized*, 38. Topham cautions that the "discourse of design" or "argument from design" should not be treated as synonymous with natural theology but rather as only one outgrowth of this religious and rhetorical tradition (38).
17. Bernard Lightman, *The Origins of Agnosticism: Victorian Unbelief and the Limits of Knowledge* (Baltimore: Johns Hopkins University Press, 1987), 152–53.
18. John Hedley Brooke and R. Hookyaas, *New Interactions between Theology and Natural Science* (Milton Keynes: Open University Press, 1974), 42.
19. Gold, *ThermoPoetics*, 71. On the relation of *The Unseen Universe* to "grand unified" theories of energy physics, see 90–91, 126–28.
20. *Ibid.*, 57–58. Gold compares the development of thermodynamic concepts to elegiac processes of consolation in Alfred Tennyson's *In Memoriam* (1850).
21. Bruce Clarke, "Allegories of Victorian Thermodynamics," *Configurations* 4, no. 1 (1996): 14.

22. Helge S. Kragh, *Entropic Creation: Religious Contexts of Thermodynamics and Cosmology* (Aldershot: Ashgate, 2008), 47.

23. As defined by Stewart and Tait, this pseudoscientific principle allies cause-and-effect logic with both the law of conservation and the teleological demands of natural theology. Widely faulted for its vagueness and imprecision, the “Law of Continuity” expresses the consistency, uniformity, and comprehensibility of the universe’s combined visible and invisible worlds (271). See also Kragh, *Entropic Creation*, 64.

24. Postmodern models of the multiverse differ importantly from Stewart and Tait’s, however, as they restrict any physical interchange between their parallel worlds. On multiple bubble-worlds, see Brian Greene, *The Elegant Universe: Superstrings, Hidden Dimensions, and the Quest for the Ultimate Theory* (New York: W. W. Norton, 2010).

25. Michel Serres, *Hermes: Literature, Science, Philosophy*, trans. Josué V. Harari and David F. Bell (Baltimore: Johns Hopkins University Press, 1982), 116.

26. *Ibid.*, 72, 71–72.

27. On mechanical and thermodynamic accounts of life, see David Channell, *The Vital Machine: A Study of Technology and Organic Life* (Oxford: Oxford University Press, 1991), 81–83; Tamara Ketabgian, *The Lives of Machines: The Industrial Imaginary in Victorian Literature and Culture* (Ann Arbor: University of Michigan Press, 2011), 121–24; and Serres, *Hermes*, 71–83.

28. On Carnot’s engine, see Stewart and Tait, *Unseen Universe*, 117–21.

29. William Paley, *Natural Theology* (London: J. Faulder, 1809), 12. Hereafter cited parenthetically.

30. Tamara Ketabgian, “Prosthetic Divinity: Babbage’s Engine, Spiritual Intelligence, and the Senses,” *Victorian Review* 35, no. 2 (2009): 33–34.

31. Arnold Huijgen, *Divine Accommodation in John Calvin’s Theology: Analysis and Assessment* (Göttingen: Vandenhoeck and Ruprecht, 2011), 14.

32. Edward A. Dowey, *The Knowledge of God in Calvin’s Theology* (New York: Columbia University Press, 1965), 10.

33. Ketabgian, “Prosthetic Divinity,” 33.

34. As Gooday notes, this explanation of “delicacy” originated in an earlier journal article coauthored by Stewart and J. Norman Lockyer, “The Sun as a Type of the Material Universe,” part 1, *Macmillan’s Magazine* 18 (1868): 246–57. See Gooday, “Sunspots,” 113.

35. Oppenheim, *Other World*, 336–37; Balfour Stewart, “Address IV, April 23rd, 1887,” in *Presidential Addresses to the Society for Psychical Research, 1882–1911* (Glasgow: Robert Maclehose, 1912), 28. Before the founding of the Society for Psychical Research in 1881, Stewart analyzed chemist William Crookes’s experiments on the production of “psychic force” in séances by medium Daniel Dunglas Home in 1871. Stewart concluded that Crookes’s findings were subjective and inconclusive. On the “evidential crisis of orthodox science” that followed, see Peter Lamont, “Spiritualism and a Mid-Victorian Crisis of Evidence,” *Historical Journal* 47 (2004): 911–19; and Balfour Stewart, “Mr Crookes on the ‘Psychic’ Force,” *Nature*, July 27, 1871, 237.

36. Richard Noakes, “The Sciences of Spiritualism in Victorian Britain,” in *The Ashgate Research Companion to Nineteenth-Century Spiritualism and the Occult*, ed. Tatiana Kontou and Sarah Willburn (Burlington, VT: Ashgate, 2012), 41–42. On the failed séance, see also John Tyndall, “Science and the Spirits,” *Reader* 4 (1864): 725–26; and [William Henry Harrison], “Professor Tyndall at a Spirit Circle,” *Spiritualist* 1 (1871): 156–57.

37. Humphrey Palmer, *Analogy: A Study of Qualification and Argument in Theology* (New York: St. Martin's Press, 1973), 15–16.
38. William James, *Essays, Comments, and Reviews* (Cambridge: Harvard University Press, 1987), 292. Hereafter cited parenthetically as “*Essays*.”
39. Emphasis mine.
40. Emphasis mine.
41. Istvan Csicsery-Ronay, *The Seven Beauties of Science Fiction* (Middleton, CT: Wesleyan University Press, 2008), 111.
42. Daniel Brown, *Poetry of Victorian Scientists: Style, Science, and Nonsense* (Cambridge: Cambridge University Press, 2013), 254.
43. Qtd. in Knott, *Life and Scientific Work*, 214–15.
44. *Ibid.*, 215.
45. Brown, *Poetry of Victorian Scientists*, 254.
46. *Ibid.*
47. James Clerk Maxwell, *The Scientific Papers*, vol. 2 (Cambridge: Cambridge University Press, 1890), 376.
48. *Ibid.*
49. Tyndall, *Fragments of Science*, 103.
50. Maxwell, *The Scientific Papers*, 374.
51. *Ibid.*, 376.
52. Daniel M Siegel, “Thomson, Maxwell, and the Universal Ether in Victorian Physics,” in *Conceptions of Ether: Studies in the History of Ether Theories, 1740–1900*, ed. G. N. Cantor and M. J. S. Hodge (Cambridge: Cambridge University Press, 1981), 258.
53. Richard Noakes, “Ethers, Religion and Politics in Late-Victorian Physics: Beyond the Wynne Thesis,” *History of Science* 43 (2005): 422.
54. Siegel, “Thomson,” 258.
55. G. N. Cantor, “The Theological Significance of Ethers,” in Cantor and Hodge, *Conceptions of Ether*, 140.
56. Knott, *Life and Scientific Work*, 106.
57. Morus, *When Physics Became King*, 174.
58. Clarke, “Allegories,” 87–88.
59. Helena Petrovna Blavatsky, *Isis Unveiled: A Master-Key to the Mysteries of Ancient and Modern Science and Theology*, 6th ed., vol. 1 (New York: J. W. Bouton, 1891), 185. Hereafter cited parenthetically as “*Isis*.”
60. Mark Morrisson, “The Periodical Culture of the Occult Revival: Esoteric Wisdom, Modernity, and Counter-public Spheres,” *Journal of Modern Literature* 31, no. 2 (2008): 7.
61. Oppenheim, *Other World*, 163.
62. Helena Petrovna Blavatsky, *The Key to Theosophy: Being a Clear Exposition, in the Form of Question and Answer, of the Ethics, Science and Philosophy for the study of which the Theosophical Society has been founded* (London: Theosophical Publishing Company, 1889), 39.
63. See Clarke, “Allegories,” 87–88.
64. *Ibid.*, 88.
65. I have revised this passage to reflect *The Unseen Universe*'s plural authorship, of which James was presumably ignorant upon the review's publication in May 1875.
66. James C. S. Wernham, *James's Will-to-Believe Doctrine. A Heretical View* (Kingston: McGill-Queen's University Press, 1987), 13–15; Edward H. Madden, *Chauncey Wright*

and the Foundations of Pragmatism (Seattle: University of Washington Press, 1963), 43–45.

67. Ralph B. Perry, *The Thought and Character of William James*, vol. 2 (Boston: Little, Brown, 1935), 244. According to Perry, James later regretted his original title for the essay (244–45).

68. Wernham, *Doctrine*, 6.

69. Dickinson S. Miller, “James’s Doctrine of ‘The Right to Believe,’” *Philosophical Review* 51, no. 6 (1942): 541.

70. Wernham, *Doctrine*, 15. Wernham’s phrase alludes to Wright’s claim that during their debate James intended to argue “it is foolish not to believe, or try to believe, if one is the happier for believing” (14).

71. On parallelism in the language of James’s 1875 review and his later 1896 essay, see Wernham, *Doctrine*, 16; and Madden, *Chauncey Wright*, 43.

72. William James, *The Will to Believe and Other Essays in Popular Philosophy* (New York: Longmans, Green, 1912), 1–2. Hereafter cited parenthetically as “*Will*.”