Deep Time in the Nineteenth-Century British Novel: Temporality, Science, and Literary Form

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Abstract

This dissertation examines representations of deep time in nineteenth-century British novels in order to argue that these texts help carve a path for our contemporary definitions of deep time and the Anthropocene. Examining fiction by Charles Dickens, George Eliot, Thomas Hardy, Edward Bulwer-Lytton, H. Rider Haggard, H. G. Wells, and Joseph Conrad, I suggest that these novels participate in the secularization of deep time by transforming the concept of vast spiritual time that had been in use earlier in the nineteenth century into a scientifically-informed model that anticipates our current understandings of deep time. While the concept of geological time emerged in the late-eighteenth century and became widely recognized in the nineteenth, the phrase "deep time" originates in nineteenth-century literature when Thomas Carlyle first used it in a non-scientific context. By studying a wide range of fiction, I demonstrate how nineteenth-century authors employed innovative narrative strategies to convey these potentially inconceivable timescales in non-numerical terms, and thereby make them more accessible to human comprehension. I also challenge conventional distinctions between literary realism and popular romance in the period by analyzing the complementary ways in which both genres of fiction engage with vast temporal scales in their narratives. I develop my argument by examining how these novels use a model of what I call "folding time" to incorporate remote time periods into their texts. Departing from the novel's linear narrative structure to bring distant historical moments into direct contact with one another, folding time situates human activity in relation to vast pre-and-post-human periods and in doing so acknowledges an age of humans within deep time; in this sense, these novels articulate an early concept of the Anthropocene. By including deep time in the novel's traditionally individual and familial framework, these authors simultaneously expand the novel's temporal scope and humanize vast scientific timescales.

Further, as these novels illustrate characters' psychological responses to overwhelming scientific timescales, they reposition deep time in relation to private temporal experience. This study employs an interdisciplinary approach to acknowledge the mutually reciprocal relationship between science and literature in the nineteenth century, and draws on temporality studies, history of science theory, and literary criticism to situate its argument in relation to current critical discussions. I also consider the work of scientists such as Charles Lyell, Charles Darwin, and William Thomson in order to contextualize my novels' scientific references. By studying nineteenth-century British novels in relation to scientific temporalities, this dissertation recovers an overlooked component of the history of deep time that has had significant and lasting cultural influence given the enduring popularity and wide readership of these texts.

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INTRODUCTION
Deep Time in the Nineteenth-Century British Novel

> It is highly important for us to gain some notion, however imperfect, of the lapse of years. During each of these years, over the whole world, the land and the water has been peopled by hosts of living forms. What an infinite number of generations, which the mind cannot grasp, must have succeeded each other in the long roll of years!
>
> —Charles Darwin, *On the Origin of Species*

> Deep time is so alien that we can really only comprehend it as metaphor.
>
> —Stephen Jay Gould, *Time's Arrow, Time's Cycle*

This dissertation argues that nineteenth-century British novels helped to transform the literary concept of "deep time" into a specifically scientific model that anticipates our contemporary definitions of deep time and the Anthropocene. I examine representations of deep time in fiction by Charles Dickens, George Eliot, Thomas Hardy, Edward Bulwer-Lytton, H. Rider Haggard, H. G. Wells, and Joseph Conrad to demonstrate how these novels participated in the secularization of deep time. By studying a wide range of fiction, I demonstrate how nineteenth-century authors employed innovative narrative strategies to convey these potentially inconceivable timescales in non-numerical terms, and thereby make them more accessible to human comprehension. The nineteenth-century novel accommodates vast scientific timescales by expanding its temporal scope while simultaneously humanizing the concept of deep time by downsizing it to the novel form. For instance, the traditional inheritance plot expands to consider racial or species ancestry; landscapes are described in geological terms; and social problems have evolutionary implications. Conversely, vast timescales are humanized when authors translate deep time frames into an individual or familial scale: for example, when they reveal Darwinian processes at work in an individual's life or identify similarities between natural processes at various levels of existence, such as dying stars compared to aging individuals. I

examine how these novels use a model of what I call "folding time" to incorporate remote time periods into their texts. Departing from the novel's linear narrative structure to bring distant historical moments into direct contact with one another, folding time situates human activity in relation to vast pre-and-post-human periods and in doing so acknowledges an age of humans within deep time; in this sense, these novels articulate an early concept of the Anthropocene. These novels acknowledge that attempts to grasp and convey deep time are always, inevitably, limited by human perspective, and as they illustrate characters' psychological responses to overwhelming scientific timescales they work to reposition deep time in relation to private temporal experience. This introduction will outline my methodology and provide historical background on some of the major nineteenth-century chronometric and scientific developments before examining the concept of deep time and its recent critical definitions. I will present a brief overview of deep time and the nineteenth-century novel before outlining the following chapters. By studying nineteenth-century British novels in relation to scientific temporalities, this dissertation recovers an overlooked component of the history of deep time that has had significant cultural influence given the enduring popularity and wide readership of these texts.

"Deep Time" from Carlyle to Wells

While the concept of geological time emerged in the late-eighteenth century and became widely recognized in the nineteenth, the phrase "deep time" originates in nineteenth-century literature when Thomas Carlyle first used it in a non-scientific context.[1] In "Boswell's Life of Johnson" (1832) Carlyle writes: "To Johnson's Writings, good and solid, and still profitable as they are, we have already rated his Life and Conversation as superior. By the one and by the other, who shall compute what effects have been produced, and are still, and into deep Time,

[1] The *Oxford English Dictionary* lists Carlyle's as the term's earliest recorded usage ("Deep Time").

producing?" (406). In this context deep time refers to vast time without any specific scientific connotations, as it does when Carlyle returns to this metaphor in *Sartor Resartus* to imagine "Pauls and Senecas, who as yet stand hidden in the depth of that late Time!" (198). Carlyle's sense of vast time represents a spiritual time that is obscure, immeasurable, and eternal; his usage of deep time is clearly distinct from the contemporary scientific concept coined by John McPhee in *Basin and Range* (1981) to describe geological time. In Carlyle's work, this sense of deep time is also expressed in water metaphors: for instance, he describes "the stream of time" (441) in "Signs of the Times" (1829) and "the eternal Flood of Time" (407) in "Boswell's Life of Johnson." The sense of temporal fluidity embodied in these water metaphors is reproduced in later novelistic versions of both Carlylean and scientific deep time which are often portrayed through a model of folding time. Barri Gold proposes "that literature has often, perhaps always, influenced science, especially in the delicate, early stages of a scientific development, before a phenomenon has been named or a hypothesis adequately articulated" (15).[2] Given the literary origins of "deep time," Gold's premise seems particularly relevant: although the *concept* of geological time predates Carlyle's phrase, his expression would be used to convey geological time long after its initial usage. During the nineteenth century novelists broaden this spiritual concept of vast time to include increasingly secular and scientific connotations.

To frame my investigation of deep time in nineteenth-century novels, I will consider two textual examples from either end of my period of study: Carlyle's *Sartor Resartus* (1833-34) and Wells's *The Time Machine* (1895). Although the contrast between these texts demonstrates the secularization of the concept of deep time throughout the century, they share similar temporal

[2] For example, Gold argues that *Bleak House* "manifest[s] a profound sense of entropic decay" before "entropy" is coined: "How, we may reasonably ask, is this possible? After all, the term *entropy* was a decade away. But engineers were struggling to make better engines long before the scientific object *entropy* came into being. And like them, *Bleak House* struggles with the list of features that will become entropy—the tendency of all systems to decay, the difficulty of maintaining order or producing work" (188).

concepts and a preoccupation with individual temporal perspectives. *Sartor Resartus*, a formally complex and polyvocal text that features an Editor who acts as "the reader's surrogate as he struggles to make sense of Teufelsdröckh's book and the six bags of miscellaneous and randomly arranged autobiographical documents" (McSweeney and Sabor xix), provides an example of eternal spiritual time. According to Teufelsdröckh, since we are exposed to a sliver of Time and not Eternity, our conception of temporality is inadequate and camouflages or misrepresents the transcendental "Everlasting NOW" (198). Indeed, he goes so far as to question the stable reality of time and space, claiming: "But deepest of all illusory Appearances, for hiding Wonder, as for many other ends, are your two grand fundamental world-enveloping Appearances, SPACE and TIME" (197). For Teufelsdröckh, our understanding of time and space limits our spirituality:

> That the Thought-forms, Space and Time, wherein, once for all, we are sent into this Earth to live, should condition and determine our whole Practical reasonings, conceptions, and imagings (not imaginings),—seems altogether fit, just, and unavoidable. But that they should, farthermore, usurp such sway over pure spiritual Meditation, and blind us to the wonder every where lying close on us, seems nowise so. Admit Space and Time to their due rank as Forms of Thought; nay, even, if thou wilt, to their quite undue rank of Realities: and consider, then, with thyself how their thin disguises hide from us the brightest God-effulgences! (198-99)

Teufelsdröckh encourages readers to focus on God and Eternity rather than Time and Space, which are merely God's creations, insisting that, "The curtains of Yesterday drop down, the curtains of To-morrow roll up; but Yesterday and To-morrow both *are*. Pierce through the Time-Element, glance into the Eternal." The past and future—which remain in our consciousness

through "Memory and Hope"—are signs of an enduring dimension (198). If memories and aspirations are proof of a temporal consciousness unrestricted by the present, one's individual, private, and spiritual temporality can lead to a transcendental recognition of eternity.

Six decades later, Wells imagines a decidedly materialist concept of deep time that nevertheless recalls Carlyle's spiritual eternity. Wells proposes a similar link between time and space in *The Time Machine*, in which the Time Traveller argues that "Scientific people…know very well that Time is only a kind of Space" (61).[3] It is only human perspective that causes us to conceive of time differently than space: "There is, however, a tendency to draw an unreal distinction between the former three dimensions and the latter [the fourth dimension of time], because it happens that our consciousness moves intermittently in one direction along the latter from the beginning to the end of our lives" (60). Wells likewise proposes an interpretation of time as a falsely conceived idea that masks a greater understanding of the eternal. An early version of *The Time Machine* echoes Carlyle's description of time as "illusory" when the protagonist "propose[s] a wholly new view of things based on the supposition that ordinary human perception is an hallucination." He explains that "To an omniscient observer there would be no forgotten past—no piece of time as it were that had dropped out of existence—and no blank future of things yet to be revealed. … Indeed, present and past and future would be without meaning to such an observer: he would always perceive exactly the same thing" ("The Inventor" 93). In *The Time Machine*, individual experiences of time limit one's understanding of eternal time; in this sense, the temporal understanding critiqued by the Time Traveller recalls Teufelsdröckh's "Time-Element."

The key difference, then, between the fictional theories of time espoused by Carlyle's Philosopher and Wells's Time Traveller lies in their respective spiritual and scientific

[3] Unless otherwise noted, I refer to the Broadview edition of *The Time Machine*, based on the 1895 Heinemann.

understandings of vast time: where Teufelsdröckh proposes a comprehension of eternal time through spiritual enlightenment, the Time Traveller describes a scientific understanding of time that confirms the deep time intrinsic in evolutionary, geological, and astrophysical theories. The Time Traveller's mathematical theorization gives him the means to travel in time, while the adventures he encounters during his voyage confirm theories of evolutionary degeneration and thermodynamic dissipation that unfold over vast expanses of time (and are thus only apparent to a rapidly moving Time Traveller equipped with nineteenth-century scientific knowledge). Despite their very different approaches, Carlyle and Wells both imagine deep time in non-linear terms as they envision a temporal continuum in which "present and past and future [are] without meaning." Moreover, their characters' shared notion "that ordinary human perception is an hallucination" emphasizes the subjectivity and partiality of individual temporal experience. Carlyle's and Wells's use of frame narration further destabilizes their protagonists' accounts and draws attention to the limitations of individual perspective, even as their characters insist that an individual whose perspective is grounded in the present cannot access or comprehend the full spectrum of time (and the possibility of timelessness).

Moreover, both texts imagine a model of folding time as a way to conceptualize a vaster temporal scale. It is notable that Teufelsdröckh's temporal philosophy leads him to the notion of time travel, an idea which will be developed—and treated in mechanical, technological, and scientific terms—in *The Time Machine.* He imagines a "Time-annihilating Hat":

> [T]o clap on your other felt, and, simply by wishing that you were Any*when*, straightway to be *Then*! This were indeed the grander: shooting at will from the Fire-Creation of the World to its Fire-Consummation; here historically present in the First Century, conversing face to face with Paul and Seneca; there

> prophetically in the Thirty-first, conversing also face to face with other Pauls and Senecas, who as yet stand hidden in the depth of that late Time! (197-98)

Albeit in very different ways, Carlyle and Wells posit time travel technology that would allow individuals to experience remote time periods. If individuals can free themselves from the restrictions of their perspectives and overcome the limitations of current technology (with the help of a "Time-annihilating Hat" or a "Time Machine"), they can, conceivably, travel in time. What Teufelsdröckh imagines, the Time Traveller realizes when his machine enables this simultaneity between distant eras "hidden in the depth of that late Time." Carlyle's interest in travelling back in time is indicative of an earlier nineteenth-century preoccupation with history and a human past, while Wells's fascination with the future is characteristic of pessimistic fin-de-siècle theories of dissipation and degeneration. This shift from looking back to looking forward in deep time is elaborated in nineteenth-century novels which become more future-oriented over the course of the century.

Although this is merely one example taken from two literary texts, *Sartor Resartus*'s and *The Time Machine*'s deliberately philosophical and somewhat radical reflections on time reveal the nineteenth-century literary transition from spiritual to scientific deep time. I begin with *Sartor Resartus* as it represents an early nineteenth-century example of literature which considers time—particularly quotidian and quantifiable time—as suspect and, intriguingly, goes so far as to propose time travel; it also reveals the spiritual component of Carlyle's deep time. Carlyle's radical insistence on time as "illusory" and his evocation of relative temporal experience present a starting point for literary considerations of temporality in the nineteenth century. Despite the secularization that distinguishes their models of time, both Carlyle and Wells use a model of folding time as a literary strategy to convey deep time and overcome chronological time.

Furthermore, their texts reveal similar preoccupations with the subjectivity of temporal perspective and the limitations of time-keeping.

Methodology and Area of Study

My dissertation examines a wide range of nineteenth-century British novels. By exploring texts that range from Eliot's canonical novels to Wells's scientific romance, I challenge conventional distinctions between literary realism and popular romance in the period and establish points of intersection among works regardless of their traditional generic affiliations. Like Adam Barrows, who considers a variety of fictions "rigidly segregated by disciplinary boundaries" in his study of literature and the implementation of Greenwich Mean Time (*Cosmic Time* 3), I analyze the complementary ways in which both genres of fiction engage with vast temporal scales in their narratives. Many novelists used scientific models for their realist practices as "self-conscious speakers for narrative art frequently invoked science as a model or analogy for their own work" (Levine, *Darwin and the Novelists* 12). George Levine observes that "Victorian gradualism, an idea that popped up in geology (on a Newtonian model), fought its way into biology, and was the groundwork of nineteenth-century 'realism'" (5), and realist novels often employed third-person narration to present a seemingly objective and scientific observation of human life (14).[4] On the other hand, popular authors like Arthur Conan Doyle, Grant Allen, and Wells contributed to the emergence of science fiction by using science as inspiration or justification for their fantastic ideas. Along with writers such as Haggard, Robert Louis Stevenson, and Bram Stoker, they contributed to what Michael Saler calls "the New Romance," an immensely popular genre that combined fantasy with scientific realism as "prominent writers of the *fin-de-siècle*…reacted against the dominance of literary realism by

[4] References to George Levine in this chapter refer to *Darwin and the Novelists.*

artfully combining the empiricism and apparent objectivity of the realists with the imaginative fabulations of the early nineteenth-century romantics" (611). Although the novels I study often use genre-specific strategies to incorporate contemporary science and vast timescales in their texts, I wish to challenge the critical assumption that "popular" works cannot be as experimental and temporally engaged as more canonical texts. Moreover, I would argue that during the time period I focus on, certain current distinctions between nineteenth-century authors as "artistic" or "popular" were not commonplace and thus risk misrepresenting the literature of the period through contemporary generalizations.[5]

While I have chosen to analyze a selection of novels that reveals an increasingly scientific concept of deep time, I believe that this study could be extended to include additional novels and other types of fiction.[6] The priority of my project, however, is to provide an in-depth examination of the narrative strategies and literary techniques—such as folding time and metaphorical time travel—that authors used to incorporate vast timescales into the nineteenth-century novel. Similarly, a study of scientific temporalities in literature after this period would address very different concerns in light of Einstein's theory of relativity, the complete implementation of global standard time, and the significant cultural changes in the lead-up to World War I. I have chosen, though, to focus in particular on the Victorian era and its increasingly secularized sense of time in order to underscore the modernity of a body of fiction that has often been depicted by critics as that against which more experimental modernist novelists react. Too often high Modernism's engagement with temporality, time-keeping, and

[5] See also Nicholas Daly, who proposes that "what we see now as a chasm between two distinct literary cultures, the great divide, was scarcely more than a crack in 1899.… Authors whom we now see as 'serious' and those whose names we have all but wiped from the slate of literary history…debated the merits of their particular schools, but they did not see themselves as *radically* different in kind" (4).

[6] For example, Alfred Tennyson's *In Memoriam A.H.H.* (1850) evokes deep time scales through its references to geology and evolution in lines such as: "From scarpèd cliff and quarried stone," "Though Nature, red in tooth and claw," and "Dragons of the prime, / That tare each other in their slime" (LVI: lines 2, 15, 22-23, p.167).

scientific modernity is represented as revolutionary and wholly distinct from Victorian concerns; equally, theorists validate Victorian fiction only as it functions as a precursor to modernist writing. For instance, Barrows's assertion that "modernist texts of the early twentieth century radically destabilized the coordinates of world standard time in their texts, [while] late nineteenth-century adventure novels rigidly enforced them" (14) overlooks the many ways that Victorian fiction—both "literary" and "popular"—engages with and troubles cultural conceptions of time. Instead, I study these nineteenth-century novels as they emerge from a specifically Victorian context, and argue that they offer innovative, distinctive narrative strategies for conceptualizing vast temporalities, which relate in important, underappreciated ways to temporal and scientific issues addressed in modernist literary production.

This study employs an interdisciplinary approach to acknowledge the mutually reciprocal relationship between science and literature in the nineteenth century, and draws on temporality studies, history of science theory, and literary criticism to situate its argument in relation to current critical discussions. I also consider the work of scientists such as Charles Lyell, Charles Darwin, and William Thomson in order to contextualize my novels' scientific references. There were greater similarities between scientific writing and literature—and their respective audiences—in the nineteenth century than now. Gillian Beer observes that, "[t]here is nothing hermetic or exclusive in the writing of Lyell or Darwin" since "scientists still shared a common language with other educated readers and writers of their time. … Scientific writers shared a literary, non-mathematical discourse which was readily available to readers without a scientific training. Their texts could be read very much as literary texts" (4). There are notable stylistic and thematic similarities between nineteenth-century science writing and prose fiction. For instance, *Origin of Species* borrows literary imagery and narrative devices while establishing its argument,

such as Darwin's famous "entangled bank" (141);[7] Henry James criticized Eliot's highly literary *Middlemarch* for being "too often an echo of Messrs. Darwin and Huxley'" (qtd. in Beer 139); and early science-fiction texts like *The Coming Race* and *The Time Machine* transition seamlessly into scientific digressions without considerable change in language or style. Pamela Gossin observes that "[t]he latest developments in cell biology, medicine, psychology, sociology, geology, and Darwinism all received literary treatment by various authors. Such works stand as evidence of the degree to which particular sciences had been popularized and made accessible to the generally educated but non-scientific public" (112). Literature played a significant role in the general popularization of science which took place in the nineteenth century.[8]

While literary analysis provides valuable insight into how scientific ideas were perceived and disseminated, I am particularly interested in the ways that literature contributed to and shaped nineteenth-century culture, including emerging scientific theories. I am working to avoid what Gold refers to as "the 'diffusion model' of science and society—manifest in the dominant assumption that science may influence literature, but not the other way around" (15). Levine describes the "peculiarly complex and even counterchronological interpenetration between science and literature" (3) during the Victorian period and notes that "the relationship was certainly two-way: how the culture tells stories, that is, imagines its life, subtly informs the way science asks questions, arrives at the theories that reshape the culture that formed them" (4). In a similar vein, Beer maintains that "scientists themselves in their texts drew openly upon literary, historical and philosophical material as part of their arguments," and observes that "[b]ecause of

[7] Unless otherwise noted, I refer to the first edition of *Origin* (1859) (ed. Carroll, Broadview). Beer emphasizes "the degree to which Darwin drew on familiar narrative tropes (such as leaving the garden, or discovering your ancestry was not what you believed)" (xxiv). All references to Beer are to *Darwin's Plots* unless otherwise noted.

[8] Levine explains that, "Popularizations of science were filling lecture halls, journals, and workingmen's institutes; 'lay sermons' were displacing religious ones; amateur fossil hunting, insect collecting, seashell study were holiday diversions and potential contributions to rapidly expanding scientific knowledge" (3-4).

the shared discourse not only *ideas* but metaphors, myths, and narrative patterns could move rapidly and freely to and fro between scientists and non-scientists" (5). Gossin and Gold, who argues that "[l]iterature participates in creating as well as expressing the cultural milieu in which science happens" (15), also provide useful interdisciplinary models. Gold's observation that literature may help to express hard-to-grasp concepts is especially pertinent to my research:

> Victorian energy physics, moreover, may have had an added incentive to keep up the correspondence with literature, for it was deeply engaged in pondering imponderables. In retrospect, we can see why scientists found it hard to think about what were called imponderables—such as heat, light, electricity, and magnetism—once they have given up thinking of them as liquids…. Literary methods, such as metaphor, which make it possible to say in words 'what cannot be said in words,' must have seemed more than usually handy. (27)

Not only does the concept of deep time constitute just such an "imponderable," but, as a metaphor, the phrase reveals how literature can help express a concept that scientists like Darwin deemed "quite incomprehensible" (*Origin* 396). Given the literary roots of the term deep time, an interdisciplinary approach seems particularly relevant since it reveals how literature carves a path for science's figurative language.

My literary analysis also draws on temporality studies and the history of chronometry. It can be risky to assume that we can trace certain temporal developments in an author's work and understand the degree to which they are intentional. As E. P. Thompson asks, "If the transition to mature industrial society entailed a severe restructuring of working habits…how far is this related to changes in the inward notation of time?" (57). Barrows similarly inquires, specifically about literature, "To what extent is it possible to suggest that the world-historical transformations

of global standard time, managed not by artists but by scientists, politicians, and industrialists, had any kind of impact on a handful of writers, alone in their studies, as they crafted their narratives?" (15). Although it may be difficult to tell the extent to which certain temporal or chronometric innovations were internalized by individuals, if similar temporal preoccupations are apparent in various texts of a period, it suggests a cultural shift. Moreover, many of the novelists I study explicitly address issues of science and time, thereby making their concerns evident. I propose that we can understand, to a degree, the internalization and artistic impression of such temporal shifts—and, for my purposes, scientific theories—by studying texts and, in this case, literature. Both Thompson and Stuart Sherman suggest how readily we adapt to new concepts of time; Sherman remarks on "the capacity of the new chronometry, with its attendant experiences and language, to 'naturalize' itself—to get itself taken for granted as something perpetual, to slip in below the radar of consciousness even in a knowing, careful scientist and historian" (6). It is probable that, if widely disseminated, newer models of time and narrative are likely to appear in nearly contemporary texts. Further, Sherman suggests that by looking to texts we might understand cultural responses to and representations of time: he proposes that

> a study of their [these texts'] 'timings'—their movement in time, their articulations of time—provides the most fruitful means for attending to them, for making sense of their historical, cultural, and artistic importance. These texts are not mere witnesses to their culture; they are active embodiments of one of its newest, most important, and withal most elusive organizing principles: its temporality. (27)

I will take Sherman's model and strive to focus not only on what authors write on the subject of time, but also "the form" of their writing, and the "temporally inexplicit passages where all the

testimony about time inheres in the texture" (28). In the case of deep time, a highly metaphorical concept, literature not only reflects contemporaneous scientific developments but helps to produce a cultural idea of time.

Chronometry and Temporality in the Nineteenth Century

The nineteenth century witnessed extensive changes to time-keeping technology as well as public, cultural, and philosophical concepts of time. In my considerations of time, I have found Sherman's definitions of two key terms helpful: he distinguishes "*chronometry*, a means for measuring time" (in other words, a timepiece) from "*temporality*, a way of reckoning time that includes but goes beyond counting, a way of conceiving it and experiencing it. Chronometry inheres in the clock. Temporality may suffuse other components of the culture, notably its narratives" (6). Both concepts underwent unprecedented transformations during the nineteenth-century. As Peter Galison observes, "Before the nineteenth century, clocks normally did not even have minute hands.… [By 1881], a fifteen-second discrepancy could drive engineers to modify public clocks" (95).[9] In his study on industrial labour and clock-time in the nineteenth century, Thompson explains that "[i]t is clear that there were plenty of watches and clocks around by 1800. But it is not so clear who owned them" (66) and proposes that "a general diffusion of clocks and watches is occurring (as one would expect) at the exact moment when the industrial revolution demanded a greater synchronization of labour" (69). The relatively recent method of measuring time in consecutive units depended on technological innovation. Gerhard Dohrn-van Rossum notes that "[o]nly since the 'Scientific Revolution' in the middle of the seventeenth century can one speak of experimentally quantifying scientific procedures and of conceptions of time as a scaled continuum of discrete moments" (287). While chronometric devices were

[9] All references to Galison refer to *Einstein's Clocks, Poincaré's Maps* unless otherwise noted.

common circa 1800, at the end of the century their technology, political importance, and scientific role had progressed significantly. By 1900, Greenwich had been designated as the official prime meridian, clock coordination efforts had been prevalent for decades, and global time standardization was underway.

Alongside the proliferation of clocks—many of which showcased slightly different times—and the ensuing debates over time conventions, standardization, synchronization, and simultaneity, the concept of stand-alone absolute time came into question. By the late-nineteenth century physics began to dismantle the concept of absolute time, which Newton had defined as follows: "Absolute, True, and Mathematical time, of itself, and from its own nature flows equably without regard to anything external, and by another name is called Duration: Relative, Apparent, and Common Time, is some sensible and external … measure of Duration by the means of motion, which is commonly used instead of True time; such as an Hour, a Day, a Month, a Year" (9). By the end of the century, physicists such as Ernst Mach and Karl Pearson were challenging the concept of absolute time in their publications. Galison writes that "[i]n Einstein's favourite work of Mach's (*The Science of Mechanics*, 1883) he would have found a polemic against Newton's absolute time and space that began by citing the master" (236). Similarly critical of Newton's absolute time was "Karl Pearson, the Victorian mathematician-physicist known for his contributions to statistics, philosophy, and biology" who "also put the naïve reading of 'absolute time' under the critical microscope." Pearson's *Grammar of Science* (1892) contained a "sharply critical assessment of the relation of all observable clocks to Newton's absolute time": while it maintained, as Galison explains, that "all clock time is ultimately astronomical time," it posited that "many factors could alter the great earth-clock in its rotation—tides for examples" which posed a challenge to concepts of absolute time (237-8).

These and other objections to Newtonian absolute time paved the way for Einstein's theory of relativity as nineteenth-century physics dismantled traditional concepts of time and brought about major developments in chronometry and astronomy.

Interestingly, nineteenth-century scientific concepts of time seemed to represent competing tendencies: while disciplines such as geology, biology, and astrophysics increased the temporal frame of reference, the mechanical science of chronometry carved up time into small, discrete sections. Depending on the discipline in question, scientific time was conceived of as both immeasurably vast and reductively minute. On one hand, these two strains of scientific time represent vastly different concepts of time and scales of measurement; on the other, clocks were considered emblems of science and technology that functioned to measure, quantify, and denote natural time cycles. Indeed, the most exact measurements of time and space—embodied in the search for exact longitude—depended on arguably the vastest science of astronomy.[10] Perhaps the most significant embodiment of both precision chronometry and immense scientific breadth was Greenwich, which, since the Royal Observatory's 1675 construction, functioned as a centre of astronomy and would later become a symbol of global time-keeping. In this sense, Greenwich embodied the notion that "all clock time is ultimately astronomical time" (Galison 237). Sherman observes that Greenwich was

> the site for the first methodical assault on the problem of the longitude, in the eighteenth century the center for its solution, in the nineteenth and twentieth (with the gradual dissemination of Greenwich Mean Time) the citadel for precision timekeeping. It has achieved, in reckonings of both space and time, a centrality

[10] Galison explains that "time was inseparable from longitude. Finding local time on the spot was a matter of watching the sky, then setting a clock by the moment when the sun passed its highest point… [I]t meant determining the moment a certain star crossed an imaginary line running vertically up from the northern horizon" (101).

> amounting to hegemony, figuring as degree zero in cartographic space, and as global reference point for clock time. (80)

Galison writes that "[w]ithout a doubt the first meridian stood as a powerful if highly contested symbol" (160), a statement to which the Observatory's 1894 attempted bombing by a French anarchist, later memorialized in Conrad's *The Secret Agent*, can attest. Greenwich was an especially important temporal and scientific symbol for Britain and, later, for global time standardization. Barrows clarifies the Observatory's symbolic importance: "If Greenwich's spatiotemporal privilege is a mere historical anachronism today, at the height of the British Empire its status as time zero seemed the crowning symbol of empire's assumed authority to measure, regulate, and delimit the uneven temporalities of global modernity" (19). In this sense nineteenth-century science and chronometry not only conceived of time as both vast and fragmented, but contributed to Britain's imperial project by establishing the international meridian in the heart of the empire.

As nineteenth-century time-keeping was increasingly associated with science and technology, cultural concepts of time became progressively secular and modern. From the eighteenth century onwards there was an increasing secularization of time as concepts of time shifted from traditional Christian temporality to more material notions of the past and future alongside Europe's cultural secularization. Sherman, drawing on J. G. A. Pocock, discusses the increasingly secularized concept of the future in the eighteenth century (190), while Galison, in his discussion of Poincaré, notes "the transformation of time—its radical secularization" (42). In the nineteenth century, this temporal secularization corresponds with an increasingly modern sense of time. Dohrn-van Rossum suggests that the nineteenth century marked the beginning of a different, modern temporal experience, and lists some of the period's changing concepts of time:

> In the nineteenth century, working time became a central theme in the "social question" that divided political movements and parties. … Railway traffic and the telegraph had put the fact that urban, regional, and national times of day were not synchronous on the political agenda. The movements of the sky became problematic as an absolute frame of reference for scientific and technical time-measurement when astronomers, using progressively better clocks, discovered a growing number of irregularities. Old interests in chronology, the science of time-reckoning and time-measurement, were reawakened in the wake of the debates over national and international time conventions. At the same time, a host of unmeasurable, rather subjective experiences of time became topics of discussion: the intellectual experiences of the Enlightenment, the political transformations since the French Revolution, and the technical transformations brought on by the industrial revolution gave contemporaries the feeling that they were living in a era of more rapid and continually accelerating historical change. … Ever since, the temporal pattern of daily life in modern industrial society has seemed to be dominated to a high degree by the constraints and pressures of time. (1-2)

Although these changes took place over the nineteenth century, particular critical and historical attention has been paid to the push for global standardized time at the end of the century. Many accounts, and especially those that focus on standardized time as a symbol or key element of modernism, overlook the fact that shifts in temporal understanding would have been felt much earlier in the century as a result of improved time-keeping technologies, clock synchronization, and longitude measurement, all of which contributed to the lead-up to the project of global standardization. Certainly, as Barrows acknowledges, "the International Prime Meridian

Conference of 1884 stands as a signal moment in the history of modernity, providing a global grid whereby the minutest spatial unit and the most infinitesimal duration of time could be measured in relation to Greenwich, England" (1). However, he accurately points out that "[t]he impact of world standard time in England was not to alter the private sensation of English temporality" since "British clocks had…been synchronized to Greenwich since the mid-1850s" (8). While I include some literature that reflects the Greenwich conventions and their aftermath, it is my intention to focus on novels that reflect Victorian temporal preoccupations leading up to these late-nineteenth-century events in order to demonstrate the period's interest in scientific temporality and, specifically, deep time.

I would also propose that many of the temporal issues often identified by critics as modernist preoccupations are apparent during the nineteenth century and develop from specifically nineteenth-century concerns. In *The Culture of Time and Space* Stephen Kern proposes that from 1880-1918, "the affirmation of the reality of private time" was "the most important development" in cultural notions of time (8): "The thrust of the age was to affirm the reality of private time against that of a single public time and to define its nature as heterogeneous, fluid, and reversible" (34). However, this shift—and the understanding of time as "heterogeneous"—is apparent even earlier in the Victorian period, when novels represent time as "fluid, and reversible." I think it is necessary not only to broaden Kern's designation of "a single public time" to account for the multiplicities of public time which were prominent in the nineteenth century, but to question the distinction between private and public. Although there are certainly internal, individual, and subjective temporal considerations that are indeed private, they are not inseparable or uninfluenced by "public" representations of time such as clocks, timetables, or calendars. That being said, Kern's distinction between public and private time is

useful to my considerations of deep time since novels of this period often work to reposition scientific timescales in relation to private experiences when they imagine the psychological consequences of deep time or explore the personal implications of collective inheritance. In this sense, literary representations of this thread of scientific time frequently reflect both external and internal temporalities. Other sectors of time that might be categorized as both public and private include the mechanical (associated with chronometry—public clocks and private watches),[11] industrial (relating to economics and labour laws),[12] historical (such as ethnic, racial, or national history),[13] and spiritual (such as Christian eternity or cyclical reincarnation). While these aspects often overlap to contribute to a sense of public time—for instance, the influence that railroads had on standardized time evidently relates to mechanical, industrial, and national time[14]—they reveal the complex and multilayered nature of public time and its inevitable influence on temporal perspectives. Further, private concepts of time once expressed or published—perhaps in a diary, fictional text, or written philosophy—not only become public but may shape others' concepts of time and result in changes to cultural, social, as well as political thought.

I do not wish to suggest that the nineteenth century is anomalous in its complex and shifting temporalities. Developments in time-keeping have always been enmeshed with culture and technology, and theorists and historians can pinpoint key advancements in chronometry and temporal alterations throughout human history. For instance, Sherman identifies an increasing

[11] For instance, Sherman focuses on "the absorption into narrative form of the kinds of time propounded by the new chronometry, and of the emergence of new narrative time" (25), while Thomas Allen's chapters "Material Time" and "Clockwork Nation" in *A Republic in Time* discuss the market for clocks and the national significance of chronometry in nineteenth-century America.

[12] See Thompson for a discussion of labour and time-regulation.

[13] Dohrn-van Rossum acknowledges a range of temporal-historical thought: "The experience of time, conceptions of time, and time-consciousness are very broad concepts. … The various ways in which historical change is perceived—as cyclical movement, as rise and fall, as unending progress, as accelerated or delayed change—all contain different notions about the relationship between past, present, and future" (3).

[14] For a detailed account of timekeeping technology and transportation, see Carlene Stephens. Galison also discusses standardization and the railways: "Time went up for sale, and astronomers, telegraphers, and clockmakers all profited as they sent coordinated time down the railway lines" (Einstein's Clocks: The Place of Time": 372).

awareness of time beginning in the seventeenth century, noting that "seventeenth- and eighteenth-century English culture, with its newly heightened consciousness of time, was awash in models of temporality, some conflicting, some congruent: philosophical, social, theoretical, scientific, and psychological" (24). Galison addresses the inherent intricacies of time and chronometric devices:

> Time was complex because, long before the nineteenth century, clocks and simultaneity were already more than gears, pendula, and pointers. In the eighteenth century, for example, the precision chronometers of the long-suffering British clockmaker John Harrison appeared in a larger print world about the longitude problem as well as in diaries and satires about timekeeping and mapping. … Forging back earlier than the eighteenth century still does not shake timepieces loose from the cultures in which they were built. Sand clocks and church clocks carried much besides the assignment of time; they conveyed different, overlapping authorities of God, of the feudal lord, of the memory of mortality. There simply is no getting behind the cultural to some primordial moment in which time was nothing but sand, shadow, or a mechanical pointer. (312)

That being said, certain changes are particular to specific time periods, and certain time periods undergo remarkable changes. As previously mentioned, the rapid advancement of chronometric technology and clock coordination provides one such example in the nineteenth century; another would be the extent to which Victorian-era scientific developments revolutionized not only theories of time in scientific disciplines but cultural, philosophical, and literary notions of time.

Nineteenth-Century Scientific Developments

I will provide a brief overview of some of the major developments in nineteenth-century science that pertained to the concept of deep time and were particularly prominent in novels of the period. Alongside the substantial chronometric and temporal changes that took place in the nineteenth century, various scientific disciplines proposed vast timescales that extended far past previous estimates of the earth's history. While speculations on the earth's origin and expiry date varied, a consensus emerged in disciplines such as geology, biology, and physics that the earth was much older than had been previously acknowledged: until the nineteenth century, the earth's age was often accepted as six thousand years, which established the earth's creation at around 4004 BC (Allen 147). The vast geological timeframes that would come to be known as deep time are generally traced back to Scottish geologist James Hutton (1726 – 1797). First presented to the Royal Society of Edinburgh in 1785 (McPhee 95), Hutton's *Theory of the Earth; or, an Investigation of the Laws Observable in the Composition, Dissolution, and Restoration of Land Upon the Globe* introduced the foundation for modern geology, uniformitarianism, and geologic time, and they relied on a much vaster concept of the earth's existence than had previously been considered. McPhee explains:

> What called most for demonstration was Hutton's essentially novel and all but incomprehensible sense of time. In 4004 + 1785 years, you would scarcely find the time to make a Ben Nevis, let alone a Gibraltar or the domes of Wales. … The geologic process was evidently slow. To accommodate his theory, all that was required was time, adequate time, time in quantities no mind had yet conceived; and what Hutton needed now was a statement in rock, a graphic example, a breath-stopping view of deep time. (104)

Hutton would find the proof he needed in the rock formations of Scotland. He also acknowledged the overwhelming sense of deep time required for an understanding of geologic process when he explained his concept of the earth's geological stages:

> the world which we inhabit is composed of the materials, not of the earth which was the immediate predecessor of the present, but of the earth which, in ascending from the present, we consider as the third, and which had preceded the land that was above the surface of the sea, while our present land was yet beneath the water of the ocean. Here are three distinct successive periods of existence, and each of these is, in our measurement of time, a thing of indefinite duration.
>
> … But if the succession of worlds is established in the system of nature, it is in vain to look for any thing higher in the origin of the earth. The result, therefore, of this physical inquiry is, that we find no vestige of a beginning,—no prospect of an end. (199-200)

This concept of deep time—along with Hutton's intimation that Creationism was not a tenable scientific position—was key not only to developing geological theories but to emerging concepts of evolution, thermodynamics, and astronomy. McPhee suggests that Hutton's "picture of the earth…would gradually remove the human world from a specious position in time in much the way that Copernicus had removed us from a specious position in the universe" (100). The vast timeframes endorsed by Hutton's theories challenged biblical estimates, and although "[t]he acceptance of deep time, as a consensus among scholars, spans a period from the mid-seventeenth through the early nineteenth centuries" (Gould 3), broader cultural acknowledgement of geological timescales occurred in the nineteenth century. The most influential Victorian geologist was arguably Lyell, whose seminal *Principles of Geology* (1830-

33) declares: “There is not one great question relating to the former changes of the earth and its inhabitants into which considerations of time do not enter” (302 [1830]). An expanded geological timescale was essential to Lyell’s gradualism, which informed many of the century’s scientific disciplines.

Nineteenth-century biology applied geological timescales to the living natural world and, most controversially, to humans in order to determine when and how species originated, evolved, and would transform or die out in the future. Beer observes that

> It is hard to overestimate the imaginative turmoil brought about by evolutionary theory, beginning in England already in the 1830s with the publication of Lyell’s *Principles of Geology*, continuing in the 1840s with the publication of Robert Chambers’s anonymously published and immensely popular work *Vestiges of the Natural History of Creation*, and concentrated in 1859 by Darwin’s long-ruminated and rapidly written argument, *On the Origin of Species By Means of Natural Selection, or the Preservation of Favoured Races in the Struggle for Life.* (10-11)

Darwin drew inspiration from Lyell for *Origin of Species* (1859), in which he declares: “He who can read Sir Charles Lyell’s grand work on the Principles of Geology, which the future historian will recognise as having produced a revolution in natural science, yet does not admit how incomprehensibly vast have been the past periods of time, may at once close this volume” (271).[15] *Origin of Species* proposes that: “The whole history of the world, as at present known, although of a length quite incomprehensible by us, will hereafter be recognised as a mere fragment of time, compared with the ages which have elapsed since the first creature, the progenitor of innumerable extinct and living descendants, was created” (396-7). Darwin

[15] Darwin famously brought *Principles of Geology* along for his voyage on the Beagle, along with Milton (Beer 29).

acknowledges "the recessional and forgotten multitudes which form the ground of the present" (Beer 36), and his theory of evolution is predicated on the vast timeframes associated with geological deep time. Darwin insists: "it is highly important for us to gain some notion, however imperfect, of the lapse of years. During each of these years, over the whole world, the land and the water has been peopled by hosts of living forms. What an infinite number of generations, which the mind cannot grasp, must have succeeded each other in the long roll of years!" (274). Evolutionary theory entailed vast timeframes which extended previous concepts of human history and proposed a new understanding of origins and ancestry. Although nineteenth-century literary criticism often risks focusing on Darwinism at the expense of other influential disciplines—what Gold calls "the impulse to over-Darwinize" (29)[16]—Darwin's impact on concepts of time and the history of human species was profound.

Evolution, especially in Darwin's terms, is an essentially temporal concept. Elizabeth Grosz explores Darwin's impact on philosophy and theory and focuses in part "on elaborating his understanding of evolution as the emergence in time of biological innovation and surprise" (19). Noting that "the term 'evolution' itself, derived from the Latin *e-volvere*, means 'to roll out,' 'to unfold,'" Grosz stipulates that Darwinian evolution presents a durational unfolding that entails "biological 'memory,'" "continuing inheritance," and a sense of the "past in the present" (24). She illustrates how Darwin overlooks "the *origin* of species" to "analyz[e]" their "*descent*," thereby focusing on "the historical movement…of species" to suggest that origins exist only "in retrospect" (21). Evolution depends on time since "it is through the continual production of degrees of difference, over long enough periods of time, that kinds of difference will emerge"

[16] Gold contends that "[t]he discourse on energy is at least as prevalent as Darwinian biology in Victorian sensibilities, and perhaps even more important to us." She proposes "that the treatment of Victorian literature and science could do with some reassessment and redistribution. Texts that seem to scream *Darwin* also reveal their deep investment in thermodynamic concerns. These texts include those by Darwin himself" (29).

(24-5); as Beer notes, "[b]ecause of its preoccupation with time and with change evolutionary theory has inherent affinities with the problems and processes of narrative" (5). Grosz elaborates on Darwin's analogy between natural history/biology (evolution of species) and philology/linguistics (evolution of languages)[17] and its emphasis on inheritance and temporality:

> What species and languages share is a reliance on the concept of genealogy. Both are fundamentally temporal processes, capable only of retrospective rather than prospective analysis, which involve the hypothetical reconstruction of a past that has left only fragmented and decaying traces or remnants, modes in which order, timing, and precedence are irreducible factors, in which historicity and the movement forward of time are necessary considerations. (27)

In sum, evolution is "possible only through the irreversible temporality of genealogy"; its necessarily "dynamic" and temporal process is defined by "the impossibility of stasis and mere reproduction, the impulse toward a future that is unknown in and uncontained by the present and its history" (32). Darwin's representation of descent acknowledges the differences between species but ultimately focuses on degrees of difference over time; evolution entails duration.

Significantly, especially for a nineteenth-century audience, Darwinian evolution denies any purposeful or predestined plan and entails a secular future. As Grosz explains, "Darwin provided a model of time and development that refuses any pregiven aim, goal, or destination for natural selection" (90).[18] Levine characterizes this aspect of Darwinian theory as "*Denial of design and teleology*" and explains that Darwin's "rejection of the natural-theological assumption of teleology fundamentally undercut the basis of most Western narrative" (18).

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[17] In *Origin* Darwin "illustrate[s] [his] view of classification, by taking the case of languages" (357).

[18] This distinguishes Darwin's work not only from that of natural theologians but, as Grosz notes, later evolutionary theorists: "This already serves to differentiate him from virtually all of his followers. He refuses anything like the telos or directionality of the dialectic, or a commitment to progressivism in which we must always regard what presently exists as superior to or more developed than its predecessors" (90).

While the secularizing implications of Darwinian theory have been well-documented,[19] I wish to emphasize its contributions to the secularization of time. No creator implied no destiny, no planned future for humankind; it also allowed for scientific theories to be applied to humans (15). Darwinian theory proposed a non-anthropocentric reading of history, species development, and—as would be emphasized in late-century degeneration theories—the future. Despite its interest in origins and ancestry, Darwinism looks to the future (in decidedly secular terms). Grosz elaborates on this temporal aspect of evolution:

> This logic of self-overcoming, which is the motor of Darwinian evolution, must be recognized not only as a distribution of geographical and geological spacing, but above all as a form of temporization, in which the pull of the future exerts a primary force. Beings are impelled forward to a future that is unknowable, relatively uncontained by the past. It is only retrospection that can determine what direction the paths of development, of evolution or transformation, have taken, and it is only an indefinitely deferred future that can indicate whether the past or the present provides a negative or positive legacy for those that come. (90)

From a Darwinian perspective, the past might "set the terms for" the present and future, but it cannot guarantee what is to come (90). Time functions as a continuum in which the present is inextricable from the past but the future remains undetermined. This outlook on the future is linked to the emergence of contingent or hypothetical thought in the nineteenth century. Tina

[19] Levine describes evolutionary theory's blow to religion: "The tradition of natural theology was threatened and largely dismantled by Darwinian science, and in the process nature, society, narrative, and language itself were desacralized, severed from the inherent significance, value, and meaning of a divinely created and designed world" (viii). Beer explains: "The all-inclusiveness of its explanation…seemed to offer a means of understanding without recourse to godhead. It created a system in which there was no need to invoke a source of authority outside the natural order: in which instead of foreknown design, there was inherent purposiveness" (12). In particular, Darwin destabilized boundaries between human and animal species: "most pre-Darwinian speculation about science drew an absolute line between animal and human life, and the detected *physical* similarities between humans and beasts was not taken to reflect any consanguinity" (Levine 37).

Young Choi writes that "the *Origin*…is rather a noteworthy example of the period's fascination with and emphasis on contingent thinking," and she "suggest[s] that the *Origin* played a particularly significant role in shaping the mid-nineteenth-century readerly imagination around the logic of contingency" as "Darwin repeatedly situated both himself and his readers at a moment of uncertainty, in which both past and present were reconfigured as hypothetical futures" ("Natural History" 275-6). In brief, Darwinian theory entails vast timescales, depicts evolution as an essentially temporal process, proposes a secularized temporal continuum, and involves future-driven narratives which are not predestined but encourage hypothetical thinking.

On a different scientific front, the often overlapping disciplines of astronomy, astrophysics, and thermodynamics transformed understandings of deep time and space in the nineteenth century. Gossin argues that "in many ways, the astrophysical revolution" of the nineteenth century "was no less significant than the astronomical (Copernican-Keplerian) and Newtonian revolutions of the previous centuries" (58). As "[a]stronomy grew in sophistication as a branch of the practical, observational and theoretical, mathematical sciences" (59), it had, as Galison demonstrates, significant implications for time-keeping systems (101). Gossin explains that "biological evolution on earth was considered by at least some Victorian thinkers to be a continuation of cosmic evolution in the universe. The inorganic development of the galaxies, stars, and planetary systems gave birth to organic development, so astronomy and Darwinism were naturally linked in the scientific story of the cosmos" (55). In temporal terms, the deep time of geology was extended to cosmic proportions in astronomy: for instance, astronomer William

> Herschel…saw himself as working within the long respected tradition of natural history, counting and cataloguing, collecting and categorizing astronomical observations…like so many stellar seashells, or cosmic fossils…. Herschel

> compiled a compelling 'natural history of the heavens'—a tale of epic proportions, dramatic development and change, and all told from an eye-witness perspective. (87)

Like Swithin in Hardy's *Two on a Tower*, Herschel "knew that his vision into the depths of space was also a journey into the depths of 'time past.' As he remarked in old age, 'I have observed stars of which the light, it can be proved, must take two million years to reach the earth'" (89).

Astronomical deep time was studied by nineteenth-century physicists in accordance with the laws of thermodynamics. In particular, estimates of the sun's life and eventual heat death were predicated on a vast time scale, as were studies in astrophysics regarding the lifespan of various stars. Physicists like William Thomson (Lord Kelvin)[20] applied the second law of thermodynamics to the sun's energy; just as there were debates amongst geologists regarding the age of the earth, many physicists attempted to predict the lifespan of the sun. Thomson's "On the Age of the Sun's Heat" (1862), in which he strove to determine the "probable limits to the periods of time, past and future, during which the sun can be reckoned on as a source of heat and light," was influential across disciplines (389). In his article Thomson articulates that "[t]he second great law of Thermodynamics involves a certain principle of *irreversible action in nature*. It is thus shown that, although mechanical energy is *indestructible*, there is a universal tendency to its dissipation, which produces gradual augmentation and diffusion of heat, cessation of motion and exhaustion of potential energy through the material universe." Although Thomson states that "it is impossible to conceive a limit to the extent of matter in the universe" and proposes that "science points rather to an endless progress, through an endless space, of action

[20] Gold explains that "The term [*thermodynamics*], coined by physicist William Thomson in 1854 at a meeting of the Royal Society of Edinburgh, refers to that branch of physics that deals with the relations between heat and *other forms of energy*. When Thomson introduced it, he limited the latter to electricity and mechanical action. The word *thermodynamics* itself evokes the roots of the science of energy in the study of the movements, flow, interactions, and generation of heat" (5).

involving the transformation of potential energy into palpable motion and thence into heat, than to a single finite mechanism, running down like a clock, and stopping for ever" (388), the chronometric imagery of the sun "running down" was an evocative symbol of the second law of thermodynamics. Thomson is focused, in part, on contesting the generously long estimates that many biologists and geologists proposed to accommodate theories of gradualism and evolution. For instance, he asks,

> What then are we to think of such geological estimates as 300,000,000 years for the "denudation of the Weald?" Whether is it more probable that the physical conditions of the sun's matter differ 1,000 times more than dynamics compel us to suppose they differ from those of matter in our laboratories; or that a stormy sea, with possibly channel tides of extreme violence, should encroach on a chalk cliff 1,000 times more rapidly than Mr. Darwin's estimate of one inch per century? (391-92).

Thomson predicts the eventual heat death of the universe and offers a shorter estimate of the sun's and earth's lifespan than had been previously suggested:

> It seems, therefore, on the whole most probable that the sun has not illuminated the earth for 100,000,000 years, and almost certain that he has not done so for 500,000,000 years. As for the future, we may say, with equal certainty, that inhabitants of the earth 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. (393)

Although, as Crosbie Smith notes, Thomson "speak[s] confidently of the universe in terms of an endless flow, implying a perfect infinite creation rather than an imperfect finite mechanism"

(143), his depiction of the potential heat death of the sun provided a culturally memorable illustration of cosmic dissipation. Thomson's influence was felt throughout the century, as evidenced by Wells's reliance on his timeframe in *The Time Machine* (Ruddick, "Note" 225).

The idea of cosmic decay and the eventual death of the sun, predicated on the notion of "irreversible action in nature" and "a universal tendency to...dissipation," captured the public's imagination and was often associated with narratives of decline. Gold observes that "the second law of thermodynamics…participated in an already widespread mythology regarding the death of the sun" (17), and thermodynamic temporality lent itself to non-scientific discourse by being easily translated into apocalyptic allegory and metaphor. Despite the non-correlation between entropy and extinction, by the end of the century many writers drew connections between dissipation and degeneration. Stephen Brush describes how "the same notion may appear at about the same time in both science and culture without any apparent causal influence one way or the other. Such was the case with the principle of dissipation of energy in physics, and the corresponding theory of degeneration in biology, both of which flourished in the pessimistic atmosphere of the latter part of the nineteenth century" (2). In *Energy Forms* Bruce Clarke describes the temporal implications embedded within theories of evolution and thermodynamics:

> In the 1850s, the laws of thermodynamics as well as the theory of evolution introduced versions of irreversibility into the temporal description of physical and biological systems. The dissipative transformations of energy and the progressive metamorphoses of species now marked the performance of the world-system over time, marked it as a system in time. Today we view the arrival of irreversible time within thermodynamics as bringing physics closer to the actual workings of cosmological self-organization and far-from-equilibrium systems, thus as an

> advance over the generalized temporal reversibility that functioned within the regime of Newtonian dynamics and other regimes of scientific materialism. But thermodynamic temporality also came forward as mythic time. Hypothetical thermodynamic causality was often troped as a universal and seemingly imminent mythic fate. (40)

Allegories of dissipation and degeneration became especially apparent later in the nineteenth century and in many ways marked a continuity with earlier (Christian) narratives of apocalypse:

> Fin-de-siècle thermodynamic prophecies of a universe evacuated of vitality by mechanical dissipation were founded on proverbial Western concepts of temporal linearity, fruition, and summation followed by apocalyptic cessation. Irreversible time emerged in science simultaneously in the historical form of random evolutionary transitions and in mythic or phantasmagoric forms of certain, imminent heat death. (Clarke 40)

These "mythic" interpretations of contemporary scientific theories were often employed by authors intent on exploring the psychological impact of scientific time or sensationalizing their representations of the future. As I propose in my analysis of Dickens, apocalyptic connotations associated with spiritual deep time often overlap with scientific imagery in novels from this period. While this summary touches on only a few key scientific figures, it indicates the extent to which theories such as gradualism, evolution, and the heat death of the sun could only be understood by accepting immense and previously inconceivable timescales.

Deep Time: Critical Context

Although Carlyle's non-scientific use of the phrase "deep time" and widespread cultural recognition of geological time can be traced to the nineteenth century, the geological term "deep time," as I have suggested above, was coined by McPhee in 1981. From its eighteenth-century origins, however, the concept of deep time entailed a significant rethinking of human timescales and the human species' place in history. Stephen Jay Gould identifies "the discovery of 'deep time'" as "the great temporal limitation imposed by geology upon human importance" (1-2). *Basin and Range*, McPhee's first journalistic account of geology, explores deep time and the possibility that humans may not be capable of truly grasping the concept and its implications:

> The human consciousness may have begun to leap and boil some sunny day in the Pleistocene, but the race by and large has retained the essence of its animal sense of time. People think in five generations—two ahead, two behind—with heavy concentration on the one in the middle. Possibly that is tragic, and possibly there is no choice. The human mind may not have evolved enough to be able to comprehend deep time. It may only be able to measure it. At least, that is what geologists wonder sometimes, and they have imparted the questions to me. They wonder to what extent they truly sense the passage of millions of years. They wonder to what extent it is possible to absorb a set of facts and move with them, in a sensory manner, beyond the recording intellect and into the abyssal eons. Primordial inhibition may stand in the way. On the geologic time scale, a human lifetime is reduced to a brevity that is too inhibiting to think about. (127-28)

McPhee's contention, that the human mind may not even be capable of comprehending deep time, is acknowledged in early concepts of geological time and extends to contemporary

Anthropocene studies. In the wake of Hutton's claim "that we find no vestige of a beginning,—no prospect of an end," Lyell similarly recognized the daunting implications of deep time: "Such views of the immensity of past time, like those unfolded by the Newtonian philosophy in regard to space, were too vast to awaken ideas of sublimity unmixed with a painful sense of our incapacity to conceive a plan of such infinite extent" (63 [1830]). In the ninth edition Lyell again considers the possibility that we may simply be unable to comprehend deep time:

> Could our survey embrace other worlds, and the events, not of a few centuries only, but of periods as indefinite as those with which geology renders us familiar, some apparent contradictions might be reconciled, and some difficulties would doubtless be cleared up. But even then, as our capacities are finite, while the scheme of the universe may be infinite, both in time and space, it is presumptuous to suppose that all sources of doubt and perplexity would ever be removed. (493)

Deep time demands a reconsideration of humankind's position in the earth's history, and it is possible that humans do not have the requisite mental capacity to process the concept. As Darwin puts it: "It is hardly possible for me even to recall to the reader, who may not be a practical geologist, the facts leading the mind feebly to comprehend the lapse of time" (*Origin* 271).

How, then, can such vast timescales be understood, represented, or transmitted? In other words, what terms will most effectively convey deep time so that "[t]he human mind" might "be able to comprehend" it? Interestingly, questions about the insufficiency of numerical representations of deep time are apparent in the term's geological origins. McPhee first mentions deep time to suggest that "Numbers do not seem to work well with regard to deep time. Any number above a couple of thousand years—fifty thousand, fifty million—will with nearly equal effect awe the imagination to the point of paralysis" (20). How, then, is deep time to be

understood or envisioned? In *Time's Arrow, Time's Cycle*, Gould acknowledges that authors—including writers of scientific texts—must often resort to metaphor or analogy in their attempts to convey the breadth of deep time:

> An abstract, intellectual understanding of deep time comes easily enough—I know how many zeroes to place after the 10 when I mean billions. Getting it into the gut is quite another matter. Deep time is so alien that we can really only comprehend it as metaphor. And so we do in all our pedagogy. We tout the geological mile (with human history occupying the last few inches); or the cosmic calendar (with *Homo sapiens* appearing but a few moments before *Auld Lang Syne*). … John McPhee has provided the most striking metaphor of all (in *Basin and Range*): Consider the earth's history as the old measure of the English yard, the distance from the king's nose to the tip of his outstretched hand. One stroke of a nail file on his middle finger erases human history. (3)[21]

Gould's examples effectively downsize deep time into recognizably human units; they convert the numbers of geological time into the language of human experience.

More recently, Wai Chee Dimock has also suggested the insufficiency of numbers to convey deep time. In *Through Other Continents: American Literature Across Deep Time*, she redefines the concept of deep time from its geological usage and employs the phrase in relation to literary studies. She proposes that the temporal relations revealed through "scale enlargement" represent a non-mathematical way of conceiving of time:

[21] McPhee's original statement reads: "With your arms spread wide again to represent all time on earth, look at one hand with its line of life. The Cambrian begins in the wrist, and the Permian Extinction is at the outer end of the palm. All of the Cenozoic is in a fingerprint, and in a single stroke with a medium-grained nail file you could eradicate human history" (126).

> Rather than being a discrete entity, [‘American’ literature] is better seen as a crisscrossing set of pathways, open-ended and ever multiplying, weaving in and out of other geographies, other languages and cultures. There are input channels, kinship networks, routes of transit, and forms of attachment—connective tissues binding America to the rest of the world. Active on both ends, they thread America texts into the topical events of other cultures, while also threading the long durations of those cultures into the short chronology of the United States. This double threading thickens time, lengthens it, shadowing in its midst the abiding traces of the planet’s multitudinous life. (3)

Dimock suggests “a new term—‘deep time’—to capture this phenomenon. What this highlights is a set of longitudinal frames, at once projective and recessional, with input going both ways, and binding continents and millennia into many loops of relations, a densely interactive fabric” (3-4). Dimock’s usage of “deep time” works to “thicke[n] time,” giving it a three-dimensional aspect which accommodates literary history and cultural traditions, as well as scientific timescales. This “threading” of time weaves different timescales together and presents the possibility of loops or folding temporal relations. Dimock’s concept of deep time as time that exists outside a nation or text’s accepted chronological limits helps to contextualize literature within much vaster frameworks, and it challenges solely numerically-based concepts of time.

My usage of the term deep time will correspond largely with Dimock’s concept in that I broaden the geological notion to include vast timescales of other scientific disciplines (such as evolutionary, thermodynamic, or astronomical timeframes) as well as extended human ancestry and post-human species development. In this sense, Dimock’s notion of deep time conflates geological timeframes with human history. Mark McGurl observes that Dimock’s

> essentially Braudelian usage [of the term *deep time*]…makes it synonymous with a historical *longue durée* measured, at most, in thousands of years. Here instead we will insist upon its original geological meaning. Whether it is the 13.7 thousand million years since the Big Bang, or the 3.5 thousand million years in which life on earth has been evolving, or for that matter the 4.5 thousand million years from now until the earth is incinerated in the heat-death of the sun, the deep time of the earth sciences is difficult to integrate into even the most capacious visions of civilizational, national, or institutional continuity. (537-38)

McGurl's critique is apt, as Dimock's usage renders the term less precise; moreover, her description of deep time as "a new term" neglects to mention McPhee's terminology. That being said, Dimock's reshaping of the term resonates with a type of temporality invoked by nineteenth-century novelists. These authors deviate from the novel's typical individual or familial focus to incorporate vast timescales; however, they employ similar temporal strategies whether they investigate far-reaching human timescales (ancestry, for instance) or non-human timescales (such as earlier species). For Dimock and the nineteenth-century novelists I study, human history and ancestry are seen as something distinct from but connected to deep time, and they are represented alongside non-human timescales through similar narrative strategies. As McGurl points out, this compromises the geological integrity of the term. However, it has the advantage of considering human activity within deep time frames since, as Anthropocene studies are establishing, the age of humans constitutes a stage, no matter how brief, of geologic time, and one that has substantial (and potentially devastating) consequences for terrestrial duration. Although Dimock's concept of deep time significantly reduces the original geological sense of the term to equate it, more or less, with human history, her sense that deep time might be

explored through literature aligns with nineteenth-century novelists' interest in conveying scientific timescales through their writing.

Many of these novelists employ a model I call "folding time" to incorporate vast scientific timescales and remote periods within their generally linear narratives. I am borrowing Dimock's expression of "folds" of time or "folding time" to express the meeting of distant times that occurs in these textual moments. Although some of these moments constitute breaks, rifts, or disruptions in time, "folding time" effectively conceptualizes the way these moments contain overlapping or intersecting moments and ages: the present remains but is accompanied by the past or future. In a departure from their chronological narratives, these novels include moments of temporal fluidity to incorporate a sense of deep time that extends far beyond the novel's scope. By using folding time as a method to convey deep time, nineteenth-century novelists bring remote and contemporary time periods together; this strategy enables recognition of the proximity or similarity between chronologically-distant events, especially since these historically remote moments often take place in the same geographical space. For instance, Dickens's image of a megalosaurus in *Bleak House* evokes deep time and suggests similarities between Victorian London and the Jurassic period, while a trilobite fossil in Hardy's *A Pair of Blue Eyes* prompts Henry Knight's imaginative journey through the vast history of the area as "[t]ime closed up like a fan" (200). We might consider Carlyle's "Time-annihilating Hat" as a concept similar to folding time as it brings disparate eras—the present of the hat wearer and a distant time period—together. Interestingly, *Principles of Geology* also provides an iteration of the concept of folding time. Lyell contends that insufficient estimates of the earth's history have caused scientists to incorrectly attribute geological change to catastrophism: in a compressed timeframe, "the passage from one state of things to another must appear so violent, that the idea of revolutions in

the system inevitably suggests itself." [22] He remarks that, "The imagination is as much perplexed by the deception, as it might be if two distant points in space were suddenly brought into immediate proximity" (66 [1854]). Lyell provides a temporal example of "the legend of the Seven Sleepers," in which individuals awaken after two centuries of slumber to find themselves in another time. Obviously intrigued by the philosophical implications of this scenario, Lyell quotes Edward Gibbon, who remarks, "But if the interval between two memorable eras could be instantly annihilated;…[the spectator's] surprise and his reflections would furnish the pleasing subject of a philosophical romance" (qtd. in 67).[23] Lyell's notion of removing an "interval" between key events formulates a concept of folding time in which disparate moments exist in the same time frame; it also reveals how nineteenth-century thinkers conceptualized human timeframes (two centuries) and deep time (geological ages) using similar strategies.

Dimock proposes a model of folding time as an alternative to linear Newtonian time. She suggests that the concept of numerical, mathematical, and linear time outlined by Plato and later developed by Newton in his description of absolute time and space in *Principia* constitutes the sense of time that modern culture has largely internalized: "Time is 'mathematical' for Newton, which is to say, quantifiable, expressible as a numerical constant. It flows everywhere at the same pace, in the same direction, and everywhere yields the same measure. It is an immutable sequence, calibrated by an immutable metric" (127). She explains that in Newton's absolute time "[e]very number is a discrete entity: it is self-contained, self-identical, ending exactly where it begins. It is a modular unit, pointlike in its ontology." However, in the model of deep time she proposes, "[t]ime is anything but that. The relation between any individual instant and time in its

[22] Beer points out that Lyell's "exploration of an infinitely extended time-scale for the earth was one of the necessary preconditions of later theory"; indeed, he believed that "too short an imagined time-scale had misled geologists into a catastrophist view of the past" (5).
[23] See Gibbon's *The History of the Decline and Fall of the Roman Empire* (363-64).

totality is not in the least cut-and-dried. Rather, it is a sinuous overlap, a fold within a voluminous fabric, registering the continual emergence of relations. This interactive process goes backward as well as forward, producing adjacencies between what was and what will be." Advocating for a sense of duration and temporal continuity that recalls Henri Bergson's concept of time in *Creative Evolution*, which insists that "[t]he universe *endures*" (11), Dimock asserts that "[c]lean resolution…is not at all possible given the ontology of time. Years, decades, and centuries are endlessly connected even when they are discretely numbered. There can be no stable partitions here, and no clean breaks" (126).[24] Dimock's concept of folding time provides a valuable framework for my literary study as the novels I analyze similarly envision time as a continuum in which disparate moments might be brought into proximity.

My conception of folding time is also shaped by Dana Luciano's analysis of the temporality of grief in nineteenth-century literature. She observes that, "As a newly rational and predominantly linear understanding of time came to dominate the West, the time of feeling, deliberately aligned with the authority of the spiritual and natural worlds, was embraced as a mode of compensation for, and, to some extent, of resistance to, the perceived mechanization of society" (6). The examples of folding time I consider are often "aligned with…spiritual and natural worlds," and they frequently depict subjective experiences of the past or prehistory resurfacing in private temporal moments. Like the moments of grief Luciano explores, folding time is "founded on a *rift* in time" that is sometimes "imagined as an investment in irrecoverable origins" and "establishes the feeling body as a potential site of historiographic and temporal interventions" (18). Moreover, like the types of folding time I identify, "the asynchronic traces

[24] In her discussion of folding time Dimock endorses Aristotle's concept of time as an alternative to the Platonic mathematical time that informed "Newton's version" (127). She writes: "Rather than segmenting evenly, along lines fixed by serial numbers, time for Aristotle is a continuum: a continuum that, at any given moment, can be cut in any way. These 'cuts'—their lengths, their angles of incision, the folds being gathered together as a result—are generated on a strictly ad hoc basis, which is to say, under the shaping hand of particular events" (126).

that haunt narrative dispositions of the grieving body in nineteenth-century American literature … enable particular arrangements of grief to propose forms of connection in and across time that fall outside or athwart the confines of both recognized history and familial generationality" (18). I examine moments of folding time that similarly establish "connection[s] in and across time," albeit in a scientific-temporal register, and in which the present "fades away and yet, at the same time, remains" (20) while the past or future materializes.

This model of folding time is also indebted to Sue Zemka's analysis of the moment in Victorian literature. When represented through folding time, deep time appears in moments or flashes of recognition, as the vastness of scientific time or the weight of duration is experienced or imagined in an instant. Zemka "argues that the rise of abstract time and temporal precision contributes to a shift in literary uses of the moment from an affective to a symbolic register" (10). She observes:

> While the early nineteenth century inherits a belief that the primary objective for artistically shaping time is to evoke emotion, by the end of the century affective objectives no longer seem sufficient. Something more is expected from literature—a vision into hidden things, into deep structures of meaning. Time itself contains these hidden meanings, and the pathway to their discovery lies through the moment. (10)

The moments of folding time I identify perform this function as they unveil a "discovery" of deep time or disparate eras. Zemka "uncovers a Victorian culture that contends with a growing separation between durational time and a sensationalized and punctualist present" (13), and I contend that moments of folding time embody these different temporal registers as novelists

employ brief "sensationalized" moments to represent the "durational time" associated with evolutionary and geologic processes.

Deep Time in the Nineteenth-Century British Novel

The inclusion of deep time in a genre that generally focuses on individual or familial timeframes pushes the temporal limits of the novel. The nineteenth-century novel's historic backdrop extends as novelists begin to locate characters within ancestral and evolutionary timeframes: for instance, Daniel Deronda must come to terms with his racial ancestry, while Bulwer's narrator apprehends his evolutionary place in *The Coming Race*. In particular, scientific romances often examine humankind's place in deep time rather than the individual's place in history. This expanded temporal perspective corresponds with changing concepts of evolution that focused on species rather than individual development. Beer observes that,

> During the eighteenth century, when the word ['evolution'] was used, it meant the stages through which a living being passes in the course of its development from egg to adult. … But evolutionary theory challenged the single life span as a sufficient model for understanding experience. In the 1830s the word evolution was used for the first time to describe the development of the *species* rather than of the individual. (11)

Texts like *The Time Machine*, in which the protagonist violently confronts his evolutionary descendants, attempt to locate their characters and the human species within vast timeframes. The Victorian novel's interest in familial inheritance and ancestry correspondingly expands to accommodate scientific timescales. The resulting "scale enlargement," to use Dimock's term, exposes relations apparent only over deep time and which might otherwise remain unseen:

> Scale enlargement along the temporal axis changes our very sense of the connectedness among human beings. It also suggests that different investigative contexts might need different time frames, with no single one serving as an all-purpose metric. Some historical phenomena need large-scale analysis. They need hundreds, thousands, or even billions of years to be recognized for what they are: phenomena constituted by their temporal extension, with a genealogy much longer than the life span of any biological individual, and interesting for just that reason. A shorter time frame would have cut them off in midstream, would have obscured the fact of their cumulation. (5)

In nineteenth-century novels, vast timescales reveal connections between characters and ancestors and extend the structural networks that characterize the multiplot novel.[25] Most evident in Dickens's and Eliot's novels, these webs are temporal as well as spatial and depict connections between families, generations, and species as well as characters, communities, and classes. *Bleak House*, for instance, presents the complex links between various characters and their respective districts, seemingly embodying Darwin's view that "[a]ll living things are related in intricate and often subtle patterns of inheritance, cousinship, mutual dependence" (Levine 17-8). Characters are often presented as specimens within a much larger ecosystem that is not only spatial but temporal, and descent is conceptualized as a web of myriad individual, familial, and racial links, rather than "simple linear progression" (Beer 189).

When nineteenth-century novels incorporate deep time and extensive networks, they evoke a continuous time that extends far beyond their narratives. This sense of infinite expansion is similar to the notion of continuous movement which, as Beer notes, characterized numerous scientific disciplines: "Comte, Eddington, Clerk Maxwell, Clausius, Darwin, Helmholtz, all in

[25] See Caroline Levine's "Narrative Networks: *Bleak House* and the Affordances of Form."

their diverse fields of social theory, physics, evolutionary and genetic theory, acoustics, and astronomy, at this period emphasised the unstayable and ever-extending movement of all phenomena" (180). Spatial as well as temporal, this infinite movement is acknowledged in narratives that deny the possibility of knowable origins and satisfactory endings: as Eliot writes in *Daniel Deronda*, "No retrospect will take us to the true beginning; and whether our prologue be in heaven or on earth, it is but a fraction of that all-presupposing fact with which our story sets out" (3). Levine observes that "closure is perceived as artificial and inadequate because it implies an end to history and is incapable of resolving the problems raised by the narrative" (17), and this lack of resolution informs the increasingly future-oriented perspectives of novels in this period. As Grosz explains, Darwinism in particular entails a futurist perspective, while Choi demonstrates how Victorian novels, by encouraging hypothetical thinking and presenting contingent scenarios, "did not undermine narrative, but rather invited readers into a different kind of relationship with it, such that they, like Darwin, became active participants in generating visions of the past as well as of the future" (275). The hypothetical narrative strategies apparent in nineteenth-century novels reveal a drive towards and an emphasis on the future; these works encourage the reader to imagine the future, much the same way that *Origin* implicitly opened up the possibility of multiple potential future scenarios in its descriptions of evolution.

Evidently, this mode of thinking focuses on the material and secular rather than spiritual future. Levine proposes that "[t]he growing nineteenth-century dissatisfactions with closure—the most marked and inevitable feature of 'plotting'—are further reflections of this Darwinian movement away from teleology and…toward a new kind of emphasis on continuing change" (19). However, unlike traditional Christian concepts of time, Darwinian, thermodynamic, and astronomical futures often appear threatening. In a nineteenth-century context, the far-reaching

future seemed unpredictable and inimical to humanity, and novels increasingly associated the future with narratives of decline. As Beer notes, the "concept of irreversible time had gained power from the emphasis in *The Origin of Species* on transformation and on extinction" (181), and authors more frequently associated the future with the threat of extinction, degeneration, and entropy. *The Time Machine*, for example, incorporates all three in its depiction of the future, while *The Coming Race* anticipates a species takeover. As nineteenth-century novels incorporate scientific timescales they develop secularized visions of the future; however, literature also contributes to the secularization of deep time, as we've seen, by transforming Carlyle's original literary concept into an increasingly scientific model. What Galison refers to as "the transformation of time—its radical secularization" (42) is apparent in the concept of deep time developed over the nineteenth century; as Levine explains, "[t]he Victorian novel clearly joins with science in the pervasive secularizing of nature and society and in the exploration of the consequences of secularization that characterized mid-Victorian England" (viii). The novels I study reveal this shift through descriptions which combine earlier spiritual imagery with emerging scientific terms, such as when Dickens describes flooded Lincolnshire and the burning ironmills of *Bleak House* in Biblical as well as thermodynamic and geological terms, passages that I will examine in detail in Chapter One.

At the same time, by translating vast scientific timescales into literary terms these authors adapt deep time to the novel. Obviously, novels convey deep time in literary rather than numerical terms, a strategy that science writing also employs, from Lyell's evocative descriptions in *Principles of Geology* to McPhee's and Gould's use of deep time as a metaphor. Nineteenth-century novels downsize deep time to accommodate vast timescales to the novel's individual or familial scope and, in doing so, humanize vast timescales. Comparing or translating

deep time into human terms makes it accessible—as Gould acknowledges—and reveals similar natural processes at all temporal scales. Moreover, by humanizing deep time these novels implicate humans within vast scientific timescales. In fact, as I propose in my conclusion, many of these novels foreground the concept of the "age of humans" which is now being proposed in Anthropocene studies. Thus although these works often evoke deep time to challenge anthropocentric interpretations of history, by humanizing deep time and depicting remote eras in relation to contemporary events they also suggest ways in which the human species might influence vaster scientific processes of evolution and environmental change.

These novels acknowledge as well the individual experience of grappling with vast scientific timescales by describing characters' subjective responses to deep time. Like earlier fiction, nineteenth-century novels frequently explore introspective, subjective, and psychological temporality; however, in this period these subjective temporal experiences often arise in specific reaction to scientific conceptions of time. Novelists are invested in portraying interiority, consciousness, and private experiences of time and duration with an emphasis on psychological realism.[26] For instance, as I will suggest in Chapter One, *Daniel Deronda*'s Gwendolen suffers from feeling temporally and spatially insignificant when she considers astronomy; similarly, my third chapter will consider, in a more fantastic context, Wells's Time Traveller's horror when he faces the immenseness of time and desolation of space thirty million years "into futurity" (144). These moments, and many others like them, imagine deep scientific time in relation to individual temporality: what has been represented as a collective or external history in the sciences is conveyed as a private experience in the novel. In many ways this literary perspective is better able to acknowledge the difficulties of grasping deep time—as Hutton, Lyell, McPhee, and

[26]I use the term "psychological realism" to refer to writing which focuses on the interiority of its characters rather than in the modernist sense of narrative innovation which is interested in directly representing the form of consciousness.

Gould describe—and explores the psychological reaction to vast timescales. Moreover, it acknowledges the inevitable subjectivity of human perspectives and extends this sense of subjectivity to scientific considerations. These novels portray scientific standpoints as partial and emphasize the limitations inherent in human conceptions of vast timeframes.

Dissertation Overview

In the following chapters I analyze a range of novels published between 1846 and 1907. In Chapter One I examine how Dickens's *Dombey and Son* (1846-48), *Bleak House* (1852-53), and *Our Mutual Friend* (1864-65), as well as Eliot's *Middlemarch* (1871-72) and *Daniel Deronda* (1876) develop a specifically scientific model of deep time from Carlyle's vast spiritual concept. Dickens and Eliot employ realist narrative techniques to incorporate facets of deep time into their works: they use environmental descriptions, narratorial digressions, and moments of psychological introspection to translate deep time into the familiar temporal register of the novel. For instance, they introduce folding time—often used to convey individual temporal experiences of memory or anticipation—in landscape descriptions, and expand themes of inheritance to include far-reaching ancestry and even prehistory. These moments of folding time add temporal depth to the novels' spatio-temporal networks and depart from their mainly linear narratives. Dickens reveals a Carlylean sense of spiritualized deep time embodied in the metaphors of "waves" in *Dombey and Son*; a combination of apocalyptic, geological, and thermodynamic imagery in *Bleak House*; and a more materialist inflection of deep time in *Our Mutual Friend*, in which the evolutionary and geological past endures and accumulates in Victorian London. Through symbols such as scientific chronometers and Darwinian dust-mounds, or geological descriptions of railway construction, Dickens places older and newer models of scientific time

into direct relation. My analysis of Eliot focuses primarily on *Deronda*, but I begin with a reading of *Middlemarch* to establish her extensive scientific background and demonstrate how uniformitarianism informs her writing. While *Middlemarch* evokes deep time through its gradualist and evolutionarily-informed narrative web, *Deronda* explores problems of temporality and duration. Eliot conceptualizes deep time in the novel's opening epigraph and explores Judaism as a means of reconciling the individual with vast historic and ancestral timeframes. I argue that *Deronda* combines religious and scientific concepts of deep time through a biologically-informed model of religious inheritance and bridges realism and romance, through its depiction of wish fulfillment and probability, more self-consciously than any other novel in this project. As Dickens and Eliot adapt spiritual deep time to encompass scientific concerns, the registers of public and private time shift: although spiritual time has often been understood as private and scientific time as public, these novels blur these distinctions and depict private temporality in relation to scientific deep time.

My second chapter analyzes Hardy's *A Pair of Blue Eyes* (1872-73), *The Return of the Native* (1878), *Two on a Tower* (1882), and *The Woodlanders* (1886-87). Hardy articulates a specifically scientific inflection of deep time that corresponds more closely with modern concepts of deep time. Hardy's deep time is divorced from spiritual connotations and he depicts scientific processes—and, in *Two on a Tower*, the work of a scientist—as he positions human activity in relation to the vast timeframes of geology, evolution, and astrophysics. Like Dickens and Eliot, Hardy employs realist narrative techniques to incorporate facets of deep time into his works and to translate deep time into the temporal scale of the novel. However, Hardy is particularly preoccupied with interrelating timescales and illustrates how natural processes unfold over both vast and minute timespans. His preface to *Two on a Tower* explains his "wish to

set the emotional history of two infinitesimal lives against the stupendous background of the stellar universe, and to impart to readers the sentiment that of these contrasting magnitudes the smaller might be the greater to them as men" (289). Hardy's novels set vast and minute "magnitudes" into relation, and he acknowledges that, despite its relative insignificance, the human scale is more comprehensible and important to us. In this sense, he suggests that literary form—the novel genre and its techniques such as description, metaphor, and analogy—provide a means of accessing deep time. Like Dickens, Hardy includes imaginative moments of folding time and depicts a temporal continuum by using prehistoric imagery in his landscape descriptions, while his overt allusions to scientific theories and his scientifically-minded narrators, who seem to exist outside the novel's timeframe and serve to situate humankind within vast timescales, recall Eliot. Despite these similarities, though, Hardy's deep time is more overtly pessimistic. From their vaster temporal perspective his narrators identify and critique various stages of human development, often using the language of decline to suggest a negative telos over vast timescales. Hardy places greater emphasis on a sense of decay associated with deep time processes, and he underscores the pessimistic implications of scientific theories, challenges anthropocentric perspectives, and suggests that natural processes play a determining role in individual lives.

Chapter Three demonstrates how Bulwer's *The Coming Race* (1871), Haggard's *She* (1886-87), and Wells's *The Time Machine* employ adventure narratives to represent time travel. Using the structure of imperial romances, these texts embody deep time in foreign locations, alien individuals, and post-human species, thereby conceptualizing deep time as something effectively inhuman and other. These popular romances incorporate science and deep time differently than do their realist counterparts: their protagonists journey to undiscovered locations

that also represent unfamiliar time periods, so that folding time—the meeting of distant eras—is represented in the form of cross-cultural encounters. Unlike realist novels, these texts incorporate folding time into their plots so that it functions as a component of, rather than a digression from, their storylines. These proto-science fiction texts or "New Romances," to use Saler's term, combine science and fantasy and employ first-person narrators to recount fantastic scenarios. Like realist novels they are interested in representing private experiences of deep time and explore the psychological impact of vast timescales; however, their characters confront fantastic embodiments of deep time face-to-face and their experiences are sensationalized. In Bulwer's satiric *The Coming Race* an American narrator discovers a subterranean post-human species called the Vril-ya. During his captivity, the narrator reassesses his concepts of time-keeping, history, and imperialism, and anticipates that this advanced race will conquer or annihilate humankind. In Haggard's imperial adventure *She* a group of British explorers travel to Africa and discover the ancient kingdom of Kôr, ruled by a seemingly immortal queen Ayesha, *She-who-must-be-obeyed*. The protagonists' journey represents a voyage into the past (in much the same way as Conrad would depict Marlow's journey up the Congo River in *Heart of Darkness*), and their exposure to reincarnation, Ayesha's longevity, and her materialist sense of deep time disrupt their understanding of linear time and history. *The Time Machine* literalizes the metaphorical time travel of the imperial romance as the Time Traveller voyages into the future only to witness the outcome of human devolution and the heat death of the universe. These romances challenge anthropocentrism, destabilize imperialist assumptions, and hypothesize about scientific developments; they look to the future and propose narratives of decline as they associate deep time with the processes of degeneration, extinction, and entropy.

Finally, my conclusion looks ahead to modernist literature and contemporary Anthropocene studies to demonstrate the extent to which Victorian novels foreground temporal concerns that twentieth and twenty-first-century critics now conceptualize specifically through a concept of deep time. My readings of Conrad's *Heart of Darkness* (1899) and *The Secret Agent* (1907) demonstrate how nineteenth-century novels anticipate modernist temporal preoccupations and suggest continuities between Conrad and earlier novelists. In particular, I argue that late-century popular romances addressed many temporal and scientific issues that would later be developed in modernist writings. For instance, *Heart of Darkness* employs a travel narrative similar to that used by Conrad's romance predecessors, as Marlow's colonial expedition to the Congo represents a voyage into a seemingly primordial—and timeless—wilderness. *The Secret Agent* addresses late-nineteenth-century scientific culture and re-imagines the events surrounding the 1894 attempted bombing of the Royal Observatory. Greenwich is at the heart of the narrative and embodies both standardized time and British astronomy. The novel, which Conrad dedicates to Wells, takes up the interest in formal temporal measures expressed in works such as *Dombey and Son* and *The Time Machine* and purposefully engages with fin-de-siècle science and vast evolutionary and thermodynamic timescales. *The Secret Agent* explores different strains of scientific time as Greenwich's politicized chronometry is contrasted with the novel's pervasive and subjective sense of deep time.

Lastly, I briefly summarize contemporary perspectives on the Anthropocene to consider how nineteenth-century British novels contributed to the cultural concept of an "age of humans." One of the proposed dates of commencement for the Anthropocene is the Industrial Revolution (Voosen 852), and, as Dickens's geological descriptions of railway construction in *Dombey and Son* and *Bleak House* reveal, nineteenth-century novels are witness to a defining period of human

development with a corresponding environmental impact. The strategies these texts employ to convey seemingly incomprehensible scientific timescales and their interest in positioning individuals and the human species in relation to prehistoric and post-human time periods represent an early conceptualization of the Anthropocene. By the end of the nineteenth century, novels are anticipating the future effects of scientific processes and technology on evolution and the environment. As contemporary scholars consider the far-reaching implications of human activity, the ways that nineteenth-century novels communicate a concept of deep time and conceptualize human existence in relation to pre- or post-human eras seems remarkably prescient. This dissertation examines representations of deep time in nineteenth-century British novels and argues that these texts help carve a path for our contemporary definitions of deep time and the Anthropocene.

CHAPTER 1
"*In Medias Res*": Spiritual and Scientific Deep Time in Dickens and Eliot

The first usage of the term "deep time" was not in a geological or even scientific context but in Thomas Carlyle's "Boswell's Life of Johnson" (1832). Although our contemporary understanding of deep time has its roots in James Hutton's geology (McPhee 95-108), the expression itself is originally literary, which Gould indirectly acknowledges when he proposes that "[d]eep time is so alien that we can really only comprehend it as metaphor" (3). In this sense, Carlyle's non-scientific use of the phrase supplies a metaphor for science's figurative language. When we consider "deep time" not just in its modern incarnation but from its starting point, we can appreciate how literature plays a significant role in expanding the concept of deep time, as coined by Carlyle, to encompass not just historical and spiritual but scientific timescales.

In this chapter I propose that Charles Dickens's and George Eliot's novels adapt Carlyle's traditional literary concept of vast spiritual time to a more modern understanding of scientific deep time. However, these scientific timescales are often conveyed through literary strategies including religious language, landscape descriptions, and subjective temporal experience. Dickens and Eliot imagine points of contact between remote periods through a model of folding time that departs from the linear narrative structure which is often ascribed to literary realism. These moments of folding time have been overlooked in Darwinist criticism which associates gradualism with sequential narrative chronology, and they complicate critical interpretations of Dickens's and Eliot's novels as webs or networks as they admit another dimension to these systems: a depth of time. Further, Dickens and Eliot imagine deep time as a private as well as public temporal experience. When they introduce folding time into their landscape descriptions, for instance, they draw from the novelistic tradition of private subjective temporal experience which conveys memories or anticipation. They also modify novelistic

representations of subjective temporal experience in order to depict individuals who are grappling with the concept of scientific deep time, which further complicates a simple distinction between private and public temporality. Finally, they convey deep time through the novelistic rubric of inheritance: deep time appears in their novels through the concepts of inheritance and duration, both of which inform both public and private temporal experiences. By using literary descriptions and folding time to convey subjective temporal experiences and vast scientific timeframes, Dickens and Eliot expand the scale of the realist novel and depart from Carlyle's original concept of deep time to help to develop the term's modern scientific sense.

This chapter will analyze Dickens's *Dombey and Son* (1846-48), *Bleak House* (1852-53), and *Our Mutual Friend* (1864-65), as well as Eliot's *Middlemarch* (1871-72) and *Daniel Deronda* (1876). *Dombey and Son* retains a spiritualized sense of deep time embodied in the natural metaphors of "waves" and uses folding time to portray the processes through which individuals experience time and memory. Through his depiction of Sol Gills's timepieces, however, Dickens links chronometry to an emerging idea of science and scientific time. *Bleak House*, by contrast, introduces evolutionary, geological, and thermodynamic timescales that produce an overlapping sense of spiritual and scientific deep time. Dickens employs folding time to bring remote moments together, represents old-fashioned and industrial temporalities as distinct geological periods, and proposes a spatial-temporal network that relies on evolutionary concepts of connectivity. In *Our Mutual Friend*, his last completed novel, Dickens presents a bleaker Darwinian vision of society and a materialist sense of a temporal continuum in which the evolutionary and geological past endures and accumulates in the present. In these novels we can trace how Dickens uses water symbolism to move from a Carlylean sense of spiritualized deep time in *Dombey and Son*, to the "antediluvian" Chesney Wold's prehistoric yet biblical sense of

time in *Bleak House*, to the more explicitly materialist deep time embodied by the primordial Thames in *Our Mutual Friend*. Eliot famously incorporates her extensive scientific knowledge into all her novels, although *Middlemarch* is her most overtly scientific novel while *Deronda*, her final novel, is most noticeably concerned with time. *Middlemarch*'s uniformitarianism entails an implicit sense of deep time, and Eliot depicts an evolutionarily-informed web of lives in which individuals, with various scientific projects and social goals, exist within historic and scientific timeframes. Lastly, I argue that *Deronda* proposes a means of reconciling the individual with greater historic and ancestral timeframes through an historic-religious sense of time and biologically-informed inheritance that links individuals over the course of time. Although my analysis of Eliot will focus primarily on *Deronda*, my overview of *Middlemarch* will establish her scientific background and demonstrate how she incorporates uniformitarian principles into her writing prior to *Deronda*'s more experimental narrative temporality.

By the mid-nineteenth century British literature was incorporating contemporary science to an unprecedented extent. Although Dickens is less well known for his scientific involvement than Eliot and Hardy, there is strong biographical evidence and a growing body of criticism recognizing his familiarity with current science. Articles in his periodicals *Household Words* (1850-59) and *All the Year Round* (1859-95) were "often surprisingly sophisticated in exposition despite their popular audience, [and] demonstrate that Dickens was both aware of what was happening in the world of science and convinced that the new developments had real significance for ordinary life" (Levine, "Dickens" 256). For instance, Jessica Kuskey describes how "the *Household Words* articles engaged readers by transforming Faraday's scientific presentations into fictional stories and made scientific concepts accessible,"[1] while *All the Year*

[1] Kuskey refers to a "series of four articles [that] appeared [in *Household Words*] between August 1850 and February 1851 to educate readers on 'The Chemistry of a Candle,' 'The Laboratory in the Chest,' 'The Mysteries of

Round ran a series of articles that "summarize[s] material straight out of [John] Tyndall's [*Heat Considered as a Mode of Motion* (1863)]" (80). Howard Fulweiler notes that "Dickens…had in his library copies of *The Origin* and of Lyell's *Principles of Geology*" (52) and observes that the public's "interest [in natural philosophy at mid-century] was specifically reflected in…*All the Year Round*" through reviews of *Origin of Species* (1860), Lyell's *The Geological Evidences of the Antiquity of Man* (1863), and an article on "Transmutation of Species" (1861) (53-54). Adelene Buckland proposes that Dickens's influences included "the panorama, the diorama, the cyclorama, and the burgeoning museum and exhibition culture of the 1840s and 1850s [which] presented a very different view of geology from that offered by Darwin. … [T]here were sensational and spectacular displays of dinosaurs and other 'monsters,' and something like 'catastrophism' was a popular visual form in the city's many earthquake and volcano shows" ("Poetry of Science" 679). Throughout his career, and particularly as an editor, Dickens was in contact with prominent scientists whose work he followed and revised for publication in his journals, and his personal reading testifies to his knowledge of contemporary science.

Eliot's immersion in contemporary science is well-documented: she kept abreast of theories ranging from positivism and phrenology to Darwinism, and was personally acquainted with scientific thinkers such as George Combe and Herbert Spencer (Postlethwaite 104-7). In *George Eliot and Nineteenth-Century Science*, Sally Shuttleworth explains that "[a]lthough all novelists in the nineteenth century were inevitably affected by the close interdependence of social and scientific thought, George Eliot was, in this respect, remarkable. She brought to her writing a breadth of knowledge of contemporary social and scientific theory unmatched by any of her peers" (ix). Eliot's relationship with George Henry Lewes, "a scientific popularizer [who]

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a Tea-Kettle,' and 'The Chemistry of a Pint of Beer'" (79). Ann Wilkinson also studies the *Household Words* essays "that redact, in a quasi-fictional form, the celebrated lectures of Michael Faraday to juvenile audiences" (234).

wanted also to be known as a true scientist in his own right," helped increase her exposure to scientific ideas, although, as Diana Postlethwaite reminds us, "even before she met Lewes and became 'George Eliot,' Marian Evans was deeply engaged with contemporary scientific thought" (100). While Lewes generally wrote non-fiction and Eliot focused on novels, she nonetheless produced some science writing, such as "The Natural History of German Life" while visiting Ilfracombe in 1856 (106). She was familiar with evolution and development theory even before the publication of *Origin* due to her reading of Lamarck, Chambers, Spencer, and Lyell, "whose expansion of the geological time-scale had provided a necessary precondition for evolutionary ideas" (Beer 146).[2] Often Eliot's novels are considered to exemplify the link between uniformitarianism and nineteenth-century literary realism: "Aesthetically, the fulfillment of the uniformitarian vision was articulated in the Victorian novel's constant reversion to the ordinary and to its treatment of it as normative. We find it most completely formulated in George Eliot's celebration of the art of the Dutch realist school of painting as a kind of model for her fiction" (Levine, "Dickens" 263). Her knowledge of science is not only apparent in her novels' scientific references, metaphors, and themes, but also in her approach to genre, form, and narrative.

As Dickens and Eliot evoke timescales recently established in disciplines such as astrophysics, geology, and evolutionary biology, they introduce a specifically scientific inflection of vast time that exceeds the traditional scope of the novel. They extend the novel's time frame beyond its customary individual and familial scales and expand the historical scale apparent in earlier nineteenth-century novels to include prehistory. For instance, while *Dombey and Son* depicts a more traditional familial scale of three generations, *Bleak House* extends this

[2] Similarly, Postlethwaite remarks, quoting from Eliot's letters: "Familiar as she was with these earlier versions of evolutionary theory, Darwin's *Origin of Species* would come as little surprise to Marian Evans: 'We have been reading Darwin's book on the 'Origin of Species' just now: it makes an epoch, as the expression of his thorough adhesion, after long years of study to the Doctrine of Development'" (107).

temporal scale to allude to the far-reaching inheritance of Lincolnshire (in genealogical and geological terms), prehistoric times, and the heat death of the sun. Similarly, *Our Mutual Friend* emphasizes the primordial aspects of London in a way that seems to foreshadow Conrad's depiction of the devolutionary and dissipated city in *The Secret Agent*. In Eliot, the historical scale framing *Middlemarch* is extended in *Daniel Deronda* to include the scientific time referenced in the epigraph, while Deronda is situated within a biological and historical sense of ancestry, and Gwendolen confronts an overwhelming sense of vastness that seems both historical and cosmic. Further, Dickens and Eliot depart from a sense of spiritual deep time to ground these scientific timescales in the material world: vast time is embodied in accumulating dust mounds in *Our Mutual Friend*, thermodynamic dissipation and explosion in *Bleak House*, and a chain of ancestry in *Deronda*. The vast timescales that Dickens and Eliot incorporate into their novels extend beyond the historic scale and into biological, geological, or cosmic timeframes, and they are often rendered in concrete and materialist scientific imagery rather than abstract terms.

Further, Dickens's and Eliot's long multi-plot texts mirror the vast scientific timescales that had been established by the theories of scientists such as Lyell, Darwin, and Thomson while simultaneously exposing the necessary limitations of narrative by hinting at the infinite beyond the novel. While the sheer breadth of Dickens's and Eliot's novels is not anomalous for Victorian literature, their vast scope is a significant formal component of their writing. The wide-reaching social perspective sought by Dickens and Eliot is mirrored in the volume of their novels, and their ambitiously broad portrayals of society extended to include references to recent scientific theories, previously inconceivable timeframes, and newly discovered connections between the ancient past, the present, and the future. Their novels' extreme length facilitates the impression of a vast historical, evolutionary, and geological context in which their characters are situated.

Eliot makes this explicit in the prelude and conclusion to *Middlemarch* and the opening epigraph of *Deronda*: the former acknowledges a much broader historical perspective when it introduces Dorothea's story in relation to the historical circumstances of Saint Theresa, while the latter insists that all stories start off "*in medias res*" (3). Thus, despite the often diverse worlds and wide range of characters they represent, these novels suggest an even broader world outside of their spotlight. Beer observes that "[t]he organisation of Dickens's novels shifts from the picaresque…to a profuse interconnection of events and characters so extreme as to seem to defy any overall meaning. Instead the activity of such novels ranges out towards infinity rather in the manner of medieval ornament" (40). Dickens's and Eliot's focus on individual lives within a much longer timeframe inevitably calls attention to the limited section of history—and small selection of people—the novel portrays; these narratives are self-consciously and obviously partial. Levine proposes that in Dickens's novels "[t]he world is larger than any character's imagination of it, and connections extend out endlessly. In its vastness and in the serenity of its movement, it seems indifferent to human ambition" ("Dickens" 274). This "vastness" is also apparent in temporal terms as both authors depict an "indifferent" natural world that endures far beyond their novels' timescales.

As novelists, Dickens and Eliot portray deep time in literary rather than numerical terms. In particular, they employ moments of folding time and utilize the novel's inheritance plot in order to convey deep time and temporal continuity. My analysis of folding time draws on Dimock's discussion of instances when "[e]vents otherwise far apart can find themselves suddenly side-by-side, rendered simultaneous for the moment" (126). In nineteenth-century novels folding time conceptualizes the way that two distinct and otherwise disconnected historical moments can be brought into relation to one another. This sense of subjective and fluid

temporality is not new to the Victorian novel; the British novel had long registered the relativity of personal temporal experience (consider any text that depicts a character's retreat into memory, for instance). However, mid-nineteenth-century novels extend this concept of fluctuating time to depictions of the external world and use these moments of folding time to bring together more remote periods. For instance, while *Dombey and Son* contains familiar novelistic portrayals of private temporality as it depicts characters like Dombey Sr struggling with resurfacing memories, Dickens's subsequent novels, by contrast, use folding time to imagine a rematerialized natural history (like the megalosaurus in *Bleak House*) or an enduring primordial past (like the prehistoric Thames in *Our Mutual Friend*). The novelistic concept of inheritance functions in a similar way: this recognizable trope imparts a much vaster sense of inheritance, so that what was traditionally generational becomes ancestral, biological, and even geological. In *Our Mutual Friend* the dust-mounds represent layers of time in geological terms; that they constitute the Harmon inheritance extends familial continuity to vast proportions. In *Deronda*, inheritance is not merely familial but religious and racial: Deronda's Jewish ancestry imbues his life with genealogical purpose and establishes continuity between an ancestral past and future.

By identifying folding time as a key device used to communicate deep time in these novels, I hope to draw attention to the non-realist strategies employed by Dickens and Eliot to convey the vast scientific timescales associated with theories such as uniformitarianism. Critics including George Levine have identified how gradualism, most often associated with geology and particularly Lyell's uniformitarianism, provided an influential model for literary realism (*Darwin and the Novelists* 5), and he explains that "[n]ovels as much as geology depended on the apparent plausibility conferred by the idea that all events can be explained causally, and by causes now in operation, and that extremes are to be regarded as the consequence of the gradual

accumulation of the ordinary" (15). Levine suggests that these geological principles are reflected in the sequential and chronological narratives which underlie nineteenth-century realist novels. Eliot's novels provide perhaps the most prominent example of the link between uniformitarianism and nineteenth-century realism, which generally focuses on detailed descriptions of daily domestic life and gradually unfolding plots. However, these readings of the linear structure of realist novels overlook the narrative device of folding time and the sense of overlapping timescales within these novels. Both gradualist and folding time narrative devices uphold a concept of deep time; however, folding time introduces a non-linear temporality in order to convey a sense of deep time in these novels. Folding time represents an alternative way of conveying the vast timescales associated with geological uniformitarianism, as it departs from the sequential representation of time which is often associated with nineteenth-century realism.

Dickens's and Eliot's use of folding time and their references to deep time also complicate critical readings of their multi-plot novels as "webs" or "networks." Their novels depict interwoven stories and viewpoints which critics have likened to Darwin's famous imagery of the "entangled bank" in *Origin of Species* (397): for example, Levine proposes that "[t]he Victorian multiplot novel is a fictional manifestation of the attitudes implicit in the metaphor of entanglement in Darwin" (*Novelists* 18). By striving to convey the vast connections or networks between different strata of society, Dickens and Eliot draw on the biological model of the ecosystem, portray Darwinian models of interconnectedness between individuals and species, and reveal characters' hidden histories. Caroline Levine proposes a similar reading using network theory in her analysis of *Bleak House*. Where George Levine interprets the Victorian novel's numerous and complex plots as features of Darwinian "abundance"—"The overpopulated worlds of the Victorian novel, those 'large, loose baggy monsters,' as [Henry]

James called them, are narrative equivalents of Darwin's 'endless forms, most beautiful, most wonderful'" (18)—Caroline Levine proposes that by "[u]sing the expansive form of the long, loose, baggy triple decker, Dickens had tried to represent all of England as interconnected." She argues that "*Bleak House* relies heavily on the form of the network in a way that paves the way for recent narratives about political, technological, economic, and social networks" (517) and acknowledges the temporal component of these networks:

> To capture a moment, one must struggle to grasp the multiple systems of interconnection—constantly unfolding and expanding and overlapping—that constitute local instantiations of the social. Since these different systems emerge, expand, and develop in different times and places and at different rates, any apprehension of a cultural network must be responsive not only to multiple networks but also to their multiple temporalities. (522)

However, this expansive and spatialized sense of time fails to take into account the moments of folding time apparent in these novels. Both structural models of entanglement and networks assume a temporal component that requires further attention; moreover, they necessitate the addition of an added dimension of temporal depth to their grids. Although Levine acknowledges that "networks expand indefinitely" and identifies the "multiple temporalities" inherent in "different systems" (522), both her model of network systems and the Darwinian concept of entanglement overlook temporal folds as additional points of connection and overlap. In this sense Dickens's and Eliot's strategies align with Dimock's concept of deep time: they focus on the relations revealed through scale enlargement and employ folding time in order to portray moments of connection between vastly different eras.

Criticism on literature and the history of science is increasingly aware of how fiction plays an active role in shaping scientific discourses and cultural concepts of science. Dickens was certainly influencing cultural concepts of science by publishing popular accounts of, for instance, thermodynamics in his journals; further, Beer suggests that Dickens may have influenced Darwin's writing: "the organisation of *The Origin of Species* seems to owe a good deal to the example of one of Darwin's most frequently read authors, Charles Dickens, with its apparently unruly superfluity of material gradually and retrospectively revealing itself as order, its superfecundity of instance serving an argument which can reveal itself only *through* instance and relations" (6). Similarly, Eliot transmitted scientific concepts through her fiction: "Scientific ideas did not merely filter through into the metaphors and images of her work; in constructing her novels she engaged in an active dialogue with contemporary scientific thought" (Shuttleworth ix). Both novelists were in conversation with leading scientists and weighed in on contemporary scientific debates through their writing. By extension, their novels contributed to the cultural understanding of deep time: they produce an idea of scientific deep time rooted in Carlyle's spiritualized literary concept which enables them to imagine deep time as a dynamic and often personal temporality. By employing a non-linear, relational model of deep time which exposes connections between remote times rather than representing vast time numerically, these novels construct a concept of vast scientific time as an active and connective chain between distant eras. Further, by adapting deep time to the novel genre from a spiritual model, Dickens and Eliot imagine scientific time as a private individual experience. Their descriptions of landscapes which feature folding time generally reflect a narrator's subjective perspective, and they depict the private temporal experiences of characters who struggle to grasp the implications of deep time. They also expand the theme of inheritance to include vast histories and suggest a

shaping and fluid relationship between individuals and their ancestors. While scientists like Hutton, Lyell, and Darwin wrote about deep time as an overwhelming and potentially incomprehensible concept, Dickens and Eliot imagine it in interactive terms with contemporary characters. In scientific terms, deep time is viewed as an external and public timescale; however, in these novels it is conveyed as part of one's individual temporal experience. Dickens and Eliot employ literary strategies to convey a scientific sense of deep time and duration in their works as they transform the Carlylean notion of deep time into a scientific concept informed by contemporary geology, biology, and physics.

"Lord, how that clock would go!": Memory and Chronometry in *Dombey and Son*

Dombey and Son marks the beginning of Dickens's mature period, and while it incorporates less contemporary science than his later works, it is significantly preoccupied with time-keeping and temporality. Its various and often competing models of time include chronometry, natural cycles, spiritual eternity, and characters' temporal experiences. Paul Dombey Jr's—and the narrator's—concept of "waves" functions as a natural metaphor to represent the passage of time and evokes a Christian afterlife. *Dombey* is particularly invested in portraying private temporal experience. Dickens's Preface emphasizes the role of memory in the novel, and he portrays memories through a type of folding time in which the past resurfaces in the present at key moments. This technique is apparent when characters such as Mrs Skewton, Mr Dombey, and Mr Carker undergo disorienting and frightening private temporal experiences. In later texts, this model of private folding time will be transformed into public folding time to convey deep time, and in Carker's case it is connected to another technology with chronometric implications, the railway. While *Dombey* presents fairly traditional reflections on time, it evinces

a more modern engagement with time through its frequent portrayals of time-keeping devices. These timepieces represent, variously, a traditional sense of clocks as property and status symbols; an understanding of chronometry as standardized, mechanical, and authoritative; and, an emerging concept of time-keeping as inherently scientific. Although *Dombey* is more broadly concerned with memory and the passage of time, Sol Gills's shop with its seafaring chronometers introduces a point of intersection among science, technology, and time-keeping. Through Sol, Dickens develops a model of scientific time linked to timepieces which is prescient and future-driven. In this sense, Sol represents a mediating figure between traditional models of time and modern scientifically-informed time-keeping, as well as between the past and future. In *Dombey and Son* vast time is portrayed as natural and religious rather than scientific; however, the link that Dickens develops between time-keeping and science foreshadows the scientific concepts of deep time that he would explore in *Bleak House* and *Our Mutual Friend*.

Dombey and Son charts the Dombey family history, beginning as Paul Dombey Sr witnesses the birth of his son, and concluding once he has become a grandfather to Florence's children. Given that the novel spans a familial timeframe, it is hardly surprising that the passage of time constitutes one of its major themes, and in many ways Dickens addresses time in a fairly traditional manner. He often personifies "Time" in standard literary fashion:

> On the brow of Dombey, Time and his brother Care had set some marks, as on a tree that was to come down in good time—remorseless twins they are for striding through their human forests, notching as they go—while the countenance of Son was crossed and recrossed with a thousand little creases, which the same deceitful Time would take delight in smoothing out and wearing away with the flat part of his scythe, as a preparation of the surface for his deeper operations. (1)

Such descriptions align with Raleigh's observation that "[t]hroughout [Dickens's] novels there are scattered, sententious, and more or less conventional statements about time. There is rather less of this in the earlier works and rather more of it in the later ones, beginning with *Dombey and Son*; and, in the later works, the mood becomes graver, as might be expected." Raleigh adds that "[b]y *Dombey and Son*, however, the mood has shifted to the inexorability of time" (129), and indeed the theme of aging and the poignancy of time's passing are prominent in the text. However, Dickens is also noticeably attuned to a variety of timescales and temporal measurements: for instance, when the narrator observes, "It was a dull, grey, autumn day indeed, and in a minute's pause and silence that took place, the leaves fell sorrowfully" (58), he acknowledges the season, the time of day, the time-unit of a minute, the personal experience of a "pause and silence," and nature's symbol of passing time in the falling leafs.

This personification of time is accompanied by a sustained metaphor of time as a body of water, generally through Paul Dombey Jr's impressions of a river and waves that correspond to a Christian concept of eternity. Paul's waves are soothing to him during his illness; they seem to symbolize natural cycles of life and death within a Christian worldview and are at odds with Blimber's strict clock-schedule and Mr. Dombey's prominent watch. On his death bed he exclaims, "How fast the river runs, between its green banks and the rushes, Floy! But it's very near the sea. I hear the waves! They always said so!" (224). The narrator concludes the chapter of his death by entreating: "Oh thank GOD, all who see it, for that older fashion yet, of Immortality! And look upon us, angels of young children, with regards not quite estranged, when the swift river bears us to the ocean!" (225). Dickens merges natural and religious symbolism in the waves, as the river brings individuals to an eternal afterlife symbolized by the ocean. This water-based metaphor echoes Carlyle's language regarding deep time: in "Signs of the Times"

he describes “the stream of time” (441) and in “Boswell’s Life of Johnson” he mentions “deep Time” (406) and “the eternal Flood of Time” (407). Dickens’s “waves” share Carlyle’s sense of a vast, abstract, and spiritualized time but nevertheless introduce a natural embodiment of time that he will return to in later, more scientific novels. Raleigh notes that “[i]n *Dombey* too Dickens begins to use natural phenomena as symbols of time, in this case the sea,” and although he proposes that “[t]his kind of symbolism is developed at length, and not very successfully” (130), Dickens’s symbolism anticipates the natural imagery he will use to embody scientific timescales in *Bleak House* and *Our Mutual Friend*. Unlike these later works, however, *Dombey* portrays nature without any disconcerting Darwinian connotations.

Dombey is particularly concerned with the relations of temporal experience, subjectivity, and memory, and Dickens’s portrayal of memory and anticipation demonstrates a more modern and psychological engagement with time. The novel goes beyond standard literary formulations of time to illustrate the jumbled movements between past, present, and future that characterize private temporal experience. The 1858 Preface draws the reader’s attention to this movement and acknowledges the complex role that memory plays in our temporal experience:

> I began this book by the Lake of Geneva, and went on with it for some months in France. The association between the writing and the place of writing is so curiously strong in my mind, that at this day, although I know every stair in the little Midshipman’s house, and could swear to every pew in the church in which Florence was married, or to every young gentleman’s bedstead in Doctor Blimber’s establishment, I yet confusedly imagine Captain Cuttle as secluding himself from Mrs. MacStinger among the mountains of Switzerland. Similarly, when I am reminded by any chance of what it was that the waves were always

> saying, I wander in my fancy for a whole winter night about the streets of Paris—as I really did, with a heavy heart, on the night when my little friend and I parted company for ever. (834)

Dickens describes the layers of memory that accompany his text: he recalls where the novel was written as well as his life at the time.

This sense of memory as an echo from the past triggered by one's present surroundings (or, in the preface, one's writing) is evident in the novel as well. For instance, Dickens employs the repetition of the narrator's phrase, "Let him remember it in that room, years to come" (253), to demonstrate how Dombey's recollection of his cruelty to Florence returns unbidden: "'Let him remember it in that room, years to come!' He did remember it. It was heavy on his mind now; heavier than all the rest. … In the miserable night he thought of it; in the dreary day, the wretched dawn, the ghostly, memory-haunted twilight. He did remember it. In agony, in sorrow, in remorse, in despair!" (795). Dombey's breakdown is characterized by temporal confusion as his memories border on hallucinations: "He almost saw it, going on before. He stopped, looking up towards the sky-light; and a figure, childish itself, but carrying a child, and singing as it went, seemed to be there again" (797). Haunted by memories, Dombey becomes suicidal and envisions a hypothetical future in which his slowly-leaking blood would reveal his injury and death: he "s[ees], in the glass,…[a] spectral, haggard, wasted likeness of himself" that "was thinking that if blood were to trickle that way, and to leak out into the hall, it must be a long time going so far. It would move so stealthily and slowly, creeping on, with here a lazy little pool, and there a start, and then another little pool, that a desperately wounded man could only be discovered through its means, either dead or dying" (801). Of course, Florence saves Dombey from his fate in the nick of time; however, the profound suffering he undergoes is characterized in temporal terms before

he is rescued from himself. While Dombey's suicidal vision represents an extreme version, the novel's characters often anticipate the future at the expense of the present. In happier times, Dombey nevertheless longs for Paul to grow up quickly and become a man: "he was impatient to advance into the future, and to hurry over the intervening passages of his history" (92). In another morbid scenario, Mrs. Skewton demonstrates an unhealthy focus on the future when she is anxious and fearful at the end of her life: she becomes a "figure that is often wheeled down to the margin of the sea…; but…for which the murmur of the ocean has no soothing word. She lies and listens to it by the hour; but its speech is dark and gloomy to her, and a dread is on her face, and when her eyes wander over the expanse, they see but a broad stretch of desolation between earth and heaven" (561). *Dombey and Son* probes the psychological conditions of memory and anticipation, depicting time as a non-linear continuum in which the present can seem to fluctuate or fold into the past or (hypothetical) future.

The chapters describing Carker's escape from France offer *Dombey*'s most protracted depiction of private temporal experience. Carker's inner torment is characterized by temporal disorientation as he loses track of the date and time and has difficulty distinguishing the past from the present. He is quite literally running against the clock in his flight from Dombey, but the time that passes seems increasingly indefinite as his memories torment him:

> Shadows of familiar people, stooping at their desks and books, in their remembered attitudes; strange apparitions of the man whom he was flying from, or of Edith; repetitions in the ringing bells and rolling wheels, of words that had been spoken; confusions of time and place, making last night a month ago, a month ago last night—home now distant beyond hope, now instantly accessible;

> commotion, discord, hurry, darkness and confusion in his mind, and all around him. (735)

Like Skewton, Carker fears death and suffers "intolerable awe and dread";[3] like Dombey, his temporal anxiety is accompanied by a sense of unbearable repetition: "The monotonous ringing of the bells and tramping of the horses; the monotony of his anxiety, and useless rage; the monotonous wheel of fear, regret, and passion, he kept turning round and round" (737). Eventually, he loses his sense of chronological order and experiences "a fevered vision of things past and present all confounded together; of his life and journey blended into one"; he is "unable to reckon up the hours he had been upon the road, or to comprehend the points of time and place in his journey" (738) and finds that "the past, present, and future, all floated confusedly before him, and he had lost all power of looking steadily at any one of them" (742).

There are striking similarities between Dickens's Preface and Carker's breakdown: both sections describe the confused movements among past, present, and future that characterize personal temporality. Carker's case seems to represent an extreme example of the subjectivity of temporal experience that Dickens elsewhere explores as a familiar part of quotidian life. However, Carker's eventual death at the railway adds a new dimension to this sense of time: what Dickens presents in the Preface as a familiar model of temporal experience becomes associated with modern technology, velocity, and violent death. In his chaotic state Carker must eventually ask a waiter, "What day is this?" and mistakes the day: "I forgot. How goes the time? My watch is unwound." While his "unwound" watch symbolizes his temporal unmooring, the railway is specifically associated with a new and "confusing" sense of time. In fact, the waiter assumes that Carker's disorientation results from his mode of travel: he remarks that travelling

[3] Dickens also connects the two by likening Carker's mental state to paralysis, which Skewton suffers from before dying: for Carker, "to be within his own knowledge such a miserable tool—was like being paralysed" (730).

"by rail" is "Very confusing, Sir. Not much in the habit of traveling by rail myself, Sir, but gentlemen frequently say so" (740). The railway entails a new type of time that seems to compound Carker's chaotic temporality. In reality, the railroad had significant implications for British—and global—time-keeping as railways required a coordinated time-system to ensure safety and adhere to schedules. Randall Stevenson explains how "Railway companies in the mid-nineteenth century sent officials with accurate chronometers up and down the country, resetting station clocks to eliminate local times in favour of a national standard, Railway Time, established more or less throughout the land by 1848" (124), while Galison proposes that "[t]he first time zones were these long, thin, territories carved by steel tracks" ("Place of Time" 372). Carker's subjective temporal experience—characterized by pervasive memories and fluctuating temporality, similar to those mentioned in the Preface—is set in tension with modern time-keeping systems through his "unwound" watch and his death at the railroad, both of which represent newer technoscientific models of time.

The tension between older models of personal, subjective temporality and a newer sense of modern, technologically-founded time is also apparent in the novel's depiction of timepieces. If earlier timepieces had functioned predominantly as status symbols and represented an idiosyncratic time, nineteenth-century chronometric devices were increasingly precise, synchronized with standard public time, and associated with the scientific projects of cartography, astronomy, and physics. Sherman explains that "[t]he gentry and the merchants who could first afford clocks and watches in the late seventeenth and early eighteenth centuries were socially positioned to see in these instruments a figuration of personal time—and by extension of the private self in time—as a kind of liquid capital and portable property" (21). Indeed, *Dombey and Son* portrays clocks and watches first and foremost as property: they belong to a particular

character or family; reflect their owners' wealth, social status, and character; and possess financial value. Apart from Solomon Gills and his "tremendous chronometer" (37), Dombey Sr is characterized by his pocket-watch to the extent that for young Florence a "blue coat and stiff white cravat…with a pair of creaking boots and a very loud ticking watch, embodied her idea of a father" (3). Captain Cuttle considers his watch a valuable possession, offering it to offset Solomon Gills's debt and later giving it to Walter as a token of affection (133, 771). When Susan visits the Toodles, she observes "the Dutch clock" on their mantelpiece (68), and Toots is often seen "ostentatiously examining the wheels in his watch, and counting his half-crowns" (148). These timepieces are personal, valuable, and frequently on display. Toots's inspection of his watch and coins signals the connection between individuals' timepieces and their wealth, and demonstrates how watches and clocks were viewed as status symbols. This is most evident through Dombey's oft-noted watch and chain, mentioned from the outset as "Dombey, exulting in the long-looked-for event [the birth of his son], jingled and jingled the heavy gold watch-chain that depended from below his trim blue coat" (1). The "gold watch-chain" signifies wealth, power, and pride, while his incessant "jingling and jingling" (3) warns of his self-importance. The financial symbolism and commercial value of timepieces is perhaps most evident in the reader's brief glimpse of Mr. Brogley, the broker and appraiser: "Of motionless clocks that never stirred a finger, and seemed as incapable of being successfully wound up, as the pecuniary affairs of their former owners, there was always great choice in Mr. Brogley's shop." His out-of-commission clocks are reduced to dispossessions; their failure to run is aligned with the financial failure of their owners facing "bankruptcy and ruin" (116) and they no longer have a time-keeping function. While this passage foreshadows Dombey's bankruptcy, it also underlines the

financial significance of timepieces and suggests that they retained commercial value and continued to represent property.

However, the timepieces in *Dombey and Son* also reflect the developing cultural acceptance of chronometry as a system of regulated public time. In reference to the 1884 Prime Meridian Conference, Barrows notes that "[t]he impact of world standard time in England was not to alter the private sensation of English temporality. British clocks had, after all, been synchronized to Greenwich since the mid-1850s, and it is in Dickens rather than Conrad that one finds evidence of reaction to that move (in *Dombey and Son*, for example)" (*Cosmic Time* 8). Dickens associates mechanical and inflexible time-keeping with intimidating authority figures: for instance, while Dombey's "loud ticking watch" (3) personifies his unapproachable patriarchal authority, other ominous timepieces are linked to doctors. In Fanny's death scene, Mrs Chick cries "Fanny! Fanny!," but receives "no sound in answer but the loud ticking of Mr. Dombey's watch and Doctor Parker Peps's watch, which seemed in the silence to be running a race":

> "Fanny….?" …
>
> No word or sound in answer. Mr. Dombey's watch and Doctor Parker Peps's watch seemed to be racing faster. …
>
> The race in the ensuing pause was fierce and furious. The watches seemed to jostle, and to trip each other up. (10)

This passage intersperses the "racing" watches with dialogue and contrasts the mechanical, professional, and emotionally distant ticking (which seems to embody Dombey's coldness) with Florence's heartbroken response as well as Fanny's waning pulse that, like the pawnbroker's clocks, is soon to be inanimate. Dickens also juxtaposes these timepieces with a natural, spiritual temporality when he concludes the scene with the observation that "the mother drifted out upon

the dark and unknown sea that rolls round all the world" (11). Similarly, when Paul is sent away to school he faces Dr. Blimber's imposing clock alongside his strict educational regime: "there was no sound through all the house but the ticking of a great clock in the hall, which made itself audible in the very garrets" (143). Paul is nervous and conflates the doctor and his clock: "Grave as an organ was the Doctor's speech; and when he ceased, the great clock in the hall seemed (to Paul at least) to take him up, and to go on saying 'how, is, my, lit, tle, friend, how, is, my, lit, tle, friend,' over and over and over again. …. 'Very well, I thank you, Sir,' returned Paul, answering the clock quite as much as the Doctor" (145). While Dombey's watch represents his detached patriarchal authority to Florence, Dr. Blimber's clock embodies his mechanically studious schooling. These watches and clocks are examples of privately-owned timepieces that simultaneously represent an authoritative, and often intimidating, sense of public time.

Finally, Dickens uses Solomon Gills to explore these old and new systems of time-keeping and, more specifically, to propose a connection between chronometry and science. One of the many characters whose personal timepieces are described to the reader, Sol is associated with chronometry and always "carrie[s]….a tremendous chronometer in his fob, rather than doubt which precious possession, he would have believed in a conspiracy against it on the part of all the clocks and watches in the City, and even of the very Sun itself" (37). In fact, he is introduced to the reader in the act of time-keeping: "It is half-past five o'clock, and an autumn afternoon, when the reader and Solomon Gills become acquainted. Solomon Gills is in the act of seeing what time it is by the unimpeachable chronometer. The usual daily clearance has been making in the City for an hour or more; and the human tide is still rolling westward" (38). These passages mark the "chronometer[']s" relation to other timepieces and "the Sun," and they reiterate the importance of Sol's favourite possession while emphasizing various modes of

observing time: the reader learns the time of day ("half-past five o'clock"), the daily period of time ("afternoon"), the season ("autumn"), the narrative time of a character's introduction to "the reader," the daily City work pattern, and its social rhythms ("the human tide").

Throughout the novel, science is most frequently invoked in the context of Sol and his shop. Dubbed "the Instrument Maker" (38), Sol is generally associated with science in the older sense of the word, as "a particular area of knowledge or study; a recognized branch of learning" or "a craft, trade, or occupation requiring trained skill" ("Science"). Dickens writes that "[t]he stock-in-trade of this old gentleman comprised chronometers, barometers, telescopes, compasses, charts, maps, sextants, quadrants, and specimens of every kind of instrument used in the working of a ship's course, or the keeping of a ship's reckoning, or the prosecuting of a ship's discoveries" (36), and it is Captain Cuttle who most often praises Sol's scientific knowledge, claiming that "[i]f there is a man chockfull of science in the world, it's old Sol Gills" (133). However, in this context the term 'science' is most frequently used in conjunction with timepieces: while it embodies the older sense of 'science' as a trained skill or mechanical craft, it also reflects an emerging sense of time as scientific, which was premised on a newer definition of science as "the systematic study of the natural world and its physical and biological processes, through observation, identification, description, experimental investigation, and theoretical explanations" (Park). It becomes clear in *Dombey* that clocks are viewed as scientific instruments of measurement: Cuttle proposes, for example, that "it's a fine thing to understand 'em. And yet it's a fine thing not to understand 'em. I hardly know which is best. It's so comfortable to sit here and feel that you might be weighed, measured, magnified, electrified, polarized, played the very devil with: and never know how" (45). When he and Walter contemplate Sol's goods, Cuttle explicitly links Old Sol's technological knowledge with time-keeping:

> "I suppose he could make a clock if he tried?"
>
> "I shouldn't wonder, Captain Cuttle," returned the boy.
>
> "And it would go!' said Captain Cuttle…. "Lord, how that clock would go!"
>
> For a moment or two he seemed quite lost in contemplating the pace of this ideal timepiece, and sat looking at the boy as if his face were the dial.
>
> "But he's chockfull of science," he observed, waving his hook towards the stock-in-trade. "Look ye here! Here's a collection of 'em. Earth, air, or water. It's all one. Only say where you'll have it. Up in a balloon? There you are. Down in a bell? There you are. D'ye want to put the North Star in a pair of scales and weigh it? He'll do it for you." (44-45)

Cuttle links timepieces with "science": "Earth, air, or water" evokes the natural sciences; the "balloon" and "bell" are mechanical devices functioning in relation to gravity that require knowledge of physics; lastly, "the North Star" evokes astronomy. In particular, Sol Gills's instruments demonstrate the relationship between time-keeping and seafaring, which were linked through the quest for exact longitude that had been underway for centuries.[4] As the nineteenth century progressed, clocks would continue to be associated with longitude and astronomy, but also, increasingly, temporal synchronization and physics. Sol and his clocks or timepieces, then, seem to bridge traditional and emerging definitions of 'science.'

In addition, Sol eventually achieves financial success through his investments, suggesting that his scientific knowledge entails foresight. Sol sees himself as out-of-date, claiming that "the world has gone past me. I don't blame it; but I no longer understand it. … Seven-eighths of my stock is old-fashioned. I am an old-fashioned man in an old-fashioned shop, in a street that is not

[4] Sherman observes that, "[i]n the eighteenth century the search for a chronometric navigational tool for reckoning longitude triggered a nationwide desire for a *Tick, Tick, Tick* ever lighter, more distinct, more uniform in both its pulse and its intervals" (8).

the same as I remember it. I have fallen behind the time, and am too old to catch it again. Even the noise it makes a long way ahead, confuses me" (41-2). His claims of anachronism are belied, however, when the novel reveals that he is far from being outdated and is instead prescient. Early in the novel, Sol explains to Cuttle that he has invested some money, but that his investments are intangible and incomprehensible: "'I've got some [money]…but I—the little I have got, isn't convertible, Ned; it can't be got at. I have been trying to do something with it for Wally, and I'm old-fashioned, and behind the time. It's here and there, and—and, in short, it's as good as nowhere,' said the old man, looking in bewilderment about him" (123). By novel's end, the prescience of his financial decisions becomes clear when we learn that his seemingly intangible investments have, with time, become lucrative. The narrator remarks: "But they do say…that some of Mr. Gills's old investments are coming out wonderfully well; and that instead of being behind the time in those respects, as he supposed, he was, in truth, a little before it, and had to wait the fullness of the time and the design. The whisper is that Mr. Gills's money has begun to turn itself, and that it is turning itself over and over pretty briskly" (830). Thus, despite his initial belief that he is "behind the time[s]," the instrument-maker turns out to be at the forefront of speculation, and his insight is appreciated in due course. In this sense, Sol may be seen as a scientific figure not only through his chronometric devices and their scientific significance, but also due to his prescient, astute, and ultimately successful speculation. Through this character, Dickens links scientific knowledge with chronometry and the successful anticipation of the future. Sol's timepieces gesture towards an emerging sense of time as scientifically-founded and abstract which contrasts with the proprietary function of watches and clocks in the novel.

Dickens's editorial work increasingly exposed him to scientific developments, and his later novels develop scientific concepts of time in greater depth. However, *Dombey and Son*'s

depiction of Sol and his timepieces seems to bridge traditional and emerging definitions of science, providing a valuable starting point for these considerations by connecting scientific and technological devices to time-keeping. Various timepieces in *Dombey and Son* symbolize a more traditional concept of clocks and watches as symbols of property and status, though Dickens also links chronometry to a sense of authority which reflects England's increasingly standardized time. Throughout the novel Dickens is invested in portraying the private and often distressing temporality of its characters, and he often uses a model of folding time to convey resurfacing memories which he will employ to incorporate deep time in novels like *Bleak House* and *Our Mutual Friend*. In his Preface, Dickens draws attention to the psychological experience of memory, and he depicts characters including Mrs. Skewton, Mr. Dombey, and Mr. Carker who undergo disorienting and distressing temporal experiences. Finally, although *Dombey and Son*'s water metaphor for deep time corresponds with a Carlylean sense of spiritualized eternity, it nevertheless represents an early example of Dickens using natural metaphors to convey vast timescales that dwarf the span of individual lives.

"As old as the hills": The Antediluvian World of *Bleak House*

Bleak House departs from *Dombey and Son*'s spiritualized concept of vast time embodied in the metaphor of "waves" to produce a more scientific inflection of deep time. The novel presents overlapping concepts of religious and scientific deep time as Dickens mixes geological, thermodynamic, and evolutionary language with Christian, and particularly apocalyptic, imagery. While critics including Levine, Beer, Ann Wilkinson, and Gold have studied *Bleak House*'s biological, geological, and thermodynamic allusions, I will analyze how Dickens uses these scientific theories to establish a background of vast time. Specifically, he transforms and

substantiates apocalyptic imagery and Christian sensibilities by employing corroborative scientific language. *Bleak House* acknowledges that it is set within immense evolutionary, geological, and thermodynamic timeframes that extend far past its mid-century setting. The novel repeatedly relates its contemporary events to the past, as in its famous opening reference to a megalosaurus or its depiction of the generations of ancestry embedded in Lincolnshire, and employs a model of folding time to establish these resurgences of the past. The competing apocalyptic images of Lincolnshire and the Rouncewell ironmills are described as different geological periods; in a prescient analogy, Dickens illustrates how industrialization has transformed the environment in geological terms. He also mixes apocalyptic and thermodynamic language, and his cosmic allusions evoke narratives of decline at an astronomical scale. *Bleak House*'s broad scope and complex plots locate individuals and events within a vast temporal network that unfolds through genealogy and inheritance. Through his treatment of Jo, Dickens employs evolutionary discourse to reinforce his message of Christian brotherhood, a message which is predicated on evolutionary timescales. The networks and connections Dickens establishes depend on a vast temporal scope, and although *Bleak House* depicts a cross-section of London life, its considerable breadth inevitably suggests the much greater social, geological, evolutionary, and cosmic world which exists outside its narrative.

Bleak House's famous beginning situates the novel's events within a vast timeframe by comparing mid-century London to a prehistoric era. In a significant departure from *Dombey*'s natural metaphors, Dickens's scientifically-influenced opening not only explicitly refers to a dinosaur but also suggests the possible heat death of the sun, presents humankind as an animal species, and alludes to geological history:

> As much mud in the streets, as if the waters had but newly retired from the face of the earth, and it would not be wonderful to meet a Megalosaurus, forty feet long or so, waddling like an elephantine lizard up Holborn-hill. Smoke lowering down from chimney-pots, making a soft black drizzle, with flakes of soot in it as big as full-grown snow-flakes—gone into mourning, one might imagine, for the death of the sun. Dogs, indistinguishable in mire. Horses, scarcely better; splashed to their very blinkers. Foot passengers, jostling one another's umbrellas, … and losing their foot-hold at street-corners, where tens of thousands of other foot passengers have been slipping and sliding since the day broke (if the day ever broke), adding new deposits to the crust upon crust of mud, sticking at those points tenaciously to the pavement, and accumulating at compound interest. (11)

Not only does the muddy setting appear fittingly prehistoric, but the image of the megalosaurus on Holborn-hill functions as a moment of folding time: the vision of a Jurassic dinosaur—the megalosaurus was "named in 1824" after "its partial skeleton [was] discovered the year before" in England (Gill 918)—resurfacing in nineteenth-century London represents a layering of past and present in a shared location. This moment anticipates Hardy's description of folding time in *A Pair of Blue Eyes*, in which an imaginative return to the remote past similarly stems from a prehistoric landscape. While the sooty atmosphere frames the novel's interest in the social problems of poverty and pollution, when coupled with "the death of the sun" and the aside "(if the day ever broke)," Dickens seems to foreshadow representations of the theory of heat death as advanced by William Thomson nearly a decade later in "On the Age of the Sun's Heat" (1862). Barri Gold proposes that here Dickens is "thinking about universal decay" as this "image of local decay…evokes the end of life itself" (192-3); she notes that "Dickens's black snow…anticipates

images of darkness and cold we will soon see in Flammarion and Wells" (193). In the novel's opening reference to "the death of the sun," Dickens thus envisions entropic processes not just within London but on a vast cosmic timescale, and Gold argues that "*Bleak House* proves deeply invested in the broader thermopoetic conversation, and without once using the word—how could he?—Dickens nonetheless works to factify entropy itself" (192).

As the paragraph continues, Dickens proceeds to list the animals—dogs, horses, humans—struggling through the mud, thus including humankind alongside other similarly labouring mammals. This description suggests an evolutionary perspective which frames both animal and human activity as interactions within an ecosystem. Finally, the paragraph concludes with a Lyellian geological reference to the layers of "crust" that are "accumulating" as a result of the pedestrians: the daily masses of people gradually leave their mark on the earth, enacting, on a smaller scale, the long-term geological effects of environmental change. Notably, however, this geological image retains biblical connotations from the description that it was "as if the waters had but newly retired from the face of the earth." Dickens's introductory paragraph is couched in naturalistic imagery and, more specifically, introduces the vastness of evolutionary, geological, and cosmic history in relation to the everyday world of "London" and its more precise yet trivial sense of time: "Michaelmas Term lately over, and the Lord Chancellor sitting in Lincoln's Inn Hall. Implacable November weather" (11). As Dickens moves from the prehistoric dinosaur imagery to specific Victorian-era London and its inhabitants, the narrative effectively narrows its focus from deep time to daily contemporary society. However, the vast timescales evoked through these references to prehistoric times, the death of the sun, biological relations, and geological development expand the novel's scope beyond its contemporary setting, while Dickens's use of folding time brings distinct and remote historical moments into relation with

one another. While the deep time represented in this passage implies temporal continuity, the vision of the megalosaurus eschews a linear or unidirectional representation of time as it juxtaposes a Jurassic moment with the recently completed Michaelmas Term.

Dickens uses a similar model of folding time in his descriptions of Chesney Wold, Sir Leicester Dedlock's ancestral home in Lincolnshire. While the past frequently resurfaces in *Bleak House*, it happens most often at Chesney Wold, which is consistently described in relation to its history and past inhabitants. Sir Leicester, whose "family is as old as the hills, and infinitely more respectable" (18), is a symbol of old-fashioned English aristocracy and the immense social privilege it entails. Physically, Sir Leicester embodies this ancestry—he suffers from gout, as "[a]ll the Dedlocks, in the direct male line, through a course of time during and beyond which the memory of man goeth not to the contrary, have had the gout. … It has come down, through the illustrious line, like the plate, or the pictures, or the place in Lincolnshire. It is among their dignities" (234)—and his country home embodies this far-reaching line of descent:

> Outside, the stately oaks, rooted for ages in the green ground which has never known ploughshare, but was still a Chase when kings rode to battle with sword and shield, and rode a hunting with bow and arrow; bear witness to his greatness. Inside, his forefathers, looking on him from the walls, say, 'Each of us was a passing reality here, and left this coloured shadow of himself, and melted into remembrance as dreamy as the distant voices of the rooks now lulling you to rest;' and bear this testimony to his greatness too. (235)

Chesney Wold is ghostly with the echoes of past inhabitants: "On all the house there is a cold, blank smell, like the smell of the little church, though something dryer: suggesting that the dead and buried Dedlocks walk there, in the long nights, and leave the flavour of their graves behind

them" (422). Although Sir Leicester and his land represent remains of the past that linger in the present, this temporal continuum is accompanied by moments of folding time—when ghostly ancestors reappear, for instance—that eschew linearity and a sense of historical progress. The land is ancient, and the remaining traces of Leicester's ancestors—both supernatural, in their ghostly spirits, and physical, in their mausoleum-housed remains—suggest a parallel to the geological layers of earth described in the novel's opening.

Furthermore, the wet atmosphere of Lincolnshire contributes to *Bleak House*'s geological and apocalyptic imagery. As we saw in the "muddy" opening, water imagery seems to occupy a middle ground between the spiritualized "waves" in *Dombey* and the more explicitly materialist Thames in *Our Mutual Friend*. While all three examples of natural water imagery represent vast time, the landscape of Chesney Wold is imbued with biblical as well as geological and thermodynamic connotations. Apart from the strong sense of family history, Sir Leicester's land is associated with the past as it is described as a damp, prehistoric place:

> The waters are out in Lincolnshire. An arch of the bridge in the park has been sapped and sopped away. The adjacent low-lying ground, for half a mile in breadth, is a stagnant river, with melancholy trees for islands in it, and a surface punctured all over, all day long, with falling rain. … The weather, for many a day and night, has been so wet that the trees seem wet through.… The vases on the stone terrace in the foreground catch the rain all day; and the heavy drops fall, drip, drip, drip, upon the broad flagged pavement, called, from old time, the Ghost's Walk, all night. (17-18)

This land is later described as containing "Dedlock timber and antediluvian forest" (411), implying that traces of a primitive world remain in this area of modern-day England. Dickens's

water imagery suggests the severely outdated nature of Chesney Wold as well as imagery of Noah's flood, as though "the Dedlock family and their institutions … were not quite swept away by the waters" (Wilkinson 238-9). Wilkinson proposes that, in its obsolescence, Sir Leicester's home is similar to Chancery: "Yet the Court of Chancery, like the Dedlock institutions, though they spread damp rot and blight and fog all round them, and are, really, vestiges of antediluvian creation, even thinking in antediluvian terms, nevertheless exist under the new dispensation, or should, and their destruction…must come by fire, not flood" (239). While "antediluvian" alludes to the land's longevity and ancient history, it also, when coupled with the dominant water imagery, suggests the apocalyptic connotations of the great flood. Buckland observes that *Bleak House* "repeatedly returns to the language of geology," often to convey apocalyptic themes:

> The apocalyptic images of flood and fire are both Biblical and geological in *Bleak House*. … Together, these double images of science and apocalypse suggest millennialism: as *Bleak House* closes there is both extinction and death, and a new, reborn world emblematized by the new Bleak House in which Esther will live, and the end of the Chancery case. Catastrophe in *Bleak House*, as in *Dombey and Son*, draws on the city's proliferating images of volcanoes and earthquakes as display and is essential to the novel's conception of progress and change. It invests the scientific observations and descriptions of the anonymous, impersonal narrator with a sense of the forces of myth and history through allusion to popular spectacle. In doing so, it … maintains popular beliefs in Noah's Flood and Biblical history through catastrophic geology. (688)

Apocalyptic imagery appears throughout the novel and is often couched in scientific terms such as those of geological catastrophism. However, I would reverse Buckland's interpretation of

these images to suggest that Dickens imbues the mythic with scientific connotations, particularly when it comes to vast timescales. There are also thermodynamic connotations to his description of Lincolnshire's "stagnant river" and sluggish, swampy environment. Its inhabitants mirror this lack of energy, as Sir Leicester represents an aging class of leisure, tradition, and preservation, while Lady Dedlock speaks "with the dreariness of the place in Lincolnshire still upon her" (22). As Gold remarks, "[i]f the Dedlocks are not quite dead, they certainly approximate equilibrium very nearly. Having achieved a stagnation trumped only by Miss Havisham herself, the Dedlocks have perfected the art of accomplishing no work" (215). The overall impression of Lincolnshire is that of a prehistoric geological epoch and an entropic system: its energy—and that of its inhabitants—seems to have been spent over the course of its vast history.

The "antediluvian" Lincolnshire has its counterpart in Mr Rouncewell's fiery ironmills: while the damp Chesney Wold recalls the Great Flood and symbolizes the aristocracy's ancestry and current stagnation, the northern iron factory is aligned with progress, the future, and a different set of apocalyptic imagery. When George visits his brother, Dickens illustrates Rouncewell's world in very different terms from Lincolnshire: "As [George] comes into the iron country farther north, such fresh green woods as those of Chesney Wold are left behind; and coalpits and ashes, high chimnies and red bricks, blighted verdure, scorching fires, and a heavy never-lightening cloud of smoke, become the features of the scenery" (878). George "sees a great perplexity of iron lying about, in every stage, and in a vast variety of shapes; … mountains of it broken-up, and rusty in its age; distant furnaces of it glowing and bubbling in its youth; bright fireworks of it showering about, under the blows of the steam hammer; red-hot iron, white-hot iron, cold-black iron; an iron taste, an iron smell, and a Babel of iron sounds" (879). The imagery of progress is volcanic, fiery, and even hellish. In its energetic chaos, it recalls the novel's

depiction of railroad construction, similarly symbolic of progress, speed, technology, and geological destruction. Dickens's descriptions of nascent railways anticipate a new landscape:

> Railroads shall soon traverse all this country, and with a rattle and a glare the engine and train shall shoot like a meteor over the wide night-landscape, turning the moon paler…. Preparations are afoot, measurements are made, ground is staked out. … [F]ragments of embankments are thrown up, and left as precipices with torrents of rusty carts and barrows tumbling over them; tripods of tall poles appear on hill-tops, where there are rumours of tunnels; everything looks chaotic, and abandoned in fell hopelessness. (775)

In a similarly geological passage, *Dombey and Son* describes the "first shock of a great earthquake" which is in fact the construction of the railway: "There were a hundred thousand shapes and substances of incompleteness, wildly mingled out of their places, upside down, burrowing in the earth, aspiring in the air, mouldering in the water, and unintelligible as any dream. Hot springs and fiery eruptions, the usual attendants upon earthquakes, lent their contributions of confusion to the scene" (65). Like the emerging railroads, the ironmills symbolize not only a new cultural age and modern sense of time but a new geological epoch; they reflect a period of industrialization which is transforming the countryside. Dickens's apocalyptic and geological language is effectively describing an age of human technology which will transform the "antediluvian forest" and "fresh green woods" in catastrophic geological terms. That Dickens uses geological language to convey the magnitude of industrialization and its effects on the environment seems especially prescient in context of the environmental changes which have given rise to the Anthropocene. He suggests that the ironmills and railways herald a

new geological period as the countryside is transformed by industry, although he is no more enthusiastic about this imminent epoch than the anachronistic era aligned with the Dedlocks.

The opposing apocalyptic images of flooded Lincolnshire and the burning ironmills carry temporal significance: Chesney Wold represents the past, while Rouncewell's mills announce the future. Both worlds—and the men who lead them—represent new and old models of time as well as different eras of social development. Sir Leicester and Mr Rouncewell are juxtaposed when the latter visits Chesney Wold: Rouncewell is a leader of industry, and his confrontation with Leicester contrasts the baronet's privileged ancestry and leisurely pace of life with his modern and hurried lifestyle. Mr Rouncewell explains that, "In these busy times, when so many great undertakings are in progress, people like myself have so many workmen in so many places that we are always on the flight." However,

> Sir Leicester is content enough that the ironmaster should feel that there is no hurry there; there, in that ancient house, rooted in that quiet park, where the ivy and the moss have had time to mature, and the gnarled and warted elms, and the umbrageous oaks, stand deep in the fern and leaves of a hundred years; and where the sun-dial on the terrace has dumbly recorded for centuries that Time, which was as much the property of every Dedlock—while he lasted—as the house and lands. Sir Leicester sits down in an easy chair, opposing his repose and that of Chesney Wold to the restless flights of ironmasters. (416)

While Rouncewell is "busy" and traveling, Leicester lives a quiet, slow-paced life: unlike Rouncewell's technologically-advanced mills, his terrace still maintains a "sun-dial," old-fashioned to the point of obsolescence. Leicester's sun-dial seems especially archaic in contrast with Rouncewell's technological proficiency—at a young age he had already "t[aken]…to

constructing steam-engines out of saucepans…with artful contrivance of hydraulic pressure" (98).[5] The notion that "Time" has been "the property of every Dedlock," moreover, recalls the distinction in *Dombey* between older models of time, associated with timepieces as symbols of property, and newer models of time, linked to chronometry as an emerging technoscience. The two men's disparate tempos of life and their respective links to the past and the future are emblematized in the opposing catastrophic imagery of flood and fire, descriptions which also suggest old and new geological epochs as the countryside is transformed by industry. Unsurprisingly, Leicester feels threatened by Rouncewell and believes that industrial progress and a diminishing class system are changing the traditions into which he was born. He begins to fear that "the whole framework of society [is] receiving tremendous cracks" and imagines these changes in geological terms, as "educating other people out of *their* stations, and so obliterating the landmarks, and opening the floodgates, and all the rest of it" (419). This flood marks social change, which Dickens expresses by associating the new geological epoch of industrialization with a technologically-informed sense of time, progress, and speed. The apocalyptic and geological imagery in these passages reflects both a spiritualized, nearly Biblical sense of time as well as a scientifically-informed concept of geological time.

These geo-apocalyptic images of flood and fire correspond with thermodynamic metaphors that Dickens develops throughout *Bleak House*: the stagnating waters which link Chesney Wold to the past also represent entropy, while the burning fires of the Rouncewell mills represent not just the future but combustion. Both thermodynamic eventualities—dissipation and

[5] Gold notes that Rouncewell's invention "recalls the popular stories told about James Watt…. [H]e tinkers with something that sounds a lot like Newcomen's pump and with a view to improving efficiency." She contends that while "Sir Leicester's effectiveness depends on usable energy he no longer has, on distinctions that he can no longer sustain[,] Rouncewell's search for Wattlike efficiency…has created new distinctions—hot/cold, high pressure/low pressure, nouveau riche/passé aristocracy—which will do the work of the next century." She suggests that, "The mechanical work of drawing water thus presages the social work of raising its inventor in the world" (212-13).

explosion—also constitute temporal processes based on the accumulation and expenditure of energy over time, and they function at all levels of the text, from the dying sun to the clogged system of Chancery to the explosive Krook.[6] Although the novel's "thermopoetics," to borrow Gold's term, are apparent throughout the text, my analysis will focus on Dickens's usage of planetary imagery to evoke narratives of decline on a cosmic scale. Wilkinson proposes that the novel's "universe…operate[s]…in terms of thermodynamics" (229) and observes that although "there is much activity of all sorts in the immensely energetic world of *Bleak House*, … there is no 'work.' In such a case, where entropy exists in such alarming proportions, and chaos must naturally increase, the danger is that it will all run down to 'perpetual stoppage'" (230). Although the threat of entropy is instantly discernible in a darkening London seemingly "gone into mourning…for the death of the sun" (11), energy dissipation is apparent from the solar level, over vast astronomical timescales, down to the individual level, in terms of the energy of a single lifespan. Gold sums up the cooling world of *Bleak House*:

> the sun itself has gone out; the city—like its dogs—is mired in indistinction. And on a smaller scale, the fires of London prove similarly unable to provide heat or light, order or distinction. Throughout, we see further evidence of heat death, of energy sources running down: darkness, cold, fatigue. …the lack of sunlight…. It perhaps goes without saying that such haggard gas lamps are no substitute for the absent sun, which even if not truly dead, certainly does not shine here. (193)

[6] For further discussion of thermodynamics in *Bleak House*, see Wilkinson, as well as Gold, who observes: "Entropy manifests itself in black snow, in the failure of light, warmth, or color, as well as in boredom and fatigue. It also manifests itself as heat" (194). Her thermodynamic examples include Chancery, which "functions as an enormous heat sink, sucking up the energies of those who venture into too close contact and causing the deaths of Tom Jarndyce, Richard Carstone, and Mr. Gridley" (195). The novel's most famous thermodynamic image is, of course, Krook's spontaneous combustion, and Gold notes that "the combustible Mr. Krook is christened 'Chancery' by his neighbors for his simultaneously absorptive and entropic qualities" as he "reproduces in miniature the function of the larger energy sink" (196). Wilkinson proposes that Dickens' spontaneous combustion provides an analogy "to the inevitable purging by fire of all internally diseased and corrupted bodies" (231).

Dickens often employs thermodynamics metaphorically,[7] and his scenes of a darkened London once more evoke an apocalyptic world and suggest decline or degeneration. For instance, on the evening that Esther visits Jo in his illness she notes that

> The sky…was very gloomy…. In the north and north-west, where the sun had set three hours before, there was a pale dead light both beautiful and awful; and into it long sullen lines of cloud waved up, like a sea stricken immoveable as it was heaving. Towards London, a lurid glare overhung the whole dark waste; and the contrast between these two lights, and the fancy which the redder light engendered of an unearthly fire, gleaming on all the unseen buildings of the city, and on all the faces of its many thousands of wondering inhabitants, was as solemn as might be. (450)

The north appears stagnant and "immoveable" in "a pale dead light," as if all energy has dissipated. London represents a different scenario of fiery apocalypse and combustion as its "lurid glare" suggests "an unearthly fire," while the surrounding "dark waste" evokes both a thermodynamic sense of sun death and entropy – there is no longer light and no energy remains.

Bleak House sustains a planetary metaphor to depict "the world of fashion," not only to satirize the fashionable set's self-importance but to emphasize the duration—and imminent expiration—of their class. Like Chancery and Chesney Wold, the fashionable world has run its course, and Dickens evokes thermodynamic narratives of decline to suggest its waning social power. These institutions represent outdated remnants of the past: "Both the world of fashion and

[7] For instance, *Bleak House* often depicts clogged and unhealthy systems in thermodynamic terms: Chadband seems to secrete "oil" and presents the "general appearance of having a good deal of train oil in his system" (282), while areas without proper ventilation are thermodynamically and biologically threatening. The closed-off spaces of Tom-All-Alone's which function as a breeding ground for disease seem to mirror Krook's claustrophobic, dirty, and enclosed storefront. Both locations illustrate the gradual accumulation of unhealthy conditions and propose a metaphorical link between biological infection, gradualist accumulation, and thermodynamic concepts of energy build-up. Confined systems and disease contagion are also linked in the oppressive home where Esther and Charlie visit Jo: "The place was closer than before, and had an unhealthy, and a very peculiar smell" (451).

the Court of Chancery are things of precedent and usage; over-sleeping Rip Van Winkles, who have played at strange games through a deal of thundery weather; sleeping beauties, whom the Knight will wake one day, when all the stopped spits in the kitchen shall begin to turn prodigiously!" (17). Dickens uses the language of astronomy to describe the Dedlocks' sphere:

> [The world of fashion] is not a large world. Relatively even to this world of ours, which has its limits too (as your Highness shall find when you have made the tour of it, and are come to the brink of the void beyond), it is a very little speck. … But the evil of it is, that it is a world wrapped up in too much jeweller's cotton and fine wool, and cannot hear the rushing of the larger worlds, and cannot see them as they circle round the sun. It is a deadened world, and its growth is sometimes unhealthy for want of air. (17)

Although this imagery is largely spatial, emphasizing this world's smallness within its universe, the thermodynamic implications of "deadened" suggest stagnation and imminent extinction. Gold compares this planet to the novel's other thermodynamic systems: "Like Chancery, London and the universe, the fashionable world is a large system dominated by the drive to entropy…. The very insulation of this world—its isolation from other worlds and possibly from the sun—is responsible for its decay. Supplies of energy are limited" (215). In this context, it would seem that Weevle's prize possession, "a choice collection of copper-plate impressions from that truly national work, The Divinites of Albion, or Galaxy Gallery of British Beauty" (305), featuring "the brilliant and distinguished meteors that are shooting across the fashionable sky in every direction" (306), depicts astral bodies shining all the brighter before they die out. Dickens's astronomical terms evoke narratives of thermodynamic decline on a cosmic scale.

The novel also evokes a sense of evolutionary deep time through its depiction of entangled relations and Jo's animalistic traits. As many critics have pointed out, *Bleak House* exemplifies the Victorian novel's ambitious multi-plot structure and its exploration of the connections that exist between all tiers of society.[8] The novel's thematic and structural "connections"—identified by critics as examples of "entanglement" (in George Levine's terms) or "networks" (as Caroline Levine describes them)—are partly predicated on the vast timescales established in its opening pages. Dimock observes that "[s]cale enlargement along the temporal axis changes our very sense of the connectedness among human beings" (5), and indeed *Bleak House*'s web of connectivity hinges on its sense of history. George Levine observes that "Dickens makes us see the history in the object. In the long run, perhaps, there is, for Dickens, an eternal reality that lies behind time…. But the world he allows us to see and care about…is, like Darwin's, time-bound. Truth is not on the surface, after all, except as the surface offers clues to its history. All things imply histories, but hide their pasts" ("Dickens" 265). *Bleak House*'s plotlines reveal the histories of its characters, and the narrator asks, repeatedly: "What connexion can there be, between the place in Lincolnshire, the house in town, the Mercury in powder, and the whereabout of Jo the outlaw with the broom…? What connexion can there have been between many people in the innumerable histories of this world, who, from opposite sides of great gulfs, have, nevertheless, been very curiously brought together!" (235). The novel uncovers mysteries by revealing characters' pasts and their interconnections, suggesting that each individual and place has an (often hidden) history. This is most evident in Esther's relationship to Lady Dedlock: as her biological daughter, Esther is the living embodiment of her past, and "[t[he

[8] For instance, Levine notes that *Bleak House* "embodies in every aspect of its plots and themes the preoccupation with connections, across place, class, and institutions" ("Dickens" 274). "Connections" inform the novel's themes and narrative structure as characters are linked through chance encounters, lawsuits, kinship, illness, and mutual acquaintances. Caroline Levine lists these points of intersection: "linking characters in the novel are the law, disease, philanthropy, the space of the city, class, gossip, and the family tree" (518).

answer to the question, 'What connexion can there be?' is a genealogical one" (Levine, "Dickens" 273). Esther recognizes that the mystery of her descent is a threat to her mother's social standing and marriage: "Knowing that my mere existence as a living creature was an unforeseen danger in her way, I could not always conquer that terror of myself which had seized me when I first knew the secret" (618). This sense of genealogical history embedded within living individuals informed evolutionary theory and would be developed in Darwin's work.

By the end of the novel, all characters seem to be, like the "outcast" Jo, "entangled…in the web of very different lives" (675) and *Bleak House*'s system of networks or entanglement suggests the intertwined, symbiotic, and genealogical relationships of an ecosystem. In particular, this metaphor of entanglement anticipates the final passage of *Origin of Species,* which describes "an entangled bank, clothed with many plants of many kinds, with birds singing on the bushes, with various insects flitting about, and with worms crawling through the damp earth, and…reflect[s] that these elaborately constructed forms, so different from each other, and dependent on each other in so complex a manner, have all been produced by laws acting around us" (397). Levine remarks that "[h]ad Darwin not written this passage in almost the same form ten years before *Bleak House*, one might have thought he was trying to sum up that great novel" ("Dickens" 275).[9] Similarly, Beer cites another passage from *Origin*—"The dependency of one organic being on another, as of a parasite on its prey, lies generally between beings remote in the scale of nature" (141)—and notes that "[a]s [*Bleak House*] proceeds the immense assemblage of apparently contingent characters is ordered and reordered into multiple sets of relations so that

[9] Dickens may have influenced Darwin's writing. Darwin's notebooks and letters reference Dickens as far back as the late 1830s (Levine, "Dickens" 250-51), and his posthumous *Autobiography* confirms that he enjoyed novels: "I like all if moderately good, and if they do not end unhappily—against which a law ought to be passed" (138). Beer suggests that *Origin* employs Dickensian forms of plotting to unveil relations: "The sense that everything is connected, though the connections may be obscured, gave urgency to the enterprise of uncovering such connections. This was a form of plotting crucial to Dickens's work, as we can see, for example, in *Bleak House,* where the fifty-six named—and many more unnamed—characters all turn out to be related by way either of concealed descent (Esther and Lady Dedlock) or of economic dependence" (*Darwin's Plots* 42).

we can discover that all of them are interdependent. What at first looks like agglomeration proves to be analysable connection" (42). These partially genealogical and intertwined histories establish an ecosystem of sorts as well as a lineage or a temporal network that anticipates *Origin*'s "Tree of Life" (Appendix A), in which genealogical relations branch out over time.

Through Jo, Dickens also develops an analogy between poverty, or low social standing, and animalistic traits, or a lower-than-human evolutionary ranking. If London represents an ecosystem, the impoverished street-sweeper is one of its more unfortunate organisms, and Dickens uses Jo to draw attention to the abysmal quality of life for its poorest and to criticize the unhelpful, if not self-serving and damaging, type of charity favoured by Mrs Jellyby, Mrs Pardiggle, and Mr Chadband. Levine aligns Dickens's "Christian view, that we are all one and deny our brotherhood at our peril," with Darwin's explanation "that seeing all organisms as 'lineal descendants of some few beings which lived long before the first bed of Cambrian system was deposited,' makes them seem to him 'ennobled'" (275). In fact, I would suggest that by emphasizing Jo's animal nature, Dickens extends the metaphor of Christian brotherhood to suggest the literal kinship of species. Just as he infuses the novel's apocalyptic imagery with geological and thermodynamic language, Dickens frames his Christian model of charity in evolutionary terms. Jo functions not only as a social link—"What connexion can there be, between the place in Lincolnshire, the house in town,…and the whereabout of Jo the outlaw with the broom…?" (235)—but nearly as a connection between species, suggesting the evolutionary connotations of the term "link"[10]: "Jo sweeps his crossing all day long, unconscious of the link, if any link there be. He sums up his mental condition, when asked a question, by replaying that he

[10] Dickens would have been familiar with evolutionary terminology through his reading of Chambers' *Vestiges of the Natural History of Creation* (1844), which he found "remarkable" (qtd. in Wilkinson 238). Chambers uses the term "missing link" (87) and frequently refers to "link[s]" between species: "In the imperfect structure of their [the marsupialia] brain, deficient in the organs connecting the two hemispheres…this family is clearly a link between the oviparous vertebrata (birds, reptiles, and fishes) and the higher mammifers" (112).

'don't know nothink'" (235). Dickens emphasizes Jo's regressive status and not-fully-evolved nature to suggest that his lack of resources, education, and proper living conditions compromises his humanity: "It must be a strange state, not merely to be told that I am scarcely human (as in the case of my offering myself for a witness), but to feel it of my own knowledge all my life! To see the horses, dogs, and cattle, go by me, and to know that in ignorance I belong to them, and not to the superior beings in my shape, whose delicacy I offend!" Although Jo is most often described as one with "the other lower animals" (237), he is at times reduced to squalid vegetation: in clothes that resemble "a bundle of rank leaves of swampy growth, that rotted long ago" (659), "he lies in the corner up against the hoarding so like a growth of fungus or any unwholesome excrescence produced there in neglect and impurity" (660). On an evolutionary scale, "[h]e is not of the same order of things, not of the same place in creation. He is of no order and no place; neither of the beasts, nor of humanity" (669). Jo becomes a pre-*Origin* or *Descent of Man* example of a missing link between the upper orders of humankind and animal or vegetable life; he provides an evolutionary parallel to class hierarchy, representing a regressive, primitive, and un-evolved stage of human development in contemporary London. By evoking an evolutionary sense of genealogical and ecological relations, Dickens subtly expands the novel's scope to suggest that social connections stretch to encompass evolutionary timelines.

However, Christian and scientific worldviews and their respective concepts of deep time are not always reconcilable. Dickens illustrates the tension between spiritual and materialist deep time in Esther's feverish nightmare, which represents an early literary example of an individual confronting deep time and space. Esther experiences temporal and spatial disorientation as a result of her illness and recalls, "I have a very indistinct remembrance of that night melting into day, and of day melting into night again" (464). This distorted temporality only worsens:

> Before I had been confined to [the sick room] many days, everything else seemed to have retired into a remote distance, where there was little or no separation between the various stages of my life which had been really divided by years. In falling ill, I seemed to have crossed a dark lake, and to have left all my experiences, mingled together by the great distance, on the healthy shore.
>
> My housekeeping duties…were soon as far off as the oldest of the old duties at Greenleaf, or the summer afternoons when I went home from school…to my godmother's house. I had never known before how short life really was, and into how small a space the mind could put it.
>
> While I was very ill, the way in which these divisions of time became confused with one another, distressed my mind exceedingly. At once a child, an elder girl, and the little woman I had been so happy as, I was not only oppressed by cares and difficulties adapted to each station, but by the great perplexity of endlessly trying to reconcile them. (513)

Esther's temporal confusion is in many ways a feverish version of Carker's, though while he mixes up dates and times, she confounds entire periods of her life. She experiences a disorienting folding time, as the "divisions of time" by which she categorizes her memories become muddled. Further, from her feverish perspective the timeframe of her life seems reduced, as though she sees her life from a vaster temporal perspective and so it appears to have shrunk. Esther's sense of diminishment is heightened when she is subjected to a cosmic vision: "Dare I hint at that worse time when, strung together somewhere in great black space, there was a flaming necklace, or ring, or starry circle of some kind, of which *I* was one of the beads! And when my only prayer was to be taken off from the rest, and when it was such inexplicable agony and misery to be a

part of the dreadful thing?" (514). This dream, with its apparent references to astronomy, is at odds with her customary faith in heaven and suggests a feverish horror at the immensity of space and time alongside the jumbled confusion of the stages of her life. In her vision, Esther is merely part of a chain—a "starry" "bead"—"in great black space"; these cosmic terms suggest a materialist concept of the universe, while the descriptor "flaming" takes up the novel's apocalyptic and thermodynamic imagery. The vision links Esther's temporal disorientation during her illness with a fear of being lost in space, tethered to a material, chaotic system. Like Gwendolen in *Deronda*, Esther shrinks from this astronomical sense of time and space.

Bleak House's innovative structure, which divides the novel between Esther's first-person and a third-person narrative, enables Dickens to depict both this personal temporal experience and the vast non-human timescales evoked by the omniscient narrator. The novel considers how individuals fit within larger systems (particularly legal, social, and religious systems) and how they interact and connect when their worlds overlap. *Bleak House* depicts a network of characters within a temporal continuum and portrays their world as a system informed by geological time, thermodynamic processes, and biological connections. Dickens's allusions to geology, astrophysics, and biological entanglement entail such vast timeframes that despite the novel's formal length and its sweeping vision it also suggests its own limited scope. The means through which Dickens conveys this sense of deep time are, however, notably literary: he employs Biblical language of apocalypse alongside his geological and thermodynamic descriptions, and he suggests a correlation between Christian and evolutionary kinship. More broadly, *Bleak House* does not rely on realist techniques to convey scientific concepts. The novel in many ways borrows from the conventions of romance, and in his Preface Dickens addresses this generic intersection. He criticizes the social ills of Chancery and defends

his depiction of spontaneous combustion as scientifically legitimate against charges by "Mr Lewes," George Eliot's partner. However, he ends by claiming: "In *Bleak House,* I have purposely dwelt upon the romantic side of familiar things" (6). Stephen Gill links this assertion to Carlyle's "declar[ation] that 'Romance exists…in Reality alone,'" as well as Dickens's statement in the initial copy of *Household Words* that, "To show to all, that in all familiar things, even in those which are repellant on the surface, there is Romance enough, if we will find it out…is one main object of our Household Words" (qtd. in Gill 918). For Dickens, the reality of daily life, severe social problems, and scientific data are not incompatible with romance. By transforming a spiritual sense of vast time into a scientifically-inflected model, he not only retains a spiritual and even supernatural temporality but provides a literary method for conveying deep time which deviates from science's quantitative models. Through *Bleak House*'s romance elements Dickens portrays folding time and visions of the past to produce an imaginative, non-linear concept of scientific deep time.

"Its geological formation was Dust": Accumulation and Inheritance in *Our Mutual Friend*

Our Mutual Friend incorporates scientific deep time more directly than Dickens's earlier works. Critics like Buckland, Fulweiler, and Kuskey have analyzed the novel's Darwinian, geological, and thermodynamic themes; my reading builds on their scholarship to demonstrate the extent to which these allusions are predicated on scientific deep time. Through allusions to evolutionary theory, geology, paleontology, and the heat death of the sun, Dickens not only includes scientific references but purposefully incorporates vast timeframes into his last completed novel. *Our Mutual Friend*'s landscape descriptions evoke deep time and bring the remote past into relation with its contemporary story, while its setting and its characters'

motivations reflect a materialism uncommon in Dickens's previous novels. Modern London is portrayed as part of a much vaster timeframe in which geological, evolutionary, and thermodynamic processes unfold; it exists as part of a temporal continuum but at the same time does not seem far removed from the primordial past. The dust-heaps, key symbols in the novel, represent geological formations and Darwinian sites and offer an opportunity for paleontological excavation. Through the dust-mounds, *Our Mutual Friend* imbues the novelistic model of inheritance with evolutionary and geological connotations. Further, Dickens uses thermodynamic imagery which recalls Thomson's "Age of the Sun's Heat" and suggests a future of solar death and entropy for London. Despite its bleak setting, *Our Mutual Friend* maintains the possibility of a spiritual temporality which is embodied in Lizzie's prophetic visions. Although seemingly opposed to Dickens's scientific deep time, this spiritual temporality reinforces the sense of timelessness and continuity established through the references to geological, evolutionary, and thermodynamics processes. The novel's setting is at once a naturalistic and depressing picture of London life and a world of visions, miracles, and romance. Further, Dickens suggests a possibility for social and individual change that works to drive the narrative forward to an open-ended future, rather than looking back to the long-reaching past as in *Bleak House*.

Published five years after *Origin of Species*, *Our Mutual Friend* reveals Darwin's influence. In 1860 *All the Year Round* published both a review of *Origin* and "an essay called 'Species,' which…quotes Darwin at length as though in the voice of the author." Levine suggests that "[t]wo essays so generously indulgent of the development theory in a journal as tightly controlled as *All the Year Round* seem very unlikely unless Dickens were ready to endorse the idea himself" ("Dickens" 260-61). Chapter titles such as "Tracking the Bird of Prey," "A Dismal Swamp," and "More Birds of Prey" echo Darwinian topics and could conceivably constitute

additional chapters in *Origin*, and the narrator borrows the language of the naturalist, as when he describes Gaffer: "He was a hook-nosed man, and with that and his bright eyes and his ruffled beard, bore a certain likeness to a roused bird of prey" (3). More generally, the novel's world of predators, prey, and scavenging relations bears stronger marks of evolutionary theory than Dickens's previous works: the Lammles prey on Georgiana Podsnap, Fledgeby preys on Riah and his debtors, Silas Wegg preys on the Boffins and is removed by being thrown out on a scavenging cart, and even the ultimately harmless Venus is a scavenger of sorts, collecting physical remains for financial gain and scientific study. For Fulweiler, Darwin's influence is most evident in Dickens's depiction of "the mutual relationship of organic beings to each other and to their environment" (50). He identifies the Darwinian competition inherent in this "fictional world of individuals fiercely seeking their own advantage" (51) and relates "[t]he ubiquity of death [which] is the most striking aspect of *Our Mutual Friend*" (70) to extinction. Furthermore, Fulweiler observes that the novel is structured not only around species competition and death, but sexual selection and reproduction (notably in the novel's marriage plots): "The struggle between life and death in the novel, as in Darwin's picture of evolutionary processes, is closely linked to the relation of the sexes. Sexual selection is a central feature of *Our Mutual Friend*, almost as much as it is in the more self-consciously Darwinian Wessex fiction of Hardy at the end of the century" (70). If, in *Bleak House*, Dickens uses animal imagery to suggest Jo's lowly relation to beasts, in *Our Mutual Friend* we are instructed, with reference to London society, to "behold all manner of crawling, creeping, fluttering, and buzzing creatures" (209).

Accordingly, evolutionary theory informs Dickens's concept of deep time. *Our Mutual Friend* emphasizes the continuity of the evolutionary past and establishes a sense of duration as it opens on a contemporary scene that appears largely unchanged from primordial times:

> Allied to the bottom of the river rather than the surface, by reason of the slime and ooze with which it was covered, and its sodden state, this boat and the two figures in it obviously were doing something that they often did, and were seeking what they often sought. Half savage as the man showed, with no covering on his matted head, and his brown arms bare to between the elbow and the shoulder, with the loose knot of a looser kerchief lying low on his bare breast in a wilderness of beard and whisker, with such dress as he wore seeming to be made out of the mud that begrimed his boat, still there was business-like usage in his steady gaze. (1-2)

The "slime and ooze" of the riverbed evoke a prehistoric landscape (and recall *Bleak House*'s muddy London), and as the red light from the setting sun shines on the remains of a rotted human form (2), the reader is presented with a very different body of water from *Dombey and Son*'s symbolic waves. "Half savage" and wildly hirsute, Gaffer seems to have retained an essentially primitive nature. Dickens establishes a materialist world which seems to have endured from the ancient past. Buckland suggests that the prehistoric atmosphere which pervades *Our Mutual Friend* reflects a shift in scientific thought from the period: "By 1864 the optimistic heyday of the 1850s was over, and London was beginning to imagine itself in starkly different terms." Following the publication of *Origin* and "two years after Sir Charles Lyell had analysed the evidence for prehistoric man in *The Antiquities of Man* (1863)[,]…. primeval beetles and pterodactyls ("flying-lizards") crawl and fly through the streets of *Our Mutual Friend* alongside alligators, prehistoric fish, and "amphibious human creatures" scavenging survival from the refuse of the river" (689). London seems similarly primitive and dangerous, and that Dickens avoids dating the scene only heightens this sense of timelessness. Unlike *Bleak House*'s concise introduction, *Our Mutual Friend* opens with a vague sense of time: "In these times of ours,

though concerning the exact year there is no need to be precise, a boat of dirty and disreputable appearance, with two figures in it, floated on the Thames" (1). While the novel introduces a contemporary moment, its description of Gaffer and the river demonstrates the persistence of prehistoric temporalities in the present.

Dickens further establishes a sense of deep time through geological imagery which recalls the vast timeframes associated with Lyell's work, among that of others. *Our Mutual Friend* uses geological language more frequently than *Dombey* or *Bleak House* and offers a central symbol, the dust-heaps, with distinct geological properties. By portraying London and the dust-mounds in geological terms, Dickens proposes a temporal metaphor whereby the past is depicted as layers beneath the present, and temporal continuity is made visible by ongoing geological processes; essentially, he illustrates a Lyellian understanding of the present as a gradual accumulation of the past. Early in the novel, Mortimer recounts how John Harmon Sr "grew rich as a Dust Contractor, and lived in a hollow in a hilly country entirely composed of Dust."[11] Mortimer describes the business in geological terms: "On his own small estate the growling old vagabond threw up his own mountain range, like an old volcano, and its geological formation was Dust. Coal-dust, vegetable-dust, bone-dust, crockery-dust, rough dust, and sifted dust—all manner of Dust" (13). This "range of dust-mountains" (15) was likely inspired in part by Lyell's work and the contemporary articles on geology that appeared in *All the Year Round*, such as a review of *Geological Evidences of the Antiquity of Man* which Fulweiler identifies as containing "an interesting analogue to the dustheap, the central symbol of *Our Mutual Friend*" (54). "How Old Are We?" describes "heaps of waste oyster-shells, cockle-shells, and waste of other edible shell-fish, mixed with bones of divers eatable beasts and birds and fishes" along the

[11] Cotsell explains that "London parishes contracted with individual entrepreneurs—the dust contractors—for the clearance of dustbins and other rubbish. The dust was removed to some local ground owned by the contractor where it was heaped... [and] sifted, usually by women labourers who worked long hours for the lowest of wages" (825-26).

Danish coast; "these mounds—which are from three to ten feet high, and some of them a thousand feet long by two hundred wide—[are called] kitchen-middens" (33). Lyell's well-established work would have influenced Dickens's understanding of geological processes and formations, and since "Lyell…gave Hutton's theory and his sense of deep time their largest advance towards universality" (McPhee 142), these geological markers would have entailed a notion of deep time. In *Our Mutual Friend* the ubiquitous "damp earth" and dust-heaps are key images that situate contemporary London within vast geological timeframes.

As geological formations, the dust-mounds symbolize not only the passage of time but the geological and biological processes of accumulation, inheritance, and extinction that occur over vast timescales. Dickens modifies the novel's familiar treatment of death and inheritance so that *Our Mutual Friend*'s central inheritance has distinctly scientific connotations. Fulweiler acknowledges the "commonplace that one of the great subjects of nineteenth-century fiction is the role of wills and inheritance," and observes that "*Our Mutual Friend* is no exception. It is about the strange series of wills of an unhappy miser, John Harmon. The search for the valid will poses symbolically a human question larger than the material one: Will the self-seeking character traits of the miser, as well as his money, be inherited through his will?" (64-5). However, by investing this inheritance with geological and Darwinian undertones, Dickens also suggests an extended scale of inheritance that far exceeds the novel's traditional familial scope. *Our Mutual Friend* depicts inheritance in a dual sense: the plot hinges on the literal inheritance of Harmon's estate and explores the familial inheritance of genetics and characteristics. Both genetic and financial inheritance link the past to the future and establish a forward-driving narrative: through inheritance, the past is carried into the present, thereby setting the conditions for the future.

In this context, the dust-heaps constitute a legal inheritance as well as a depository of the past. The dust-heaps have developed through the geological and biological processes of gradual accumulation and the selection of random debris; they embody a temporal continuum. Fulweiler identifies the mounds' Darwinian connotations: "the garbage heap…bears an obvious analogy to the chief insight of *The Origin*…: that 'the accumulation of innumerable slight variations' is the fundamental condition from which natural selection brings about change." He observes that, "[l]ike the geological record, the mounds are composed of old bones as well as other disparate objects whose position and value in the mounds have no plan. … The dustheaps are not only a monument to accumulation and random selection but are also the site of a struggle for existence" that attract scavengers like Silas Wegg who metaphorically feed off their material remains (61). Apart from being mounds of waste, they are also mounds of death. Goldie Morgentaler writes that "from this geological perspective, the mounds become a reification of the history of the earth, and a demonstration of the manner in which life quite literally lives upon death. What lies beneath our feet is the history of the Earth, a history made up, not of the grand and the gorgeous, but of the accumulated waste of generations" (179-80). The dust-mounds represent the passage of time through their process of accumulation and their function as inheritance; these sites of competition are made up of material remains that suggest the threat of extinction. Through the symbol of the dust mounds Dickens translates the novelistic trope of inheritance into geological and biological terms, and he uses the heaps to embody temporal duration and continuity.

The deep time symbolized by the geological dust-mounds is heightened by Dickens's references to palaeontology. Fulweiler observes that "[t]he digging in the mounds….leads naturally to an analogy in paleontology" (61) as it constitutes "a search through the fossil record of Victorian London." He suggests that these allusions further the novel's theme of inheritance:

"It is here that a central concern of the Victorian novel comes together with the chief goal of Victorian science: uncovering the secret of inheritance. The endless searching is for a will. The secret of inheritance, it will be remembered, is the goal of paleontology, and, further, the riddle that Darwin claimed to have solved in *The Origin*" (62). The connections that Fulweiler uncovers between novelistic and scientific models of inheritance are apt; however, it is important to note that the novel's traditional sense of inheritance is of a vastly different timescale from that recognized by evolutionary and paleontological science. *Our Mutual Friend*'s allusions to palaeontology extend the timeframe of this inheritance and introduce a materialist representation of death. Although the descriptions of Wegg and others sifting through the heaps for treasure mirror paleontological excavation, the novel's references to paleontology are not limited to the dust-mounds and specifically Darwinian contexts. Dickens also invokes paleontology through references to Richard Owen and in his depiction of Mr Venus, a collector of curiosities and "Articulator of human bones" (83). Darwinism is far from the novel's only scientific strain, and Owen, a famous paleontologist who coined the word "dinosaur" and opposed Darwinism,[12] is named when Dickens describes "Mrs. Podsnap; fine woman for Professor Owen, quantity of bone, neck and nostrils like a rocking horse, hard features" (10). Buckland observes that "the text repeatedly alludes to Owen directly, in a period in which Dickens was reading and re-reading Owen's work with alacrity and supporting his views on the construction of a Natural History Museum" (692). Michael Cotsell notes that Owen, "known in the press as 'Old Bones,' was a friend of Dickens" and an anatomist renowned for his ability to reconstruct dinosaurs and animals: "A *Household Words* article, 'Done to a Jelly' (indexed as 'Bone Soup') reported

[12] Buckland notes that Owen "named the 'dinosaur,' and ran the Hunterian Museum, the Crystal Palace prehistoric garden, and the Natural History Museum" (680). Although he "was still one of the most famous, and illustrious, scientists," his "notorious anti-evolutionary stance had earned him unpopularity in scientific circles" and Dickens "present[s] him as a benevolent, if now somewhat obsolete, figure of scientific authority in *OMF*" (692).

Owen's lectures on the theme that the 'seemingly most worthless parts of animal bodies, are turned to uses of the most unexpected kind by the inventive skill and science of man'" (824-5).

In this context, Dickens's references to paleontology and Owen clearly relate to Mr Venus and his shop of curiosities. The novel is replete with waste and corpses, but nowhere is this fascination with death and material remains more fully on display than in Venus's shop, which is described in almost gleeful terms. Venus's business represents an intersection of various strains of scientific thought in *Our Mutual Friend*: it contains debris like the geological dust-mounds, demonstrates Venus's paleontological skills, and presents a materialistic Darwinian natural world. His workshop contains the following mix of animal and human remains: "Bones, warious. Skulls, warious. Preserved Indian baby. African ditto. Bottled preparations, warious. … [H]uman warious. Cats. Articulated English baby. Dogs. Ducks. Glass eyes, warious. Mummied bird. Dried cuticle, warious" (81). By depicting human remains jumbled alongside those of animals, Dickens situates humankind in relation to other species—both prehistoric and contemporaneous. According to his business card, Venus is a "Preserver of Animals and Birds" and an "Articulator of human bones" (83), and he is collecting said bones to complete a skeleton. His obsession and prodigious skill with bones paints him as an Owen-like figure,[13] albeit with a focus on reconstructing human, rather than dinosaur, skeletons:

> Mr. Wegg, not to name myself as a workman without an equal, I've gone on improving myself in my knowledge of Anatomy, till both by sight and by name I'm perfect. Mr. Wegg, if you was brought here loose in a bag to be articulated,

[13] Fulweiler links Venus and his shop to both Darwin and Owen: "The miscellaneous shop of Mr. Venus, with its odd assortment of parallel bone structures, is a comic analogue to Darwin's description of bone patterns among widely varied mammals…. It is equally possible that Dickens had Darwin's antagonist Richard Owen in mind. Owen was widely recognized as the greatest anatomist of the day. The proceedings of the British Association of 1846 are described as being 'dominated by Owen's numbingly technical paper comparing the homologous bones in fish, reptiles, and mammals'" (63). He also proposes that Venus may also be read as a Darwin-like "careful and patient scientist who takes a lifetime to collect and piece together innumerable small bits of evidence" (64).

> I'd name your smallest bones blindfold equally with your largest, as fast as I could pick 'em out, and I'd sort 'em all, and sort your wertebrae, in a manner that would equally surprise and charm you. (83)

By associating Venus with Owen and other palaeontologists, Dickens is also likening human remains to dinosaur bones. In *Our Mutual Friend*, it is not just geological ruins and dinosaur bones that are excavated and studied, but also human skeletons. In an evident departure from Dickens's spiritual depictions of death, such as *Dombey and Son*'s metaphorical "waves," Venus's shop demonstrates how in death, all animals—human or otherwise—are reduced to material remains**.** Furthermore, Venus's collection seems to anticipate the museums containing human artefacts in *The Coming Race* and *The Time Machine*. In Bulwer and Wells, these examples emphasize the materiality and brevity of human existence while situating humankind within deep time and in relation to other species. By linking Venus's shop to paleontology, Dickens is making a similar move as he suggests a perspective from which human remains become fossils of sorts. Dimock proposes that with a sense of deep time we can see humankind as "a species with a sedimented imprint. Honoring that imprint, and honoring also the imprints of other creatures evolving as we do, we take our place as one species among others, inhabiting a shared ecology, a shared continuum" (6). Dickens similarly reveals the shared materiality of human, animal, and dinosaur life which connects such relics from vastly different eras.

Our Mutual Friend's focus on waste takes on yet another scientific form through its representations of thermodynamics. Kuskey acknowledges "[t]he abundance of thermodynamic concepts, images, and characters in Dickens's novel" (77) and focuses in particular on the role played by the first law of thermodynamics—"the principle of energy conservation" (79). She also notes that "[f]rom 1865–1866—overlapping the serialization of *Our Mutual Friend*—[*All*

the Year Round] featured a series of five articles on John Tyndall's *Heat Considered as a Mode of Motion* (1863), which was based on his popular lecture series delivered the year before at the Royal Institution" (80). Focusing on the moral imperative implicit in Victorian energy concepts, Kuskey observes, "we see the central role ascribed to human agency—to the choice to make good use of the *opportunity* to use energy on its way to inevitable and irreversible energy—which remained central to Victorian articulations of the laws of thermodynamics" (81). However, it is the "inevitable and irreversible" aspect of energy that seems to inform the novel's depictions of the sun. Although Kuskey suggests that "the second law of thermodynamics and its concept of entropy were not fully understood by the general reading public until the 1870s and 1880s" (79), *Our Mutual Friend*'s solar imagery evokes thermodynamic dissipation and cosmic narratives of decline which recall "On the Age of the Sun's Heat" (1862). In his article Thomson advances the theory of the death of the sun and states that "[t]he second great law of Thermodynamics involves a certain principle of *irreversible action in nature.* It is thus shown that, although mechanical energy is *indestructible*, there is a universal tendency to its dissipation, which produces gradual augmentation and diffusion of heat, cessation of motion, and exhaustion of potential energy through the material universe" (388). He writes that "[t]he object proposed in the present article is an application of these general principles to the discovery of probable limits to the periods of time, past and future, during which the sun can be reckoned on as a source of heat and light" (389). In this context, Dickens's thermodynamic solar imagery seems to function as an extension of the novel's interest in death and waning life, albeit on a cosmic scale. *Our Mutual Friend*'s images of setting or dying suns build on *Bleak House*'s entropic imagery and suggest the possibility of London, and presumably the planet, undergoing dissipation.

The idea of waning solar energy is introduced in the novel's opening scene, in which "a slant of light from the setting sun glanced into the bottom of the boat, and, touching a rotten stain there which bore some resemblance to the outline of a muffled human form, coloured it as though with diluted blood" (2). In *Our Mutual Friend* the sun is frequently red and bleeding, as when Dickens describes how "the sun, blood-red on the eastern marshes behind dark masts and yards, seemed filled with the ruins of a forest it had set on fire" (74). This metaphorical language suggests a dying sun, particularly when it is coupled with descriptions of waning light: "The towers and steeples …, dark and dingy as the sky that seems descending on them, are no relief to the general gloom; a sun-dial on a church-wall has the look, in its useless black shade, of having failed in its business enterprise and stopped payment for ever" (393). As the sun seems to lose strength, sun-dials are rendered useless, as though London is approaching the end of time. As in *Bleak House*, this world is smoggy, dark, and frequently sunless:

> It was a foggy day in London, and the fog was heavy and dark. Animate London, with smarting eyes and irritated lungs, was blinking, wheezing, and choking; inanimate London was a sooty spectre, divided in purpose between being visible and invisible, and so being wholly neither. Gaslights flared in the shops with a haggard and unblest air, as knowing themselves to be night-creatures that had no business abroad under the sun; while the sun itself, when it was for a few moments dimly indicated through circling eddies of fog, showed as if it had gone out, and were collapsing flat and cold. (420)

This nearly apocalyptic description of the darkened, sooty city, complete with "the sun …collapsing flat and cold," suggests a cultural entropy of sorts, in which London's social dissipation reflects a broader cosmic sense of gradual heat death. In these descriptions Dickens

seems to anticipate Wells's imagery when the Time Traveller watches "the sun grow…duller" as a "great darkness" unfolds (147, 148). These images of failing suns and a dissipated London also seem to foreshadow *The Secret Agent*, which similarly depicts London as a Darwinian landscape in an entropic world. Dickens is both anticipating the narratives of decline that would inform numerous literary depictions of the sun around the fin-de-siècle and drawing on the massive timescale that Thomson undertakes in "Age of the Sun's Heat."

Despite its scientific references and often bleak materialism, *Our Mutual Friend* upholds a concept of spiritual time. Although Dickens reserves natural metaphors for depictions of scientific time, he also describes futurity and duration in spiritual or supernatural terms. For instance, Lizzie and Jenny experience prophetic visions: Lizzie "see[s] pictures in the fire" (529) and predicts Bella will find love, while Jenny envisions "long bright slanting rows of children, who…bring [her] ease and rest" and "hear[s]...birds sing…and smel[ls]…flowers….most beautiful and most Divine!" (737), seemingly confirming a Christian heaven. Lizzie's visions share similarities with Mordecai's prophesies in *Deronda*; both characters' premonitions are presented as legitimate, and suggest an element of folding time in which the future is momentarily revealed. Although Lizzie's visions in the fire and Jenny's heavenly dreams lend the novel a supernatural aspect and forgo realist conventions, they uphold the concept of a temporal continuum and future-driven narrative implicit in the novel's scientific deep time. *Our Mutual Friend* suggests a degree of timelessness and continuity that resonates with both spiritual and scientific deep time. For instance, its vague temporal setting—"In these times of ours, though concerning the exact year there is no need to be precise" (1)—seems to reflect the immensity of deep time as well as a sense of mythic timelessness: the opening forgoes numerical chronology in favour of temporal continuity and the intersection of remote time periods.

In fact, *Our Mutual Friend* suggests similarities between spiritual and scientific deep time as it seems to set both apart from the rigorous chronometry of Podsnappery. Both the ongoing, vast natural processes of deep time and the ahistoricity of spiritual time function in opposition to the rigid and artificial time constraints of Podsnap's chronometric schedule: "Elsewise, the world got up at eight, shaved close at a quarter-past, breakfasted at nine, went to the City at ten, came home at half-past five, and dined at seven" (128). This highly scheduled temporality is paralleled in Podsnap's inflexible perspective regarding a guest's concerns over the people who have died in the streets of starvation (a Malthusian topic of the time)—he dismisses his guest's social concerns by chalking it up to "the intentions of Providence" (141). Podsnap's controlled, artificial, and chronometric understanding of time—divided along the lines of his business-oriented life—corresponds with his small-minded dogmatism and lies in stark contrast to the novel's fluid and encompassing spiritual and scientific deep time. Clock-time, as kept rigidly by Podsnap (and versions of which appear in *Dombey and Son* and *Hard Times* (1854)), is contrasted with the scientific sense of a temporal continuum—embodied elsewhere in the novel by ongoing evolutionary, geological, and thermodynamic processes—as well as the visionary, mythic sense of time implicit in the novel's spiritual themes. For Dickens the contrast, and what connects both concepts of deep time, is moral: to understand the ongoing natural processes of deep time and the concept of eternal salvation, one must see beyond the self into a greater sense of the world, and beyond the present to a vaster sense of time and duration. The Boffins, despite their lack of education, exemplify this perspective: "These two ignorant and unpolished people had guided themselves so far on in their journey of life, by a religious sense of duty and desire to do right. … And this is the eternal law. For, Evil often stops short at itself and dies with the doer of it! but Good, never" (101). Dickens proposes that within this temporal

continuum, goodness emanates and endures (not unlike the diffusive potential of good deeds suggested in the conclusion of *Middlemarch*).

In this sense, *Our Mutual Friend* suggests a possibility for change, a drive towards the future, and a lack of closure consistent with its deep time frame. The novel concludes with the hope of a social shift through Twemlow's redefinition of the term "gentleman" (819-20) and Eugene's chance of redemption; change is possible and encouraged. However, unlike *Dombey and Son* and *Bleak House*, there is less closure to the narrative. While the former relates Dombey's happy future with his grandchildren, assuring the reader of his rehabilitation, and *Bleak House* is revealed to have been told from Esther's secure and happy future position as wife and mother, *Our Mutual Friend* presents no such optimism or guarantee of positive outcomes. In keeping with its pessimistic and frequently Darwinian tone, the novel drives towards an open and ultimately unknowable future. Thus while its questions of inheritance are in varying ways economic, Darwinian, and moral, they always demonstrate temporal concerns. Fulweiler proposes that the novel asks, "What is worthy to be inherited? How can the legacy of the past evolve into the present and future?" (65), and suggests that the "central question of the novel…is parallel to the biological question Darwin attempted to answer, as have all evolutionary theories: How is the past being transformed into the future?" (66). Geological transformation, evolution, accumulation, inheritance (be it genetic or financial), and thermodynamic processes link the past to the future and establish a forward-driving narrative: what was past continues or morphs into the present, thereby setting the conditions for the future. Dickens seems to demonstrate an outlook similar to that espoused by Henri Bergson in *Creative Evolution*: "Duration is the continuous progress of the past which gnaws into the future and which swells as it advances. And as the past grows without ceasing, so also there is no limit to its preservation" (4). In this

sense, *Our Mutual Friend* is a novel more preoccupied with the future—of its characters and society—than Dickens's earlier novels. If *Dombey* and *Bleak House* conclude with greater reassurance and resolution, thereby guaranteeing happiness for the surviving characters, *Our Mutual Friend* instead points to the necessity—and inevitability—of continuous change. The scientific-temporal processes that inform the world of *Our Mutual Friend* entail unsettling and open-ended narrative possibilities that disrupt the novel's sense of containment.

"Under the varying experiments of Time": Uniformitarianism in *Middlemarch*

Eliot's *Middlemarch* offers a categorically scientific perspective on time which departs from Dickens's often spiritualized deep time. Alongside its famously scientific outlook—established from the outset by the novel's subtitle, "a study of provincial life"—*Middlemarch*'s sense of time is grounded in uniformitarian principles. Levine proposes that *Middlemarch* reveals "[t]hat rational order, for George Eliot, was not Providential, but scientific, explicable in terms of the mechanics that govern the relations of matter, and essential in the arguments of scientists defending their mechanical explanations of inorganic and organic nature" (*Realistic Imagination* 259). Specifically, uniformitarianism exerts a prominent influence over the novel's narrative structure and temporality. Eliot's scientific knowledge and its manifestation in *Middlemarch* have been widely studied, and my analysis will outline how this scientific perspective produces a linear or gradualist model of deep time in order to set up my reading of *Deronda*, which departs from this linear structure. *Middlemarch* draws on uniformitarian principles at the thematic and structural level. The novel's thoroughly scientific perspective addresses the smallness of the individual within history and presents the omniscient narrator as an experimenter-figure outside the constraints of the narrative's time. Further, *Middlemarch*'s

geologically and biologically-inflected sense of history is mirrored in its form, as the lengthy text explores a web of connections between characters and overlapping plots. Eliot's scientific concept of time suggests an infinite temporal expansion that extends beyond its narrative and alludes to natural processes that occur over vast timescales.

Hailed as "that most scientifically knowledgeable of novels" (Levine, *Novelists* 226), *Middlemarch* reveals Eliot's interest in disciplines including natural history, biology, and uniformitarianism. Her use of scientific discourse was recognized in her time: Beer emphasizes "the degree to which language that has now lost its scientific bearing still bore a freight of controversy and assertion for George Eliot and her first readers," hence Henry James's "complain[t] that '*Middlemarch* is too often an echo of Messrs. Darwin and Huxley'" (139). In particular, *Middlemarch* was influenced by the concept of gradualism which informed geological uniformitarianism and evolutionary theory. Levine links the concept of uniformitarianism behind Darwin's and Lyell's works to Victorian realism: "Darwin's uniformitarianism seems to be echoed in the works of the self-conscious realists of high Victorian fiction, even when they did not need Darwin to confirm their own unlabeled uniformitarianism. George Eliot knew the assumptions upon which uniformitarianism was grounded, and theorized about them" (*Novelists* 8). The uniformitarian model was influential to nineteenth-century literary realism and manifests itself in novels' detailed descriptions of everyday domestic life and gradually unfolding plots. Beer observes that "[i]n the uniformitarian ordering of *Middlemarch* events, however seemingly catastrophic, are prepared for by the slight incipient movements, crumblings, pressures, erosions, and siltages observable to an immeasurably patient eye"; she notes that "[e]arlier in [Eliot's] career….[c]ausal sequence had been the organising principle both of her morality and of her practice as a novelist" (169), and that, in contrast to *Deronda*, *Middlemarch*'s "plotting …

confirms a gradualist world of uniformitarian accretion and dislimning" (193). Of course, uniformitarianism is predicated on deep time as it posits that geological and evolutionary changes develop gradually over vast timescales; accordingly, *Middlemarch* presupposes deep time alongside its linear and gradualist narrative.

In *Middlemarch*, Eliot is wary of areas of study that solely look backwards and strive to establish origins, and instead endorses a forward-thinking model of experimental science. Shuttleworth proposes that "*Middlemarch* is the first novel in which science is treated as an explicit theme" (143), and Eliot offers several models of scientific research, including Reverend Camden Farebrother's pursuit of natural history,[14] to suggest the direction that scientific studies should take. In particular, the two projects with significant temporal-scientific implications are the Reverend Edward Casaubon's and Dr. Tertius Lydgate's. Ian Duncan observes that "*Middlemarch* tracks two case histories of scientific inquiry, Lydgate's quest for the 'primitive tissue' and Casaubon's for 'the Key to all Mythologies,' both of which fall short of the modern revolutions in their fields, consolidated during Eliot's career" ("George Eliot" 17). While not strictly scientific, Casaubon's project represents a search for origins through historic research that aligns it with similar endeavours in disciplines such as biology, geology, and anthropology. Dorothea is initially impressed with this project and considers that "[t]o reconstruct a past world, doubtless with a view to the highest purposes of truth—what a work to be in any way present at,

[14] Farebrother's somewhat old-fashioned yet successful interest in taxonomy recalls the type of data collection favoured by Darwin and natural historians. He claims to "have made an exhaustive study of the entomology of this district. I am going on both with the fauna and flora; but I have at least done my insects well. We are singularly rich in orthoptera" (161). Although his is a significantly less ambitious project than Casaubon's or Lydgate's, Farebrother understands the limitations of his environment and pursues his classification without compromising his community duty. Postlethwaite sees it as "consonant with George Eliot's intellectual temperament that there should be two, equally important, models for the 'scientific' novelist: old-fashioned, observing 'natural historian'; and modern, theorizing 'natural scientist.'" She proposes that Farebrother and Lydgate constitute scientific models for Eliot's writing: "On one hand, we find…the keenly appreciative eye of the 'natural historian,' delineating the evocative particularities of a 'singularly rich' array of human nature. On the other, those individualized characters are also richly contextualized within the reflective generalizations of an omniscient narrator 'bitten with an interest in structure,' a discriminating creator who identifies and delineates larger patterns of meaning" (100).

to assist in, though only as a lamp-holder!" (17). However, Casaubon's search for an original key to link all mythologies is unsuccessful, suggesting the impossibility of pinpointing historic origins and foreshadowing *Deronda*'s declaration that "[n]o retrospect will take us to the true beginning" (3). Casaubon admits: "I live too much with the dead. My mind is something like the ghost of an ancient, wandering about the world and trying mentally to construct it as it used to be, in spite of ruin and confusing changes" (16-7). By constantly looking to the past Casaubon overlooks new developments in his field; his work is unsuccessful and portrayed as out-of-date as he "toils in the theological old regime of comparative mythology, ignorant of contemporary German innovations in philology and biblical criticism that will issue in F. Max Müller's 'science of language' and Edward B. Tylor's 'science of culture' in the decade preceding *Middlemarch*" (Duncan 17). While his aim of establishing a point of origin for all mythologies is similar to the totalizing enterprises of some branches of Victorian science—and perhaps the realist novel—its focus on the past overlooks the dynamic relations of the present and forgoes the future entirely.

In contrast, Lydgate's project is more similar to Eliot's in *Middlemarch*. Postlethwaite compares the novel's "overtly sociological" title—"it is a 'study of provincial life'—a title with a natural-science ring"—to Lydgate's "'The Physical Basis of Mind,' the real-life subtitle of volume III of Lewes's *Problems of Life and Mind*" (114).[15] Specifically, "Lydgate seeks to extend Xavier Bichat's tissue theory on the historical cusp of its transformation in the 1830s by the pioneers of cell biology, Matthias Schleiden and Theodor Schwann, whose findings will be expanded by Rudolf Virchow in the 1860s" (Duncan 17). Lydgate is "ambitious of a wider

[15] Similarly, Beer suggests that Lydgate's project seems to echo "Lewes's series of articles for the *Fortnightly Review* in 1868 on 'Mr. Darwin's Hypotheses': 'Let us for a moment glance at the resemblances and diversities observable in all organisms. All have a *common basis*, all being constructed out of the same fundamental elements: carbon, hydrogen, nitrogen and oxygen'" (143).

effect: he was fired with the possibility that he might work out the proof of an anatomical conception and make a link in the chain of discovery" (*Middlemarch* 137). He "keenly [feels] the need for that fundamental knowledge of structure which just at the beginning of the century had been illuminated by the brief and glorious career of Bichat" (138):

> That great Frenchman first carried out the conception that living bodies…must be regarded as consisting of certain primary webs or tissues, out of which the various organs—brain, heart, lungs, and so on—are compacted.… but it was open to another mind to say, have not these structures some common basis from which they have all started, as your sarsnet, gauze, net, satin and velvet from the raw cocoon? (138-9)

As Lydgate "longed to demonstrate the more intimate relations of living structure," he wonders, "What was the primitive tissue?" The narrator explains: "In that way Lydgate put the question—not quite in the way required by the awaiting answer; but such missing of the right word befalls many seekers" (139). Despite his failure to pioneer these biological developments, Lydgate's goals align most closely with Eliot's realist literary aims. Shuttleworth proposes that as "a work of experimental science" *Middlemarch* deviates from "the scientific methodology of natural history [that] had sustained [*Adam Bede*'s] static vision of social order." She observes that "Eliot turns instead to the more dynamic methodology of experimental biology, a stance which receives paradigmatic expression in the novel in the research of Lydgate. ... [I]n the long discussions of Lydgate's methods and beliefs one can discern George Eliot's reflections on her own assumptions and procedures" (143). Despite its shortcomings, Lydgate's project is forward-thinking and employs current scientific methodology, and its focus on establishing the "intimate

relations of living structure" suggests a more active engagement with the present—and more tangible social-medical benefits—than Casaubon's concentration on the ancient past.

Middlemarch's form is similarly influenced by contemporary science. In particular, the novel's web-like structure corresponds with Lydgate's "dynamic methodology of experimental biology" (Shuttleworth 143) and the study of "primary webs or tissues." However, the novel's multi-plot narrative also resembles Darwin's concept of a web of relations (as well as Dickens's thematic and structural connections in *Bleak House*). In *Origin*, Darwin writes:

> We can clearly see how it is that all living and extinct forms can be grouped together in one great system; and how the several members of each class are connected together by the most complex and radiating lines of affinities. We shall never, probably, disentangle the inextricable web of affinities between the members of any one class; but when we have a distinct object in view, and do not look to some unknown plan of creation, we may hope to make sure but slow progress. (364)

Middlemarch's narrator similarly explains: "I at least have so much to do in unravelling certain human lots, and seeing how they were woven and interwoven, that all the light I can command must be concentrated on this particular web, and not dispersed over that tempting range of relevancies called the universe" (132). Eliot suggests an evolutionary notion of the interconnected, related, and often complex relationships between individuals and species within an ecosystem. Further, she clarifies that the narrator is focused on only a small section—"this particular web"—within the much vaster system "called the universe." However, this is not just a spatial web of relations: like Dickens's networks, this "web of affinities" spreads over time, establishing kinships and connecting events in a way that recalls Darwin's "Tree of Life"

diagram (Appendix A). As in Dickens's novels, this web or tree of connections reveals surprising histories—Bulstrode's hidden background resurfaces much like Lady Dedlock's—and represents a model of temporal connectivity that Hardy will echo in his works, most explicitly in *The Woodlanders*'s description of "the great web of human doings then weaving in both hemispheres, from the White Sea to Cape Horn" (20). *Middlemarch* similarly constructs a web of lives and of times, so that deep time encompasses many overlapping and intertwining histories. By stating her intention to "concentrat[e] on this particular web" within the vast "universe," Eliot's narrator draws the reader's attention to this existing backdrop of deep time.

Middlemarch's "study of provincial life" examines a seemingly minor historical milieu within a vast timeframe, and the novel's scientific tone is established largely through Eliot's use of a third-person narrator. The omniscient narrator is a hallmark of the nineteenth-century realist novel, and in *Middlemarch* the narrator's voice presents a seemingly detached scientific perspective. The narrator is positioned outside the confines of this "study," apart from the community of Middlemarch and, by extension, outside the plot's timeframe; the narrator is not subject to the characters' temporal constraints and seems to access a wider temporal perspective. The third-person narrator's all-seeing viewpoint suggests a sense of scientific observation that separates her from the text's characters: "the narrator's wisdom extends beyond the deliberately limited vision of her most ideal characters" (Levine, *Realistic* 301). Both Levine and Beer link this style of narration to new scientific concepts. For Levine, "[t]he patient, ostensibly detached registration of human character and behaviour is an aspect of the Darwinian ethos central to the experience of the Victorian novel; it is part of a movement describing a new place for man in nature and tends to imply an ultimately material explanation for human behaviour" (*Novelists* 14). Beer suggests broader scientific origins for this type of realist narration: "Fiction in the

second half of the nineteenth century was particularly seeking sources of authoritative organisation which could substitute for the god-like omnipotence and omniscience open to the theistic narrator. … Experimental procedures in biology and physiology claimed objectivity" (149). Eliot's narrator, like Hardy's, represents a scientific perspective and accesses a much greater timeframe in which her characters' lives are rendered insignificant by comparison.

The sheer volume of *Middlemarch* enacts this sense of historical scope, while the novel's multiplot format reinforces the notion that individual lives constitute small elements of a much larger system. Eliot emphasizes the relative insignificance of human beings when compared to vaster timescales by bookending her text with a commentary on Dorothea's character and her place in history. The novel opens with the question, "Who that cares much to know the history of man, and how that mysterious mixture behaves under the varying experiments of Time, has not dwelt, at least briefly, on the life of Saint Theresa…?" (3). The narrator's scientific outlook is apparent in the language of experimentation (indicated by the terms "mysterious mixture" and "varying experiments") and her observational curiosity regarding lives unfolding over time and within history. Theresa is invoked as a type of woman—"That Spanish woman who lived three hundred years ago, was certainly not the last of her kind. Many Theresas have been born who found for themselves no epic life wherein there was a constant unfolding of far-resonant action"—whose circumstances determine her ability to express her nature or cause her to "s[i]nk unwept into oblivion." Dorothea is presented as a similar specimen of woman, but whose outlet for her great nature is limited. Eliot criticizes those who see women as indistinguishable on a lack of scientifically-validated grounds and remarks that "the limits of variation are really much wider than any one would imagine from the sameness of women's coiffure and the favourite love-stories in prose and verse" (4). "Variation," when preceded by "scientific certitude,"

suggests the term's Darwinian connotations, as Eliot considers a type of woman whose exceptional characteristics may be, nonetheless, limited or extinguished by her environment. The Darwinian implication is that a promising "variation" may not survive its habitat.[16] Levine aptly categorizes *Middlemarch*, along with Conrad's *Nostromo*, as "large historical fictions that attempt to create entire societies and—in the established tradition of Walter Scott—to read the fates of characters in the context of larger social and national movements from which they cannot withdraw" (*Realistic* 293). Similarly, Shuttleworth suggests that "[t]he Prelude poses the question of how originality can survive within an environment whose essence, as the title suggests, is its middlingness" (142). However, Eliot's language, beginning with the Prelude, imparts *Middlemarch*'s vision with a distinctly scientific—and specifically biological—take on her characters' roles in history and evokes a vast timescale as the backdrop for her epic novel.

Eliot returns to this juxtaposition of the individual and history in the novel's conclusion. She again considers Dorothea's position and restates the extent to which an individual remains conditioned by her environment and, specifically, the historical period in which she lives:

> Certainly those determining acts [Dorothea's two marriages] of her life were not ideally beautiful. They were the mixed result of young and noble impulse struggling amidst the conditions of an imperfect social state, in which great feelings will often take the aspect of error, and great faith the aspect of illusion. For there is no creature whose inward being is so strong that it is not greatly determined by what lies outside it. A new Theresa will hardly have the opportunity of reforming a conventual life, any more than a new Antigone will

[16] Beer also observes that, "in Darwin's argument, *variation* is the key to evolutionary development. Diversification, not truth to type, is the creative principle, as he emphasizes throughout the first chapter of *The Origin of Species* whose title is 'Variation Under Domestication.' … So [Eliot's] use of the phrase 'limits of variation' is a polemical signal which harbinges much for the 'domestic epic' she is about to present" (140).

> spend her heroic piety in daring all for the sake of a brother's burial: the medium in which their ardent deeds took shape is for ever gone. (784-85)

Eliot emphasizes the significance of the historic and temporal period, noting that changing times have diminished the possibility for heroism. The narrator considers whether an individual life can transcend its insignificance and its environment to have an enduring historical impact. However, she proposes that despite social drawbacks, an individual's potential can resonate after her lifetime and have an effect in the future. She offers a form of resolution through an evolutionarily-informed temporal understanding of individual life in relation to generations and descendents. Despite the limitations imposed on Dorothea,

> Her finely-touched spirit had still its fine issues, though they were not widely visible. Her full nature, like that river of which Cyrus broke the strength, spent itself in channels which had no great name on the earth. But the effect of her being on those around her was incalculably diffusive: for the growing good of the world is partly dependent on unhistoric acts; and that things are not so ill with you and me as they might have been, is half owing to the number who lived faithfully a hidden life, and rest in unvisited tombs. (785)

Although the individual life may not be remembered—"rest[ing]" as it does "in unvisited tombs"—its "incalculably diffusive" effects will continue to flow forward. In a geological or gradualist sense, minute changes can produce "incalculabl[e]" effects over time; in an evolutionary sense, a unique organism can have a significant effect on its ecosystem and through its progeny. Thus, Eliot suggests that an individual might instigate change, and although it is likely that she will be forgotten, her impact will outlast those who remember her.

"An intense life in an invisible past and future": Religious Public Time in *Daniel Deronda*

In *Daniel Deronda,* Eliot imagines Judaism as a means of reconciling spiritual and scientific deep time as she characterizes Jewish inheritance in biological terms. The novel's mix of scientific and religious deep time reflects its generic mixture of realism and romance, and I situate Eliot's exploration of temporality, duration, and probability in relation to both the romance and realism of other novels in the period similarly interested in scientific temporality. *Deronda* endorses a religious public time as a resolution to the conflict between the individual and history; however, the ability to comfortably access and join this religious inheritance is limited to those characters who embrace their Jewish heritage. This resolution integrates private temporality into a vast collective time, and throughout the novel Eliot suggests that characters' private temporal experiences cannot be extricated from external time. For instance, she draws parallels between characters' ability to endure moments of waiting and to comfortably grasp vast timescales: while Gwendolen Harleth is made anxious with anticipation and fearful of the vastness of astronomy, Daniel Deronda and Mordecai Cohen demonstrate patience in their personal lives and accept their ancestry and vast timescales with ease.

Subjective and fluctuating time characterizes both individual experiences of time and the novel's narrative structure. Like Dickens, Eliot includes moments of folding time in which characters re-experience the past or envisage the future; however, Eliot experiments with chronology through her non-linear narrative structure as well. *Deronda* produces a sense of vastness in form and theme and destabilizes quantitative and linear models of time. Most intriguingly, Eliot proposes ways in which private temporal experiences may shape public occurrences as private hopes, anticipations, or memories seemingly instigate or transform events. Eliot's final novel deviates from the scientific realism of *Middlemarch* in its more experimental

narrative structure, prophetic elements, and its focus on the future rather than the past. Although *Deronda* is less overtly scientific than *Middlemarch,* it engages more directly with the temporal; as Nicholas Dames observes, "in perhaps no other Victorian novel is the question of time so prominent, and so vexed" (129). The disruptions to narrative closure and scientific objectivity hinted at in *Middlemarch* are developed further in *Deronda*, and the latter expands the former's sense of historic time by evoking biological and astronomical timescales. Eliot continues to draw on science for her considerations of time, but science is no longer seen as objective, realism does not exclude prophecy and chance, and causal sequence is called into question.

Daniel Deronda opens against a backdrop of deep time. Eliot's initial epigraph acknowledges that the concept of beginnings is a construct, and questions the objectivity and accuracy of science and time-keeping:

> Men can do nothing without the make-believe of a beginning. Even Science, the strict measurer, is obliged to start with a make-believe unit, and must fix on a point in the stars' unceasing journey when his sidereal clock shall pretend that time is at Nought. His less accurate grandmother Poetry has always been understood to start in the middle; but on reflection it appears that her proceeding is not very different from his; since Science, too, reckons backwards as well as forwards, divides his unit into billions, and with his clock-finger at Nought really sets off *in medias res*. No retrospect will take us to the true beginning; and whether our prologue be in heaven or on earth, it is but a fraction of that all-presupposing fact with which our story sets out. (3)

Beer observes that this epigraph "places the fictions of science alongside those of poetry and emphasizes the insufficiency of each. The paragraph initiates the novel by questioning the

concept of beginning even as it enacts it" (175-76). However, Eliot is also proposing a concept of deep time—her references to "Science," chronometric "unit[s]" in the "billons," and "stars" suggest an astronomical scale—that cannot be contained or accurately delineated by chronometry. As she reminds her readers that this "story" accounts for "but a fraction" of deep or infinite time, her language recalls Hutton's claim in *Theory of the Earth* "that we find no vestige of a beginning,—no prospect of an end" (200). The epigraph underlines the artifice of time-keeping and the concept of origins, and it juxtaposes numerical divisions of time with the "all-presupposing fact" of deep time. *Deronda* opens with reference to an unimaginably vast temporal continuum which defies time-keeping, and the novel returns to the relationship between systems of time-keeping and astronomy when the narrator wonders: "What should we all do without the calendar, when we want to put off a disagreeable duty? The admirable arrangements of the solar system, by which our time is measured, always supply us with a term before which it is hardly worth while to set about anything we are disinclined to" (320). Acknowledging "the solar system" as the basis for our time measurements, the narrator contrasts vast, cosmic time with our "calendar" and reminds the reader that time-keeping systems represent a limited portion of time delineated to order our lives. While calendars and clocks may draw on the solar system for their organization, such representations of time rely on the pretence of beginnings and appear insignificant when compared with cosmic time.

The opening epigraph's sense of deep time acknowledges time that endures beyond human systems of, for instance, chronometry, science, or poetry; however, in *Deronda* Eliot is particularly interested in depicting a Judaic model of spiritual and biological deep time. While *Middlemarch* evokes Catholicism—via Saint Theresa—as an outlet for a certain type of woman in a particular historic moment (3-4, 785), Eliot's representation of Judaism embodies both

spiritual and biological continuity. Sue Zemka observes that "*Deronda* seeks refuge in temporal duration, specifically as it is imagined in Judaism," and she "refer[s] to the sacred time that operates in *Deronda* as Vast Time" (150). Dames notes that the novel's preoccupation with duration is apparent at the structural level, since its breadth in many ways represents an experience of duration for the reader (123-24). In fact, he suggests, Eliot draws attention to the "intervals" between different narrative threads and "highlights the process of leavetaking and returning, and particularly the process of *waiting* for the next appearance of that which was already seen" (162). For Dames, "*Deronda* suggests…that the central formal problem for the Victorian novel was its elongation, its sheer time-consuming bulk," although "this is a problem that has dimensions beyond the formal. Eliot goes so far in *Deronda* as to propose that the central political problem for Britain, if not for Europe, was a parallel one: the difficulties, and value, of lastingness, of institutions and habits that span time" (162). In this sense, duration becomes both a challenge and an experience for humanity as individuals must endure their own life experience and attempt to comprehend the duration of history, ancestry, and the natural world. Indeed, the sheer length of *Deronda* emphasizes the duration of the reading process and suggests duration as both a state of consciousness and the experience of waiting between events. This sense of duration seems to anticipate Bergson's expression of duration in *Creative Evolution*, in which he states: "The universe *endures*. The more we study the nature of time, the more we shall comprehend that duration means invention, the creation of forms, the continual elaboration of the absolutely new. The systems marked off by science *endure* only because they are bound up inseparably with the rest of the universe" (11).[17] Given the specifically scientific

[17] See also Zemka, who writes: "With its emphasis on slow change, *Daniel Deronda* looks forward to the work of Henri Bergson, who was, coincidentally, the scion of Jewish family, and who, like Eliot, had an ambivalent relationship with the religion of his childhood, a childhood that spanned the years of Eliot's Jewish studies" (148).

context of the opening epigraph, I wish to draw attention to the fact that *Deronda*'s sense of duration is predicated on not only religious and historic but scientific timescales.

Interestingly, Eliot conceives of duration as both an individual and collective experience: it informs characters' private temporality as well as their awareness of their place within vast scientific and spiritual timeframes. In addition to the novel's aforementioned multiplot structure and length, the dilemma of duration is represented at various levels of the text as characters endure personal moments and the weight of vast external histories. *Deronda* considers how individuals navigate their place within deep time; as the narrator states, "I like to mark the time, and connect the course of individual lives with the historic stream, for all classes of thinkers" (74). This "historic stream" recalls Carlyle's "stream of time" and similarly represents a timescale that extends beyond the individual life ("Signs" 441). Tellingly, the extent to which characters are comfortable in private moments of waiting aligns with their ability to accept their place within the extended timeframes associated with history, religion, and science. For instance, Gwendolen's impatience and discomfort with waiting corresponds with the difficulty she has situating herself and acknowledging her place within deep time; she is excluded from the formative inheritance which enables Daniel and Mordecai to endure and tolerate intervals comfortably. In contrast, Daniel waits most of his life to discover his mother's identity while Mordecai patiently awaits Daniel's return, and both men come to terms with their place in history more readily because they have access to a religious-biological ancestral chain. If in *Middlemarch* "characters seek roots, keys, original tissues—a return to some single source which will unify the diversity of the present and the past" (Beer 179), in *Deronda* characters struggle to cope with temporal experiences, come to understand their place within history (to varying degrees), and—with the notable exception of Grandcourt—anticipate their future. *Deronda*

explores how duration affects individuals and shows them navigating the relation between their subjective temporal experiences and vaster religious, historical, and scientific timescales.

Eliot provides significant insight into Gwendolen's psychological and temporal experiences. While it will become apparent that vast, scientifically-informed concepts of time and space make Gwendolen feel insignificant, it is notable that less threatening temporal experiences also make her uncomfortable. Indeed, the experience of waiting—enduring time—is painful to Gwendolen as pauses or lulls in conversation lead to unnerving moments of self-reflection. For instance, in the key moment when she decides whether to accept Grandcourt's visit (and thus encourage his proposal), "Gwendolen felt a contradictory desire to be hastened: hurry would save her from deliberate choice" (248). When Gwendolen becomes actively aware of time, she becomes impatient and rushes to avoid deliberation. Dames asks,

> How, in other words, is duration to be endured in *Deronda*, a novel which gives such a sense of spaciousness to the experience of *waiting*? Not, we may be sure, by hastening its passing. In the immediate crisis of Gwendolen's decision to marry Grandcourt despite her knowledge of his past, Eliot provides a description of ethical choice figured as accelerated reading, a reading impatient with the *longueurs* of narrative duration. (157)

Gwendolen's discomfort causes her to avoid thinking, questioning her motives, and considering alternative future possibilities; ultimately, it leads to her unfortunate marriage. Grandcourt's proposal is delivered in a similar context: "The little pauses and refined drawlings with which this speech was uttered, gave time for Gwendolen to go through the dream of a life. …Yet when Grandcourt had ceased to speak, there was an instant in which she was conscious of being at the turning of the ways" (256). Repeatedly, Gwendolen rushes into conversation (or, in her

acceptance of Grandcourt's visit, writing) to avoid her thoughts, memories, and fears; however, she is aware enough to recognize these moments of opportunity—she knows she is hurrying to avoid decision and while she acknowledges a moment of choice, she is not prepared to benefit from reflection.

Arguably, Grandcourt's mastery over Gwendolen begins when he controls the tempo and duration of their conversations, capitalizing on her discomfort with waiting. When they are first introduced, Eliot describes how "after her answers there was a longer or shorter pause before he spoke again" (92). For instance, when Grandcourt states, "I have left off shooting," she replies:

> "I hope you have not left off all follies, because I practise a great many."
>
> (Pause, during which Gwendolen made several interpretations of her own speech.) …
>
> "One must do something."
>
> "And do you care about the turf?—or is that among the things you have left off?"
>
> (Pause, during which Gwendolen thought that a man of extremely calm, cold manners might be less disagreeable as a husband than other men, and not likely to interfere with his wife's preferences.) (92)

This is an unusual technique—as Dames notes, "[t]hese parenthetical dilations of conversational time transgress normal realist notational practices" (159). Eliot uses Gwendolen's thoughts to measure duration and indicate Grandcourt's overly long conversational pauses. The pause is filtered through Gwendolen's consciousness, so that the reader experiences a similar lull between dialogue during the time it takes to read about the "pause." Eliot is not just revealing

Grandcourt's manipulative intentions and Gwendolen's nervous susceptibility to time, but also introducing this technique in an attempt to convey a temporal experience to her readers.

Grandcourt's ability to manipulate Gwendolen by controlling the pace of conversation becomes further manifest in their marriage. For instance, when she asks her husband, "Am I altogether as you like?", he replies "No" and keeps her in suspense: "Gwendolen felt suddenly uncomfortable, wondering what was to come.…'Oh, mercy!' she exclaimed, the pause lasting till she could bear it no longer. 'How am I to alter myself?' 'Put on the diamonds,' said Grandcourt, looking straight at her with his narrow glance" (365). Eliot's descriptions elongate such moments for the reader and depict Gwendolen's suffering through duration. In contrast, Daniel and Gwendolen share moments of restorative connection which are similarly elongated and rich with meaning unobservable to outsiders: "For what was an appreciable space of time to both, though the observation of others could not have measured it, they looked at each other—she seeming to take the deep rest of confession, he with an answering depth of sympathy that neutralized other feelings" (352). This "space of time" is significant as a moment of consciousness; it encompasses an imaginative response to duration and is an example of richly subjective temporal experience. In these scenarios, time is measured by Gwendolen's temporal perception as Eliot notes the effect of passing time on her consciousness rather than in chronometric units.

Gwendolen is made similarly anxious by contemplating vast time. Accustomed to being the centre of attention in her home and community, she struggles to accept any indication of her insignificance but is eventually forced to come to terms with her relative smallness in a vaster social, spatial, and temporal scheme. Initially, suggestions of deep time and human triviality—embodied in astronomy—make Gwendolen uneasy:

> Solitude in any wide scene impressed her with an undefined feeling of immeasurable existence aloof from her, in the midst of which she was helplessly incapable of asserting herself. The little astronomy taught her at school used sometimes to set her imagination at work in a way that made her tremble; but always when some one joined her she recovered her indifference to the vastness in which she seemed an exile; she found again her usual world in which her will was of some avail. (52)

Astronomy's inconceivably vast spatial and temporal scales seem to inspire this reaction in Gwendolen, and this reference recalls the novel's opening epigraph. However, Gwendolen is reassured when "her will [is] of some avail" once more and she is able to repress a frightening sense of smallness. The overwhelming private experience stemming from the study of astronomy anticipates Hardy's *Two on a Tower* and Wells's *The Time Machine*, both of which depict private confrontations with cosmic time and space. This fear of "insignificance" informs her reaction to Grandcourt's proposal. Within "minutes" the opportunity of marriage has changed Gwendolen's outlook on her future, and she realizes that "a moment of choice was come": "Yet—was it triumph she felt most or terror? Impossible for Gwendolen not to feel some triumph in a tribute to her power at a time when she was first tasting the bitterness of insignificance: again she seemed to be getting a sort of empire over her own life. But how to use it? Here came the terror" (247). Gwendolen thinks of the future with hope, believing she can avoid "the bitterness of insignificance" through an important marriage, before she experiences a flashback of her past interactions with Grandcourt.

It is not until the end of the novel, when she realizes that Daniel will not remain near her and that he has another life removed from hers, that Gwendolen feels the full effect of an enlarging temporal and spatial understanding:

> The world seemed getting larger round poor Gwendolen, and she more solitary and helpless in the midst. The thought that he might come back after going to the East, sank before the bewildering vision of these wide-stretching purposes in which she felt herself reduced to a mere speck. There comes a terrible moment to many souls when the great movements of the world, the larger destinies of mankind…enter like an earthquake into their own lives—when the slow urgency of growing generations turns into the tread of an invading army or the dire clash of civil war… (688-89)

This moment is wrought with images of expansion: in spatial terms, "the world" is "larger," Daniel is leaving for "the East," and Gwendolen feels herself to be "a mere speck" in the face of "wide-stretching purposes." The passage transitions into more specifically temporal descriptions with the introduction of "a terrible moment" when "the great movements of the world" are understood; "larger destinies" and "the slow urgency of growing generations" convey a sense of temporal magnitude that overwhelms Gwendolen and prioritizes historic development over her personal struggles. Gwendolen, who is initially fearful of vast time, later pained by recollections and premonitions, and always eager to hasten moments as a means to avoid self-reflection, realizes that she is a small, brief part of a vast, enduring world; she must accept her limited power and understand her relative insignificance. Although Eliot is primarily concerned with religious history elsewhere in the novel, this passage's temporal implications corroborate Darwinian and geological timescales. When Gwendolen feels "reduced to a mere speck" it calls

to mind the astronomy that "made her tremble," while "destinies of mankind" and "growing generations" suggest both historical and biological timelines, and "the great movements of the world" that "enter like an earthquake" evoke geological timescales. Gwendolen experiences a temporal reckoning as she envisions the world and history extending beyond her life.

Eliot demonstrates the possibility of uniting one's personal life with a type of public religious deep time through Daniel, who reconciles himself with vast time through a religious-ancestral model supplied by his Judaism. Just as he links the novel's main narrative threads, his temporal perspective functions as a middle ground between Gwendolen's secular self-consciousness and Mordecai's spiritual and epic notions of time.[18] Learning about his ancestry brings Daniel closer to Mordecai's conception of time and history—not only is he able to share Mordecai's vision of the future, but he becomes part of a larger tradition, history, and religious narrative. In the days leading up to Daniel's meeting with his mother in Genoa, the narrator emphasizes both the passage of time and the play between historic and individual events: "Day after day passed, and the very air of Italy seemed to carry the consciousness that war had been declared against Austria, and every day was a hurrying march of crowded Time towards the world-changing battle of Sadowa" (533). Daniel awaits a meeting which, for him, will be equally "world-changing." After he confirms that he is indeed Jewish, he gladly sees himself within the larger context of his historical and spiritual background and feels a connection to his forebears: "he seemed to himself to be touching the electric chain of his own ancestry" (617). He tells Mordecai,

[18] Zemka also observes that "Gwendolen lives in a constricted temporal universe, and consequently her choices bear great weight – their ramifications are overwhelming and severe – and she lives in a secular temporal universe, one where the force of destiny has shrunken into a thin, dark shadow." In contrast, "Daniel's temporal universe is enormous, and its design is a subject his ancestors have been investigating for centuries. His destiny is assured; it guides him even when he doesn't know it. Jewish Vast Time denudes his choices of tormented, isolated uncertainty and preordains their role in a benevolent progress" (155).

> It is you who have given shape to what, I believe, was an inherited yearning—the effect of brooding, passionate thoughts in many ancestors—thoughts that seem to have been intensely present in my grandfather. Suppose the stolen offspring of some mountain tribe brought up in a city of the plain, or one with an inherited genius for painting, and born blind—the ancestral life would lie within them as a dim longing for unknown objects and sensations, and the spell-bound habit of their inherited frames would be like a cunningly-wrought musical instrument… (642)

Daniel embraces his place in history more readily than Gwendolen; he believes that the past, one's "ancestral life," exists continuously in the present through one's progeny, and he is comfortable with the relative insignificance of an individual life in relation to vaster timescales. The terms Eliot uses to describe Daniel's identity are both temporal and biological as they centre on inheritance and ancestry. Dames proposes that "[w]hen Deronda chides his mother with the overwhelming force of 'effects prepared by generations' (p.663), he speaks for the principle of lastingness, and in Eliot's understanding the form of her fiction, in its very elongation, adhered to that same principle: it schooled its reader in the experience of duration" (164). Daniel's mother, on the other hand, is clearly overwrought by the effects of time, symbolized by the pressures of her age, illness, and ancestry. Dames suggests that "[t]he novel cannot help but acknowledge, however, the opposite: the limits to our endurance or our consent, eloquently expressed by Leonora herself, who is broken by the effort to resist the weight of time, and who remains stubbornly, poignantly unassimilated into the novel's closural culture of durative temporality" (164). Daniel may fit comfortably into his patriarchal Jewish history, but such ancestry

represents only a burden of duration for his mother.[19] Notably, this inclusive sense of historic acceptance eludes Leonora and Gwendolen, the novel's independent female characters, who perhaps resist assimilation into traditional systems because of their unconventional yearnings. Zemka observes that Leonora "presents a gendered threat to the durational ideal – the woman's threat of refusal, the refusal to be a corporeal conduit for male sons, which is also a threat to the ongoing survival of the conjoined elements of male Jewish bodies and Jewish books." However, "the Alcharisi does give birth to a son, to whom she transmits a Jewish identity by the law of matriarchy, whether she will it or not" (163). Zemka submits that this Jewish inheritance "subsumes the Alcharisi's rebellion into the same awe-inspiring force of necessity that characterizes Daniel's, Mordecai's, and Mirah's more cooperative behaviours" (163); however, Eliot's biological imagery and the role that the mother plays in transmitting this destiny underline the Darwinism inherent in the novel's depiction of racial inheritance.

A visionary for his race, Mordecai is completely reconciled to his role within much vaster timeframes: he sees his personal concerns as fleeting and minor in comparison with his enduring purpose; he accepts the brevity of his lifespan, shortened by illness; and he feels the past, future, and history flowing through the present. In Mordecai's attempts to teach Jacob, he "repeat[s] a Hebrew poem of his own, into which years before he had poured his first youthful ardours for that conception of a blended past and future which was the mistress of his soul" (408). His project is an extension of this idea "of a blended past and future," and his spiritual genius seems to lie in his ability to reconcile disparate periods of time within the present. His private temporal experience readily accommodates and embraces deep time. Mordecai describes to Daniel his early happiness on the way to Beirut, before his father abandoned his mother: "I felt myself in

[19] Zemka views "the interviews between mother and son [as] the most significant acknowledgment of dissent and rupture in the novel's image of Jewish Vast Time. The Contessa Alcharisi tells a story of her life as a series of self-willed changes, attempts to break the cultural transmission of identity, individuate from it, and begin again" (163).

the flood of a glorious life, wherein my own small year-counted existence seemed to melt, so that I knew it not; and a great sob arose within me as at the rush of waters that were too strong a bliss" (462). This "flood" extends beyond and envelops his "small year-counted existence": using water imagery that recalls Carlyle's "eternal Flood of Time" ("Boswell" 407), Mordecai embraces an enduring, all-encompassing sense of time that exceeds quantitative measurement and individual existence.[20] Unlike the flood imagery Dickens associates with the stagnant Dedlocks, Mordecai's metaphor reclaims the flood from its predominantly biblical associations.

For Mordecai, individual lives are not distinct units of existence associated with a particular and brief period of time; rather, they are part of a generative chain of continuous existence. This belief is the foundation of his being a "rational Jew": "But what is it to be rational—what is it to feel the light of the divine reason growing stronger within and without? It is to see more and more of the hidden bonds that bind and consecrate change as a dependent growth—yea, consecrate it with kinship: the past becomes my parent, and the future stretches towards me the appealing arms of children" (451). Time is symbolized in human genealogy, and Mordecai's metaphor captures the essence of continuity in his religious belief—his vision relies upon the endurance of race and human relations, and he believes in the future of his people. His hope for both the propagation of his race and his religion reveals the evolutionary implications of his faith: lasting Judaism entails both biological continuance and spiritual inheritance. During the meeting of "The Philosophers" (444), Daniel recognizes Mordecai as

> a man steeped in poverty and obscurity, weakened by disease, consciously within the shadow of advancing death, but living an intense life in an invisible past and future, careless of his personal lot, except for its possibly making some

[20] Zemka also notes the vastness of Mordecai's temporal vision: he "perceives divine historical agency at a rate that is analogous to evolutionary change, on a human scale. His divination demonstrates a sense of scale that exceeds unaided human perception, but it moves out from the moment, not in; it tends toward panorama, not detail" (158).

> obstruction to a conceived good which he would never share except as a brief inward vision—a day afar off, whose sun would never warm him…. It was something more than a grandiose transfiguration of the parental love that toils, renounces, endures, resists the suicidal promptings of despair—all because of the little ones, whose future becomes present to the yearning gaze of anxiety. (455)

Mordecai is aware that his own time is nearly at an end, so he lives for the future. The return of a parental metaphor emphasizes his genealogical relation to the past and the future. His own life is lost in a greater stream of existence; he knows his role is to help his inheritors acknowledge his vision and fulfil the potential of his race. In this sense he "blend[s] past and future" and embodies a type of fluid time in which the present is never severed from preceding and following eras. "For Mordecai," Zemka suggests, "the Jewish handing down of scriptural traditions across the centuries is like a biological life force" (155). However, the racial implications of his faith implicate not just a "scriptural" inheritance but a specifically genetic line of ancestry. Mordecai's philosophy enacts a line of political thought that Lee Edelman "describes as reproductive futurism," which is "political insofar as the fantasy subtending the image of the Child invariably shapes the logic within which the political itself must be thought" (2). Edelman writes:

> For politics, however radical the means by which specific constituencies attempt to produce a more desirable social order, remains, at its core, conservative insofar as it works to affirm a structure, to authenticate social order, which it then intends to transmit to the future in the form of its inner Child. That Child remains the perpetual horizon of every acknowledged politics, the fantasmatic beneficiary of every political intervention. (2-3)

Mordecai's concept of Jewish futurity is characterized by this "reproductive" model: it prioritizes the future at the expense of the present "all because of the little ones."

In *Deronda*, temporal continuity and duration are accompanied by a fluctuating concept of time. The flow of time seems flexible and unpredictable as the past often resurfaces in the present (as in *Bleak House*) or the future is anticipated or prophesied (as in *Our Mutual Friend*). Divisions between past, present, and future dissipate, and, within a comparatively minute scale, temporal fluidity informs characters' private experiences of time, and particularly Gwendolen's temporal consciousness. For instance, recall that when the opportunity of marriage arises, she experiences a flashback of her courtship: "Quick, quick, like pictures in a book beaten open with a sense of hurry, came back vividly, yet in fragments, all that she had gone through in relation to Grandcourt—the allurements, the vacillations, the resolve to accede, the final repulsion; the incisive face of that dark-eyed lady with the lovely boy; her own pledge (was it a pledge not to marry him?)" (247). Although it occurs over a very short period of time, this montage encompasses a vivid, fragmented summary of her relations to date with Grandcourt. While this flashback is an initial instance of her "terror" at remembering the past (247), it is most often Lydia's words—Gwendolen's source of guilt—that serve as a reminder of her error. Dames compares such repetitions to the Wagnerian "Motive: a password for organic linkages between past and present, for that which binds otherwise aimless temporality" (140). He observes that they serve to recall previously read material and, in doing so, emphasize the novel's length for readers, while the "characters…experience the repetitions of their narratives as the cancellation of time" (156).[21] However, these repetitions also constitute examples of folding time: the "cancellation of time" they perform connects the past and present to produce a thickened

[21] *Dombey* similarly uses the phrase "Let him remember it in that room, years to come" (253) to show how the past invades Dombey's mind and remind readers of earlier events in the novel.

temporal moment that encompasses different times at once. But for Gwendolen, looking ahead is just as distressing as remembering her past: as her murderous thoughts grow stronger, "[h]er confidence in herself and her destiny had turned into remorse and dread; she trusted neither herself nor her future" (368). After Grandcourt drowns, the past returns to Gwendolen in visions of his death: she tells Daniel, "Things repeat themselves in me so. They come back—they will all come back" (659). As Dames proposes, "the novel offers us a strenuously temporalized experience of atemporal recurrences and repetitions" (156); these patterns effectively reintroduce the past within the present. Because Gwendolen's temporal consciousness tends to jump back or ahead in time, she is rarely at peace in moments that give her pause for thought; while married, she lives with a near-constant dread of the future and regret for the past. These instances of folding time often characterize private temporal experience in *Deronda*.

While Eliot portrays Gwendolen's, Daniel's, and Mordecai's subjective experiences of time, she also destabilizes linear and causal narrative by exploring the possibility that one's wills, desires, and thoughts may influence the future. Indeed, Eliot extends subjective temporal experiences to public time: private wishes may shape future events. *Deronda*'s non-linear temporality results in part from a breakdown of divisions between private and public time as characters' internal temporal considerations bleed into external affairs. The novel's depiction of how the future unfolds is not defined by gradualism or any other rational, scientific, or cause-and-effect based system; instead, as Beer notes, Eliot destabilizes causality and "*Deronda* sets us in a vertiginous relationship to the future. Causes can no longer be authoritatively ascribed to events: multiple possibility and prediction are offered within the text" (175).[22] For example, Mordecai's wishes for the future often come to fruition, as the narrator explains:

[22] Beer also notes: "Much of *Daniel Deronda*'s activity is spent in establishing new relations between apparent causes and apparent effects. George Eliot never lost her sense of the unstayable quality of deeds. They travel like

> "Second-sight" is a flag over disputed ground. But it is matter of knowledge that there are persons whose yearnings, conceptions—nay, travelled conclusions—continually take the form of images which have a foreshadowing power: the deed they would do starts up before them in complete shape, making a coercive type; the event they hunger for or dread rises into vision with a seed-like growth, feeding itself fast on unnumbered impressions. (404)

This passage describes Mordecai's anticipation of meeting Daniel. Initially, Mordecai is severely disappointed to learn that Daniel knows no Hebrew; he experiences "deep discouragement, like that of men on a doomed ship who, having strained their eyes after a sail, and beheld it with rejoicing, behold it never advance, and say, 'Our sick eyes make it.'" However, his "sick eyes" do seem to "make it" a reality. For Mordecai, "the wish to see [Daniel] again was growing into a belief that he should see him" (411), and while the reader may be inclined to doubt his faith, this "wish" is indeed realized. When his "impressions" cause him to "quiver as with a presentiment," he sees Deronda coming to him: "The prefigured friend had come from the golden background, and had signalled to him: this actually was: the rest was to be" (422). Mordecai is proven completely right: Daniel is indeed Jewish and will gladly become his disciple. What he desires comes "to be," which suggests an irrational causality, the possibility of foreseeing the future, and a knowable sense of destiny, none of which seems to align with scientific concepts of futurity. In this sense, the novel takes the "diffusive" potential of one's "being" described in *Middlemarch* further to suggest that one's internal life might produce "incalculabl[e]" consequences (785).

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sound waves. But here she explores also the influence of the unperformed: the impulse given no expression, the sealed thought, the sequestered passion. Do these undischarged, half-conscious forces shape the future too? … [O]ur conjectures about the uncommunicated life of others—our acts of interpretation or surmise—become a part of our own future behaviour" (174).

In this context, Gwendolen's "murderous will" becomes significant. Daniel reassures her that, "With your quickest, utmost effort, it seems impossible that you could have done anything to save [Grandcourt]. That momentary murderous will cannot, I think, have altered the course of events" (598). The hesitation of "seems impossible" and "I think," however, suggests an alternative outcome. Significantly, we learn that Grandcourt's "soul was garrisoned against presentiments and fears" (582), and his arrogance in boating despite others' warnings seems an extension of his blindness to future events (a blindness which is uncommon among the characters of this novel). Reflections on the future yield complicated and contradictory results: *Deronda* suggests that one may shape future events through thoughts, not actions, destabilizing any clear sense of cause and effect and making the future subject to one's present, unspoken aspirations. This disruption of causality is also apparent in the novel's non-linear organization which prioritizes narrative time over chronology. Beer observes that for the reader, Gwendolen and Daniel's relationship is the narrative point of origin, the original relationship from which the text descends: "In *narrative* time Gwendolen has prior claims. In *chronological* time Daniel has already a year earlier involved himself with Mirah's fate" (and Gwendolen with Grandcourt) (194). This narrative structure serves to emphasize Gwendolen's relationship to Daniel and reframes the novel's events in non-chronological order.

Eliot's narrator notes, "it is the trick of thinking to be either premature or behindhand" (654), and, as we have seen, *Deronda* is intent on depicting characters' varying degrees of awareness of the past and future. Temporal contemplation often manifests itself in folding time as past and present moments come together; however, deliberations on the future function somewhat differently. In a novel that is, as Beer remarks, "haunted by the future" (169), moments of anticipation, hypothesis, and prophesy occupy considerable space in the text. If

Deronda's characters frequently spend time imagining the future, the narrator contributes to this narrative management of temporality and perspective through numerous references to probability and hypothetical scenarios. Like *Origin of Species*, which often "invite[s] readers to explore narrative trajectories that exist only in the imagination" (Choi, "Natural History" 287), *Deronda* acknowledges "the presence of lateral wishes and possibilities moving freely within consciousness and thickening the atmosphere with undischarged possibilities which do not cease to exist though they are not enacted" (Beer 194). Tina Young Choi writes that, "[t]hrough works like Eliot's novels and Darwin's *Origin*, the future became a realm shaped not primarily by the quality of individual belief, whether rational or theological, but by engagement with the hypothetical, a space thick with narratives describing an array of consequences, unrealized outcomes, and diverging alternatives" (278). This "space" has a temporal dimension: it takes up stretches of the narrative as characters and the narrator spend time hypothesizing about the future. Frequently, *Deronda*'s narrator contributes hypothetical tangents which deviate from the actual events of the novel. For instance, she reflects: "And thinking of [Gwendolen and Rex] in these moments one is tempted to that futile sort of wishing—if only things could have been a little otherwise then, so as to have been greatly otherwise after!—if only these two beautiful young creatures could have pledged themselves to each other then and there, and never through life have swerved from that pledge!" (55-56). Such considerations of future events that may or may not transpire add a hypothetical dimension to the novel's temporality.

Interestingly, this proliferation of unfulfilled narrative hypotheses does not necessarily function according to scientific probability. *Deronda* addresses probability directly through an epigraph from Aristotle's *Poetics*: "This, too, is probable, according to that saying of Agathon: 'It is a part of probability that many improbable things will happen'" (434). Indeed, in *Deronda*

Eliot suggests that probability is an unreliable method of prediction: the future often unfolds contrary to our expectations, even if they are well-calculated and rationally supported. For instance, Daniel is concerned over Mirah's future and imagines various possibilities: he "tried to believe that both he and Mrs Meyrick were foolishly troubling themselves about one of those endless things called probabilities, which never occur; but he did not quite succeed in his trying; on the contrary, he found himself going inwardly through a scene where on the first discovery of Hans's inclination, he gave him a very energetic warning" (320). This passage showcases the characters' tendency to look forward and imagine various future realities; however, its light-hearted suggestion that "probabilities….never occur" seems central to the narrative. *Deronda* consists of many improbable events: Gwendolen, who thinks it likely that Grandcourt will not be an interfering husband, marries perhaps the one man who can stifle her freedom; Mordecai's prophecies regarding Daniel are fulfilled; and Daniel comes across his future bride in time to rescue her from suicide, manages to find her brother in London (every bit as worthy as he hopes),[23] and learns of his Jewish roots, thereby enabling his marriage. Probability is not a guiding principle in *Deronda*'s narrative scheme. Further, statistical probabilities rely on a process of cause and effect that considers a chain of likely actions or events, and, as we have seen, *Deronda*'s narrative opens the possibility of unspoken will and desire as an initial cause (for instance, Daniel's desire to marry Mirah and Gwendolen's desire for Grandcourt's death). And will, or motivation, is entirely unpredictable and illogical: "There is a great deal of unmapped country within us which would have to be taken into account in an explanation of our

[23] *Deronda* also conflates the probable with the hopeful, suggesting playfully that what one hopes to avoid is often what one will receive: Daniel "particularly desired that Ezra Cohen should not keep a shop. Wishes are held to be ominous; according to which belief the order of the world is so arranged that if you have an impious objection to a squint, your offspring is the more likely to be born with one; also, that if you happened to desire a squint, you would not get it. This desponding view of probability the hopeful entirely reject, taking their wishes as good and sufficient security for all kinds of fulfilment" (322). While this passage supports Gwendolen's predicament—the main thing she hoped to gain from her marriage, freedom, is revoked—it does not hold up for Mordecai, whose wishes and visions prevail, and Daniel, who is rewarded with an Ezra Cohen who is decidedly not a shop-keeper.

gusts and storms" (235). In *Deronda*, "the hopeful" often receive "fulfilment" (322), and it seems that Daniel's and Mordecai's "mental precaution" (390) and plans for the future align with the events that occur: Daniel's suspicion that he may be Jewish is justified and thus clears a path for his marriage to Mirah, and Mordecai's desire for a companion like Daniel is fulfilled. Even Gwendolen, once she has suffered in her marriage, has her wishes realized in her husband's death; perhaps spiritual wishes are fulfilled in the world of *Deronda*, as Grandcourt's death functions, on some level, as a salvation for Gwendolen from her "murderous will." If anything, Eliot seems to suggest that faith is a stronger determinant of outcome than probability, and that while future events may be imagined or hoped for, they cannot be rationally predicted.

By denying the authority of causality and probability, Eliot raises questions about the authority of scientific observation and rational means of prediction. *Deronda*'s deviation from a strictly gradualist narrative destabilizes the text's literary realism and introduces epic and mystical elements which align the novel with the romance genre (much like Lizzie's prophecies complicate *Our Mutual Friend*'s causality). It seems that objective, scientific, and statistical considerations of time are incomplete if not fallible, and while the future cannot be predicted and temporal experiences cannot be quantified, the future may yet be determined by human subjectivity. In the following passage Daniel, through the narrator, wonders about Mordecai:

> perhaps his might be one of the natures where a wise estimate of consequences is fused in the fires of that passionate belief which determines the consequences it believes in. The inspirations of the world have come in that way too: even strictly-measuring science could hardly have got on without that forecasting ardour which feels the agitations of discovery beforehand, and has a faith in its preconception that surmounts many failures of experiment. And in relation to human motives

> and actions, passionate belief has a fuller efficacy. Here enthusiasm may have the validity of proof, and, happening in one soul, give the type of what will one day be general. (438)

It turns out that Mordecai's is indeed "one of the natures…which determines the consequences it believes in"; his vision and hope for the future are realized in his meeting with Daniel, and however much we understand Daniel's initial (and reasonable) doubts, they turn out to be incorrect. The objectivity, not validity, of science is brought into question since its results rely on "forecasting ardour"—truly great scientific discovery is achieved when an individual overcomes (or refuses to acknowledge) "many failures of experiment" and pursues his or her belief until it is realized. Once again, "Science" is conceived as a "strict measurer"; however, here—as in the opening epigraph—Eliot suggests that there is more to science than quantitative measurement. There must be an element of faith and prescience, which recalls Dickens's description of the scientific spirit which accompanies Sol's knowledge of chronometry in *Dombey and Son*. Eliot suggests that faith may not only bring about great change in future events, but that it may also result in discoveries for "strictly-measuring science."

Ultimately, *Deronda* moves beyond the scientific realism that informed *Middlemarch* to incorporate prophetic fantasy and spiritual temporality. For Eliot, scientific realism is not necessarily distinct from more fantastic genres as she stipulates that science may be informed by "forecasting ardour" and is as much a fictionalizer as literature (as the initial epigraph proposes). Duncan elaborates on the novel's romance elements: "In its rearview mirror *Deronda* discloses the kinship even of *Middlemarch* with those overtly fantastic works—the novella 'The Lifted Veil,' the dystopian fable 'Shadows of the Coming Race'—that are usually read as outliers in the George Eliot canon" (18). He suggests that *Deronda* might constitute a form of science fiction:

> Unlike its predecessors, *Daniel Deronda* faces the historical present, and assumes (accordingly) the advanced discourses of Tylorian anthropology and Darwinian evolutionary biology. … The language of organic development, progress, and revival warps into that of survival, atavism, and reversion; effects become causes; metaphors, events. Human nature, the experimental subject of the English novel in its classical phase, mutates into strange forms, as Eliot's last novel presses beyond the bounds of realism into a kind of science fiction. (18)

Although *Deronda* is still grounded in the science that informed *Middlemarch*, its deconstruction of time-keeping and scientific origins, prophetic elements, and experimental narration contribute to its sense of fantastic time. Daniel and Mordecai are able to reconcile their lives with an enduring history—the former gladly accepts his tradition and lineage, while the latter embraces his visionary role as a link between past and future. Occasionally, and in a religious context, private experiences of time merge comfortably with vaster timeframes; more often, however, individual consciousness of time is fraught with anxiety, as exemplified by Gwendolen. The passage of time is complicated by the overlap between the past, present, and future and the novel's rejection of a clear sequential order or chronology of events. Beer writes that "[i]n *Daniel Deronda*, the present is thick with precedent, encumbered with the past and also implicating itself in multiple futures. But the model employed is not solely that of genetic or biological time. It is also that of imaginative *reach*, which can move in many directions and can include space and prophecy, revival, or revolution" (195). This "imaginative *reach*" allows for many systems of prediction and narration, and it contrasts with traditional notions of temporal stability and rational linearity. In this sense, and in its interest in futurity and racial propagation,

Deronda resonates with Victorian realist fiction and shares the scientific romance's interest in alternative futures and species endurance.

Deronda develops a sense of deep time that merges the traditional Carlylean concept of spiritual eternity with a more modern conception of scientific timescales. Notably, *Deronda* is Eliot's only novel set in contemporary society, and, unlike *Middlemarch*, which was set in the recent past and often considered histories and origins, *Deronda* looks to the future. Beer observes that while *Middlemarch*'s "security in … 'universal sequence'" was informed by uniformitarianism, *Deronda* marks a departure from "causal sequence":

> For the first time in George Eliot's work the dependence of the future on the past is brought into question. Earlier in her career she had found a meta-religious security in the 'great concept of universal sequence', 'the gradual reduction of all phenomena within the sphere of established law, which carries as a consequence the rejection of the miraculous.' Causal sequence had been the organising principle both of her morality and of her practice as a novelist. (169)

In her final novel Eliot deviates from this gradualist system to propose prophecy and prescience as determinants of the future. Her conception of Judaism blends scientific and spiritual deep time and suggests a possible reconciliation of these concepts of vast collective time. Although Dickens evokes both scientific deep time and Christian temporality in his novels they often exist in opposition: Paul Dombey's spiritual waves, for instance, are juxtaposed with modern scientific chronometry, while Sol Gills's scientific-chronometric speculative foresight functions quite differently from Paul's prophetic visions of spiritual rest. In *Daniel Deronda*, however, scientific and religious conjecture are characterized by a "forecasting ardour": both philosophies represent systems of thought that locate human activity "*in medias res*" within deep time.

CHAPTER 2
"Time closed up like a fan": Deep Time in Hardy's Novels

Thomas Hardy's novels produce a specifically materialist inflection of deep time that departs from Carlyle's non-scientific model and forgoes the spiritual deep time yet apparent in Dickens's and Eliot's fiction. Acknowledging the difficulties of comprehension inherent in concepts of deep time, Hardy employs the novel and its literary strategies as a means of conveying overwhelmingly vast timescales in non-numerical terms; his novels suggest that fiction provides an ideal vehicle for grasping unfathomable scientific scales. Hardy translates deep time into familiar novelistic terms and explores it in relation to human histories, while revealing similarities between natural processes at the human and cosmic, geological, or evolutionary level. He draws the reader's attention to a variety of timescales and emphasizes moments in which these timescales overlap, collide with, or parallel each other, and he utilizes a model of folding time to juxtapose different time periods—particularly those outside the novel's scope—and reveal similarities between vastly different timescales and chronologically remote events. By repositioning deep time in relation to human temporal experience, Hardy humanizes vast scientific timescales to make them more accessible to his readers, demonstrates how individual lives are determined by natural processes, and critiques social conventions that are rendered insignificant in comparison to vast timescales. His conceptualization of deep time represents a significant departure from that of earlier novelists in that it implicates the human species within deep time: his novels illustrate the symbiotic relationship between individuals and their environments. While Dickens hints at environmental change in his depictions of industrialization as a new geological epoch and Eliot positions her characters in relation to vast timescales, Hardy's characters are fully part of their natural ecosystems and they in turn shape their environments. While critics have given substantial attention to the importance of science in

Hardy's fiction, I will use the concept of deep time to draw into focus the intersection of temporal and scientific scales in his work. I argue that we have yet to appreciate sufficiently the extent to which he equips late Victorian readers with narrative technologies for conceptualizing the vast temporal scales of nineteenth-century science and positioning humankind within environmental frameworks. By analysing *A Pair of Blue Eyes* (1872-73), *The Return of the Native* (1878), *Two on a Tower* (1882), and *The Woodlanders* (1886-87), I contend that he turns to fiction to make imaginable a temporal register that eludes human understanding, and in the process, not only transforms the novel form, but demonstrates its centrality to understandings of science in the period.

Although Hardy's scientific-materialist deep time abandons Dickens's Christian morality and Eliot's sense of religious history, the strategies he employs to convey deep time resemble those used by these predecessors. Hardy portrays the past resurfacing in the present, expands the temporal limits of the novel, and explores the connections revealed by temporal scale enlargement. Accommodating vast scientific timescales, his inclusion of deep time in his fiction expands the novel's scope and modifies a genre that traditionally focused on individual and family timeframes. He employs realist narrative techniques to translate deep time into his novels: for instance, he uses narratorial digressions, descriptive passages, and characters' moments of introspection to invoke time periods outside the novel's plot or to draw attention to non-human timescales. He also implements a model of folding time in which the past reappears in the present so that distant time periods seem to exist in the same moment. Hardy's realist novels are often compared to Eliot's, and with good reason: *Middlemarch*'s scientific narrator and her distanced temporal perspective is a recognizable model for Hardy's similarly detached narrators, and his realism and overtly scientific themes also demonstrate *Middlemarch*'s influence. Like

Eliot, Hardy employs a model of folding time to describe individuals' temporal experiences, although in his novels characters are as likely to recollect or imagine different eras as they are memories. His novels are similarly intent on situating the individual lifespan in relation to much vaster timeframes. Hardy's use of folding time in his landscape descriptions recalls Dickens's in *Bleak House*: the latter's megalosaurus is a precursor for the imaginative prehistory in *A Pair of Blue Eyes* which "culminat[es] in the colossal lizard, the iguanodon" (201). Further, while *Our Mutual Friend* retains Dickens's Christian morality, it also endorses a materialist temporality defined by natural and scientific processes, and its recurring descriptions of corpses, fossils, and waste make it an unlikely forerunner for Hardy's materialism. *Desperate Remedies* (1871) also contains fairly graphic descriptions of corpses, while *A Pair of Blue Eyes* recalls Venus's shop when it describes fossils and depicts workers toiling enthusiastically amongst the Luxellian family remains. *The Woodlanders*' decaying forests and rotting vegetation similarly recall the accumulation and decomposition that characterize Dickens's London in his last completed novel.

Hardy's representation of scientific timescales is different from Dickens's and Eliot's in that his novels emphasize narratives of decline at all levels of existence, are notably preoccupied with the interplay among various timescales, and directly address deep time's inherent challenges to human comprehension. His interest in science is well-documented: he was a self-professed Darwinist, a student of contemporary geology, and an amateur astronomer,[1] and he

[1] Hardy's scientific interests have been widely recognized by critics including Gillian Beer (*Darwin's Plots*), George Levine, and Pamela Gossin, who explains that "Hardy read Darwin's works firsthand, recorded extensive notes to Francis Darwin's *Life and Letters of Charles Darwin*…, and studied Spencer's *Principles of Biology* with special attention to his definition of determinism…. It is fair to say that Hardy had a more accurate and subtle understanding of evolutionary theory and Darwinism, in particular, than most twentieth and twenty-first century readers who tend to rely on stereotypical notions of 'struggle' and 'fittedness' rather than the finer points of the survival mechanisms Darwin described, especially those that emphasized the interactions of life forms and their environments" (54). Levine notes that Hardy was keen to be identified as a Darwinist: "in preparing the 'biography' whose protective strategies he hoped would allow him to be remembered as he wanted to be remembered, [Hardy] noted how…he 'attended…the funeral of Darwin in Westminster Abbey. As a young man he had been among the earliest acclaimers of *The Origin of Species*.' ….[T]he biography's single sentence has allowed scholars to attribute to Hardy precisely

incorporates the vast timescales of nineteenth-century geology, evolutionary theory, and astrophysics into his novels and portrays time as secular and material. Time is visible through its effects on the material world (for instance, in the physical processes of aging, decay, death, and fossilization) and can be represented in material embodiments (aged individuals, corpses, rotting vegetation, and fossils, for example). This materialist concept of time rests on Hardy's recognition of time as, ultimately, linear and irreversible, an idea that he develops through his portrayals of inevitable decay at all levels of nature, as I will discuss in the analysis that follows.

Moreover, Hardy repositions human activity in relation to the much vaster timeframes of, for instance, geology, evolution, or astrophysics more directly than does either Dickens or Eliot. To understand human life from the perspective of scientific timescales requires an assessment of humankind's relatively minor place within history and the universe. In his notes on Henri Frederic Amiel's *Journal* from 1885, Hardy observes that, "[t]o look on our own time from the point [of view] of universal history, on history from the point of view of geologic periods, on geology from the point of view of astronomy—this is to enfranchise thought" (*Literary Notebooks* I. 1340, 162).[2] Indeed, his novels locate individuals, communities, and civilizations within deep time and establish a scientific perspective that allows his narrators to evaluate stages of human development and society in relation to a much larger scale. Viewing humanity from a broader temporal perspective dismantles anthropocentric interpretations of history, as Hardy proposes most directly in *A Pair of Blue Eyes*. Andrew Radford observes that, "By revealing Knight's response to the suffocating silences of geological time-spans, Hardy captures the loss and reduction of man's significance in his own sight" (*Survivals* 51). This outlook also enables

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what he wanted: evidence that he was ahead of his time in reading and understanding Darwin" ("*Woodlanders*" 178). Beer, Patricia Ingham, and Adelene Buckland address Hardy's attention to geology, while Gossin reveals that he "achieved a sophisticated level of astronomical understanding from his active reading in popular sources of scientific information, popular texts and journals, and his attendance at popular scientific lectures" (107).

[2] I encountered this note through Gossin's citation (qtd. in 108).

narrative assessments of periods of human existence. For instance, while describing Egdon Heath in *The Return of the Native*, the narrator discusses how human tastes change over time:

> It is a question if the exclusive reign of this orthodox beauty [the sort of beauty called charming and fair] is not approaching its last quarter. The new Vale of Tempe may be a gaunt waste in Thule; human souls may find themselves in closer and closer harmony with external things wearing a sombreness distasteful to our race when it was young. The time seems near, if it has not actually arrived, when the chastened sublimity of a moor, a sea, or a mountain will be all of nature that is absolutely in keeping with the moods of the more thinking among mankind. (9)

As in this passage, Hardy's narrators often attribute an increasingly pessimistic or negative outlook to the temporal advancement of civilization: from a vast temporal perspective, human history embodies a negative telos that reflects the devolutionary and dissipative tendencies associated with evolutionary and thermodynamic processes. The narrator suggests that humankind is entering a stage of changing tastes and increasing "somberness"; the advancement of civilization is accompanied by a sense of loss.

Likewise, *The Woodlanders*' narrator describes Mrs. Charmond's home in relation to stages of human development to suggest a "declin[e]" in modern "constitutions":

> The situation of the house, prejudicial to humanity, was a stimulus to vegetation, on which account an endless shearing of the heavy-armed ivy went on, and a continual lopping of trees and shrubs. It was an edifice built in times when human constitutions were damp-proof, when shelter from the boisterous was all that men thought of in choosing a dwelling-place, the insidious being beneath their notice;

> and its hollow site was an ocular reminder by its unfitness for modern lives, of the fragility to which these have declined. (53)

These types of descriptions represent a perspective on the stages of human development that extends far beyond the novel's events. Hardy's narrators possess vaster temporal perspectives than his characters, allowing them to identify stages of human development and criticize civilization. This outlook reinforces Hardy's trenchant social critiques, as social proprieties appear particularly senseless when juxtaposed with vast natural timescales. His plots frequently hinge on individuals adhering to social conventions against their best interests; when their actions are viewed from an extended temporal perspective which diminishes human significance, such social niceties seem particularly pointless. Knight's prudish rejection of Elfride in *A Pair of Blue Eyes*, Viviette being cornered into two unhappy marriages in *Two on a Tower*, Giles's unnecessary death as an outcome of refusing to share a shelter with Grace in deference to her reputation in *The Woodlanders*, and, most famously, Angel's rejection of Tess after she confesses her earlier rape or sexual experience are examples of socially-influenced but ultimately superfluous actions which have tragic consequences. In this light, Swithin, the scientist-hero of *Two on a Tower*, seems to rise above these social customs as a *result* of his scientific perspective. He disregards religion and is not concerned with the proprieties of the church and marriage except for Viviette's sake. While his scientific perspective is often problematic in that it limits his awareness of and ability to comprehend others, including the devoted Viviette, Hardy seems more critical of characters who adhere to self-imposed social restrictions than of Swithin's scientific preoccupations that distract him from his relationship.

Hardy's conceptualization of the human species as a component of extended deep-time processes represents a departure from earlier novelistic representations of deep time in that it

fully implicates humans within a materialist natural system and acknowledges how the human species is entwined with environmental change. Although the concept of deep time originates in eighteenth-century geology, as we've seen, and the phrase's geological usage was coined in 1981, Dimock's recent redefinition of the term in relation to literary studies is particularly relevant to my analysis of Hardy. Her deep time "highlights…a set of longitudinal frames, at once projective and recessional, with input going both ways, and binding continents and millennia into many loops of relations, a densely interactive fabric" (3-4). Given Hardy's interest in overlapping and intersecting timescales, Dimock's reconceptualization of deep time as a "fabric" woven from numerous temporal threads provides a helpful model for examining his novels. Acknowledging deep time—which extends far past a text's or nation's chronological limits—enables us to contextualize literature within much vaster frameworks, and accommodate the various timescales of, for instance, literary history, national or cultural traditions, and science. Much as Hardy does in his fiction, a contemporary concept of deep time allows us to challenge solely-numerically-based models of time to focus on the relations revealed between chronologically-distant events, and imagine how various timescales are woven into the "fabric" of time. Moreover, the redefinition of deep time that Dimock offers—like that of contemporary Anthropocene studies—implicates the human species within vast timescales in order to account for the human impact on the environment. While McPhee's coinage reflects the geological sense of deep time that would have been recognized in the nineteenth century, Dimock's modification of the geological sense of the term as well as her proposal that deep time be explored through literature align more immediately with the model of time that Hardy produces in his novels.

In his novels Hardy offers literary representations of deep time that seem designed to convey vast timescales more effectively than mathematical measurements. Questions about our

ability to grasp deep time are apparent in nineteenth-century science, as when Darwin notes in *Origin of Species* "how incomprehensibly vast have been the past periods of time" (271), and Hardy similarly acknowledges this difficulty and depicts human attempts to comprehend deep time in his novels. Evidently, the concept of deep time resituates individuals, nations, and the human species within vast timescales, and it also begs the question: can humans truly grasp deep time? As I've suggested in the Introduction, there are limitations to the human ability to comprehend vast scientific timescales and, specifically, to process numerical representations of deep time (McPhee 20). The metaphorical term "deep time" suggests that literary devices offer a means of conceptualizing vast timescales, and science writers like Stephen Jay Gould have suggested that people may be better able to understand literary rather than numerical representations (3). Gould refers to McPhee's example, which in fact downsizes deep time into a human scale: "With your arms spread wide again to represent all time on earth, look at one hand with its line of life. The Cambrian begins in the wrist, and the Permian Extinction is at the outer end of the palm. All of the Cenozoic is in a fingerprint, and in a single stroke with a medium-grained nail file you could eradicate human history" (126). By translating the numbers of geological deep time into human registers, literary language such as metaphor and analogy provides a means of grasping and articulating deep time. Similarly, Hardy situates individuals in relation to the vast timescales of history, evolution, geology, and astronomy, and he connects the concepts of deep time to the emotional histories of his characters and the events of his novels. Hardy recognizes that the human imagination gravitates towards a recognizable human scale—McPhee suggests that "[p]eople think in five generations" (127)—and works to bring deep time down to a size that fits into the novel genre and is identifiable for his readers. Literary approaches may be able to convey scale more effectively than numbers, and Hardy's novelistic

depictions of deep time help humanize vast timeframes. He suggests that seemingly insignificant human stories can actually offer ways for humans to grasp deep time, since the novel can demonstrate ways in which small and vast "magnitudes" overlap and intersect with one another.

To view one's life or, more broadly, human existence from the outside perspective of, say, geologic time, is to recognize not only the insignificance of human life but the competing timescales at play. Beer observes that "Hardy is acutely alert to diverse time-scales, and to the extent to which the oblivious interaction of these differing scales make up the mesh of event and experience" (234). His novels illustrate a variety of timescales including cosmic, geological, evolutionary, and genealogical timespans, seasonal time cycles, and individual temporalities. Minute and vast timescales alike are depicted in relation to individual lives and human history. For instance, *Desperate Remedies* describes a "still pool" in which "[h]undreds of thousands of minute living creatures sported and tumbled in its depths with every contortion that gaiety could suggest; perfectly happy, though consisting only of a head, or a tail, or at most a head and a tail, and all doomed to die within the twenty-four hours" (209), while *The Return of the Native*'s landscape reveals traces "of the last geological change" (10-11). By bringing different times into relation, Hardy produces overlapping scales, an intent he states in the 1895 Preface to *Two on a Tower*: "This slightly-built romance was the outcome of a wish to set the emotional history of two infinitesimal lives against the stupendous background of the stellar universe, and to impart to readers the sentiment that of these contrasting magnitudes the smaller might be the greater to them as men" (289). Such collisions—between human and non-human (cosmic, geological, or evolutionary) timeframes, ancestral and living generations, or deep time and an individual's lifespan—suggest relations between the human and the astronomical, and mark the significance of a scale that may seem irrelevant or incomprehensible in the context of human affairs.

However, Hardy's acknowledgement that humans will naturally gravitate towards "the smaller" temporal scale rather than "the stupendous background" suggests that the former might provide a way to grasp the latter: "the emotional history" might help readers comprehend something of "the stellar universe." In effect, he is transmuting vast timescales into temporal and narrative registers with which readers are already familiar and, perhaps, on which they place a greater importance—he's aware that "of these contrasting magnitudes the smaller might be the greater to them as men."

While literary devices such as metaphor may convey the relative scale of deep time more effectively than numbers, Hardy uses the novel's narrative properties to move beyond literary language and analogy in his representation of deep time. His novels also cast deep time in human terms by comparing individual temporal experiences with the natural processes that occur over vast timescales. For instance, in *Two on a Tower* the cosmic decay of the stars is echoed in the narrator's descriptions of Viviette's aged appearance, while in *The Woodlanders* the characters are guided by the same evolutionary principles that drive species reproduction. In other words, Hardy demonstrates how the scientifically-acknowledged processes which unfold over deep time are also at play at the human level. In this sense he both humanizes deep time and vast natural processes, and situates the human species within a deep time continuum. In *Thomas Hardy's Novel Universe* Pamela Gossin observes that his secular-scientific perspective informs his sense that the past is never truly distinct from the present:

> Hardy's multifarious reading in astronomy, cosmology, geology, evolutionary theory, antiquities, anthropology, mythology, and the classics all seemed to reinforce, for him, the same set of strong messages about the human condition: the past is present, biologically and historically; evolution and adaptation are

> ongoing processes; adaptation and change do not imply progress; chance and will do not imply providence or grace. (119-20)

Hardy's sense of time as a continuum encompasses all levels of life so that "the past is present, biologically and historically" in non-human and human timescales alike. He enacts this sense of temporal continuity on a human scale in his representations of genealogy. Tess O'Toole remarks that "[h]is fascination with hereditary patterns is writ large in the multi-generational structures that underlie so many of his plots…. It is also registered at the level of description, in the minute attention paid throughout his writings to genetic features traced upon individual bodies" (1). Ancestry is significant in novels such as *A Pair of Blue Eyes*: lineage matters because Smith's inherited lower social standing impedes Elfride's feelings towards him and she inherits a painful family past. In *The Woodlanders* George Melbury allows Fitzpiers to marry Grace, despite his promise to Winterborne, due to the former's family history.[3] In *Tess of the D'Urbervilles* (1891), the heroine's family history partially determines the outcome of her life. In this sense, genealogy functions as a microcosm of Hardy's belief that "the past is present" as his novels draw narrative similarities between the natural processes that unfold over deep time and human lives.

By translating deep time into the novel's human frame, Hardy is both accommodating deep time to the novel and adapting the novel to accommodate deep time: his integration of deep time translates vast timescales into familiar novelistic forms but also expands the scope of his novels. Hardy uses his conception of deep time to challenge the conventions of the novel; he pushes the limits of what the novel can represent and thus what readers can conceptualize. His interest in incorporating the concept of deep time, which, by definition, far exceeds the scope of human existence, into the novel, a genre based around individual and familial lifespans,

[3] Hardy's narrator describes Melbury's perspective: "His daughter's suitor [Fitzpiers] was descended from a line he had heard of in his grandfather's time as being once among the greatest, a family which had conferred its name upon a neighbouring village; how then could anything be amiss in this betrothal" (144).

complicates the novel's narrative terms. The resulting "scale enlargement," to use Dimock's term (5), pushes the temporal limits of the novel and exposes relations apparent only over deep time which might otherwise remain unseen. Hardy's novels reveal extended connections over time between individuals and ancestors. These types of connections can also be seen as networks—temporal webs as well as spatial—so that connections are established between families, generations, and species as well as communities, cities, and nations. In this sense, Hardy implicates humankind within deep time: he not only situates the human species in relation to vaster timescales but emphasizes how humans interact with their environments and constitute components of deep time. In his frequent depictions of rural communities and characters whose work or leisure revolves around their environment—Knight's amateur geology, Clym's furze-cutting, Swithin's star-gazing, Giles's and Marty's tree-cutting, Tess's farm work—he illustrates the extent to which humans affect and are shaped by their habitats. By incorporating both non-human and extensive human-historical timescales in his novels, he draws parallels and uncovers relations between events and natural processes occurring at different times and over different timeframes, and demonstrates how individuals are inextricable from their ecosystems.

Hardy's novels explore the relations revealed through scale enlargement without sacrificing a scale more conducive to human comprehension, and they employ moments of folding time in order to portray deep time and temporal continuity. Dimock's spatialized sense of a temporal continuum composed of various timescales echoes Hardy's novelistic time: both writers propose a "threading" of different timescales and present the possibility of loops or folding temporal relations. Dimock's folding time, in which "events resonate with the past, drawing it into the orbit of the present" (126), represents a non-numerical and non-chronological method for conveying deep time similar to that which Hardy employs in his novels. His moments

of folding time bring together remote or distant events, thereby incorporating deep time into his novels' contemporary settings. In moments such as Knight's cliff-hanger in *A Pair of Blue Eyes*, a scene to which I will return in detail shortly, "time close[s] up like a fan" and "fold[s]" (200-201) as Hardy depicts "the distance between two events happen[ing] to collapse" (Dimock 126). By incorporating vast timescales through a model of folding time, he produces a sense of temporal elongation and acknowledges the proximity or similarity between chronologically-distant events; indeed, these historically remote moments often take place in the same geographical space. This strategy allows him to represent distant events and facets of deep time within the familiar temporal register of the novel.

Although the nineteenth-century realist novel is often associated with linear or Newtonian time (Levine, *Novelists* 5), Hardy employs realist narrative techniques to incorporate the temporal fluidity of folding time. He often departs from his novels' linear storylines and their established timeframes to introduce seemingly tangential moments of deep or non-human time under the guise of narratorial digressions, descriptions, or asides common in nineteenth-century realist literature. Generally, these passages draw attention to deep time within a natural landscape (like *The Return of the Native*'s Egdon Heath) or through material remains of the past, or they depict characters' psychologically-fraught experiences resulting from their encounters with the past or evidence of deep time, as with the aforementioned cliff-hanger scene. Significantly, such moments do not forward the novel's plot; instead, they are descriptive, introspective, or tangential and represent a departure from both the content and timeframe of the chronological narrative. Hardy's non-chronological evocations of deep time and depictions of folding time nevertheless suggest a realistic way of experiencing deep time and understanding non-human timescales. While the non-linear concepts of folding or cyclical time may recall the temporal

mode of romance rather than literary realism, Hardy uses them to suggest psychologically realistic temporality and to confirm scientific timeframes.

Hardy's interest in uncovering the relations between contemporary and remote events recalls the narrative components of non-fiction texts by scientists like Lyell, Darwin, and Herschel. These and many other nineteenth-century science writers often used literary language to communicate their disciplines' theories, histories, and timescales. Indeed, many scientific texts, like *Origin of Species*, were intent on reconstructing the past based on natural evidence such as geological markers or fossils; as Lawrence Frank notes, "Through their uniformitarianism Lyell and Darwin proposed that true knowledge is informed by a belief in fixed natural laws working in and through time that can lead to the reconstruction of the past even from fragmentary evidence" ("Reading the Gravel Page" 365). For Hardy, science acts as a narrative force by explaining natural phenomena and piecing together histories from spotty material records. His novels produce a concept of science as an imaginative tool that enables his characters or narrators to envision distant eras and link the past to the present. Radford observes that "[a]s his portrayal of Stonehenge [in *Tess of the D'Urbervilles*] reveals, Hardy was not going to be restricted only to prehistoric strata. He wished to display all the fan of time and each elaborate link in the chain between the earliest ages and late-Victorian society" (15). Hardy's interest in rebuilding "the chain" of time to connect the past with his present enacts the processes of scientific theories such as Darwinism that sought to uncover the links between different eras. Disciplines such as geology, biology, and archaeology helped to reconstruct or recall the past, imagine different epochs, and explain the causes and effects of natural processes such as gradualism, evolution, and thermodynamic dissipation. Likewise, in Hardy's novels science functions as an imaginative force capable of reconstructing the ancient past (as in Knight's cliff-

hanger scene, when his geological understanding enables him to envision past ages). By using a concept of science as an imaginative tool, he draws attention to the ways that science constructs culturally significant narratives of the past while, simultaneously, culture, and literature in particular, constructs accessible conceptions of science, and especially its scales and measures.

As his interest in the imaginative aspects of science might suggest, Hardy does not shy away from mixing the materialism and gradualism associated with his literary realism with romance elements. On the contrary, he classified works such as *A Pair of Blue Eyes* and *Two on a Tower* as "Romances and Fantasies," despite their extended discussions of geology, biology, and astronomy (Thomas 282). Along with his interest in various timescales and deep time, Hardy explores different genres and their respective narrative temporalities.[4] In particular, his novels contain a mixture of cyclical time, often associated with romance, and the gradualist temporality generally aligned with realism. For instance, the *Two on a Tower* Preface proposes a study of the contrast between the "romance" of Swithin and Viviette's love plot and the apparent realism of Swithin's scientific research (289). Similarly, when Knight (sensationally) hangs from a cliff, he is exposed to realistic natural elements and imagines a scientifically-accurate account of the area's geological and evolutionary history. However, this sense of history is derived from a romance-like vision in which time folds back on itself, rather than the gradualist temporality associated with literary realism and geology. Another such example is apparent in the various narratives surrounding Elfride's genealogy, her death, and the Luxellian family vault. Gossin considers Elfride's life-story in relation to her romance-writing:

[4] For instance, Levine's "*Woodlanders*" discusses the novel's "generic instability" and observes that Hardy "set[s] in motion a narrative that refuses to stand still for genre, that breaks the boundaries between tragic and comic, farce and melodrama, and that repudiates the tragic even as it enacts it" (195-6). Similarly, Penny Boumelha remarks that *The Woodlanders* "draws on genres so widely disparate as to be at times incompatible" (98), while Jane Thomas proposes that "the 'Romances and Fantasies,' along with the 'Novels of Ingenuity,' should attract more serious critical attention …because they demonstrate Hardy's radical rather than his 'flawed' aesthetic. … [T]he 'subgenres' of romance, fantasy, and historical fiction excite critical interest today precisely for the ways in which they draw attention to the tensions and oppositions inherent in more apparently 'seamless' forms of aesthetic practice" (296).

> Elfride's youthful idealistic cosmology may be most obviously symbolized by the "romance" novel she is writing. Like her own fictional heroine, any number of decisive choices may have led to this imagined narrative becoming the "story of her life." Instead, her choices, indecision and errors, and the choices, indecision and errors of others, and her apparent belief that there were no other choices—a staple of all Gothic horror—results in her accepting the lead role in another kind of narrative: the family curse. (153)

The sense of familial destiny that accompanies Elfride's death seems in line with the cyclical time and fate associated with romance; however, the crypt in which she will lie has already been exposed as full of rotting materials and deathly decay.[5] Thus while Elfride's story retains a sense of romance, echoed by her own authorial efforts in the genre, the depiction of decay in the Luxellian tomb adheres to the bleak materialism of Hardy's literary realism. In these and other instances, romance narrative devices enable Hardy to depart from his linear plotlines to include timeframes from beyond the novel's scope.

In this sense, these depictions of folding time, colliding timescales, and humanized deep time present different ways of conceiving of scientific time; moreover, they suggest an alternative sense of what constitutes "realistic" portrayals of time. Linear, gradualist, and chronological time generally underlies Victorian realism, and Hardy's inclusion of folding, repeating, cyclical, or generally subjective and fluctuating time blurs the boundaries between literary realism and romance, sensation, or fantasy genres. As I will suggest in this chapter's conclusion, Hardy's use of romance elements to explore deep time and scientific timescales

[5] The crypt symbolizes cyclical family romance—it's here that Simeon shares the tale of Lady Elfride—as well as the material reality of death, which Hardy describes in detail: "The order of interment could be distinctly traced by observing the appearance of the coffins.…Those of an earlier period showed bare wood, with a few tattered rags dangling therefrom. Earlier still, the wood lay in fragments on the floor…; whilst in the case of the very oldest, even the lead was bulging and cracking in pieces, revealing to the curious eye a heap of dust within" (233).

suggests an affinity with contemporary popular adventure tales and scientific romances which similarly incorporate non-realistic narrative devices to include times and events outside of the novel's traditional scope.

"Between this creature's epoch and his own": Folding Time in *A Pair of Blue Eyes*

A Pair of Blue Eyes (1872-73) depicts a love triangle between Elfride Swancourt, Stephen Smith, and Henry Knight. Although critics have studied the novel's scientific language, the strategies that Hardy employs to incorporate deep time require further analysis in order to demonstrate how he juxtaposes minute and vast timeframes to convey scientific timescales. In the wake of Darwin's examination of "the evidence of the descent of man from some lower form" (*Descent* 1: 9), *A Pair of Blue Eyes* contrasts minute organisms—zoophytes and a trilobite fossil—with human lives to reveal unexpected parallels and to suggest ways in which minor creatures might participate in or embody deep time. As these seemingly insignificant organisms illuminate humankind's position within vaster timeframes, Hardy demonstrates unanticipated relations between lesser and greater temporal scales that help to conceptualize deep time. This temporal strategy is enacted in a powerful moment of folding time that suggests how, just as seemingly insignificant organisms might elucidate vast temporal perspectives, brief moments might provide glimpses into substantial scientific histories. Hardy draws the reader's attention to various timescales in order to situate humankind in relation to both minute and vast temporal perspectives and to acknowledge the limitations of his characters' inevitably anthropocentric outlook. By introducing these overlapping timescales and then depicting Knight's imagined journey through deep time as he faces death, Hardy proposes that science can act as an imaginative force to reconstruct the past or help individuals grasp non-human timescales.

The novel's events are purposefully situated within deep time and are subject to the same natural processes that occur over vast timeframes. Gossin observes that:

> Hardy sets the Darwinian sexual selection of the novel's action squarely within geological and meteorological reality. When the characters undertake geological excursions to the cliffs in the area, they are exposed to layers of the past. Hardy mentions specific formations of igneous and metamorphic rock, slate and fossils that are found in the region…, establishing that part of the story's place is also its time. (126)

As Hardy emphasizes the brevity of human life in relation to geological timescales and suggests that the past endures to shape the present, he critiques human limitations but also offers a memorable method of translating deep time into novelistic and human terms. By enlarging the novel's temporal scale, he diminishes Knight's social proprieties and sense of self-importance, and he portrays genealogy and sexual selection as determining factors in an individual's life. Angelique Richardson observes that in the novel "Hardy furnishes the reader with a detailed study of patterns of sexual relations at a timely historical moment [following the publication of *The Descent of Man*]" (304) and "draws out the creative possibilities of the new evolutionary discourses on love" (307). By framing human activity in relation to both smaller and greater timescales *A Pair of Blue Eyes* demonstrates how humans are subject to evolutionary imperatives, offers alternatives to a strictly anthropocentric interpretation of history, and situates humankind within deep time. Hardy emphasizes the material effects of time and reduces human importance in comparison with vaster timeframes; however, he also suggests that all levels of organisms are subject to the same natural processes and, adhering to *Descent of Man*'s strategy, suggests that "lower animals" might provide insight into "higher" organisms.

This juxtaposition between timescales is apparent when *A Pair of Blue Eyes* employs minute organisms to illuminate human temporal perspectives. For instance, Hardy's depiction of Knight's aquarium establishes the overlapping timescales at play in the novel as well as a sense of connectedness or shared nature among different levels of species. Often Hardy emphasizes the brevity of human existence in relation to deep time, and the contrast developed between geological timescales and individual lives is complemented by the parallel he draws between Knight's aquarium of "zoophytes" and his view of a bustling London. In Knight's room,

> An aquarium stood in the window. It was a dull parallelepipedon enough for living creatures at most hours of the day; but for a few minutes in the evening, as now, an errant, kindly ray lighted up and warmed the little world therein, when the many-coloured zoophytes opened and put forth their arms, the weeds acquired a rich transparency, the shells gleamed of a more golden yellow, and the timid community expressed gladness more plainly than in words. (122)

This description of the setting sun illuminating these minute creatures behind their glass partition is picked up later in the chapter, when Stephen approaches the window which contains the aquarium. Knight asks, "There! … where is there in England a spectacle to equal that? I sit there and watch them every night before I go home." The narrator describes Knight's view:

> Beneath them was an alley running up to the wall, … so that Knight's back window was immediately over the angle, and commanded a view of the alley lengthwise. Crowds—mostly of women—were surging, bustling, and pacing up and down. Gaslights glared from butchers' stalls, illuminating the lumps of flesh to splotches of orange and vermillion, like the wild colouring of Turner's later

> pictures, whilst the purl and babble of tongues of every pitch and mood was to this human wildwood what the ripple of a brook is to the natural forest. (126)

Through Knight's window, human life is similarly illuminated and under observation. While the human-made world of London differs in scale from the aquarium, the sense of busy animal activity is repeated (and reinforced by Hardy's description of the scene as a "human wildwood"). This scene contributes to the novel's critique of Knight's often unfeeling amateur-scientific perspective—Radford identifies "[t]he aquarium [as] a symbol of Knight's unhealthy detachment" (46)—which leads him to reject Elfride, and it also suggests similarities between very different levels of species. Human activity is akin to animal activity, and its significance seems accordingly diminished.

Hardy includes a similar scene in *Desperate Remedies* which directly compares human life cycles to the temporal perspectives of "minute living creatures" when a "still pool" filled with "perfectly happy" organisms inspire Manston to think, "D—n…! Why shouldn't I be happy through my little day too?" (209); these comparisons acknowledge both the relative brevity of a lifespan (regardless of species distinctions) and suggest a temporal perspective in common with the tadpole-like creatures.[6] Levine recognizes similarities between Darwin's descriptions of all levels of species and Hardy's focus on "minute living creatures" in his novels: "It is not a long way from [*The Origin*] to Jude's innocent concern for the crows, the narrator's alertness to the destruction of the snails on which Tess trod, or the sudden revelation of other life—the 'ephemera'—when the match for a moment illuminates the evening in *A Pair of Blue Eyes*"

[6] Hardy often recognizes minute animal and insect life: in *The Return of the Native* he describes a "pool" in which "[a] timid animal world had come to life for the season. Little tadpoles and efts began to bubble up through the water, and to race along beneath it; toads made noises like very young ducks, and advanced to the margin in twos and threes; overhead, bumble-bees flew hither and thither in the thickening light" (163). Levine notes that "As Darwin eradicated the divide between the human and the animal (and beyond that, between the animal and the vegetable), for Hardy, humans are not—in the cosmic scheme of things, that is—more important than the bugs, horses, and birds that seem constant companions to the humans, whether the humans are always aware of them or not. Human failure to note them is often thick with moral implications" ("*Woodlanders*" 188).

("Enchanting" 43) and "awaken[s] gnats, … reveal[s] shiny gossamer threads, disturb[s] earthworms" (*PBE* 224). Hardy's novels acknowledge connections among all levels of species and insist that they are fundamentally similar in that they are subject to evolutionary precepts, decay, and extinction. However, such comparisons also reveal his interest in the varying timescales that exist in nature and they establish a shift in temporal perspective. While the smaller organisms are rendered insignificant in comparison with humankind, the parallels also suggest that humans might be similarly reduced from a vaster temporal perspective. Moreover, it is not that Hardy is dismissing the smaller of the creatures: they enable recognition of vaster timeframes and are subject to the same essential natural processes as humans.

Perhaps the most striking example of Hardy's incorporation of deep time occurs in *A Pair of Blue Eyes*' literal cliff-hanger. Hardy contrasts evolutionary and geological timescales with the human lifespan and employs a model of folding time to admit these timespans into the novel's scope. By using a moment of introspection to include deep time, he employs a realist and novelistic convention to transcribe vast timescales and manages to convey the depth of history in literary rather than numerical terms. In a scene framed by scientific language,[7] Henry Knight ends up hanging on a cliffside as "[h]e recline[s] hand in hand with the world in its infancy. Not a blade, not an insect, which spoke of the present, was between him and the past" (199). He finds himself face-to-face with a material embodiment of the past:

> By one of those familiar conjunctions of things wherewith the inanimate world baits the mind of man when he pauses in moments of suspense, opposite Knight's eyes was an imbedded fossil, standing forth in low relief from the rock. It was a

[7]As Radford observes, Knight's "ordeal begins with him…displaying his scientific erudition to Elfride" (49), and Hardy describes his predicament in scientific terms: "By an ill fate, the force downwards of [Elfride's] bound, added to his own weight, had been too much for the tooth of quartz upon which his feet depended. It was, indeed, originally an igneous protrusion into the enormous masses of black strata, which had since been worn away from the sides of the alien fragment by centuries of frost and rain, and now left it without much support" (197).

> creature with eyes. The eyes, dead and turned to stone, were even now regarding him. It was one of the early crustaceans called Trilobites. Separated by millions of years in their lives, Knight and this underling seemed to have met in their place of death. (200)

Knight is "a fair geologist," and "at this dreadful juncture his mind found time to take in, by a momentary sweep, the varied scenes that had had their day between this creature's epoch and his own" (200). Notably, Hardy employs this ostensibly less-evolved organism to evoke vast geological timeframes, thereby setting the "early crustacean" into relation with Knight's lifespan and evolutionary timescales. He writes:

> Time closed up like a fan before him. He saw himself at one extremity of the years, face to face with the beginning and all the intermediate centuries simultaneously. Fierce men, clothed in the hides of beasts, and carrying, for defence and attack, huge clubs and pointed spears, rose from the rock, like the phantoms before the doomed Macbeth. They lived in hollows, woods, and mud huts—perhaps in caves of the neighbouring rocks. Behind them stood an earlier band. No man was there. Huge elephantine forms, the mastodon, the hippopotamus, the tapir, antelopes of monstrous size, the megatherium, and the mylodon—all, for the moment, in juxtaposition. Further back, and overlapped by these, were perched huge-billed birds and swinish creatures as large as horses. Still more shadowy were the sinister crocodilian outlines—alligators and other / uncouth shapes, culminating in the colossal lizard, the iguanodon. Folded behind were dragon forms and clouds of flying reptiles: still underneath were fishy

> beings of lower development; and so on, till the lifetime scenes of the fossil confronting him were a present and modern condition of things. (200-201)

Although this passage is informed by "the discoveries of geologists like Lyell" (60), Patricia Ingham has identified Gideon Mantell's *The Wonders of Geology* (1838) as Hardy's key source and demonstrates the extent to which this description resembles Mantell's "Retrospect" from *Wonders* (62-3). This vision of time travel is filtered through Knight's perspective and does not contribute to the plot; it functions as a digression both on the geological time which surrounds the novel's events and to develop Knight's point of view during this crisis. Hardy employs this realist technique to translate deep time into the descriptive language of the novel, despite the fact that Knight's imaginings focus on events well outside the novel's time-scheme. The language Hardy uses here clearly illustrates folding time: "time close[s] up like a fan" that "fold[s]" while the trilobite fossil, which exists in Knight's present, brings him "face to face with the beginning and all the intermediate centuries simultaneously" so that they appear "for the moment, in juxtaposition." Without compromising his novel's linear plot and literary realism, Hardy incorporates deep time into this chapter by using narrative digression and Knight's perspective to bring the past into the novel's present.

Hardy's strategy differs from the manner in which Dickens and Eliot incorporate deep time in that he stages a direct encounter between prehistoric past and the present. Unlike Dickens's brief and fanciful vision of a dinosaur in modern London—a vision none of his characters shares—Hardy depicts Knight confronting a material embodiment of a different era. Moreover, Knight's moment of folding time encompasses and connects numerous evolutionary stages and geological periods at once: the history he imagines constitutes a movement through time rather than a singular vision of the past, as the brief moment expands to reveal vast histories

that lay hidden in the present. Indeed, Knight's scientific knowledge—he is after all "a fair geologist"—enables his vision, which is depicted as an accurate impression of past ages and the passage of time; in this sense, his reconstruction of the past based on an encounter with a fossil echoes the narratives, likewise grounded in the analysis of land formations or fossils, that scientists like Lyell and Darwin proposed to account for geological and evolutionary history. The sense of movement through time in this passage both recalls Teufelsdröckh's idea of a time continuum accessible through one's consciousness in *Sartor Resartus,* and suggestively aligns the novel with the metaphorical and literal time travel of the period's popular romances as it utilizes science as an imaginative and narrative force.

Through Knight's perspective Hardy extends the novel's temporal scale in order to place human lives in relation to non-human timescales and reveal far-reaching relations. While this passage manages to weave individual lives into a vast temporal fabric, it also exposes the limitations of human understanding of time. Hardy's temporal scale enlargement and his inclusion of deep (or non-human) time in the novel offer a critique of human perspectives and acknowledge the inevitable anthropocentrism that colours human concepts of time. On one hand, the intersecting timescales in *A Pair of Blue Eyes*' cliff-hanger passage have the effect of reducing the significance of human existence; on the other, they situate and implicate humankind within deep time. Brought together in the prospect of death, Knight and the trilobite represent different stages of evolution and long-separated time periods:

> The creature represented but a low type of animal existence, for never in their vernal years had the plains indicated by those numberless slaty layers been traversed by an intelligence worthy of the name. Zoophytes, mollusc, shell-fish, were the highest developments of those ancient dates. The immense lapses of time

> each formation represented had known nothing of the dignity of man. They were grand times, but they were mean times too, and mean were their relics. He was to be with the small in his death. (200)

Knight's position forces him to acknowledge the inevitability of death and "reduce[s] [him] to [the trilobite's] primitive level" (Radford 49); it also forces him to confront vast timescales. As Beer notes, quoting Hardy, "Man here still feels himself at the summit of creation – the *incongruity* of companionship with minute fossil life thwarts him. Yet kinship is acknowledged, the creature had 'been alive and had had a body to save, as he himself had now'" (236). It is only by identifying with the trilobite in their shared mortality that Knight is able to confront a sense of deep time. Hardy's scale enlargement suggests inter-species connections which would only be apparent over extended evolutionary timeframes and are revealed only because of Knight's and the trilobite's similar positions; further, the juxtaposition of Knight and the trilobite serves to reduce the significance of human existence while also revealing how seemingly insignificant beings—the trilobite, or the human, depending on one's perspective—function to make vast timescales comprehensible. If, as Gould suggests, "[a]n abstract, intellectual understanding of deep time comes easily enough" but "[g]etting it into the gut is quite another matter" (3), this imaginative passage employs a humanizing strategy as it filters deep time through a character's perspective in a particularly suspenseful textual moment.

By representing death, extinction, and deep time through Knight's point of view and his psychological ordeal as he faces death, Hardy's description of deep time is more powerful and affective than if he had simply recounted dates or described an historic past. Despite Knight's scientific understanding, he still struggles to grasp deep time until he faces the trilobite, an embodiment of geological ages and the insignificance of individual deaths in the grand scheme

of time. After his visualization of the past, his perspective shifts so that he no longer feels immune to death: “Was he to die? … Was Death really stretching out his hand? The previous sensation, that it was improbable he would die, was fainter now” (201). Even in this moment, however, Knight struggles to grasp his relative unimportance and feels that he ought to be spared based on his intelligence: “without showing it much, [he] knew that his intellect was above the average. And he thought—he could not help thinking—that his death would be a deliberate loss to earth of good material; that such an experiment in killing might have been practised upon some less developed life” (203). His subjective temporal perspective is reinforced when Hardy underlines the disparity between Knight’s concept of time and an objective chronometric assessment: “Knight had over-estimated the strength of his hands. They were getting weak already. ‘She will never come again; she has been gone ten minutes,’ he said to himself. This mistake arose from the unusual compression of his experiences just now; she had really been gone but three” (202). Hardy contrasts the geological and evolutionary past Knight envisions “in less than half a minute” (201) with Knight’s perspective to emphasize the brevity of human existence in relation to deep time and the unreliability of human concepts of time. While his identification with the trilobite enables him to grasp a sense of deep time, albeit momentarily, the reader’s introduction to these vast timescales is filtered through Knight’s point of view and in the context of the very real threat he faces.

Egdon Heath’s Geological Landscape in *The Return of the Native*

The Return of the Native (1878) establishes deep time as part of the novel’s setting so that its spatial backdrop is implicitly temporal. While *The Return of the Native* places geological timescales in relation to human timelines like *A Pair of Blue Eyes*, in *Native* Hardy specifically

identifies the rural landscape as a material embodiment of deep time so that the novel's setting reflects a continuum of time: as Gossin notes, "geology and geography provide central symbolic force as they are embodied in the physical presence of the heath—the setting and literal 'environment' of the novel's story." She observes that Egdon Heath "is representative of impersonal forces at work in the universe, eternal truths about the relationship of humankind and the land, a repository of the human past, and a carrier of meaning for the human lives existing upon it" (145) and acknowledges that, "It is proof that the world and firmament are divided by time no less than by matter" (146). However, Hardy also employs his setting and accompanying realist landscape descriptions to effectively translate deep time into a novelistic register to make it accessible to his readers. He incorporates descriptions of temporal continuity in which the past endures in the present as well as moments of folding time wherein the past imaginatively reappears in the present. These strategies acknowledge overlapping timescales and utilize a shifting perspective, and they reveal certain similarities with Dickens's representations of the past intruding in the present: like *Bleak House* and *Our Mutual Friend*, *Native* sets its landscape in relation to prehistory and geological epochs. Beer observes that "Hardy like Darwin places himself in his texts as observer, traveller, a conditional presence capable of seeing things from multiple distances and diverse perspectives almost in the same moment," and she notes how in his novels, "The eye of the writing moves far and near, not so much dwelling in multiple minds, as in George Eliot, as creating a shifting space and changing scales" (230). In *Native* Hardy's narrator "moves far and near" to capture different timescales and different epochs, situating the novel's events and characters within vaster historic, evolutionary, and geological timeframes.

In particular, the novel's backdrop represents a material embodiment of the past enduring into the present. Hardy describes Egdon as an immutable landscape nearly unchanged over time:

> The sea changed, the fields changed, the rivers, the villages, and the people changed, yet Egdon remained. Those surfaces were neither so steep as to be destructible by weather, nor so flat as to be the victims of floods and deposits. With the exception of an aged highway, and a still more aged barrow presently to be referred to—themselves almost crystallized to natural products by long continuance—even the trifling irregularities were not caused by pickaxe, plough, or spade, but remained as the very finger-touches of the last geological change. (11)

As in *A Pair of Blue Eyes*, Hardy portrays a geological embodiment of the past that outlasts human timespans and, in this case, other natural phenomena such as "the fields" and "rivers." J. O. Bailey proposes that, "Exactly this double vision, of the object seen and then of time and space beyond it, is apparent in the description of Egdon Heath. On the surface, it is heath …. Then the scene expands in time" (673). Like the trilobite, the heath reveals vast histories and embodies geological time. The novel depicts Egdon as representative of an enduring past, particularly in passages in which Clym Yeobright, the eponymous "native," returns to Egdon:

> [Clym] was in a nest of vivid green. The ferny vegetation round him, though so abundant, was quite uniform: it was a grove of machine-made foliage, a world of green triangles with saw-edges, and not a single flower. The air was warm with a vaporous warmth, and the stillness was unbroken. Lizards, grasshoppers, and ants were the only living things to be beheld. The scene seemed to belong to the ancient world of the carboniferous period, when the forms of plants were few, and of the fern kind; when there was neither bud nor blossom, nothing but a monotonous extent of leafage. (174-75)

As with *Our Mutual Friend*'s description of the primordial Thames flowing above a bed of "slime and ooze" while a "half savage" Gaffer steers his boat (1-2), this passage describes a prehistoric past—"the ancient world of the carboniferous period"—that endures in the present. The fact that the present appearance of Egdon remains indistinguishable from its past suggests a certain simultaneity in its stages of existence: if unchanged, the landscape is essentially a lasting past framing the contemporary events of the novel. These types of descriptions of Egdon promote a temporal continuity in which traces of the ancient past remain visible in the present.

While these passages depict a continuity of the past and a simultaneity of past and present conditions, Hardy also describes a type of folding time similar to that in *A Pair of Blue Eyes*, which in this text occurs during Clym's solitary walks:

> He frequently walked the heath alone, when the past seized upon him with its shadowy hand, and held him there to listen to its tale. His imagination would then people the spot with its ancient inhabitants: forgotten Celtic tribes trod their tracks about him, and he could almost live among them, look in their faces, and see them standing beside the barrows which swelled around, untouched and perfect as at the time of their erection. (315-16)

These narrative tangents represent temporal folds, so that distant time periods seem to encounter each other in the same instant and through a shared space. The remaining material traces of the "ancient inhabitants" tie Clym's present environment to past times and people. This description of the simultaneity of distant events—wherein the past imaginatively reappears in the present—shares similarities with Dickens's megalosaurus in *Bleak House*, or the scenes in which ghosts seem to haunt Chesney Wold in Lincolnshire. These moments disrupt the linear proceedings of the novel's plot, taking the reader outside the novel's events and its timeframe. In these scenes

Hardy conceptualizes deep time and the connections which exist across it through the landscape of Egdon Heath, and he employs realist landscape descriptions to embody deep time in his setting. It is also notable that *The Return of the Native* implicates human activity within its sense of deep time, indicating the formative relationship people have with their environments: the Heath's geological landscape is, after all, marked by ancient human-made "barrows," and characters like Clym who perform agricultural labour seem to become extensions of the landscape. Hardy will develop his representation of humans as components of natural ecosystems more fully in *The Woodlanders*.

"They burn out like candles": Dying Stars and Cosmic Time in *Two on a Tower*

While Hardy adjusts the novel's individual and familial timeframe to include deep time, he also humanizes deep time by translating scientific timescales into the literary form. Although this conversion of non-human timescales into human terms is apparent throughout his novels, it is most explicitly addressed in *Two on a Tower* (1882), a novel that explores the vastness of cosmic time and space in relation to Swithin St Cleeve and Lady Viviette Constantine's love story, despite "[t]he simple fact…that the vastness of the field of astronomy reduces every terrestrial thing to atomic dimensions" (205). Hardy employs the novel form to suggest ways in which small and vast "magnitudes" overlap and intersect with each other, and to describe natural processes which unfold over both cosmic and human timeframes. Through his characters, and specifically Viviette's introduction to astronomy, he acknowledges that humans resist grappling with that which exceeds our understanding and offers the novel as a form and medium to make sense of deep time. He proposes that since his characters' love-story will interest his readers more than Swithin's astronomy, deep time and space might be conveyed through their

"emotional history" (289). While Hardy emphasizes contrasting timescales in order to situate his characters within deep time, he also illustrates their reactions to astronomy to help humanize cosmic scales and employs literary language and narratives as a means of conveying vast time. Finally, *Two on a Tower* compares individual temporal experiences and the natural processes which occur over cosmic time to suggest that similar processes—or narratives—inform human and cosmic activity.

As in the fields of geology and biology, nineteenth-century astronomy and, in particular, the emerging field of astrophysics entailed an understanding of deep time in order to grasp cosmic processes. In this sense, *Two on a Tower*'s astronomical terms represent an extension of—rather than a departure from—Hardy's geological and Darwinian landscapes and timeframes. Shuttleworth explains that

> In *The Return of the Native* (1878), the brooding landscape of Egdon Heath had presided over the action, placing human history in the context of the aeons of geological time. … The lives and passions of Clym, Eustacia and Wildeve were set within a Darwinian frame which took from humans their centrality, and placed them firmly within the slowly-evolving processes of nature and natural law. *Two on a Tower* develops this meditation on human significance, but now the context extends beyond the natural history of the earth to take in the infinite domain of space and time suggested by astronomy. (Introduction xvi)

Similarly, Gossin, who analyzes Hardy's interest in astronomy and cosmology, explains that he likely considered biological processes as an extension of cosmic activity "because biological evolution on earth was considered by at least some Victorian thinkers to be a continuation of cosmic evolution in the universe. The inorganic development of the galaxies, stars, and planetary

systems gave birth to organic development, so astronomy and Darwinism were naturally linked in the scientific story of the cosmos" (55). Gossin names astronomers such as the Herschels and Richard Proctor (1837-88) as key sources for Hardy's depiction of astronomy,[8] and she describes how the intersection of time and space influenced William Herschel's thought:

> While stellar parallax and the first scientific measurements of stellar distances were not achieved until sixteen years after his death, what he knew of stellar "profundity" affected Herschel profoundly. He knew that his vision into the depths of space was a journey into the depths of "time past." As he remarked in old age, "I have observed stars of which the light, it can be proved, must take two million years to reach the earth." (89)

Like Hutton's and Lyell's geological theories, Herschel's discoveries supported a concept of deep time which contradicted earlier assessments and Biblical estimates of the earth's history:

> Herschel's theories of the origins and nature of the universe offered a different story from that imagined by literal readers of the Bible. What Herschel saw of the cosmos did not lead him to believe it was the result of a single set of relatively recent creative acts, although the visual evidence for development strongly indicated that it *had* had some sort of beginning and had not existed from all time. To his telescopically trained eye, the universe appeared to still be in the process of becoming, changing, growing, and decaying. Given the distances of the stars and

[8] William Herschel (1738-1822), his sister Caroline (1750-1848), and his son John (1792-1871) were well-known astronomers (Gossin 83). Hardy was familiar with Proctor's work and owned *Essays on Astronomy* (1872) (113). Gossin writes that "many of Proctor's descriptions found their way into Hardy's writing. Proctor's account of John Herschel's accomplishments, his completion of his father's research, his testing of his father's theories, his original observational work at the Cape, and Proctor's analysis of Herschel's justly admired prose descriptions of celestial objects, may all have played a part in developing the character of Swithin St. Cleeve in *Two on a Tower*" (114-5).

> nebulae and the speed of light, its first moments must have taken place many many millions of years ago, rather than a few thousand. (91)

As in other scientific disciplines, astronomy was changing standard conceptions of time and history; significantly, it displaced humans from a central position in the universe and extended time to unthinkable proportions. Moreover, for Hardy and other thinkers, similarities between theories in fields like astronomy, geology, and biology seemed to suggest that the same natural processes were occurring at various levels of the universe.

The intersection between time and astronomy is also developed through *Two on a Tower*'s references to the Royal Greenwich Observatory, which would come to symbolize standardized time as well as the study of astronomy.[9] Swithin, who is referred to as an "astronomer" and "physicist" interchangeably throughout the text (29, 92), "aim[s] at nothing less than the dignity and office of Astronomer Royal" (10), the astronomer in charge of the Royal Observatory. Greenwich is a pilgrimage of sorts for Swithin: he submits a copy of his paper "A New Astronomical Discovery" to the Observatory (62) and later arranges to travel to Greenwich "to view the Observatory" (193) where he meets the astronomers (209). Finally, Swithin is "fortunate enough to interest some leading astronomers, including the Astronomer Royal" and receives an invitation to use "the Cape Observatory [in South Africa]…for any southern observations [he] may wish to make" (220). Additionally, Greenwich acts as a symbol

[9] As Galison explains, nineteenth-century astronomers like Swithin were implicated in clock coordination, cartography, and the search for exact longitude: "Finding longitude was part of the job description of French, British, and American astronomers, and they deployed every conceivable method to find it" (132). Chronometry and astronomy also overlap in Swithin's equipment: he explains that an equatorial uses "clockwork to make the telescope follow the motion in right ascension" (44). Hardy later describes how the tower's "silence was broken only by the ticking of the clockwork which gave diurnal motion to the instrument" (58). *Two on a Tower* hints at Greenwich's imperial undertones, which Conrad explores more fully in *The Secret Agent*, by suggesting parallels between Swithin's astronomical journey and Sir Blount's voyage to Africa, "which he dignified by calling it a scheme of geographical discovery; for he was inordinately anxious to make a name for himself in that field" (23). Viviette learns of her husband's death in a correspondence from Cape Town, linking Blount's journey with Swithin's astronomical expedition. Although she overlooks the similarities between Swithin's and Blount's expeditions, Jane Bownas "draw[s] a parallel between exploration of the unknown universe [embodied in Swithin's astronomy] and of unknown areas of the Earth during the height of Imperial expansion" (52).

of Swithin's scientific interest—generally, in competition with his love for Viviette—in a way that foreshadows Conrad's deployment of Greenwich as a symbol of time and science in *The Secret Agent* (1907). Swithin's "visit to Greenwich… momentarily revive[s] that zest for his pursuit that was now less" (213), and Viviette recognizes that after his "Greenwich visit she had again sunk to a second place in his heart" (214). *Two on a Tower* continues Hardy's exploration of vast scientific timescales and gestures towards the temporal and chronometric underpinnings of contemporary astronomy as embodied by the Greenwich Observatory.

Hardy's preoccupation with diverse timescales and deep time is perhaps most apparent in *Two on a Tower*, which features an array of contrasting and overlapping timespans. As we've seen, in the 1895 Preface in which he defends his novel from charges of immorality, Hardy clarifies his intention to set up cosmic time and space as the novel's backdrop: "This slightly-built romance was the outcome of a wish to set the emotional history of two infinitesimal lives against the stupendous background of the stellar universe, and to impart to readers the sentiment that of these contrasting magnitudes the smaller might be the greater to them as men" (289). By contrasting these timescales Hardy draws the reader's attention to the cosmic insignificance of human life; however, he also acknowledges that the novel's love-story will likely be the greatest point of interest for readers. He observes that humans gravitate towards temporal scales that we can fathom and which reflect human preoccupations: by presenting a "romance" which will be of "greater" significance to his readers, he may more successfully offer an impression of vast time and space. While *Two on a Tower* emphasizes the difference in "magnitud[e]" between these timescales, Hardy is more interested in placing these scales into relation than reconciling them.

Hardy does not abandon the geological, evolutionary, and archaeological timelines which informed *A Pair of Blue Eyes* and *The Return of the Native*, but in *Two on a Tower* they are also

understood in relation to the astronomical scope. As we've seen, he frames all these temporal scales in relation to his characters and uses their "emotional history" to help readers grasp deep time. For instance, Hardy locates the titular tower and surrounding land within historic, archaeological, and natural timelines: the "column" which Swithin has repurposed for star-gazing was in fact "erected in the last century, as a substantial memorial of [Viviette's] husband's great-grandfather, a respectable officer who had fallen in the American War" (4). Before that, "[t]he fir-shrouded hill top turned out to be (as some antiquaries said) an old Roman camp,—if it were not (as some insisted) an old British castle, or (as others swore) an old Saxon field of Witenagemote" (5). Later in the novel, as Swithin readies himself in the cabin near the tower for his marriage with Viviette, the narrator remarks that "the primitive simplicity of the young man's preparations accorded well with the prehistoric spot on which they were made. Embedded under his feet were possibly even now rude trinkets that had been worn at bridal ceremonies of the early inhabitants" (110). Hardy develops this geologically-informed image of the layers of history when he depicts Viviette (wife of the present landowner) sitting in a historic landmark erected in tribute to her family's ancestors, above long-standing vegetation which itself grows from primitive remains: "Lady Constantine might have felt a nameless fear in thus sitting aloft on a lonely column, with a forest groaning under her feet, and Palaeolithic dead men feeding its roots" (102). The landscape's history is invoked in relation to Viviette and tied to her love-story so that it becomes part of the novel's setting. The tower's surrounding land reveals a geological record of "prehistoric earthwork, under the heavy gloom of the fir-trees" (54) and is described through Darwinian language: in "early winter…the vegetable world was a weird multitude of skeletons through whose ribs the sun shone freely" (3), while the "lichen-stained and mildewed" tower is overrun by nature and "seldom visited by a pedestrian…. The rarity of

human intrusion was evidenced by the mazes of rabbit-runs, the feathers of shy birds, the exuviae of reptiles; as also by the well-worn paths of squirrels down the sides of trunks" (5). *Tower* depicts layered history—literally "embedded under [the] feet" of its protagonists—and interlacing timescales in order to situate "the emotional history of two infinitesimal lives" within deep time.

Hardy acknowledges that humans struggle to grasp vast time and space and, as in *A Pair of Blue Eyes*, portrays characters confronting and struggling to comprehend non-human scales. By depicting characters' horrified reactions to the spatial and temporal magnitudes uncovered by the study of astronomy and presenting these scales through their perspective, he manages to humanize *Two on a Tower*'s astronomical scale. The "terrible" nature of astronomy is acknowledged often and early in the novel: as Swithin makes clear, "If you are cheerful, and wish to remain so, leave the study of astronomy alone. Of all the sciences it alone deserves the character of the terrible" (31). Hardy suggests that these human reactions to deep time and vast space are natural and inevitable given that the study of astronomy reduces humankind's significance and annihilates any mistaken notions of human centrality. Swithin recognizes "that, whatever the stars were made for, they were not made to please our eyes. It is just the same in everything; nothing is made for man," while Viviette observes that "astronomy …. makes you feel human insignificance too plainly" (28). Viviette expresses her reaction to her astronomy lessons more sensationally: after "traversing distances beside which the immense line stretching from the earth to the sun is but an invisible point" by telescope (28), Viviette responds by crying out, "Oh, pray don't; it overpowers me! .... It makes me feel that it is not worth while to live; it quite annihilates me" (29). In these moments, Hardy resituates scientific timescales in relation to private temporal experiences and frames deep time in terms of human emotion. His descriptions

of Swithin and Viviette experiencing astronomy—much like Knight's immersion in geology—depict private experiences of scientific timescales. In this sense, Hardy repositions science as a private experience, suggesting that science functions not only as a force for explaining natural processes but also produces an internalization of deep time. While the evidence of deep time is traceable in nature, its reality is experienced and confirmed internally in these novels as non-human timescales inform personal temporal experiences.

These scenes also acknowledge that the human imagination seems to have a limited ability to grasp deep time, as when Viviette attempts to withdraw from the "overpower[ing]" vastness of astronomy. Hardy does not depict Swithin's research in inordinate detail but instead emphasizes the "terrible" aspect of his studies and the difficulty inherent in his attempts to convey the vastness of space to Viviette (and, by extension, the reader). Swithin's approach mirrors Hardy's: he employs literary and emotional language rather than numbers to represent vast time and space in human terms. Swithin "tried to give her yet another idea of the size of the universe—never was there a more ardent endeavour to bring down the immeasurable to human comprehension!" (30). He takes exception to Viviette's description of the sky as "grand" and explains, "But the actual sky is a horror. … You would hardly think, at first, that horrid monsters lie up there waiting to be discovered by any moderately penetrating mind,—monsters to which those of the oceans bear no sort of comparison" (29). Much like Hardy, Swithin must employ descriptive and metaphorical language to convey the mathematical truth of astronomy: "By figures of speech and apt comparisons he took her mind into leading-strings, compelling her to follow him into wildernesses of which she had never in her life even realized the existence." Indeed, to describe the cosmic scale Swithin turns to emotive language:

> ‘There is a size at which dignity begins,’ he exclaimed: ‘further on there is a size at which grandeur begins; further on there is a size at which solemnity begins, further on a size at which awfulness begins, further on a size at which ghastliness begins. That size faintly approaches the size of the stellar universe. So am I not right in saying that those minds who exert their imaginative powers to bury themselves in the depths of that universe merely strain their faculties to gain a new horror?’ (30)

Swithin uses terms to describe the human reaction to such vastness rather than employing numerical explanations, perhaps because space, like “[d]eep time is so alien that we can really only comprehend it as metaphor” (Gould 3). Beer observes that “[t]he absolute gap between our finite capacities and the infinite time and space of the universe burdens Hardy’s texts with a sense of malfunction and apprehension. There is a collapse of congruity between the human and the objects of human knowledge and human emotion” (237). In these passages, Swithin grounds his attempts to communicate astronomical knowledge to Viviette in humanizing terms, much as Hardy introduces his cosmic scale through literary language and by means of a “romance.” His literary descriptions represent an attempt to convey deep time, in McPhee’s words, “in a sensory manner” (128), much as Hardy uses the novel as a vehicle to transmit vast time and space.

However, it is from the temporal aspect of astronomy—deep time, rather than deep space—that Hardy draws parallels between human and cosmic conditions. *Two on a Tower* humanizes deep time by suggesting similarities between individuals’ experiences of time and the processes which unfold over deep time. These descriptions of natural processes suggest that narrative has the potential to convey the temporal more readily than metaphorical or literary language. While Swithin describes vast space through literary language and Hardy uses his

characters' emotional history as a way to introduce deep time, Swithin narrativizes cosmic developments and Hardy aligns cosmic and emotional histories. For instance, Hardy draws comparisons between the inescapable "quality of decay" at both the cosmic and individual level in his descriptions of dying stars and aging individuals. Swithin describes decay and extinction on a cosmic scale to Viviette:

> And to add a new weirdness to what the sky possesses in its size and formlessness, there is involved the quality of decay. For all the wonder of these everlasting stars, eternal spheres, and what not, they are not everlasting, they are not eternal; they burn out like candles. You see that dying one in the body of the Greater Bear? Two centuries ago it was as bright as the others. The senses may become terrified by plunging among them as they are, but there is a pitifulness even in their glory! Imagine them all extinguished, and your mind feeling its way through a heaven of total darkness, occasionally striking against the black, invisible cinders of those stars… (30-31)

Here, Hardy uses familiar language to humanize the processes of decay which unfold over vast timescales: stars "burn out like candles" and inspire "a pitifulness" for their extinction like other forms of death, suggesting an emotional response to their passing. This passage's description of the death of stars draws on nineteenth-century thermodynamics and astrophysics and presages literary representations of cosmic decay in, for instance, Wells's description of the heat death of the sun in *The Time Machine* and Conrad's portrayal of thermodynamic decay at all levels of the universe in *The Secret Agent*. Astronomical decay is yet another example of the narratives of decline that characterize Hardy's representation of deep time processes.

Space may be "a horror" for humans, but decay on a cosmic scale is likewise recognizable in more earthly temporal processes. In human terms, Viviette's aging affects Swithin's love for her and is described in a passage which incorporates cosmic imagery: "Yes; he was shocked at her worn and faded aspect. … Her cheeks had lost for ever that firm contour which had been drawn by the vigorous hand of youth, and the masses of hair that were once darkness visible had become touched here and there by a faint grey haze, like the Via Lactea in a midnight sky" (259). Gossin observes that "[t]he association of the Milky Way with time passing—as a marker of universal seasons, as the aging of a human life—bespeaks the final avengers of the novel: time, decay, and mortality" (189). As Hardy notes in the Preface, the human register—despite its insignificance in relation to deep time and space—nevertheless "might be the greater to [readers] as men" (289), and Viviette's death is certainly more affecting than Swithin's cosmic musings. Hardy makes sense of planetary decay by casting it in human terms and then framing it in relation to aging, so that cosmic decay is translated into the temporal scale of an individual life.

Two on a Tower teases out the similarities between natural processes over vastly different timescales and "magnitudes." In this sense, Hardy's humanization of deep time shares similarities with his incorporation of folding time. To use Dimock's terms, we can understand the parallels or encounters between different timescales as "cuts" in the "continuum" of time: "These 'cuts'—their lengths, their angles of incision, the folds being gathered together as a result—are generated on a strictly ad hoc basis, which is to say, under the shaping hand of particular events" (126). Thus while Hardy humanizes deep time by presenting human correlations, he is doing more than simply translating it into human terms: he is demonstrating how different timescales or moments in time fold back upon one another. Again, such parallels

humanize non-human timescales, but they also suggest similarities and even simultaneities of events which represent a temporal folding of chronology and timescales. *Two on a Tower* reflects on the immense lifespan of stars (which are nonetheless also subject to decay) relative to human existence and proposes a similar temporal form between their modes of aging. These temporal comparisons humanize deep time and make it to some degree accessible to readers; in this sense, Hardy's novels might be seen to provide a literary language for accessing deep time, shaping a concept which nineteenth-century and contemporary scientists alike admit remains elusive to human understanding.

"The great web of human doings": *The Woodlanders*' Darwinian Ecosystem

The Woodlanders describes life in the rural community of Little Hintock after Grace Melbury's plans to marry woodsman Giles Winterborne are disrupted by the newly arrived Dr. Fitzpiers. Deep time is embodied in the woodlands, a complex ecosystem that reveals the Darwinian processes at work over vast time periods. Although critics have recognized *The Woodlanders*' Darwinism, Hardy's intentional reduction of vast evolutionary processes into the individual and familial scale of the novel requires further analysis. By portraying characters subject to the same Darwinian processes which occur over deep time, Hardy translates evolutionary timeframes into human terms. When considered in context of his other novels, particularly *The Return of the Native* and *Two on a Tower*, he seems to propose that similar natural (in this case, predominantly evolutionary) processes inform all levels of existence. Evidently, Hardy's portrayal of the woodlands as a Darwinian ecosystem presupposes the deep time frame necessary to accommodate evolutionary theory. An extended temporal scale similar to that suggested by geologists such as Lyell would be necessary to produce the woodlands

ecosystem in which, like the "entangled bank" of *Origin* (397), the lives of various animal, human, and plant species are intertwined. Hardy associates the passage of time with Darwinian impetuses such as survival, reproduction, and extinction and demonstrates how they unfold in the lesser scale of his characters' lives. He proposes a correspondingly materialist view of time: time is measured by natural units (such as John South's lifespan) and natural processes (including astronomical cycles), and its effects are visible in material signs (like decaying trees). The Darwinian setting also functions to implicate humans within deep time: as part of the ecosystem, the woodlanders rely on the area's trees for their livelihood and, in turn, significantly shape their environment. This symbiotic relationship functions as a microcosm of the environmental implications of human activities, and Hardy's rural-agricultural setting both humanizes deep time and suggests ways in which humans are implicated in geological and evolutionary processes.

Additionally, Hardy develops two temporal models to illustrate the connections, predicated on deep time, that exist between individuals, species, and ecosystems: he evokes Darwin's tree of life diagram and describes an active temporal-spatial "web of human doings" (20). *The Woodlanders*' spatialized sense of relations produces an impression of time as a continuum thickened with different lives, timescales, relations, and unfulfilled ideals or possibilities; the novel shifts from the explicit collision of timescales apparent in *Two on a Tower* to focus on the relations which are revealed by temporal scale enlargement. Finally, Hardy's depiction of Little Hintock's slower pace of life and its inhabitants' awareness of natural time cycles suggests affinities between the rural-agricultural way of life and scientific perspectives on deep time.

The Woodlanders returns to the dominantly geological and evolutionary imagery of *The Return of the Native*, and Gossin suggests that the "failings of *Two on a Tower* may have" led

Hardy to focus on biology: “Instead of obscure astronomical images, Hardy chose highly popularized aspects of Darwinism; instead of melodrama, Hardy chose tragedy, and the result was a novel in which ‘God’s *not* in his heaven; all’s *wrong* with the world!” (195). The woodlands setting is recognizably Darwinian. Levine identifies “[t]he radical materialism implicit in the Darwinian way of viewing the world” in “the reversals and boundary blurrings that mark [Hardy’s] representation of nature; the emphasis on the corporeal—as in the unequivocal sexual power that pulls Grace and Fitzpiers together, the frustration of intention and consciousness; [and] the disparity between human conceptions and material reality” (“*Woodlanders*” 195). Hardy’s vivid descriptions of the woodlands are more often than not characterized by deformity, decay, extinction, and the struggle for survival:

> From the other window all [Grace] could see were more trees, in jackets of lichen, and stockings of moss. At their roots were stemless yellow fungi like lemons and apricots, and tall fungi with more stem than stool. Next were more trees close together, wrestling for existence, their branches disfigured with wounds resulting from their mutual rubbings and blows. It was the struggle between these neighbours that she had heard in the night. Beneath them were the rotting stumps of those of the group that had been vanquished long ago, rising from their mossy setting like black teeth from green gums. (280)

Notably, the inhabitants of Little Hintock are included in the woodlands’ Darwinian scheme, while animals and vegetation are frequently anthropomorphized. The connection between nature and the characters is evident when John South dies following the removal of the “tall elm” (83) outside his window, or when Hardy depicts Marty and the woodsmen as part of the potentially violent ecosystem:

> Each tree doomed to the flaying process was first attacked by Upjohn; with a small bill-hook he carefully freed the collar of the tree from twigs and patches of moss which encrusted it to a height of a foot or two above the ground, an operation comparable to the 'little toilette' of the executioner's victim. After this it was barked in its erect position to a point as high as a man could reach. If a fine product of vegetable nature could ever be said to look ridiculous it was the case now, when the oak stood naked-legged, and as if ashamed; till the axe-man came and cut a ring round it; and the two Timothys finished the work with the cross-cut saw.
>
> As soon as it had fallen the barkers attacked it like locusts; and in a short time not a particle of rind was left on the trunk and larger limbs. Marty South was an adept at peeling the upper parts, and there she stood, encaged amid the mass of twigs and buds like a great bird, running her ripping-tool into the smallest branches, beyond the furthest points to which the skill and patience of the men enabled them to proceed. (122)

Levine notes that "the metaphorical language is clear that this is a ruthlessly cruel (and Darwinian) activity" (192), while Hardy's language equally functions to animalize Marty, who rips the trees "like a great bird," and "the barkers [who] attac[k] like locusts," while humanizing "the oak st[anding] naked-legged, and as if ashamed." The woodlands' essentially Darwinian milieu is comprised of humans, animals, and vegetation. Even when, as Gossin notes, Hardy "indicates [Fitzpiers's] dissociation from his immediate surroundings,…he…ground[s] the point in biological and Darwinian terms" (206). For example, Grace finds it "strange" to find Fitzpiers in Little Hintock, "like a tropical plant in a hedgerow" (46). Evolutionary language imbues the

novel and emphasizes that, as Michael Millgate proposes, "the woods may be beautiful, but they can also be terrifying, nor are the woodlanders themselves exempt from the fight for survival. Little Hintock becomes not a haven of 'sylvan peace' but the microcosm of a world in which the struggle for existence is everywhere the chief condition of existence" (250-51).

In Hardy's woodlands, the Darwinian precepts of survival, reproduction, and extinction guide the characters and define their lifespans. By depicting these evolutionary processes within the individual and family lives of Little Hintock, Hardy brings vast scientific timelines down to a size that will fit into his novel. In "*The Woodlanders* and the Darwinian Grotesque" Levine assesses "what it is that constitutes success in Darwin's nature. The answer is simple: survival and, more important, reproductive success" (193). The importance placed on survival and reproduction unsettles the expected moral narrative of the novel, as instead of Giles being rewarded for his devotion to Grace, or Marty for her devotion to Giles, "[w]hat we see onstage is the reaffirmation of the powerful sexual attraction between Fitzpiers and Grace" (194). Levine suggests that "[t]he rich sensuousness and fertility of that green moment [of Grace and Fitzpiers's reunion] also suggest … something about how tightly the relationship is tied to material rather than conventionally romantic or moral conditions" (195). This emphasis on sexual selection and reproductive viability is evident in the novel's conclusion which sees Grace and Fitzpiers reunited, while Giles' fidelity to Grace has resulted in his death. In contrast to the lovers' potentially fruitful union is Marty, an idealized figure of tragedy rather than a physically attractive potential mate. She mourns Giles and vows to remember him:

> As this solitary and silent girl stood there in the moonlight, a straight slim figure, clothed in a plaitless gown, the contours of womanhood so undeveloped as to be scarcely perceptible in her, the marks of poverty and toil effaced by the misty

> hour, she touched sublimity at points, and looked almost like a being who had rejected with indifference the attribute of sex for the loftier quality of abstract humanism. (331)

Her devotion to Giles is moving and tragic; however, she is depicted in asexual terms and, from a Darwinian perspective, remains unproductive. Marty presents an image of renounced womanhood in favour of "abstract humanism," and while Giles's death enables her devotion—since her idealized love cannot be acted upon or rejected it will never be dismantled—it also bars any chance of reproduction and renewal of the woodlanders' line of descent. Her admirable loyalty is nonetheless non-generative and contrasts with Grace's adaptability to her surroundings. Grace, however, is a more viable mate and her reunion with Fitzpiers suggests reproductive possibilities. Extinction threatens the community of Little Hintock, and its traces are evident in the landscape and in the deaths of Giles and John South; one must survive and reproduce to extend the community's existence. By effectively shrinking evolutionary timescales into the novel's timeframe, Hardy attributes evolutionary motivations to the novel's courtship plot.

Like Egdon Heath in *The Return of the Native*, *The Woodlanders*' natural world reveals material signs of the passage of time. These various markers represent a range of timescales, and the wear they exhibit represents Darwinian processes (namely, the struggle for survival and extinction) unfolding on a smaller scale. Time can be read or measured in nature's cycles, and, as in Hardy's other novels, physical remnants of the past serve as postmarks of time: "the material traces…of the past that are visible on fence posts and in their materiality register a form of consciousness, or memory" (Levine, "*Woodlanders*" 177). The woodlands reveal signs of decomposition and death: there is "the scent of decay from the perishing leaves underfoot" (9), "[d]ead boughs…scattered about like ichthyosauri in a museum," "perishing wood-bine stems

resembling old ropes," and "the rotting stumps of those of the group [of trees] that had been vanquished long ago, rising from their mossy setting like black teeth from green gums" (280). In *The Woodlanders* such material effects of time are clearly linked to Darwinian processes.

However, Hardy also demonstrates how natural timespans and cycles can be used to measure time, particularly by the novel's rural characters. For instance, Gossin notes how he "describes Grace, who was born and raised in the village, as directly and intimately connected with the local effects of the earth's nearest star and its cycles" (208). Grace measures the days leading up to her wedding by nature's daily and seasonal changes:

> The interim closed up its perspective surely and silently. Whenever Grace had any doubts of her position the sense of contracting time was like a shortening chamber: at other moments she was comparatively blithe. Day after day waxed and waned; …. The sappy green twig-tips of the season's growth would not, she thought, be appreciatively woodier on the day she became a wife, so near was the time; the tints of the foliage would hardly have changed. (154-55)

Hardy's narrator proposes that rural time is based on an understanding of nature and its timescales, and that it provides an alternative to the numerical forms of chronometric measurement: "The countryman who is obliged to judge the time of day from changes in external nature sees a thousand successive tints and traits in the landscape which are never discerned by him who hears the regular chime of a clock, because they are never in request" (98). *The Woodlanders* suggests that time can be read in nature's landscape as well as (or better than) through the use of chronometry and acknowledges a variety of natural time markers and often overlapping timescales. From this perspective, it seems somewhat natural that John South's life is used as a legal measurement of property ownership:

> The Life—the one fragile life—that had been used as a measuring-tape of time by law, was in danger of being frayed away. It was the last of a group of lives which had served this purpose, at the end of whose breathings the small homestead occupied by South himself, …and half-a-dozen others that had been in the possession of various Hintock village families for the previous hundred years, and were now Winterborne's, would fall in and become part of the encompassing estate. (82-83)

The inhabitants of Little Hintock are part of the woodlands ecosystem, and South's life represents a natural and legal unit of measurement.

Hardy's materialist sense of time and his depiction of interconnected species in the novel call to mind Darwin's "Tree of Life" diagram (Appendix A). *Origin* outlines species development using the following metaphor: "As buds give rise by growth to fresh buds, and these, if vigorous, branch out and overtop on all sides many a feebler branch, so by generation I believe it has been with the great Tree of Life, which fills with its dead and broken branches the crust of the earth, and covers the surface with its ever-branching and beautiful ramifications" (177). Like the novel's representation of an ecosystem, Darwin's figure situates individuals within an evolutionary network and attempts to chart evolution over time. Hardy's allusion to the "Tree of Life" is strengthened by the imagery of the woodlands and the peculiar circumstances of South's death following that of the great tree outside his window. Beer remarks that,

> In *The Woodlanders* Hardy reuses the image of the tree, first in the abbreviated anthropological/psychological riposte of the old man whose life is literally dependent on the tree which has grown alongside his life's span; then through the entire imagery of work which places the human at the service of the natural

> world, and most strikingly in passages…in which the human is seen as part of (not fully in control of) natural process. (233)

Although South's life is connected to the woodlands as it represents a unit of measurement for legal purposes, it is more literally connected to nature as it is governed by the tree on his property. This tree functions as an allegorical "tree of life" in that its death results in South's;[10] as Levine remarks, his "life is entirely inwoven with the life of that frighteningly swaying tree—South too is a part of nature" ("*Woodlanders*" 175). Apart from South's death, however, the idea of the "Tree of Life" pervades the novel as Hardy depicts the struggle for existence and the evolutionary relationships which have evolved between the inhabitants, creatures, and plants of Little Hintock. Although Beer and Levine recognize how Hardy's tree imagery establishes a sense of Darwinian connectedness in the woodlands, the temporal implications of this metaphor require further analysis. In Darwin's diagram, species evolution develops along a temporal axis, and in *The Woodlanders* Hardy essentially illustrates a slice of Darwinian time: the novel's setting and events are similar to a section of the diagram within a temporal continuum that extends interminably. Like a stratum of time, *The Woodlanders* shows connections as they exist within the ecosystem for a specific period, that of the novel's timespan, while the continuum of time extends in either direction, representing the past and future outside the novel's events.

The material embodiments of time in the landscape, including the physical manifestation of a "Tree of Life," are accompanied by a spatialized description of relations that produces a thickening of the novel's time. Deep time is an essential component of this Darwinian world, and

[10] South's illness is brought on by fear of the "tall elm, familiar to him from childhood, which stood at a distance of two-thirds its own height from the front of South's dwelling.… [T]he sight of its motion, and sound of its sighs, had gradually bred the terrifying illusion in the woodman's mind [that it would descend and kill him].… This fear it apparently was, rather than any organic disease, which was eating away the health of John South" (83-4). In a bid to save his life Fitzpiers recommends its removal, but it produces the opposite effect: "As soon as the old man saw the vacant patch of sky in place of the branched column so familiar to his gaze he sprang up, speechless; his eyes rose from their hollows till the whites showed all round; he fell back, and a bluish whiteness overspread him" (94).

it is through this "scale enlargement along the temporal axis," to use Dimock's phrase, that extensive spatial-temporal connections can be perceived (5). In his novels Hardy portrays time as a continuum which encompasses different timescales; in *The Woodlanders*, he is primarily focused on illustrating humans' roles in the spatial-temporal web of existence. Unlike the cliff-hanger scene in *A Pair of Blue Eyes*, for instance, he does not imagine a voyage through deep time; instead, his novel's milieu functions as a microcosm of larger evolutionary processes and represents a cut of time that illustrates the connections developed over vast timescales. While the historic and archeological past was presented as layers underneath the protagonists' feet in *Two on a Tower*, the woodland ecosystem's extensive connectivity is itself proof of deep time. Despite the novel's secluded rural setting, its events are connected with much vaster timeframes: "Hardy's descriptive introductions of this story's human actors establish the interconnectedness of celestial and terrestrial forces at work within them and around them. Each character embodies, in unique combination, the variable action and interactions of the laws of nature, human nature and society" (Gossin 205). The narrator specifically locates Marty and Giles within broader spatial-temporal contexts: "Hardly anything could be more isolated, or more self-contained, than the lives of these two walking here in the lonely hour before day, when grey shades, material and mental, are so very grey. And yet their lonely courses formed no detached design at all, but were part of the pattern in the great web of human doings then weaving in both hemispheres, from the White Sea to Cape Horn" (20). This passage shares affinities with Dimock's proposal that deep time enables us to understand literature not "as a discrete entity" but "as a crisscrossing set of pathways, open-ended and ever multiplying, weaving in and out of other geographies, other languages and cultures" (3). Hardy's passage describes a thickening of time, and temporal

relations seem akin to spatial connections as both encompass the "weaving" of individual lives, generations, and even flora and fauna within a greater fabric of time and space.

If "the great web of human doings" is comprised of individuals' material existence in space and time, then the temporal becomes a spatialized dimension since the passage of time produces material effects. In this sense, Hardy's usage of the term "temporal" encompasses its various definitions. In its most common modern usage "temporal" means "Of, pertaining, or relating to time, the present time, or a particular time." However, the *OED*'s definition of temporal also includes "Lasting or existing only for a time; passing, temporary," "Of or pertaining to time as the sphere of human life; terrestrial as opposed to heavenly; of man's present life as distinguished from a future existence; concerning or involving merely the material interests of this world; worldly, earthly. (Opp. to *eternal* or *spiritual*.)," and "Secular as opposed to sacred" ("Temporal"). In *The Woodlanders* "temporal" means not just "relating to time" but also "temporary" and "terrestrial as opposed to heavenly" or, I would suggest, material as opposed to ideal. For instance, Hardy writes that "[t]he intersection of [Fitzpiers'] temporal orbit with Mrs. Charmond's for a day or two in the past had created a sentimental interest in her at the time, but it had been so evanescent that in the ordinary onward roll of affairs he would scarce ever have recalled it again" (172). An individual's "temporal orbit" refers to one's material existence, or the space and time he or she occupies within a vaster temporal continuum. Although the novel's characters are often preoccupied with idealized notions, Hardy insists on material reality and the physical place individuals occupy within a spatial-temporal network. *The Woodlanders* consistently denies the possibility of realizing human ideals since they exist in one's imagination rather than the material world. For instance, Dr Fitzpiers is mistaken when he believes that Grace has visited him in a dream, since she was actually in his home (in both

"Time" and "Space"). He exclaims: "I thought, what a lovely creature!—the design is for once carried out. Nature has at last recovered her lost union with the Idea! … I almost wept when I awoke and found that you had appeared to me in Time, but not in Space, alas!" (118).[11] Fitzpiers, who "endeavour[s] to carry on simultaneously the study of physiology and transcendental philosophy, the material world and the ideal" (119),[12] mistakes the real for the ideal; ultimately, his relationship with Grace will unfold with complications along the material plane. Hardy insists that human ideals do not correspond to reality, and that which does not materialize simply remains unreal; or, as Gossin puts it, "Human life is lived along time's arrow; missed opportunities do not pass by again" (209). For an event to occur on the temporal plane, it must manifest itself materially as well.

However, Hardy does not evacuate these "missed opportunities" from his narrative. Instead, they hover above the plot, so that *The Woodlanders*' narrative time is thick with the unfulfilled possibilities of alternative narrative paths and ideals which never materialize. Like *Origin of Species*, which often "invite[s] readers to explore narrative trajectories that exist only in the imagination" (Choi, "Natural History" 287), this sense of possibility thickens the novel's narrative time. Tina Young Choi's description of "works like Eliot's novels and Darwin's *Origin*" in which "the future became a realm shaped not primarily by the quality of individual belief, whether rational or theological, but by engagement with the hypothetical, a space thick with narratives describing an array of consequences, unrealized outcomes, and diverging

[11] Fitzpiers explains, "My thoughts ran in that direction because I had been reading the work of a transcendental philosopher last night; and I dare say it was the dose of Idealism that I received from it that made me scarcely able to distinguish between reality and fancy" (118). Although the "philosopher" in question is not identified, Levine categorizes Fitzpiers' thinking as "watered down German romantic philosophy" ("*Woodlanders*" 190).

[12] Fitzpiers presents a parallel to *Middlemarch*'s Lydgate; they are both doctors who move to small towns and enter local courtships. Levine proposes that Fitzpiers's "enterprise [to discover…a point of contact between (the material world and the ideal)] is the same as Lydgate's, who, in his search for the primitive tissue, seeks also to 'pierce the obscurity of those minute processes which prepare human misery and joy.' The coincidence of objectives and situation is so close that it is hard not to think of this as something of a parody of George Eliot, herself; but in any case, it is a parody of ideas that Hardy takes with the greatest of seriousness and that are central to the novel" (191).

alternatives" (278) seems apt for Hardy's novels and *The Woodlanders* in particular. The landscape is rife with evidence of its material shortcomings, divergences from ideal forms, and stunted Darwinian possibilities:

> [Grace and Mr. Melbury] went noiselessly over mats of starry moss, rustled through interspersed tracts of leaves, skirted trunks with spreading roots whose mossed rinds made them like hands wearing green gloves, elbowed old elms and ashes with great forks in which stood pools of water that overflowed on rainy days and ran down their stems in green cascades. On older trees still than these huge lobes of fungi grew like lungs. Here, as everywhere, the Unfulfilled Intention, which makes life what it is, was as obvious as it could be among the depraved crowds of a city slum. The leaf was deformed, the curve was crippled, the taper was interrupted; the lichen ate the vigour of the stalk, and the ivy slowly strangled to death the promising sapling. (48)

Hardy describes the ways in which nature fails to fulfill its potential, suggesting a hypothetical narrative and ideal inherent within Darwinian thought.[13] Levine explains the contrast between the ideal and actuality of these woods: "There are, indeed, the material woods, meticulously, painfully described, but there is too the human dream of their fullest fruition—akin, one might say, to the vision of natural theology. In the ideal woods, each organism comes to full growth without encroaching on its neighbours" ("*Woodlanders*" 185). The "Unfulfilled Intention[s]" and narratives which proliferate in the novel establish a thickened sense of time and add a dimension of hypothetical or unrealized possibility to its already existing web of relations and timescales.

[13] *Origin*'s many examples of "hypothetical" (196) thought include Darwin's explanation that "fortuitous destruction … ha[s] little or no influence on the course of natural selection. For instance a vast number of eggs or seeds are annually devoured, and these could be modified through natural selection only if they varied in some manner which protected them from their enemies. Yet many of these eggs or seeds would perhaps, if not destroyed, have yielded individuals better adapted to their conditions of life than any of those which happened to survive" (68 [1872]).

This Darwinian mode of hypothetical thinking plays out at the human level in *The Woodlanders* as well, where "[u]pon the freshly cleared *tabula rasa* of the woods, then, lit and backlit by the stars, sun and moon, Hardy is free to offer a new consideration of the *possibilities* of living a full and fruitful life in contrast to the *probabilities* of living an empty and meaningless existence" (Gossin 204). The narrator suggests the possibility of an ideal outcome of events which is, ultimately, denied to the reader. These prospective plots enact Darwinian imaginative thinking in a novelistic register as they propose alternative romantic or emotional narratives as "Unfulfilled Intention[s]." This type of hypothetical digression is most apparent in Grace and Giles's thwarted romance: if the pair had communicated differently or been less attuned to social expectations, their union may have succeeded and Giles survived. The narrator directs the reader's attention to an alternative narrative possibility at a key moment:

> Had Giles, instead of remaining still, immediately come down from the tree to her, would she have continued in that filial, acquiescent frame of mind which she had announced to him as final? If it be true, as women themselves have declared, that one of their sex is never so much inclined to throw in her lot with a man for good and all as five minutes after she has told him that such a thing cannot be, the probabilities are that something might have been done by the appearance of Winterborne on the ground beside Grace. But he continued motionless and silent in that gloomy Niflheim or fog-land which involved him, and she proceeded on her way. (86)

This hypothetical plotline, like an ideal form, exists on an alternative temporal plane: it does not occur and cannot be said to exist, yet readers are nevertheless aware of its possibility permeating the text. These passages recall *Daniel Deronda*'s line of hypothetical thinking as both novels

register alternative and unrealized narrative possibilities. Hardy's narrator, however, emphasizes the sheer chance of these interactions (we have the impression that this alternative ending could have transpired), while Eliot's seems to acknowledge a degree of fate which informs her characters' lives.[14] These types of unfulfilled narratives burden the text and thicken its temporal scope. By recognizing the "Unfulfilled Intention," Hardy offers a Darwinian counterpart for these failed narratives which exist in the narrator's and reader's imaginations, but outside the novel's time and plot.

Finally, Hardy uses the novel's rural setting to suggest that the inhabitants of Little Hintock are aware of vast timescales by being in tune with natural time cycles. Gossin notes:

> As in *A Pair of Blue Eyes*, astronomical realities are subtly present in this virtual terrarium, being most often felt simply, obviously and directly by the characters—as by most humans from time immemorial—through its influence upon the immediately surrounding environment and its atmosphere: in the effects of the changing seasons upon the works and days of the rural folk; through the light and warmth of the sun; through local weather patterns and fluctuations; and the effects of moonlight on human behaviour. (205)

The Woodlanders proposes a provincial understanding of time that acknowledges non-human timescales and corresponds with cosmic cycles. Hardy writes: "Almost every diurnal and nocturnal effect in that woodland place had hitherto been the direct result of the regular terrestrial roll which produced the season's changes; but here was something dissociated from these normal sequences, and foreign to local knowledge" (44). The "something dissociated" is, of course, Fitzpiers, "a somewhat rare kind of gentleman and doctor to have descended, as from

[14] For example, Eliot's narrator admits: "one is tempted to that futile sort of wishing—if only things could have been a little otherwise then, so as to have been greatly otherwise after!—if only these two beautiful young creatures could have pledged themselves to each other...and never through life have swerved from that pledge!" (*Deronda* 55-56).

the clouds, upon Little Hintock" (93), who invades and disrupts the rural community. In this sense, vast nonhuman timescales of "natural cycles and…astronomical patterns" are "reassuring" in comparison to the disruptions "of human-made change in the environment" (Gossin 206). Significantly, the sense of time the woodlanders derive from natural cycles and patterns shares affinities with scientific concepts of vast timeframes. Rural settings, Hardy proposes, provide venues for private experiences of the non-human timescales endorsed by science; both rural and scientific temporal perspectives produce an understanding of one's place within nature.

In this sense, an internalized understanding of natural or scientific time can be seen as an alternative to the modern, urban, and synchronized time of progress which is generally missing from Hardy's rural narratives. In *The Woodlanders* and other novels, Hardy suggests that this rural recognition of one's place within non-human timeframes is threatened by the advance of modernity. "In *Tess* and *Jude*," Gossin proposes, "the possibilities of human beings achieving a life of harmony within the confines of the natural laws of biology and evolution are reduced to next to nothing as the world of the 'moderns' (like Fitzpiers) continues to encroach upon the rural environment, thwarting the attempts of its inhabitants to fit themselves to an increasingly *unnatural* world" (209). Gossin's observation, that "[t]he urban and rural worlds are not just different cultural places, they are different cultural *times*. … [T]he modern world has deeply encroached upon the fast-fading habitat of creatures like Tess" (215), seems equally applicable to the woodlanders. There is a different speed of life in Hardy's rural settings: Little Hintock, for instance, exudes a sense of stillness that reflects the community's adherence to rural and agricultural time cycles rather than the hectic pace of modern life. This unhurried pace of life is apparent in the characters' habits and the narrator's description of the village as "one of those sequestered spots outside the gates of the world where may usually be found more meditation

than action, and more listlessness than meditation" (7-8). Grace views the early morning "stillness" in similar terms: "The tree-trunks, the road, the outbuildings, the garden, every object, wore that aspect of mesmeric passivity which the quietude of the daybreak lends to such scenes. Helpless immobility seemed to be combined with intense consciousness; a meditative inertness possessed all things, oppressively contrasting with her own active emotions" (150). In part, this reduced pace of life seems to result from the rural community's acceptance of non-human timescales (such as the astronomical cycles previously mentioned) and their immersion in nature. This slower rhythm of living presents an alternative to modern concepts of time associated with the progress of cities and standardized time-keeping. Hardy suggests that a slower tempo of life results from an understanding of one's place within vast timeframes and nature, so that it is more in keeping with rural time cycles.

Interestingly, an understanding of scientific timescales may corroborate mythic or primitive explanations of natural phenomena. Hardy suggests that the rural setting and primitive customs of the woodlands enable a more direct engagement with nature and vast timescales than modern and urban life. In this sense, his interests in science and rural myths coincide, as he draws on both to position his characters and their stories in relation to nature, history, and deep time. Rural mythology strives to explain many of the same natural events and time cycles which were being analysed by scientists, and Hardy's settings reference folklore, including solar and planetary mythology, that functioned to situate individuals and humans within vast spatial and temporal frames.[15] Gossin notes that "[n]umerous critics have marked the influence on [Hardy's] work of the archaeological speculations and solar myths of Norman Lockyer and Max Müller, especially apparent in the staging of the final Stonehenge scene in *Tess*" (42). She proposes that

[15] For instance, *Two on a Tower* contrasts the rural characters' superstitious reactions to a comet with Swithin's astronomical interpretation; both, however, are trying to make sense of natural phenomena (78-80).

> Hardy garnered a sense for how primitive humans may have felt living beneath a seemingly capricious sky, how they considered natural phenomena such as the movements of the sun, moon, stars, and planets, meteors and the weather, and how they devised strategies to try to predict and control them. Bit by bit, Hardy accumulated a feel for a prehistoric world view that he could compare to his era's and his own. (43)

In this sense, mythic explanations of natural phenomena play a similar role to scientific investigations into deep time. For instance, the physics which inform Swithin's astronomical studies and the mythology referenced in *The Woodlanders* both acknowledge the vast frames of space and time that exist beyond the earth. In the woodlands, there is little mediating technology between individuals and nature: as Marty leaves her home in the evening, "[t]he night in all its fulness met her flatly on the threshold, like the very brink of an absolute void, or the ante-mundane Ginnung-Gap believed in by her Teuton forefathers; for her eyes were fresh from the blaze, and here there was no street-lamp or lantern to form a kindly transition between the inner glare and the outer dark" (15).[16] The rural setting fully exposes Marty to the night, and the woodlands' history of Norse mythology reflects an attempt to understand non-human time cycles ("the night") and spaces (the "absolute void"). Despite his astronomical prowess, Swithin describes the sky's vast spaces—which he explores with the aid of a telescope—as "[i]mpersonal monsters, namely, Immensities"; he explains that these "monsters of magnitude without known shape….are the voids and waste places of the sky" (29). Moreover, during his observations in South Africa, he admits to feeling a heightened fear of the sky in the Southern hemisphere without the sense of history which, from his Eurocentric perspective, characterizes "the north stellar region" (250). Both mythic and astronomical explanations acknowledge a frightful sense

[16] Ginnung-Gap is, "in Norse mythology, the void that was all that existed at the beginning of time" (Kramer 342).

of nothingness outside human existence and convey a private and inherent reaction to deep time and vast space. The rural myths which have been used to contextualize human life and explain nature's processes for centuries prefigure scientific research that strove to explain nature for human benefit. In this context, scientific concepts of deep time might be seen to function as an extension of the mythology which recognized non-human time and space, and scientific timescales to correspond with rural, agricultural, and natural time cycles.

For Hardy deep time is embodied by fossils, landscapes, stars, and ecosystems that reveal the natural processes at work over vast time periods. However, he also insists that individuals constitute components—no matter how small—within the continuum of time. His characters are unmistakeably part of nature's evolutionary and geological processes as their "temporal orbit[s]" interact with a wider "web" of relations across earth and time. They are not isolated from temporal processes such as decay or natural selection, and they unwittingly participate in the evolutionary process by carrying hereditary markers of the past and containing seeds of that which will develop into the future. Moreover, by illustrating how individuals are part of vaster natural processes and demonstrating their effects on the environment, Hardy implicates humans within deep time. While he suggests that deep time is embodied within individuals, he also proposes that recognition of deep time constitutes an individual experience (as when Knight envisions stages of the past, or when Swithin and Viviette suffer existential crises in the face of astronomical time and space). His novels consider how humans conceive of or struggle to grasp vast timescales and explore the effect that our recognition of deep time produces, given that it plainly reveals human insignificance and the material reality of existence. Gossin observes that,

> For Hardy, the accumulated "truths" of Victorian natural sciences, especially those of astronomy, are not "terrible" in and of themselves; instead, they help him

> formulate what will remain a crucial question throughout his life and career: how can anyone cope with the truly frightening fatal flaw in nature's unintended consequences, namely, that beneath an *astronomical* sky, filled with evolving and decaying stars, upon this actively *geological* planet, *biological* beings should ever have evolved *consciousness* of our own evolution and mortality? (116-17)

Hardy's novels retain a realist perspective on deep time while they attempt to situate individuals and communities within vast timeframes: characters grapple with vast timescales and narrators evoke remote eras to translate deep time into the familial scale of the novel. However, the central questions he considers—how are humans and individuals situated in deep time, how might vast timescales be conveyed in human terms, and how does human knowledge of deep time affect us?—were also being addressed in a very different manner by scientific and popular romances. Where Hardy focuses on transmitting deep time within the framework and familial scale of realist novels, authors like Bulwer, Haggard, and Wells employ fantastic scenarios to imagine confrontations between individuals and different eras, alternative histories, or undiscovered species. Essentially, they bring Knight's cliff-hanger fantasy to life while envisioning future possibilities for the human species. Although Hardy humanizes vast timescales and utilizes folding time to fit deep time into the realist novel while romance authors generate fantastic settings and histories, both narrative approaches focus on the imaginative possibilities of science and propose literary methods of conveying unfathomable timescales.

CHAPTER 3
"Into Futurity": Time Travel and the New Romance

This chapter will analyze three late-Victorian popular romances that combine science and fantasy to depict alternative histories, undiscovered species, and different eras. Despite their fantastic elements, these texts evince similar preoccupations with deep time and scientific temporalities as those in realist novels. Edward Bulwer-Lytton's *The Coming Race* (1871), H. Rider Haggard's *She* (1886-87), and H. G. Wells's *The Time Machine* (1895) use the structure of adventure or travel tales to incorporate deep time and render different eras coexistent in their narratives: their characters travel to unknown locations which also represent unfamiliar and remote time periods. By using this travel-model, Bulwer, Haggard, and Wells are able to depict temporal folds, wherein two chronologically distinct moments intersect, as cross-cultural encounters. These interactions between contemporary protagonists and unfamiliar times, alien individuals, or post-human species render deep time as inhuman, although the narrative staging of these interactions also works to make deep time accessible to human understanding. While Hardy draws parallels between natural processes which occur at both human and vast scales, these authors use fantastic settings and characters to depict deep time as alien and threatening. If the predominantly realist novels of my previous chapters use folding time to position characters in relation to remote eras or humanize vast timescales, these romances evoke deep time in order to reveal the *inhumanity* inherent within our species. In Bulwer, Haggard, and Wells, folding time-via-time travel not only juxtaposes or connects remote eras but exposes animalistic, prehistoric, post-human, or monstrous vestiges or seeds within even the most modern and ostensibly civilized human specimens. By using a vaster temporal perspective and comparing distant eras, these texts trouble the category of the human by showing its potential to shift.

Like *Deronda*'s opening epigraph, these texts also draw attention to the limitations of human time-keeping systems and scientific knowledge. In these romances, time travel—whether metaphorical or literal—reveals multiple, simultaneous, and alternative timelines and histories which unsettle the notion of a singular and comprehensive time-keeping system. Concurrently, the new scientific perspectives uncovered via time travel reveal the subjectivity and limitations of scientific knowledge. The texts' undiscovered locations have different methods of time-keeping, alternative histories, or unknown species; essentially, they reveal time concepts to be relative to species, cultures, and different eras. This temporal relativity destabilizes rather than restores the authority of standardized time; in Bulwer and Wells, it also decentres the human species and challenges anthropocentric interpretations of history. The temporal experiences which threaten to overwhelm the protagonists' conception of linear history, Western civilization, and standard time are often aligned with deep time. Finally, these scientific romances expand the temporal frame common to all these works by extending it well into the future. While they remain interested in continuities or recurrences of the past in the present, these texts push their narrative focus forward to imagine what deep time will encompass and where it will lead in the future. These scientific romances depart from the representations of the past in the novels of Dickens, Eliot, and Hardy to anticipate narratives of decline and extinction for humankind.

Although Bulwer's and Wells's novels are proto-science fiction while Haggard's hugely successful *She* is an imperial adventure, all three works incorporate legitimate and fantastic science into the novel genre and document cultural encounters to register temporal differences. While there are many points of intersection among *The Coming Race*, *She*, *The Time Machine*, and their authors,[1] it is significant that the works use romance and fantasy elements to represent

[1] The parallels between *The Coming Race* and *The Time Machine* are evident in their depictions of a subterranean race, post-human species, and use of satire. There is an interesting connection between Haggard and Bulwer's

alternative temporality and scientific time. In this sense, they contribute to the late-nineteenth century New Romance and early science fiction. Michael Saler explains that a vital characteristic of the New Romance was its use of seemingly rational or scientific documentation to substantiate outlandish plots: "Many of the[se] works…utilized the latest advances in printing technologies…to incorporate photographs, drawings, diagrams, and maps as a complement to the authors' aim of imbuing their fantasies with an aura of scientific authenticity," and their "imaginative explorations were grounded in rationalist tropes" (612). Saler's description is apt as these three texts combine indisputably fantastic plots with a rigorous narrative pretence of realism and scientific legitimacy. They explore scientific deep time through romance conventions by imagining different eras and the post-human world in fantastic and sensational terms, and they adopt the techniques of non-fiction writing in service of romance narratives.

Naturally, a late-nineteenth-century "romance revival" (Daly 7) which incorporates contemporary scientific perspectives and employs recent technology to produce its paratextual elements bears resemblance to and often overlaps with the emerging genre of science fiction. Although the term is anachronistic for the period,[2] Bulwer, Haggard, and Wells certainly produced proto-science fiction works given that "[the label] 'science fiction' suggests a hybrid form, not quite ordinary fiction, not quite science, yet partaking of both," ("Science Fiction"). Adam Roberts defines science fiction as "that genre of literature that, even when it uses realist textual strategies, proceeds from a nonrealist premise," and he notes that, in comparison with

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families which ties into Haggard's work in Africa: Haggard's father asked Sir Henry Bulwer, the novelist's nephew, to take his son as staff for his trip to Natal as Lieutenant-Governor (Mazlish 737). More directly, in 1887 Haggard acknowledged Bulwer's literary influence when he wrote that "my two favourite novels are Dickens' *Tale of Two Cities* and Lytton's *Coming Race*. Both these books I can read again and again, and with an added pleasure" (qtd. in Mazlish 738). Haggard and Wells were acquainted (Daly 1) and Wells had reviewed the former's work for the *Saturday Review* (Philmus, "Wells as Literary Critic" 172).

[2] Saler dates "the establishment of 'science fiction' as a defined literary genre in 1926": "The phrase 'science fiction' and the first magazine devoted to it were established in America by the Luxembourg immigrant [Hugo] Gernsback. *Amazing Stories* was established in 1926 to publish 'scientifiction'; Gernsback modified the ungainly phrase to 'science fiction' in 1929" (605).

American versions, "British science fiction has developed a reputation as something gloomier, more pessimistic, in which the negative aspects of technology are stressed." *The Coming Race*, *The Time Machine*, and, to a lesser extent, *She*, certainly portray scientific and technological advancements as potentially threatening for humankind. Darko Suvin claims that science fiction ("SF") "hinge[s] on the category of the *novum*," a "cognitive innovation [which] is an important difference superadded to or infused into the author's empirically 'known'— i.e., culturally defined — world…; or, more usefully, it is an important deviation from the author's norm of reality." He contends that "the essential tension of SF is one between the reader, representing a certain type of Man of our times, and the Unknown introduced by the *novum*," which might include an "invention,...scene (spatiotemporal *locus*), agent (main characters), and/or relations basically new and unknown in the author's and the implied reader's environment." Finally, Suvin, drawing on Robert Philmus, "distinguishes naturalistic fiction which does not require scientific explanation, and fantasy which does not allow it, from SF which both requires and allows it" ("State of the Art" 36). While Farah Mendlesohn proposes that a "sense of wonder is the emotional heart of sf," she similarly notes that "[t]he earliest sf relied on the creation of a new invention, or an arrival in a new place" (3). By these definitions, *The Coming Race*, *She*, and *The Time Machine* constitute early works of science fiction. Their protagonists represent both "the reader" and "M[en] of our times" as they discover new worlds; further, Bulwer's *vril* and the Vril-ya, Haggard's Flame of Life and the longevity it bestows, and Wells's time machine are examples of "the *novum.*" As I will discuss shortly, *The Coming Race* is part of both science fiction's hollow earth and alternative history subgenres. Admittedly, *She*'s supernatural elements prevent it from being a pure science fiction text,[3] but it certainly contains elements of the genre:

[3] *She*'s supernatural and spiritual elements such as reincarnation make it a problematic work of science fiction: "It is intrinsically or by definition impossible for SF to acknowledge any meta-physical agency, in the literal sense of an

namely, its representation of an alternative history and previously undiscovered scientific premises are features of science fiction, and indeed Tim Murray claims that "Haggard's romances were pure science fiction or science fantasy" (181). *The Time Machine*, which Wells later referred to as his "first scientific fantasia" (*Autobiography* 172), remains one of the genre's most influential works and inaugurated the trope of the time machine.

Moreover, Bulwer, Haggard, and Wells go to great lengths to establish a sense of scientific legitimacy in their romances. They draw on contemporary science writing to present seemingly plausible explanations for the occurrences in their otherwise fantastic texts. Bulwer's narrator adopts an anthropological outlook and analyses the technological innovations and language of the subterranean Vril-ya with extensive references to Lyell, Faraday, and philologist Max Müller, to whom the novel is dedicated. *She* uses archaeology to substantiate its narrative and includes editorial annotations, historical references, and extensive facsimiles of transcriptions, convincingly academic scholarship which Haggard only augmented for subsequent editions by including photogravure images of a potsherd made to match the "Sherd of Amenartas" (Stauffer 29-30). Wells draws on mathematical theories to lend credibility to his explanations of the time machine, and his evolutionary and thermodynamic premises are largely based on Darwin's, Huxley's, and Thomson's theories. His scientific education and writing made him well-equipped to explore the possible outcomes of nineteenth-century scientific theories in *The Time Machine*. The scientific references and often plausible explanations for the advanced technology and fantastic innovations portrayed in these texts achieve an effect of realism. *The Coming Race*, *She*, and *The Time Machine* appropriate features of non-fiction writing, and their extensive realist elements trouble the facile critical distinction between romance and realism.

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agency going beyond *physis* (nature), beyond the ideal possibilities of physics or any other science. Whenever it does so it is not SF but a metaphysical or (to translate this from Greek to Latin) a supernatural story. The presence of scientific cognition…differentiates thus SF from the 'supernatural' genres or fantasy" (Suvin "State," 37).

Given the remarkable technological and scientific developments of the nineteenth century, the realistic narrative treatment of fantastical occurrences presents itself as a real-seeming generic option. Moreover, these romances manage to explore the implications of contemporary scientific theories and social issues because of—and not despite—their fantasy elements: the introduction of the *novum* enables them to imagine alternative histories and future conditions.

The New Romance employs different techniques to represent deep time from those used by predominantly realist novelists such as Eliot and Hardy. Bulwer, Haggard, and Wells represent deep time as monstrous, alien, and inhuman and describe vast time through the language of sensation, fantasy, and horror. They often mine vast timescales and non-human concepts of time for terror and channel their scientifically-informed portrayals of deep time into fantastic descriptions of alternative histories, new species, and the future. Like Hardy, these authors translate deep time into recognizable literary forms, rendering an overwhelming concept of time accessible and comprehensible through novelistic rather than mathematical terms. In their recourse to techniques of the romance genre, however, Bulwer, Wells, and Haggard shift their focus from individual and familial history toward other common features of fiction such as fantastical occurrences or seemingly supernatural life forms and sensational plots. While Hardy employs realist narrative conventions such as narrative asides and landscape descriptions to incorporate deep time into his novels and translates deep time into a human scale by drawing it into relation with, for instance, the emotional history of a pair of lovers, these texts do not convert deep time into human terms. Although they filter the concept of deep time through their characters' viewpoints, they establish it as inhuman by conveying it through unrecognizable or post-human species, inconceivable longevity, or unfamiliar timescales. Knight's sensational cliffhanger and fantastic vision of the past, and Swithin's descriptions of the terrors of astronomy

foreshadow this approach, but ultimately Hardy uses human scales as analogies for vast scientific-historical scales while these romances represent deep time as alien and unassimilable to human scales. Moreover, these romances juxtapose different time periods to suggest the inhuman within the human species: the contemporaneous yet post-human Vril-ya, Ayesha's devolutionary transformation and Holly and Leo's reversion to primitivism, and the degenerated Eloi and Morlocks demonstrate the ease with which humans might become something other.

While these texts explore temporality within fantastic contexts, they reveal an interest in human subjectivity and the partiality of perception which is generally associated with the high realism of novelists like Hardy and Eliot. Bulwer's, Haggard's, and Wells's first-person narrators are used to explore the limitations of human observation and subjective temporal experiences. Critics are increasingly identifying the commonalities between late-nineteenth century popular or imperial romances and the contemporary realism and modernism of canonical authors like Henry James and Joseph Conrad; however, it is also important to acknowledge that these romance authors continue to explore the subjectivity of temporal experience and the psychological dilemma of deep time apparent in Dickens, Eliot, and Hardy. The texts studied in this chapter arguably push the exploration of subjective temporality further than their realist precursors by employing unstable narrators and emphasizing the temporal limitations inherent in the human point of view. Moreover, since their fantastic settings enable them to imagine characters facing embodiments of deep time in unfamiliar locales or post-human species, they can more directly address the psychological implications of deep time.

Additionally, these popular romances continue to discern the tension between deep time, which is immeasurably vast and extends far beyond the human scale, and chronometry and chronology, which strive to measure, quantify, and divide time into discrete units or categorize

events by precise dates. In these texts, deep time breaks through or overwhelms modern chronometry and disrupts linear time. As in Dickens, Eliot, and Hardy, these texts suggest that clock-time is inherently artificial and insufficient, especially in the face of vast timescales. Although *The Coming Race* maintains a linear representation of time, Newtonian chronology and human concepts of history and time-keeping are called into question by the evolutionary evidence of the Vril-ya: the processes of deep time which produced their species tell a different and more threatening story than humans realize. Similarly, *She*'s vast timeframes and cyclical time of reincarnation butt against the linear understanding of Western history introduced through Leo's ancestry: these time cycles establish disconcerting simultaneities which overwhelm chronology and orderly time. Wells's Time Traveller relies on chronometric technology to perform his journeys in time, but the devolution and universal dissipation he witnesses exceed any sense of chronometric order: when he travels "more than thirty million years hence" (147), the terrible and disordered landscape of cosmic dissipation produces a dizzying effect on him. In this sense, these encounters with deep time seem to extend from Dickens's subjective temporality as they produce personal and psychological reactions to time which are at odds with the order, precision, and linearity of chronometric time.

In a significant departure from realist novels, these popular romances incorporate deep time or other time periods into their linear plots through metaphorical—and in *The Time Machine*, literal—time travel. Paul Cantor and Peter Hufnagel propose that "the imperialist expansion of Europe in the nineteenth century opened up the imaginative possibility of time travel" as "[t]ravelers to remote corners of empire often had the impression that they were entering the world of the past" (37). These narratives are structured as travelogues in which journeys to unfamiliar places also represent encounters with different stages of civilization, time

periods, and non-human or deep time. "Folding time" occurs when characters encounter different time periods in their travels, so that their present is brought into contact with a different era, represented by an alien location, species, or individual. This narrative model allows these authors to produce temporal simultaneity between different time periods, so that a contemporary protagonist can experience other ages. For instance, *The Coming Race*'s narrator traverses geological layers to discover the futuristic world of the Vril-ya and foresee their ascendancy. In *She*, the protagonists voyage to Africa and encounter a previously unknown history in the kingdom of Kôr. Wells depicts a literal version of time travel as the Time Traveller's invention enables him to move along the temporal—rather than spatial—dimension. These encounters bring characters in contact with other time periods or with evidence of the scientific processes which unfold over deep time, such as evolution, gradualism, and cosmic dissipation.

By presenting characters' movements through time in the spatialized terms of travelling, these authors incorporate the past or future differently than do their realist counterparts. Namely, these moments of folding time or simultaneity between disparate chronological events are not just described by narrators or imagined by characters; they constitute key elements of the novel's plot. In this sense, these romance authors, unlike their realist peers, do not need to depart from their linear narratives to include tangential or descriptive moments of deep time. Unlike novels such as Hardy's, in which the past endures or is envisioned in the present, these romances employ a literal rather than imaginative model of folding time to portray different times periods which exist in the same "now." For instance, while Knight's cliffside encounter with a trilobite fossil produces a moment of folding time in which he mentally revisits the past, Wells's Time Traveller actually inhabits a future era. As in Hardy's novels, these texts depict material embodiments of deep time; however, the romances tend to bring these fossils or unfamiliar

landscapes to life. Andrew Stauffer describes *She* as "a romantic, interactive version of the museum experience" (14), and indeed this "interactive" component differentiates the realists' imagined (pre)history from the responsive versions of these romances. In Bulwer's and Haggard's texts these encounters are not strictly with different time periods; however, they take place between individuals and civilizations which embody the future and the ancient past, respectively. These romances incorporate folding time into their plots so that time travel becomes part of their sequential narrative while simultaneously suggesting the non-linear possibility of accessing different time periods. Moreover, the futurism of *The Coming Race* and *The Time Machine* enables Bulwer and Wells to imagine what it might be like to look back on human artefacts as relics, aligning humankind with Hardy's fossilized trilobite.

Although the notion of time travel is obviously fantastic, the association of travel or imperial exploration with systems of time reflects nineteenth-century British interest in standardizing time. The connection between remote spaces and different times was substantiated by the official standardization of time effected by the Greenwich Observatory in 1884. As prime meridian and Royal Observatory, Greenwich linked time, space, and numerous scientific disciplines—physics, astronomy, geography—with an increasingly precise and standardized daily clock-time. Although "British clocks had…been synchronized to Greenwich since the mid-1850s," Barrows stresses: "What is significant about 1884 … is that it marks the date when England begins to *export* British time as a commodity to an entire globe newly dependent on Greenwich precision" (8). The 1884 Prime Meridian Conference, then, proposed "British time" as an "export[able]…commodity" and "provid[ed] a global grid whereby the minutest spatial unit and the most infinitesimal duration of time could be measured in relation to Greenwich, England" (1). The global implications of standardized time—which takes the Greenwich

Meridian as its starting point—inform the spatialized representation of time travel in these popular romances, as movement through space is equated to movement through time.

However, while these novels' protagonists embark on exploratory journeys with their standard time perspectives intact, they not only fail to convert those they meet to their time-keeping systems but find them called into question and their personal temporality irrevocably altered. Moreover, scientific knowledge fails to uphold the authority of their standard, objective, and comprehensive time systems; instead, their initial scientific positions and concepts of time appear subjective and relative. The scientific knowledge these protagonists glean from their adventures exposes the anthropocentric and/or Eurocentric biases embedded in their concepts of time. It also suggests that human time-keeping is insufficient to account for natural processes such as evolution which unfold over deep time scales. For instance, *The Coming Race*'s narrator applies an anthropological method—a product of human scientific study—to understand the Vril-ya's time system, their more sophisticated chronometry, and evolutionary history, only to find that it does not measure up to their more advanced systems. He ultimately acknowledges their supremacy and fails to provide a definite account of their evolutionary history. In *She*, Horace Holly is forced to re-evaluate his Christian faith and linear understanding of time when confronted by Ayesha's cyclical and materialist concept of time. Wells's Time Traveller fails to adhere to a scientifically objective viewpoint and mathematical understanding of time, while the evolutionary evidence he uncovers changes his outlook on the human species (and challenges the frame narrator's beliefs as well). Science, in these romances, complicates and challenges the concept of an objective and all-encompassing time-keeping system. In fact, the further these characters travel from Greenwich, the less convincing and sufficient their models of standard time appear. These works do not validate a single concept of time as a comprehensive method of

standardization; instead, they undermine the authority of Western models of time-keeping and depict time as culturally-relative. Seemingly influenced by nineteenth-century anthropology, in which "the notion of the objective Western observer [was] beg[inning] to give way to a model of the observer as subjective and culturally situated" (Hovanec 479), they suggest that different cultures, nations, or species retain different understandings of time. Far from advancing a uniform and singular public time, these works propose multiple methods of experiencing and reckoning time. Deep time is situated in relation to these various cultural systems as a vast and inhuman concept that far exceeds human temporality and chronometry.

The imperial implications of these adventure narratives and the encounters they describe between different cultural time systems are evident, particularly in Bulwer's and Haggard's texts. Bulwer's narrator dreams of American imperial expansion and of joining the super-race of the Vril-ya, Haggard's British protagonists set out on their adventure to foreign lands with imperialistic confidence (and, for Holly, under the guise of an African hunting expedition), and the Time Traveller proceeds to the future with similar egoism and attempts to teach the less-advanced Eloi the basics of the English language. In this sense, these novels introduce a temporal version of the "imperial gothic, a subgenre in which the tables are turned on an ostensibly civilized, imperial power, whose people find themselves threatened with colonization, usually at the hands of a 'barbarous' race" (Nayder 213-4), as their Western protagonists risk being converted by the alternative—or "other"—time concepts which they encounter. The protagonists' understanding of time and history are undermined and fundamentally altered by their contact with alien individuals or species. Bulwer's narrator returns above ground having accepted the Vril-ya's chronometry as legitimate and more expert than humankind's; he also takes into account the historic chronology they propose, acknowledges their supremacy, and

fears their ascendancy over the human species. Holly returns to England with a newfound understanding of time as subjective and cyclical as a result of his contact with Ayesha (and anticipates her probable return). Wells's frame narrator reassesses his concept of time and the future based on the Time Traveller's experiences, while the Time Traveller remains literally lost in time (and, it seems possible, mourning his relationship with Weena, a native of the future).

These romances further disturb accepted historical and scientific timelines and standardized time by unsettling the authority of their Western protagonists. As they reveal their main characters to be, to varying degrees, unreliable and biased narrators, these texts call into question their scientific beliefs and time systems. Bulwer's narrator is frequently satirized; his perspective is as often mocked as it is substantiated; and, mostly due to his pro-American bias, he is not represented as a reliable observer or interpreter of the Vril-ya. While *She* presents Holly as a dependable witness, he discloses the increasingly dream-like quality of his time in Kôr, admits confusion when trying to distinguish between reality and dreams, and insists that his writing fails to convey the extent of his experience. Further, Haggard's framed narration, introduced with a preface by a fictional editor, ostensibly maintains the text's truthfulness, but in reality further blurs the lines between fiction and "real life" by combining the factual (references to Haggard's previous book, *King Solomon's Mines*), the historic or archaeological (references to Herodotus and seemingly academic annotations), with the fictional (the highly implausible romance plot). Wells's Time Traveller's shifting hypotheses and innate prejudices are apparent in his first-person narration and suggest a lack of self-awareness despite his technological brilliance. Further, this fallible narrator's experiences are recounted second-hand, from memory, by a friend who lacks any conclusive knowledge about the latter's fate (or verifiable evidence to support his tale). Indeed, Wells seems to be drawing attention to the inescapably partial human

perspectives in his text. The satiric unreliability of Bulwer's narrator, the framed narrations of *She* and *The Time Machine* which present two layers of first-person viewpoints, and the general subjectivity of the first-person narrators contribute to the works' themes of temporal relativity, the subjectivity of temporal experiences, and the partiality of scientific knowledge.

These novels present open-ended conclusions which, far from neatly reinstating the temporal order, admit the validity of the alternative concepts of time to which the narrators are exposed during their adventures. Moreover, these anticipatory and unresolved conclusions—all three narrators await the future with uncertainty—reflect a lack of closure and stable representation at the narrative level of the text. While most instances of folding time in realist novels depict the past infiltrating the present, these popular romances are notably preoccupied with the future and present narratives of decline. These texts anticipate or demonstrate the outcome of the processes which unfold over vast scientific timescales and warn of the annihilation of contemporary civilization or the human species. In *The Coming Race*, for instance, the narrator wonders how long it will be before the Vril-ya conquer or destroy humankind: "Only, the more I think of a people calmly developing, in regions excluded from our sight and deemed uninhabitable by our sages…—the more devoutly I pray that ages may yet elapse before there emerge into sunlight our inevitable destroyers" (168). *She* concludes with its narrator "staring with the eyes of the mind into the blackness of unborn time" (280) as he anticipates the return of Ayesha (her reincarnation was confirmed in Haggard's sequels). After losing his friend in time, Wells's narrator similarly asserts: "But to me the future is still black and blank" (155). In these texts futurity may be threatening, but it is ultimately, disturbingly, unknowable. Geological, evolutionary, and cosmic timescales represent a destabilizing, awe-inspiring, and threatening sense of deep time which serves as a reminder of humankind's

potential for biological regression and the inevitable extinction of individual, species, and planet. Moreover, since their fantastic settings enable them to imagine the future, these romances feature a perspective of looking back on human time that echoes Darwin's claim in *Origin* that "[t]he whole history of the world, as at present known, although of a length quite incomprehensible by us, will hereafter be recognised as a mere fragment of time, compared with the ages which have elapsed since the first creature, the progenitor of innumerable extinct and living descendants, was created" (396-7). It is this paradoxical outlook—attempting to conceptualize the present from a vastly future perspective which we, or our species, will never attain—that time travel enacts. Unconstrained by realist precepts, these romances imagine not only future possibilities but formulate possible future perspectives on the human species. In relation to deep time and from a future perspective, the human species is rendered ephemeral and insignificant; moreover, any human classification appears highly mutable.

Bulwer's "Solemn Quiz on Darwin": Post-Human Evolution in *The Coming Race*

The Coming Race imagines a previously undiscovered subterranean species whose alternative, non-human concepts of time, history, and evolution dismantle the protagonist's understanding of time-keeping and evolutionary history. Using a narrator who adopts an anthropological outlook and drawing on scientific texts, Bulwer satirizes scientific narratives of the past and suggests that time is a culturally-dependent construct. The Vril-ya not only present an alternative perspective on time, history, and human achievement, they also represent a different evolutionary path for the human species. Although critics have analysed the novel's representation of evolution and thermodynamics, its insistent and seemingly superfluous interest in temporality requires further consideration. I contend that Bulwer's meticulous representation

of the Vril-ya's sense of time—via time-keeping systems, chronometry, historic chronology, and evolutionary timelines—functions to establish not just an alternative history but alternative yet concurrent timelines that anticipate time-travel narratives. By exploring parallel human and Vril-ya timelines, the novel produces an early instance of what Charles Tung has identified as a "defamiliarization of time" (94) apparent in late-Victorian and modernist writing. Through the Vril-ya Bulwer produces an alternative history that simultaneously confirms deep time processes and establishes multiple timelines. His portrayal of the discrepancies between human and Vril-ya temporal concepts upholds deep time but destabilizes anthropocentric interpretations of time, history, and evolution; it also troubles the category or classification of the human species. Although the Vril-ya share an ancestry with humankind their evolutionary history (and Bulwer's critique of evolutionary theory) is less clearly defined, and while Bulwer draws on a variety of theories to explain their evolution, none provides a satisfactory method for understanding the species' development. The result is a scientific romance that questions the possibility of establishing a definitive account of species' history. *The Coming Race* examines chronometry, historic timescales, and evolutionary explanations of the past to suggest that scientific theories represent narratives rather than comprehensive explanations of evolution; this perspective, along with Bulwer's satire, challenges anthropocentric interpretations of history and evolution and troubles imperialist evolutionary discourses. By staging the encounter between human and futuristic Vril-ya, *The Coming Race* brings folding time to life and suggests the ephemeral and highly mutable nature of the human species.

In *The Coming Race*, an unnamed narrator recounts his time as a guest and captive of the subterranean race of the Vril-ya. After falling down a mining shaft, he discovers the humanoid species that evolved from "a band of the ill-fated race" above earth who, when "invaded by the

Flood", "t[ook] refuge in caverns amidst the loftier rocks, and, wandering through these hollows, … lost sight of the upper world forever" (58). The evolutionarily superior Vril-ya represent the titular "coming race" that the narrator assumes will, eventually, render the human race obsolete or extinct. They owe the political stability, social contentment, and technological achievements of their seemingly utopian society to their mastery of the electricity-like energy source *vril*. Undiscovered by humans, *vril* is as "life-giving as life-destroying" (155): it can be used as a means of mesmerism, an energy source, and an elixir responsible for the species' longevity, but it can also cause immediate and widespread annihilation.[4] Although *vril* remains an ambiguous force, it clearly indicates the Vril-ya's technological and evolutionary superiority and represents a significant threat to the future of the human race. Bulwer is chiefly interested in exploring philosophical and social issues—Sinnema calls the novel "an apologue, an allegory that conveys lessons for the reader" (10)—and he wrote that *The Coming Race* is "satirical upon many things now discussed politically and socially, but gravely so" (qtd. in Mitchell 228). While Bulwer clearly targets democracy and women's rights, the extent to which he intends to critique evolutionary theory, technology, and imperialism remains less clearly defined, as does his relationship to the text's narrator and the Vril-ya. There are obvious parallels between *The Coming Race* and *Gulliver's Travels*, both proto-science fiction texts whose narrators explore new locations and wonderful species only to return with an altered perspective on humanity.[5]

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[4] *Vril*'s threat is so formidable that it has effectively ended war between factions of the species, since they realized that all battles would lead to absolute destruction (59-60). It has been compared to nuclear energy (Wagner 382), Maxwell's "electromagnetic ether" (Clarke *Energy Forms* 49), and, in Bulwer's own words, "electricity, developed into uses as yet only dimly guessed" (qtd. in Lytton 466).

[5] For instance, while Clarke reads the novel as a "defense of colonial motives" (32) and the Vril-ya as superhuman colonizers, Nayder argues for a more troubled representation of imperialism: "Bulwer's portrait of the Vril-ya is an oddly composite one, and parallels between the Vril-ya and either the British or the Americans prove incomplete" (216). Wagner argues that "Lytton's forgotten satire needs revaluation" as an influential model of criticism about the United States (385). Judge notes that the narrator "fluctuates between being the vehicle for and the target of a satire on progressive Victorian thought: democracy, feminism, and Darwinism" (138), and contends that Bulwer sides with flawed humankind and "credits human beings, by virtue of their aversion to mechanicality, with the potential

Often classified as a utopian or dystopian text, *The Coming Race* draws on multiple genres and uses a fantastic setting to frame its complex political, social, and scientific satire.

The Coming Race is part social satire, part metaphysical treatise, and part imperial Gothic, but it is above all a scientific romance, and Bulwer's fantastic setting—an undiscovered underground world and humanoid species—allows him to comment on contemporary science and time-keeping systems from an unusual point of view. The text is an early example of science fiction that proved influential for future writers such as Wells (Seed lii-iii), and the scientific romance lends itself perfectly to Bulwer's "use [of] fiction as a means of metaphysical speculation" (xiii-xiv) as it enables him to critique society from an imagined non-human perspective and consider alternative interpretations of human time-keeping, history, and evolution. Bulwer came close to labeling the work a scientific romance years before Wells would popularize the term, describing it to his editor as "a romance but such a romance as a Scientific amateur … might compose" (qtd. in Seed xv). Sinnema recognizes *The Coming Race* as part of "the hollow earth" subgenre which "borrowed from earlier scientific speculations about the earth's internal makeup" to imagine the discovery of a subterranean race (9), while Suvin categorizes it as an example of the "alternative history sub-genre," a "form of SF in which an alternative locus (in space, time, etc.) that shares the material and causal verisimilitude of the writer's world is used to articulate different possible solutions of societal problems" (148-9). Clarke considers *The Coming Race* as an allegorical scientific romance: "In the era of classical thermodynamics, … numerous allegories of science recast the moralized geography of Plato's cave in the service of ethereal spaces and evolutionary times." These allegories were often located in the imaginary spaces of scientific romances so that "politics of dominant and

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for heroic and tragic dignity" (151). David Seed observes that, "Like Gulliver, Bulwer's narrator is…a butt of the novel's ironies as much as a means of revealing them to the reader" (xviii). Clarke also compares the two (51), and Judge identifies *The Coming Race* as a Menippean satire like *Gulliver's Travels* (140).

subordinate groups were retold as forms of fantastic anthropology. Strangers from alien realms stumble upon various races…. Political imperialisms, technological disruptions, and spiritual idealisms were revised and rescreened through fictions of evolutionary variations. Such distinctions were moralized through spatial articulations." In texts like *The Coming Race*, "images of lost underground civilizations, displacements to other times or dimensions, or 'space travel' in general—allegorized class and race divisions, gender trouble and sex wars, perennial philosophical and religious dualisms, and modern narratives of polarized societies" (33). While Clarke explores the novel's allegorical implications, my analysis will focus on how the narrator's journey underground to a futuristic society conflates displacement in space with "displacements to other times or dimensions" and foreshadows the time travel plots of authors like Wells and Grant Allen later in the century.

Despite its fantastic setting, *The Coming Race* often imitates scientific discourse and contains extensive references to contemporary theories in disciplines such as anthropology, geology, physics, and biology, many of which rely on a concept of deep time. Seed observes that the opening dedication "to the leading proponent of philology, Max Müller, reflects Bulwer-Lytton's sensitivity to linkages between race, language, and evolution that had emerged by the 1860s in Britain" (xxvi), and Bulwer's extensive analysis of the Vril-ya reflects Müller's work and frequently mentions geology, specifically Lyell.[6] Müller seems to have influenced the narrator's ostensibly anthropological stance: he is "some Scholar or dabbler in Science" (Bulwer qtd. in Seed xv) who "enact[s] the persona of naturalist" (Judge 145). Acknowledging the text's pseudo-scientific tone, Clarke proposes that "whereas Müller's system offers an anthropological

[6] Seed specifies: "Bulwer-Lytton quotes from Max Müller's 1868 Rede Lecture 'On the Stratification of Language' in which an extended analogy is drawn between the study of geology and the study of linguistic history" (xxvi). Bulwer's narrator also notes the Vril-ya's different skull formation and "think[s] it a development, in the course of countless ages, of the Brachycephalic type of the Age of Stone in Lyell's 'Elements of Geology,' C.X., p.113" (86).

allegoresis of myth, *The Coming Race* uses a fictive anthropological report on the race of the Vril-ya to frame an allegorical apology for empire" (49). Moreover, Bulwer's depiction of *vril* draws on nineteenth-century thermodynamics—the narrator cites Faraday's *Experimental Researches in Electricity* (1845) in an attempt to explain its properties (54)—and he employs and satirizes evolutionary biology. In letters to his editor John Forster, Bulwer called *The Coming Race* his "solemn quiz on Darwin" (qtd. in Lytton 468) and insisted: "The only important point is to keep in view the Darwinian proposition that a coming race is destined to supplant our races, that such a race would be very gradually formed, and be indeed a new species developing itself out of our old one, that this process would be invisible to our eyes, and therefore in some region unknown to us" (465). Bulwer alternates between explaining and criticising various evolutionary theories and Social Darwinism; indeed, his "satirical procedure of adopting and then abandoning various scientific systems—natural history, Lamarckism, Darwinism" (Zwierlein 356) makes it difficult for the reader to assess his viewpoint. *The Coming Race* draws extensively on current scientific debates and discourses, and Clarke summarizes its combination of fantasy and scientific theory: "A full-blown cyborg fantasy leaps directly out of raw mid-nineteenth-century materials—early thermodynamics, social evolutionism, and the concurrent stirrings of cultural response to electromagnetic apparatuses and theories" (50).

Although *The Coming Race*'s interest in science is significant, I wish to emphasize its engagement of temporality in order to illuminate the broader movements developing in the novel genre in relation to science and temporality. While Bulwer's scientific references reveal similar preoccupations and influences to those in Eliot and Hardy, his depiction of an alternative geographical-temporal site anticipates both time travel fiction and later imperial romances. In Tung's discussion of *The Time Machine* he "argue[s] for a kind of 'science-fictionalization' of

time and the temporal pluralization characteristic of recent work in human geography" (96) which he associates with modernist temporality. He proposes that "modernist time culture and the time-travel trope enter into direct conversation with critical geography's multiplication of material, social, and geographical rhythms, with postcolonial treatments of temporal difference and alternative historical tracks and with the humanities' recent speculative turn toward inhuman scales and deep time" (97), and I suggest that *The Coming Race* proposes similar temporal connections via its metaphorical time travel, much earlier than Wells's and other fictional accounts of time travel. While the text is not a literal example of time travel fiction, the narrator's descent represents a figurative movement through time: in a reversal of dominant archaeological and geological imagery, in which the earth's strata was seen to represent layers of time and fossilized remnants to reflect stages of history (Mazlish 741), the subterranean represents a future stage of development rather than a fossilized past. Seed notes that "[b]y having his narrator descend into a projected future, Bulwer-Lytton inverts the trope of progress as an ascent" (xlix). Since the Vril-ya seem to share an ancestry with humankind—the narrator learns that, "the remote progenitors of the race had once tenanted a world above the surface of that in which their descendants dwelt" (57)—their world reveals "the alternative temporality and historicity" that Tung associates with "[t]he modernist time machine" which "treat[s] literature as itself a technology of temporal perception" (96). This alternative geological space is also suggestive of an alternative temporal site: as the title asserts, the sophisticated Vril-ya and their futuristic world represent an advanced dimension of humanoid development. Indeed, the Vril-ya represent an alternative history and evolutionary timeline that exists in parallel with human time; at the same time, however, their evolutionary speed seems accelerated, giving the impression that they have moved more quickly through time than their human counterparts. Since the Vril-ya

represent both another dimension and an alternative history, the narrator's voyage symbolizes a meeting of two different times as the protagonist (an embodiment of contemporary society) encounters the post-human stage of development symbolized by the Vril-ya.

Although less overt than his statements on democracy, women's rights, and language, Bulwer's representations of the time-keeping systems and history of the Vril-ya merit critical attention. In *The Coming Race,* systems of time-keeping are culturally—or species—relative: the difference between human and Vril-ya time is attributed to variations in environment, culture, and chronometry. However, this different time system is translatable into human terms, reinforcing the sense of parallel times at play in the novel. By introducing the Vril-ya's temporal perspective and time-keeping systems, Bulwer suggests that human time systems are neither comprehensive nor objective. Although the narrator plans to "reserve for a future work on the science and literature of the Vril-ya….details as to the manner in which they arrive at their notation of time," he is able, "by the aid of [his] watch,…to compute their time with great nicety" (100). Since the Vril-ya's subterranean environment is sunless, they experience "no…difference between night and day" and thus "do not…arrive at their divisions of time by the same process that we do":

> Their day (including what we call night) consists of twenty hours of our time, instead of twenty-four, and of course their year comprises the correspondent increase in the number of days by which it is summed. They subdivide the twenty hours of their day thus—light [eight] hours,[7] called the 'Silent Hours,' for repose; eight hours, called the 'Earnest Time,' for the pursuits and occupations of life;

[7] Here Bulwer's narrator provides a footnote: "For the sake of convenience, I adopt the words hours, days, years, &c., in any general reference to subdivisions of time among the Vril-ya—those terms but loosely corresponding, however, with such subdivisions" (101).

> and four hours, called the 'Easy Time' (with which what I may term their day closes), allotted to festivities, sport, recreation, or family converse. (100-1)

The protagonist understands the Vril-ya's conception of time as a system that divides and organizes the population's activities into designated time periods. The difference between human and Vril-ya temporal models is largely attributed to the lack of natural sunlight underground; for the same reason, the Vril-ya do not experience changing seasons.[8] Temporal divisions (both quotidian and seasonal), chronometry, and the regulation of social activities are culturally dependent; further, standard human divisions of time that rely upon natural cycles appear environmentally-relative. It is evident that the narrator has reassessed his concept of time after staying with the Vril-ya when he recalls how, after falling underground, "I remained in this unconscious state, as I afterwards learned, for many days, even for some weeks, according to our computation of time" (48-9). After having been exposed to another time system, the narrator feels it is necessary to distinguish between these models of time-keeping, drawing attention to the cultural—or in this case species—dependence of time. In fact, Bulwer suggests that the Vril-ya's time-keeping devices are superior to human chronometry. Although he does not describe their chronometry in detail, a Vril-ya watch is the one object the protagonist retains on his return above ground. The narrator explains that while he was among the Vril-ya, Aph-Lin's eldest son

> had been much interested in examining my watch, the works of which were new to him, and was greatly pleased when I made him a present of it. Shortly after, he returned the gift with interest, by a watch of his own construction, marking both the time as in my watch and the time as kept among the Vril-ya. I have that watch still, and it has been much admired by many among the most eminent

[8] Bulwer writes: "[T]ime is the same to them for sowing or reaping as in the Golden Isles of the ancient poets. At the same moment you see the younger plants in blade or bud, the older in ear or fruit" (101).

> watchmakers of London and Paris. It is of gold, with diamond hands and figures, and it plays a favourite tune among the Vril-ya in striking the hours: it only requires to be wound up once in ten months, and has never gone wrong since I had it. (126-7)

This watch symbolises the technological and ideological dominance of the Vril-ya who are able to comprehend, master, and reconstruct human systems of time-keeping and the devices which record them. It also, by "marking both" human and Vril-ya time at once, symbolizes the species' concurrent timelines. Aside from suggesting human inferiority to the Vril-ya, the respective differences in these species' chronometry reinforce the cultural relativity of time-keeping and temporal experience. *The Coming Race*'s focus on the Vril-ya's concept of time explores a variety of temporal experiences including the division of days and seasons, chronometry, and their remarkable longevity.[9] Bulwer depicts time as multi-faceted, suggests that time-keeping is a social construct, and links temporality to technology through his interest in the devices which keep time for individuals and communities and the resources which enable greater longevity.

The Vril-ya have a different perspective on historic as well as quotidian time, and their understanding of past events differs from the narrator's. While the protagonist's descent literally destabilizes his point of view as he "experiences a series of disorientations after his fall into the underworld" (Seed xxii), the Vril-ya expose him to historic narratives that decentre humankind and challenge Newtonian chronology. For instance, the narrator attempts (unsuccessfully) to date the historic flood that displaced the Vril-ya's ancestors underground:

[9] The protagonist explains: "But that which interested me most in reckoning up their divisions of time was the ascertainment of the average duration of life amongst them. I found on minute inquiry that this very considerably exceeded the term allotted to us on the upper earth. What seventy years are to us, one hundred years are to them." The Vril-ya enjoy extended lifespans due to "the invigorating and medicinal properties of vril" (101-2).

> Whether this be a record of our historical and sacred Deluge, or of some earlier one contended for by geologists, I do not pretend to conjecture; though, according to the chronology of this people as compared to that of Newton, it must have been many thousands of years before the time of Noah. On the other hand, the account of these writers does not harmonise with the opinions most in vogue among geological authorities, inasmuch as it places the existence of a human race upon earth at dates long anterior to that assigned to the terrestrial formation adapted to the introduction of mammalia. (57-8)

This passage engages directly with deep time and proposes an alternative to Newton's chronology.[10] It also lists numerous models for understanding historic chronology, including biblical, Newtonian, geological, and biological timelines, and highlights how the Vril-ya call human time-keeping and history into question. The Vril-ya's ostensibly superior knowledge undermines scientific authority, proposes a different historical timescale for the human species, and emphasizes the gaps in human knowledge of the past; the result is an alternative conception of time that unsettles anthropocentric versions of history and accepted chronology.

In contrast to this undetermined historic chronology, *The Coming Race* depicts time as a continuum by offering proof of the evolutionary connection between humans and the Vril-ya. Dimock distinguishes the continuum of deep time from the "numerical chronology" of Newtonian time which strives to "divide history into numbered periods and speak of them as if they were objective units" (128). While the narrator attempts to establish a chronology of the Vril-ya's past which conforms to his understanding of human history, these dates are no longer clearly defined for him. In fact, the evolutionary past and future seem increasingly indistinct and

[10] Sinnema explains: Newton "argued in *The Chronology of Ancient Kingdoms Amended* (published posthumously in 1728) that a new basis for chronological dating, independent of the Greek chronologies, was required. … Regarding the deluge, Newton foreshortened its distance in mythological history" (*The Coming Race* 57).

inseparable from the present: there is no clearly demarcated line between the human species and the Vril-ya since they share ancestry. Species classification appears fluid and even subjective as the human species' potential for evolutionary transformation becomes evident in the post-human species. To understand humankind's relationship with the Vril-ya, the narrator must go beyond American and human chronology and time-keeping systems. The parallels between the Vril-ya's past and humankind's present expose the links between species and suggest the simultaneous existence of different trajectories of development as the futuristic Vril-ya exist alongside (or below) the human species. Though the text omits any specific chronology to define these species' relations, it offers ample proof of their evolutionary inheritance.

The continuum of evolutionary time and the Vril-ya's parallel yet accelerated development becomes apparent when the narrator visits the College of Sages' portrait gallery and public museum. The College's archaeology department houses "a very ancient collection of portraits" that reveal the Vril-ya's evolutionary history and the impact that *vril* has had on their development. As artefacts of an earlier time, the portraits illustrate the species' development over vast time periods and testify to the Vril-ya's shared ancestry with humans as well as their altered and more rapid evolution. The protagonist recognizes in these paintings the similarity between the pre-*vril* people dating back six to seven thousand years and current Europeans:

> In examining this collection, two things especially struck me:—firstly, That the pictures said to be between 6000 and 7000 years old were of a much higher degree of art than any produced within the last 3000 or 4000 years; and, secondly, That the portraits within the former period much more resembled our own upper world and European types of countenance. … These were the countenances of men who had lived in struggle and conflict before the discovery of the latent

> forces of vril had changed the character of society…. The type of face began to evince a marked change about a thousand years after the vril revolution, becoming then, with each generation, more serene, and in that serenity more terribly distinct from the faces of labouring and sinful men; while in proportion as the beauty and the grandeur of the countenance itself became more fully developed, the art of the painter became more tame and monotonous. (95-6)

With the discovery of *vril*, the species branches and evinces a departure from nineteenth-century European appearances, while achieving greater peace, health, and power than their human counterparts. These scenes give proof of the evolutionary continuum that connects the two species and suggests that the Vril-ya comprise a more advanced stage of human development. For the narrator, Vril-ya civilization is futuristic; for the Vril-ya, human life seems primitive.

Indeed, humankind's greatest accomplishments—attached exclusively to American and European culture in the text—are comparable to the primitive stages of the Vril-ya's history. This relative inferiority becomes apparent when the protagonist visits "the great public museum, … in which are hoarded, as curious specimens of the ignorant and blundering experiments of ancient times, many contrivances on which we pride ourselves as recent achievements." The museum, which has much in common with the Palace of Green Porcelain in *The Time Machine*, implies that humanity is in a comparatively early stage of civilization: "In one department, carelessly thrown aside as obsolete lumber, are tubes for destroying life by metallic balls and an inflammable powder, on the principle of our cannons and catapults, and even still more murderous than our latest improvements." Human limitations are emphasized further, and racial/national connotations become more explicit, when the narrator's "host sp[eaks] of these with a smile of contempt, such as an artillery officer might bestow on the bows and arrows of the

Chinese." In a "department" housing "models of vehicles and vessels worked by steam," Zee remarks: "such were the feeble trifling with nature of our savage forefathers, ere they had even a glimmering perception of the properties of vril!" (92). Since these artefacts resemble contemporary human technology, the museum reinforces the idea that the Vril-ya represent a future stage of development that exists contemporaneously in the recesses of the earth. Despite the protagonist's boasting about America's potential, the Vril-ya view humanity as uncivilized, petty, and technologically inferior, and the text's satire mainly lies in the moments when human achievements are portrayed as distasteful and insignificant to the Vril-ya. The Vril-ya offer a sobering perspective on the human race: they perceive humankind to be of a lower technological, social, and evolutionary standing, and their outlook causes the narrator to reconsider his assumptions about human—and, more specifically, Western—progress and evolutionary fitness.

The Vril-ya's evolutionary superiority and the threat of "the coming race" are derived from a social Darwinian view of evolution as progress and survival as superior fitness. The narrator learns "that the superiority of the Vril-ya was supposed to have originated in the intensity of their earlier struggles against obstacles in nature amidst the localities in which they had first settled." Imparting what amounts to social Darwinist theories, Zee "moralis[es]":

> wherever goes on that early process in the history of civilisation, by which life is made a struggle, in which the individual has to put forth all his powers to compete with his fellow, we invariably find this result—viz., since in the competition a vast number must perish, nature selects for preservation only the strongest specimens. With our race, therefore, even before the discovery of vril, only the highest organisations were preserved; and there is among our ancient books a legend, once popularly believed, that we were driven from a region that seems to

> denote the world you come from, in order to perfect our condition and attain to the purest elimination of our species by the severity of the struggles our forefathers underwent; and that, when our education shall become fully completed we are destined to return to the upper world, and supplant all the inferior races now existing therein. (88)

Zee essentially summarizes Herbert Spencer's doctrine of the "survival of the fittest," and, somewhat ironically given the protagonist's own imperial ambitions, invokes the colonial rhetoric often associated with social appropriations of Darwinism to imagine colonising the weaker human race. For Clarke, *The Coming Race* appropriates scientific discourses "to legitimate imperialism" (50); he interprets the text as "a conservative or Tory satire of political liberalism in defense of colonial motives" (32) and suggests that the "*The Coming Race* uses a fictive anthropological report on the race of the Vril-ya to frame an allegorical apology for the politics of empire" (49). Although this reading is supported by Bulwer's public commitment to imperialism (Mitchell 210-12), the text seems to resist readings of an imperialist agenda by positioning a white American protagonist as a colonial subject, satirizing the protagonist's own imperial ambitions, and troubling the use of social Darwinism as imperial justification.

For the Vril-ya, Western civilization is far from the pinnacle of progress and they subject the American narrator to racist and imperial perspectives. By reducing his status from educated Westerner to an often-belittled captive of the Vril-ya, Bulwer imagines an alternative hierarchy of species in which humankind would be displaced from the top of the food chain. For instance, the Vril-ya call the narrator "Tish," "a pet name, metaphorically signifying a small barbarian, literally a Froglet" (115), reclassifying him as a creature of lower evolutionary standing. The narrative calls into question the protagonist's own imperialism, which he never fully

relinquishes, and the faith in humankind's evolutionary progress often promulgated in social Darwinism. The narrator is forced to acknowledge that humankind does not represent the height of advancement or evolution; instead, he recognizes "that if [the Vril-ya] ever emerged from these nether recesses into the light of day, they would, according to their own traditional persuasions of their ultimate destiny, destroy and replace our existent varieties of man" (159). He is privy to the imperial coolness of the Vril-ya and recognizes how easily the superior power might dispose of him: "On that brow, in those eyes, there was that same indefinable something which marked the being of a race fatal to our own—that strange expression of serene exemption from our common cares and passions, of conscious superior power, compassionate and inflexible as that of a judge who pronounces doom" (162). The narrator's vulnerability and the Vril-ya's cruel indifference prevent the reader from sympathising with the race's sense of imperial destiny, a destiny which the narrator, as an American imperialist, ironically shares. As Nayder notes, Bulwer satirizes the narrator's own "imperial appetite" (213) and "models the society of the Vril-ya, in part, on American ideals, which are taken to a dehumanizing extreme in their classless but unheroic culture" (215). Seed explains that "although [the narrator] naively dreams of participating in an emerging super race, he is actually condemned to death to protect the purity of the Vril-ya. In other words, the narrator falls victim to his own racial obsolescence" (xvii). For Nayder, "the novel's concern with empire building and with the interconnection between the primitive and the civilized, as well as its anxieties about colonization by a 'coming race,'…identify it as a work of imperial gothic" (213). Bulwer's complex engagement with social Darwinism, imperialism, and racial extinction support this reading, and Nayder suggests that "the Vril-ya embody Bulwer's sense that the relation between the colonized and the colonizer has become thoroughly unstable;…that those who are civilized may also be barbarian"

(217). Certainly, the Vril-ya's evolutionary superiority calls into question human progress and the validity of social Darwinist justifications of imperialism as Bulwer "imagine[s] supplantation in racial and national as well as technological terms" (Seed xlvi).

However, Bulwer's complex and inconsistent use of evolutionary theory troubles a purely social Darwinist reading of the Vril-ya as a more evolved colonial power. He takes pains to clarify that they are not merely at a more advanced evolutionary stage than humankind but have evolved into a distinct species with elevated but ultimately non-human culture and technology:

> I arrived at the conviction that this people—though originally not only of our human race, but, as seems to me clear by the roots of their language, descended from the same ancestors as the great Aryan family, from which in varied streams has flowed the dominant civilisation of the world; and having, according to their myths and their history, passed through phases of society familiar to ourselves,—had yet now developed into a distinct species with which it was impossible that any community in the upper world could amalgamate. (158-9)

Despite their common biological roots, humans and the Vril-ya indeed constitute "distinct species," a point that Bulwer underscores by emphasizing the impossibility of cross-breeding between the narrator and Zee. This distinction complicates a reading of the Vril-ya as a more advanced race of humans who have earned imperial success through survival fitness; instead, the differentiation of species draws on Lamarckian and Darwinian evolutionary theory. For instance, the relatively short timeframe in which the Vril-ya have adapted to *vril* and the role that will plays in its deployment—the females of the species more successfully utilize *vril* due to their "more resolute" will (156)—recall Lamarckian adaptation (see also Zwierlein 353). At the same time, Bulwer evokes Darwinian natural and sexual selection to explain the species' development.

Some of Bulwer's ideas seem remarkably similar to Darwin's in *The Descent of Man*, also published in 1871. In particular, his description of the Vril-ya's diminished body hair through "the law of sexual selection" (98) resonates with Darwin's examples. Amongst the Vril-ya hairlessness is desirable and the males (An) of the species have evolved to be increasingly hairless, while the narrator's "features of Victorian masculinity—his full facial whiskers—turn into a stigma, a visual sign of his difference" (Seed xxxiv) linked with lower evolutionary species.[11] More generally, *The Coming Race* speaks to "[t]he notion of species rivalry with its attendant possibility of supplantation or extinction" (Seed xxv); it acknowledges the possibility hinted at in Darwin's work that the future may be dominated by a new and better adapted species to the detriment—or destruction—of humankind.

The most significant differentiation between the Vril-ya and humankind has resulted from their discovery and application of the electricity-like energy source *vril*. The subterranean race's post-*vril* evolution has caused them to resemble humankind less and less and has afforded them other adaptations such as the ability to fly. *Vril* is a hereditary and species-specific energy source which drastically influences the species' evolution and gives them an evolutionary advantage. Although it is clear that the discovery and mastery of *vril* has been a turning point in the species' development, the ways in which the Vril-ya have biologically adapted to its use is less evident. For instance, as Clarke notes, "the authority to control vril technology is determined by race—'hereditarily transmitted organisation.' Among the Ana, over many thousands of years the Vril-ya have so perfected vril technology that they have evolved a new nerve to interface with the 'Vril Staff'" (51). It is unclear whether this nerve—along with the larger thumbs

[11] In *Descent* Darwin writes, "There can be little doubt that the hairs thus scattered over the body are the rudiments of the uniform hairy coat of the lower animals" (1: 24-5). Seed observes that in Darwin's "account, hairlessness was introduced by the female of the species; thus there is a suggestion that the loss of hair reflects both evolutionary progress and a certain feminization of the species" (xxiv).

characteristic of the Vril-ya and desirable for the operation of *vril*—developed through the natural selection of individuals with evolutionarily preferable traits or whether such adaptations represent a cyborg-like bonding between species and technology. Through *vril*, Bulwer seems to suggest that there is no single explanation for a species' existence; instead, evolutionary and technological developments are inevitably intertwined, mutually determined, and ultimately unpredictable. By imagining the drastic effect that a powerful energy source like *vril* might have on species evolution, Bulwer expands the Darwinian model of natural selection to anticipate extraordinary technological advances.

Finally, Bulwer does not provide a clear evolutionary explanation for the Vril-ya and further obscures their history by including their own account of descent from a frog-like species. The novel's strangest and most sustained debate on evolution occurs in the portrait gallery when the narrator notices "three portraits belonging to the pre-historical age, and, according to mythical tradition, taken by the orders of a philosopher." From this ancestor, "the principal sections of the Vril-ya race pretend to trace a common origin":

> The philosopher is attired in a long tunic which seems to form a loose suit of scaly armour, borrowed, perhaps, from some fish or reptile, but the feet and hands are exposed: the digits in both are wonderfully long, and webbed. He has little or no perceptible throat, and a low receding forehead…. He has bright brown prominent eyes, a very wide mouth and high cheek-bones, and a muddy complexion. (96)

The Vril-ya believe that "this philosopher had lived to a patriarchal age, extending over many centuries" (96), but it is his bizarre appearance that most disturbs the protagonist. He is further shocked by "[t]he portrait of the grandfather," which "had the features and aspect of the philosopher, only much more exaggerated: he was not dressed, and the colour of his body was

singular; the breast and stomach yellow, the shoulders and legs of a dull bronze hue: the great-grandfather was a magnificent specimen of the Batrachian genus, a Giant Frog, *pur et simple*" (96).[12] Bulwer introduces the story of an ancient frog philosopher in order to satirize evolutionary discourses as well as the desire for scientific explanations of species origins. Although the discussion of the frog-philosopher specifically targets the notion of evolutionary ties between humans and seemingly baser species, it upholds an evolutionary temporal continuum and implies that species distinctions might appear blurry depending on one's perspective. The narrator cannot believe that "the lofty Vril-ya" or even the "meanest varieties of the human race, had its origin in a Tadpole," yet the race reveres their frog ancestry and abides by the philosopher's advice: "Humble yourselves, my descendants; the father of your race was a *twat* (tadpole): exalt yourselves, my descendants, for it was the same Divine Thought which created your father that develops itself in exalting you" (96-7). Bulwer seems to echo *Descent of Man* in his satire on evolutionary theories that link humankind to apes, amphibians and, before that, molluscs.[13] The Vril-ya's self-perceived failure to live up to earlier incarnations of their species suggests an anticipation of degeneration theories, and Bulwer proposes that evolutionary values are subjective and open to interpretation. His satire of evolutionary origins targets not only the idea that humans originate from lower life forms but that our evolutionary past is even knowable. However, it nevertheless hints at the instability of species classification since, from

[12] Anne-Julia Zwierlein traces Bulwer's association of the frog and philosopher to "William Paley's *Natural Theology* (1802)" and "George Lewes's physiological *Studies in Animal Life* (1862)" (349), explaining that "[w]hile Paley and Lewes had pointed to the *ontogenetic* similarity between the initial states of frog and philosopher, Bulwer-Lytton, albeit tongue-in-cheek, discusses the possibility of a *phylogenetic* connection between them" (353). She notes, "read 'ape' instead of 'frog,' and the text exactly reproduces contemporary popular debates about evolution" (354). Seed proposes that "Bulwer-Lytton imitates Darwin's procedure of regularly comparing human characteristics with those of other species," and he also notes that "the frog was a creature symbolically important in [T. H. Huxley's] formulation of a theory that humans and other animals were conscious automata" (xxv).

[13] *Descent of Man* suggests that although humans may be humbled by our descent from lower life forms, we can take pride in having evolved to a higher state: "Man may be excused for feeling some pride at having risen, though not through his own exertions, to the very summit of the organic scale"; however, "we must acknowledge,…that man with all his noble qualities…still bears in his bodily frame the indelible stamp of his lowly origin" (2: 405).

the vaster temporal perspective enabled by the portrait gallery, it becomes apparent that humans mutate into post-humans, who might also share ancestry with tadpole-like organisms.

Ultimately, *The Coming Race* denies the possibility of a single clear-cut and stable evolutionary explanation. The variety of often contradictory evolutionary perspectives Bulwer offers suggests that scientific reconstructions of the past produce partial narratives rather than definitive accounts and timelines of species history. Moreover, Bulwer uses the Vril-ya to produce multiple times and alternative yet concurrent evolutionary timelines. *The Coming Race* anticipates time-travel narratives and produces a materialization of temporal folds as its narrator, a recognizable man of his time, is brought into contact with a futuristic society and post-human species. Bulwer stages these interactions and uses the fantastic Vril-ya to imagine what a post-human perspective on our time systems and history might entail. When the protagonist returns above-ground and retains the technologically-superior watch from the Vril-ya, it speaks to his rethinking of human time systems and anthropocentric interpretations of evolution as a result of the alternative perspectives he has encountered. Although *The Coming Race* satirizes evolutionary theory, it nonetheless anticipates post-human evolution, explores species relations, and destabilizes species boundaries by imagining the inhuman forms that might evolve out of our species. Bulwer evokes deep time by portraying an evolutionary continuum that connects contemporary and futuristic species and insists that we cannot discount the influence that technology or energy sources might have on a species' evolution. The result is a scientific romance which denies the possibility of a comprehensive evolutionary account, stresses the unpredictability of future evolution, and establishes alternative histories and multiple timelines in ways that would be developed in later science fiction.

"As Ye Reckon Time": Materialist Time in Haggard's *She*

In *She: A History of Adventure*, deep time is embodied in the two-thousand-year-old *She-who-must-be-obeyed* and the ancient civilization of Kôr. As with Hardy, Haggard's novelistic representation of deep time expands the novel's scale and depicts a past that endures—and recurs—in the present. However, Haggard uses romance conventions to embody deep time in the ageless Ayesha, who is effectively living history, her undiscovered kingdom, and reincarnation. As it appears in these forms, deep time is at once alien and familiar: the novel's contemporary protagonists are overwhelmed by what they encounter in Ayesha and Kôr but come to recognize their own role in this history. Haggard situates his fantastic plot within a seemingly rigorous historical frame, and the resulting combination of romance and history destabilizes historical authority and linear chronology. Although *She* draws significantly from contemporary anthropology and archaeology, the novel's protagonists are never detached observers as they quickly become embroiled in their adventure. Haggard renders different time periods co-existent by using a travel narrative which brings his contemporary British protagonists into contact with an alternative history in Africa. *She*'s plot also relies on reincarnation which introduces a model of folding time as characters are at once contemporary and past versions of themselves; in this sense, Haggard produces overlapping timelines as ancient history is brought to life. The deep time associated with Ayesha and Kôr challenges and disrupts the British protagonists' sense of linear history and standard time as they come to see historic time as cyclical and fluid. While critical analysis of Ayesha's temporality often focuses on her eroticism and pagan ahistoricism in contrast to the explorers' historicized time, I want to draw attention to the fact that Ayesha and the deep time she embodies are essentially materialist and work to oppose Holly's Christian beliefs. Although Ayesha succumbs to historical time in the novel's fantastic conclusion, her

"deviant" temporality (Barrows 76) is not eradicated as it has already revealed the insufficiencies of standard and linear time and disrupted Holly and Leo's temporal order. Moreover, the materialist deep time associated with Ayesha and exposed in her final devolutionary transformation is foreshadowed in the explorers' reversion to primitive behaviours during their voyage, suggesting the potential for animal regression within all individuals. While *She* looks towards the past more than *The Coming Race* and *The Time Machine*, its premise of reincarnation and open-ended conclusion also orient its temporality to the future.

Once known as "King Romance" (Gilbert and Gubar 5), Haggard achieved success as a writer mostly from his African lost world adventures *King Solomon's Mines* (1885) and *She*.[14] He embraced his role as romance-writer and used the genre to explore uncharted places, different temporalities, and alternative histories.[15] In "About Fiction" (1887), Haggard distances the romance from the domestic trivialities and bleakness of realism and naturalism, and draws a parallel between the bravery of the romance writer and his adventurous heroes: "There is indeed a refuge for the less ambitious among us, and it lies in the paths and calm retreats of pure imagination.… Here we may even…cross the bounds of the known, and, hanging between earth and heaven, gaze with curious eyes into the great profound beyond. There are still subjects that may be handled *there* if the man can be found bold enough to handle them" (180). The romance was an artistic mode that best suited Haggard's imperial adventures. Barrows remarks that "[j]ust as the adventure novels of Haggard depended on topography uncharted in any official map, they

[14] One critic observed: "Haggard is one of the most successful members [of the 'new school of romance']. He has soared into fame on the pinions of two novels—for no one knows the names of his other works—and the 'historical adventure' which has evoked…admiration for its 'daring originality' is still selling by thousands" ("Who is She" 1).
[15] Haggard championed the genre and claimed that "really good romance writing is perhaps the most difficult art practised by the sons of men. It might even be maintained that none but a great man or woman can produce a *really* great work of fiction" ("About Fiction" 172-3). He counters critical prejudice by noting that "although some there be who consider this a lower walk in the realms of fiction, and who would probably scorn to become a 'mere writer of romances,' it may be urged in defence of the school that many of the most lasting triumphs of literary art belong to the producers of purely romantic fiction, witness the 'Arabian Nights,' 'Gulliver's Travels,' 'The Pilgrim's Progress,' 'Robinson Crusoe,' and other immortal works" (180).

also depended on dramatically unsynchronized exotic populations. If the imperial Gothics drew fantastical spaces of the imagination, they primarily populated those spaces with temporally deviant or discordant inhabitants." Indeed, the fantasy of unusual time and immersion in alternative histories that *She* offers were a large part of its appeal since "to a certain extent the late nineteenth-century adventure novel depended for its pleasures on an evocation of discrepant times not capable of being measured by the clock or by Greenwich Mean Time" (76). As in *The Coming Race* and *The Time Machine*, the journey undertaken by *She*'s Englishmen crosses spatial as well as temporal boundaries. Cantor and Hufnagel observe that "[i]n *King Solomon's Mines* and *She* the journey to the imperial frontier becomes a journey into the past; for Haggard space travel becomes time travel" (37). When Holly, Leo, and Job travel to Africa, they discover the ruins of the long-lost kingdom of Kôr, the descendants of a once-mighty race called the Amahagger, and its ruler, the irresistible, brilliant, and seemingly immortal queen Ayesha.

Haggard's most successful and enduring novel is often labelled a popular romance, imperial Gothic, or an adventure novel; however, *She*'s self-conscious claims of authenticity—especially in the novel's narrative format and historic documentation—alongside outlandish fantasy, coupled with the alternative history of Kôr and Ayesha's previously undiscovered scientific achievements and telepathic powers, align it with science fiction. Murray proposes that "Haggard's romances were pure science fiction or science fantasy," and highlights the "science backgrounds for his fiction, and the way in which they were linked together to give credibility to the plot, to humanize a past that had suddenly become immensely deep and a present that was more varied than first thought" (181). *The Coming Race* is a potential forerunner to the elements in Haggard's work that classify it as a scientific romance: Ayesha's ability to harness a natural force in order to "blast" people to control or even kill them echoes Bulwer's *vril*, while the

alternative history of an undiscovered people—and a ruler who lives in the caverns of Kôr—also bears similarities to the Vril-ya. Like Bulwer and later Wells, Haggard includes nonfiction and scientific details to accompany his novel's fantastic plot. Where Bulwer insists on an anthropological reading of the Vril-ya and Wells discusses mathematics to account for his time machine, Haggard draws primarily on archaeology to ground his text in realistic detail. As "a dedicated amateur Egyptologist and…a student of anthropology" (Gilbert and Gubar 28) who wrote *She* following "the great discovery of royal Egyptian mummies at Deir el-Bahri in 1881…and amidst speculation regarding the Great Zimbabwe ruins in Africa" (Stauffer 14), Haggard was well-poised to capitalize on the late nineteenth-century public's fascination with ruins, artefacts, and museum displays. As Stauffer explains, "Haggard's novel was predicated on archaeological curiosity and the contemporary passion for the exotic past. What is more, it represented a romantic, interactive version of the museum experience" (14). However, Haggard does more than bring the museum to life: he uses fictional artefacts of the past to challenge conceptions of history, the present, human civilization, and evolutionary development.

She is a romance that, as its subtitle makes clear, combines a sense of realistic "history" to better recount a tale of "adventure": the novel couches its alternative history in the non-fiction language of archaeology, anthropology, and history. Despite its extraordinary plot, *She* establishes a sense of credibility through the text's framing device, realistic use of paratext, and Horace Holly's relatable first-person narration; moreover, both the text's editor—supposed to be Haggard—and its narrator frequently insist upon the veracity of their stories. The novel's extensive documentation, reproductions of archaeological artefacts, and editorial annotations imbue the tale with a sense of realism that recalls a nonfiction scientific text or travel narrative.[16]

[16] While *She*'s claims of legitimacy are not necessarily unusual for a work of fiction, Haggard went to great lengths to validate his romance, and critics have remarked on how insistent it is of its own accuracy. Murphy writes:

She presents an introduction by an editor (understood to be Haggard) who purports to have received Holly's manuscript with the request that he publish it: "We give you complete freedom, and as a reward you will certainly have the credit of giving to the world the most wonderful history, as distinguished from romance, that its records can show" (38). The manuscript is accompanied by material artefacts which corroborate the story—a composition scarab and a potsherd—and are described in great detail. Apart from the "editor's" introduction, the novel's paratextual elements include extensive footnotes attributed to both the narrator and Haggard-as-editor, illustrations, and Latin, medieval English, and modern English transcriptions of the sherd's uncial Greek inscription as well as photogravure images of the relic. Haggard went so far as to construct an authentic-looking sherd to match the artefact at the centre of his novel, admitting, "I am not without hopes of getting a rise or two out of the antiquarians" (qtd. in Stauffer 13). His textual additions and framing devices bolster the novel's assertions of historical realism and substantiate the narrator's authority, while his creation of a relic to corroborate the novel's "history" helped the work capitalize on the public's fascination with archaeology. In addition, Sandra Gilbert and Susan Gubar locate Leo's ancestor Kallikrates in a brief appearance in *The Persian Wars*: "That…Herodotus really does mention a 'Callicrates' who was 'the most beautiful man…in the whole Greek camp' gives uncanny solidity to Leo's heritage. That the misadventures of this grandson or great-grandson of Callicrates have been recorded in every major western classical language makes them appear even more compellingly substantial" (11).

"Though the use of a frame narrative to establish a story's authenticity is not an anomalous approach, *She's* version is remarkable for its extreme concern with credibility" (751). Similarly, Gilbert and Gubar observe that "Haggard's contrivance of the fictionalized scholarly apparatus with which he surrounds this manuscript is especially expert. Informational footnotes to Holly's narrative, illustrative diagrams, sample quotations, and realistically representative typographies create an illusion of historicity so intricate that the reader is quickly entangled in the web of alternative history that is Her story" (10). Saler provides further details on *She*'s paratextual and academic framework (612) and proposes that "readers attuned to irony would have recognized the citations to be almost as extravagant in their mock sobriety as the events of the novel" (622).

However, despite the material artefacts and realistic paratext portraying the novel as a historic document, Haggard's fantastic story of reincarnation, near-immortality, and a lost race prevents *She* from being read as anything other than a romance. Instead, his use of "authentic" documentation questions the stability of historic narratives and the authority attributed to realistic or nonfiction writing. Stauffer notes that it "foreshadows the priority Haggard gives to historical records, relics, and narratives in the novel—not in the interest of simple realism, but in a way that keeps questions of authenticity and evidence in constant tension with the plainly fantastic occurrences that comprise the plot" (13). Throughout the narrative, the seemingly disparate genres become intertwined and indistinguishable, and Holly voices the progressively murky line between realism and romance. After reading Amenartas's story, he proposes that the fantastic may be a sign of realism, remarking that "it scarcely seemed likely that such a story could have been invented by anybody. It was too original" (60). Despite providing a vivid account of his adventure, Holly claims that his narrative cannot do justice to the true events they experienced, rueing "I only wish that I could describe the wild and marvellous beauty of that sword of fire, laid across the darkness and rushing mist-wreaths of the gulf" (245). He insists, "No nightmare dreamed by man, no wild invention of the romancer, can ever equal the living horror of that place" (270). This narrative tactic, along with Holly's deliberations on what constitutes fact versus fantasy, further troubles the distinction between reality and fiction. After recounting a daydream, Holly declares, "Let him who reads this forgive the intrusion of a dream into a history of fact. But it came so home to me—I saw it all so clear in a moment, as it were; and, besides, who shall say what proportion of fact, past, present, or to come, may lie in imagination? What is imagination? Perhaps it is the shadow of the intangible truth, perhaps it is the soul's thought" (179). Haggard proposes that realism is more fantastic than romance, and imagination more

truthful than fact; in this sense, then, his commitment to realistic details could be seen as a means of reinforcing the text's adventure and fantasy elements in a way that is characteristic of the New Romance, which "combined realism and romance in a knowing, ironic manner" (Saler 618).

This tension between realism and romance is echoed in the novel's representations of linear history and fluid deep time. Just as Haggard introduces historical paratext only to counter this pseudo-realism with a fantastic alternative history, he includes the timelines of linear history only to overturn their chronology with depictions of folding time. In Kôr, the protagonists encounter a concept of deep time as a continuum in which history is never severed from the present. Within this continuum—and compounded by the cyclical time of reincarnation—past events resurface to shape the present, disrupting linear time. Dimock describes a similarly fluid temporality in her analysis of time as a continuum in which chronologically distinct moments may be brought together: "As these events resonate with the past, drawing it into the orbit of the present, distance can become sharply foreshortened. Events otherwise far apart can find themselves suddenly side-by-side, rendered simultaneous for the moment." A similar sense of the potential for "'simultaneity' … when the distance between two events happens to collapse" undergirds *She*'s fantastic time (126). The adventure begins when Leo inherits the records of the Vincey family legend from his deceased father who "influence[s] both the reading of the past and the direction of the future course of that history by instructing the next generation 'through this link of pen and paper'" (Murphy, "Gendering" 754). In Africa the divisions between past and present—as well as the dead and living—are increasingly blurred as the explorers become submerged in a cyclical experience of history and identity. When Leo encounters the preserved corpse of Kallikrates, their identical appearances validate Ayesha's certainty that Leo is in fact his ancestor reincarnated (an interpretation that Holly eventually endorses). Patricia Murphy

recognizes this as a "severing [of] the Englishmen's temporal moorings," explaining that "[t]emporal confusion results from the difficulty in distinguishing between life and death, since the boundary between a deceased Leo represented by the ancient Kallikrates and a living Leo figured as contemporary Englishman periodically collapses and reappears" (767). Kallikrates's exceptional preservation and reincarnation are examples of the embalming imagery which contributes to the novel's motif of the re-emerging past. Gilbert and Gubar note that "embalming frequently becomes both theme and subject" (11): Kôr's "mummy-crowded tombs…hint that dead history may still be wilfully present in the living moment. Just as Amenartas's vengeful imperative was 'embalmed' in the apparently ordinary modern name of Vincey, so the quests and failures of Leo's 'ordinary' ancestors are embalmed in Leo" (17). Ayesha herself is a relic of the past whose appearance is frozen in time—at "more than two thousand years old, She has been embalmed alive" (18).

She's insistence that the past is never truly distinct from the present not only confuses chronology but troubles stadial readings of history. Holly's frequent comparisons of ancient Kôr and contemporary London suggest that the disparate locations share unlikely commonalities; despite the former's antiquity, the primitive past is not as far removed from civilized England as one might suspect. While entering Ayesha's volcanic cave, Holly observes that the "dark tunnel … forcibly reminded me of those undertaken by our nineteenth-century engineers in the construction of railway lines" (132), and notes that it "was faintly illuminated with lamps which seemed to me to stretch away for an almost immeasurable distance, like the gas lights of an empty London street" (134). He similarly compares London and the ruins of Kôr, describing "the main thoroughfare of the city" as "very wide, wider than the Thames Embankment" (236) and a pit "literally full of thousands of human skeletons" as "about the size of the space beneath the

dome of St. Paul's" (174). These associations link vastly different time periods and locations, and they often emphasize the sophistication of the architecture and technology of ancient Kôr civilization. Holly admires their drainage systems (130) and cannot fathom "how [a cutting hewn in the living rock] was ever executed at all without the aid of blasting-powder or dynamite" (131). He enthuses that "the great cultivated plain or lake bed framed like a vast emerald in its setting of frowning cliff…. is, indeed,...an unequalled instance of what man can do in the face of nature, for in my opinion such achievements as the Suez Canal or even the Mont Cenis Tunnel do not approach this ancient undertaking in magnitude" (234). The ancient civilization also boasts magnificent artwork and exceptional scientific knowledge. Holly declares a marble statue of the figure of Truth to be "perhaps the grandest allegorical work of Art that the genius of her children has ever given to the world" (239) and, noting "the great ball of stone representing the World whereon the figure stood," remarks that, "It is at any rate suggestive of some scientific knowledge that these worshippers of Truth had recognised the fact that the globe is round" (240). Modern European works are not necessarily superior to the ancient structures of Kôr, an observation which contradicts progressivist interpretations of history and evolution.

She also unsettles the distinction between ostensibly civilized and primitive cultures by illustrating the facility with which the English explorers revert to savagery. The novel troubles imperial assertions of Western superiority by suggesting that modern man is not so far removed from his primitive and animal past. Initially Holly distinguishes the explorers from the African landscape and their native guides as he notes "ourselves—three modern Englishmen in a modern English boat—seem[ed] to jar upon and look[ed] out of tone with that measureless desolation" (81). When the mosquitoes that torture the Englishmen disregard Mahomed, their Islamic guide, Holly once more distinguishes them from him: "How often…during the next week or so did we

wish that we were flavoured like an Arab!" (85). However, it soon becomes clear that these supposedly civilized men have much in common with their primitive—and evolutionary—pasts. When the need for the Englishmen to defend themselves arises, they slip with astonishing ease—and success—into a violent primitive state. After Mahomed's hot-potting,[17] they enter into a visceral battle with the Amahagger. Holly recalls: "They were strong men, but I was mad with rage, and that awful lust for slaughter which will creep into the hearts of the most civilised of us when blows are flying, and life and death tremble on the turn." He considers the impact his fighting would have on his peers in England: "Lying on my back there, so that their bodies should protect me from spear thrusts from above, I slowly crushed the life out of them, and as I did so, strange as it may seem, I thought of what the amiable Head of my College at Cambridge and my brother Fellows would say if by clairvoyance they could see me, of all men, playing such a bloody game." Leo is similarly transformed into a warrior-like hero, evoking his Greek ancestry; Holly observes him battling "in the centre of a surging mass of struggling men, who were striving to pull him down as wolves pull down a stag" and "[sees] that he was fighting with a desperate abandonment and energy that was at once splendid and hideous to behold" (111). Holly and Leo act primitively in self-defense and are further associated with animals when the Amahagger name them, along with Job, the Baboon, the Lion, and the Pig, respectively, which Hinz interprets as Haggard's "use of a kind of reverse metamorphosis to emphasize a journey back in time." The "los[s] of their Christian names" in favour of "be[ing] called by the names of the animals which they resemble" (429) suggests parallels with the Amahagger, whose festivities include dressing up in animal skins "to dance about in a lumbering, unnatural fashion, and to imitate the sounds produced by the respective animals they represented, till the whole air was alive with roars and bleating and the hissing of snakes" (*She* 205). According to Gilbert and

[17] In which Mahomed is killed by having a burning "red hot pot jammed upon his head" (109).

Gubar, Haggard "hinted" that "racial/sexual otherness could unman western marauders … precisely because it might ironically call into question the very nature and culture of the imperialist project, but at the same time, in a more Darwinian sense, it might be disturbing to supposedly 'civilized' westerners because it forced them to confront what they feared was the primordial 'barbarism' of the human" (40). The explorers' adventures in Africa elicit primal instincts which upset imperial, racial, and historical designations of the primitive and the civilized.

However, reading the Englishmen's journey as a Darwinian reversion or an imperialist example of "going Native"—in line, perhaps, with Conrad's Kurtz—is complicated by the text's consistent simian descriptions of Holly. Even while at "one of the Universities, which for the purposes of this history we will call Cambridge" (35), Holly is described as apish: the editor notes in his introduction that "he was shortish, rather bow-legged, very deep-chested, and with unusually long arms. He had dark hair and small eyes and the hair grew right down his forehead, and his whiskers grew right up to this hair, so that there was uncommonly little of his countenance to be seen. Altogether he reminded me forcibly of a gorilla" (35-6). Holly's gorilla-like appearance, emphasized in the text's illustrations, is his most striking feature: early in his narrative he explains how "[o]nly a week before I had heard one [woman] call me a 'monster' when she thought I was out of hearing, and say that I had converted her to Darwin's theory" (41). His appearance grows wilder in Africa, where he, out of the Englishmen, is best protected from the mosquitoes, "owing to the toughness of my dark skin, and to the fact that a good deal of it was covered by hair, for since we started from England I had allowed my naturally luxuriant beard to grow at its own sweet will" (85). From the beginning of the text, however, Holly's animalistic appearance is contrasted to his intellect. He explains that "[l]ike Cain, I was

branded—branded by Nature with the stamp of abnormal ugliness, as I was gifted by Nature with iron and abnormal strength and considerable intellectual prowess" (40). The combination of his superior intelligence (along with his British education and Christian values) and his monkey-like features dismantles interpretations of an evolutionary hierarchy based on appearance. Murphy observes that "Holly's simian appearance resembles the devolutionary figure whom She finally becomes" (767-8), which further confuses the racial, gender, and evolutionary distinctions we might expect in a Victorian colonial adventure. As Stauffer points out,

> the racial politics of the novel are more complex than they first appear: Ayesha is an Arab; Leo precisely resembles (and perhaps is) an ancient Greek; Holly looks like a baboon, an association Victorians typically made with black Africans; the Arabic-speaking Amahagger are light-skinned ("yellowish") with straight hair and "aquiline" features; and Ustane may be a reincarnated Egyptian. That is, Haggard seems not to have intended a straight contrast between Anglo-Saxon whites and dark-skinned races. Rather, the novel suggests deeper connections among the races, an ancient genealogy of ethnicities and civilizations in which every character is a hybrid. (20)

In *She*, temporal, racial, and evolutionary confusion destabilizes stadial readings of history and attempts to locate the evolutionary past in ostensibly less civilized locations and even, exclusively, in the past.

Although critics often distinguish Ayesha's cyclical sense of time from Leo and Holly's modern and linear historicism, the novel's murky distinctions between what is past and present, or primitive and civilized, complicate such binaries. Murphy proposes that *She* demonstrates a "frantic attempt to privilege male historicity over female ahistoricity" since "the linear time of

history associated with the masculine civilizing mission is valorized over the nonlinear time conventionally associated with female subjectivity through procreativity, natural rhythms, and infinitude" (747-8). Leo is indeed emblematic of masculine Western history: Hinz recognizes that as "lineal descendant of Kallikrates and Amenartas, [he] is literally the epitome of Western civilization" (419), while Murphy observes that the Vincey records "[r]epresent[t] each major period in Western culture." Correspondingly, Holly embodies the ideal historian: "A Cambridge fellow immersed in a community of male scholars in this notable seat of Western learning, [he] is uniquely poised to analyze the historical record Vincey bequeaths to his son" (754). Hinz surmises that "[w]hereas Leo is the bodily heir of Western culture, Holly is its intellectual offspring—a skeptical, individualistic, scientifically-oriented academic with a firm belief in the moral and political British constitution" (426).

In contrast, Ayesha's agelessness is at odds with linear history. She is in many ways a racialized and gendered temporal "other,"[18] and Murphy examines "the text's obsessive portrayal of She as severed from history, in striking contrast to the historical groundings of the male protagonists whom she confronts" (750). Ayesha is often associated with a mythic sense of time which Gilbert and Gubar identify as "the eternal feminine," a term Freud used in his description of *She* (43). More broadly, Barrows summarizes that, "[h]idden within her geological labyrinth unmapped by the Western powers, Ayesha also hides from conventional methods of historical dating, inhabiting a temporality based on occult powers, memory, and emotional events rather than the clock" (80); equally, she seems to hide from conventional definitions of historical and evolutionary progress. While these critics offer compelling readings, the binaries they establish

[18] Murphy explains that, "In identifying her Arabian background, *She* connects Ayesha to the racial Other constructed through the Victorian conception of Orientalism" that contrasted "the assumption of Oriental immutability" with progressive Western history: "In *She*, the Oriental separation from history is transposed onto ancient Kôr's unchangeability across centuries" (759-60).

between the linear, historic, and progressive time of the British adventurers and Ayesha's cyclical, ahistorical, and primitive time are troubled by the aforementioned descriptions of Holly as a (d)evolutionary figure and the fact that he comes to accept rather than reject Ayesha's cyclical sense of time.

These readings are further complicated by the fact that Ayesha's sense of time, and the deep time She embodies, are not supernatural (in the context of the novel) but extensions of her materialism. Ayesha, and not Holly, is the "skeptical, individualistic, [and] scientifically-oriented" rationalist, and the principal threat she poses to the British protagonists' time-system is her denial of Christianity. Holly's Christianity and Ayesha's scientific-materialism entail different concepts of time and, in particular, the future. Over the course of her long life Ayesha has seen "religions come and the religions pass, and the civilisations come and pass, and nought endures but the world and human nature" (183). As a result, she is sceptical of Christianity and its promise of future happiness. She exclaims: "I see—a new religion! I have known so many.… It is terror for the end, and but a subtler form of selfishness—this it is that breeds religion. Mark, my Holly, each religion claims the future for its followers; or, at the least, the good thereof. The evil is for those benighted ones who will have none of it, seeing the light the true believers worship, as the fishes see the stars, but dimly" (183). For Ayesha, religion stems from a fear of death and offers reassurance for the future—she later muses, "[s]trange are the pictures of the future that mankind can thus draw with this brush of faith and this many-coloured pigment of imagination!" (230)—and indeed Holly's faith is informed by this sense of futurity as he anticipates his reward in eternal afterlife. This comfort is what, initially at least, gives him the strength to turn down Ayesha's offers of longevity: "Nay, oh *She,* I will live my day and grow old with my generation, and die my appointed death, and be forgotten. For I do hope for an

immortality to which the little span that perchance thou canst confer will be but as a finger's length laid against the measure of the great world" (229). This passage reveals the teleological thinking which Murphy connects to Victorian historicism: "In its unidirectional movement through time, history replicated the framework of Christian temporality, itself grounded on a conception of linear progression in contrast to the theory of cyclical repetition that had characterized ancient pagan faiths." She suggests that "Victorians could transpose the teleological element inherent in Christian time onto history to achieve a similar sense of purpose" (749), and Holly initially seems to subscribe to this linear, unidirectional, and progressivist model of history in line with his Christian beliefs. Thus in *She* the connotations of modernity signified by historic knowledge are modified by the traditionalism and spirituality of Christianity, as Haggard develops an intellectual opposition between Holly's Christian temporality and Ayesha's atheistic materialism.

As a result of her incredible longevity and her materialist philosophy, Ayesha espouses an experiential and relative understanding of time which is at odds with chronometric time-keeping. She advocates for an experiential rather than quantitative measurement of time, at one point claiming "better is an hour with love than a century of loneliness" (192). She does not disavow quantitative measurements of time—indeed, the novel repeatedly underscores her age—but rather observes the value of affective temporal experiences, as when She describes her subjective temporality when she recognizes the gravely ill Leo as her reincarnated lover:

> And if he die, surely must the Hell be lived through once more—once more must I face the weary centuries, and wait, and wait till the time in its fulness shall bring my beloved back to me. And then thou gavest him the medicine, and that five minutes dragged along before I knew if he would live or die, and I tell thee that all

> the sixty generations that are gone were not so long as that five minutes….Then thought I that he was once more dead, and all the tortures of all the years gathered themselves into a single venomed spear, and pierced me through and through, because once again I had lost Kallikrates! (190)

Ayesha's experience of time is emotional, and the intensity of her feelings—suffering and love—determines her interpretation of time, so that "five minutes" of suspense feels like more than "sixty generations"; as Barrows writes, "[h]er time reckoning is based on events rather than the revolution of the Earth around the sun" (80). Given Ayesha's great age, enduring beauty, and seeming immortality, her concept of time is necessarily different from that of the explorers and she advocates for an experiential temporality.

She portrays Ayesha's longevity and reincarnation as natural rather than supernatural phenomena (the fact that the Christian Leo and Holly accept that they have been reincarnated substantiates this belief). She insists "that naught really dies. There is no such thing as Death, though there be a thing called Change" (148), and believes that the deceased are dead only "for a time; but even to the world are they born again and again" (149). Murphy observes that "Ayesha shares the ancient pagans' presumed lack of historical consciousness through their discredited belief that events recur in a cyclical pattern" (760). However, her cyclical sense of time and longevity are not "discredited'; instead, they are associated with a materialist understanding of nature. Ayesha explains that her life has been extended by a naturally occurring pillar of fire:

> Life is wonderful, ay, but that it should be a little lengthened is not wonderful. Nature hath her animating spirit as well as man, who is Nature's child, and he who can find that spirit, and let it breathe upon him, shall live with her life. He shall not live eternally, for Nature is not eternal, and she herself must die, even as

> the nature of the moon hath died. She herself must die, I say, or rather change and sleep till it be time for her to live again. (150)

Ayesha sees Nature rather than God as the creator of life, a belief that suggestively aligns her philosophy with Darwinism. She considers the Pillar of Life to be the source of life and, as they enter the fire's cave, she warns: "prepare to enter the very womb of the Earth, wherein she doth conceive the Life that ye see brought forth in man and beast—ay, and in every tree and flower" (256). Suitably, given her investment in earthly life, Ayesha's beauty derives from her exceptional life force: Holly declares that "Life—radiant, ecstatic, wonderful—seemed to flow from her and around her" (181). When imbued with the flame of life her vibrant beauty surpasses the heavenly (260), and even Holly is powerless to resist her earthly appeal: "I worshipped her as never woman was worshipped, and [told her] that I would give my immortal soul to marry her" (182). Ayesha's longevity, her desirability, and her temporality all stem from her earthliness and her investment in nature.

Although Ayesha's mysticism, exoticism, and obvious erotic appeal have garnered extensive critical attention, her interest in science is often overlooked. Haggard emphasizes her materialism by demonstrating how she has used her longevity to study the earth's secrets and practice scientific experiments. Moreover, she exhibits a notably non-Christian hubris in her brilliance which suggestively aligns her with the mad-scientist trope: *She* can be interpreted as a cautionary tale in which Ayesha's pride in her abilities, knowledge of the earth's secrets, and tendency to play God result in her punishment by those same forces she thought she could control. Like *vril* or the time machine, her powers resemble the fantastic technology of science fiction. Holly explains that "Ayesha was a great chemist…. She had one of the caves fitted up as a laboratory, and although her appliances were necessarily rude, the results that she attained

were…sufficiently surprising" (184), as the "wonderful drug" (197) she administers saves Leo's life. Ayesha's knowledge of ancient embalming methods enables her to prepare a "liquid" that destroys Kallikrates' corpse in a matter of minutes so that nothing remains "but a few handsfull of smoking white powder. The acid had utterly destroyed the body, and even in places eaten into the stone" (219). Even Ayesha's most fantastic powers—specifically, her power to "blast" others and her psychic abilities—result from her ability to exploit unfamiliar principles of electricity and telepathy. Ayesha explains to Holly her *vril*-like "blasting powers," which allow her to brand, immobilize, or kill others, by insisting, "I tell thee I deal not in magic—there is no such thing. 'Tis only a force that thou does not understand" (195); later, Holly will explain that the Amahagger woman Ustane "was stone dead—blasted into death by some mysterious electric agency or overwhelming will-force whereof the dread *She* had command" (210-11). Ayesha insists, repeatedly, that she is merely harnessing natural energy, reassuring the narrator: "Have I not told thee that there is no such thing as magic, though there is such a thing as understanding and applying the forces which are in Nature?" (184). While Holly, a scholar, substantiates Ayesha's elucidation, it is only the uneducated Job who, "so far from accepting a natural explanation of the matter, which was after all…nothing more than an instance of glorified and perfected telepathy,…set[s] the whole thing down as a manifestation of the blackest magic" (201-2). *She* provides pseudo-scientific explanations for Ayesha's powers and insists on their limitations as well as their natural rather than supernatural origins.

Ayesha's earthly temporality and scientific interests align her with nineteenth-century materialists. In an 1887 letter to the *Spectator* Haggard confirms Ayesha's materialism and proposes a contemporary equivalent, noting that "in She herself some readers might find a type of the spirit of intellectual Paganism, or perhaps even of our own modern Agnosticism; of the

spirit, at any rate, which looks to earth, and earth alone, for its comfort and rewards" (111). In *She* Holly directly compares Ayesha's stance to nineteenth-century materialists:

> It is hard enough to argue with an ordinary materialist, who hurls statistics and whole strata of geological facts at your head, whilst you can only buffet him with deductions and instincts and the snowflakes of faith, that are, alas! so apt to melt in the hot embers of our troubles. How little chance, then, should I have against one whose brain was supernaturally sharpened, and who had two thousand years of experience, besides all manner of knowledge of the secrets of Nature at her command? (184)

Exasperated by Ayesha's perspective, Holly depicts her as a more developed version of the scientific "materialist" who employs "statistics" and "geological facts." He feels threatened by her materialism and wisdom, and cedes: "Feeling that she would be more likely to convert me than I should to convert her, I thought it best to leave the matter alone, and so sat silent" (184). From a Christian viewpoint, this materialist philosophy is particularly problematic when it promotes a social Darwinist ethos of 'survival of the fittest.' Ayesha asks,

> Is it then, a crime, oh foolish man, to put away that which stands between us and our ends? Then is our life one long crime, my Holly; for day by day we destroy that we may live, since in this world none, save the strongest, can endure. Those who are weak must perish; the earth is to the strong, and the fruits thereof. For every tree that grows a score shall wither, that the strong ones may take their share. We run to place and power over the dead bodies of those who fail and fall; ay, we win the food we eat from out the mouths of starving babes. It is the scheme of things. (192)

She mocks Holly's sense of morality until he eventually "felt it was hopeless to argue against casuistry of this nature, which, if it were carried to its logical conclusion, would absolutely destroy all morality, as we understand it" (192).

In combination with her longevity, Ayesha's materialist temporality aligns her with the vast scientific timescales proposed by disciplines such as biology. In fact, her longevity has enabled her to apply her social Darwinist beliefs. She is well-versed in biology and has dabbled in experimental breeding: presumably through artificial selection, she has created a race of beautiful mute servants to wait on her. These "mutes" are "the safest of servants," and Ayesha explains: "I bred them so—it hath taken many centuries and much trouble; but at last I have succeeded. Once I succeeded before, but the race was too ugly, so I did away with it; but now, as thou seest, they are otherwise. Once, too I bred a race of giants, but after a while Nature would no more of it, and it died away" (152). Ayesha's selective breeding echoes nineteenth-century concepts of evolution, most famously Darwin's examples of breeding from *Origin of Species*, and social Darwinian eugenics. Such experiments demonstrate both Ayesha's understanding of biology—what she would likely term nature's secrets—and her tendency to assume a god-like role. Within the scheme of the novel, Ayesha's lifespan encompasses evolutionary time: that she has successfully bred more than one "race" is a testament to her inhuman longevity. Her prolonged lifespan and scientific materialism make her an embodiment of something akin to deep time and suggest the possibility of far greater temporal scales that could exist.

Ultimately, Ayesha's quest to renew herself and attain longevity for Leo results in her destruction. In the novel's most striking scene, She enters the flame of life only to have it reverse its previous effect, causing her to rapidly age two millennia before dying. As Ayesha steps into the pillar's flames, she suffers an accelerated aging process that mimics a reversal of human

evolutionary stages; she appears to simultaneously grow old and regress biologically. Job cries, "*Look!—look!—look!* she's shrivelling up! she's turning into a monkey!", and Holly recalls:

> smaller and smaller she grew; her skin changed colour, and in place of the perfect whiteness of its lustre it turned dirty brown and yellow, like an old piece of withered parchment. She felt at her bald head: the delicate hand was nothing but a claw now, a human talon like that of a badly preserved Egyptian mummy, and then she seemed to realise what kind of change was passing over her, and she shrieked—ah, she shrieked!—she rolled upon the floor and shrieked! (261)

Haggard repeatedly compares Ayesha to a monkey and emphasizes her shrinkage as she ages: "Smaller she grew, and smaller yet, till she was no larger than a she baboon. Now the skin was puckered into a million wrinkles, and on the shapeless face was the stamp of unutterable age. … [N]obody ever saw anything like the frightful age that was graven on that fearful countenance, no bigger now than that of a two-months' child, though the skull remained the same size" (261-3). Moments before her death, She is "no larger than a big monkey, and hideous—ah, too hideous for words"; finally, she is compared to a reptile, an animal 'lower' on the evolutionary scale, when "She raised herself upon her bony hands, and blindly gazed around her, swaying her head slowly from side to side as a tortoise does" (263). Ultimately, all that remains is "the hideous little monkey frame, covered with crinkled yellow parchment, that once had been the glorious *She*" (264). This devolutionary transformation enacts the deep time of evolution, which was embodied in her lifespan, over the course of minutes. Reduced to grotesque material remains and destroyed by the effects of old age she had long avoided, She is punished for her agelessness, her deviant temporality, and her materialist beliefs.[19] As Hinz observes, Ayesha "is

[19] In a similar reading of this scene, Murphy observes that "*She* not only points to Ayesha's antithetical relationship with linear time but also casts her as the devolutionary figure critics have identified, one who seemingly reverses

reduced to a version of what, according to Darwin, the human race began as" (417). This, *She* insists, is the temporal fate of the materialist, in contrast to Holly's visions of spiritual eternity.

Unsurprisingly, Holly views Ayesha's destruction as a Christian punishment—she is both temporally deviant and a sinner—and "see[s] the finger of Providence" in her death: "Ayesha strong and happy in her love, clothed in immortal youth and godlike beauty, and the wisdom of the centuries, would have revolutionised society, and even perchance have changed the destiny of Mankind. Thus she opposed herself against the eternal Law, and strong though she was, by it was swept back to nothingness, swept back with shame and hideous mockery" (264). It is worth noting, however, that Holly had previously proposed that Ayesha's journey to England would also enact the will of providence: "I could only conclude that this wonderful creature, whose passion had kept her for so many centuries chained as it were, and comparatively harmless, was now about to be used by Providence as a means to change the order of the world, and possibly…to change it materially for the better" (233). "Providence" is conveniently used as an explanatory force whenever something inscrutable happens or threatens to happen in *She*, which somewhat weakens its authority. However, in his letter to the *Spectator* Haggard confirmed Holly's assessment and describes Ayesha's destruction as a critique of her materialism: "All through the book, although Ayesha's wisdom tells her that there is some ultimate fate appointed for man which is unconnected with the world…, it is to this world only and its passions that she clings. Even in the moment of her awful end, she speaks of a future *earthly* meeting with the lover, whom in the past she had feared to follow into death." Ayesha is punished for her pride and her investment in what is "earthly" by being reduced to the material elements of her being:

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and subverts temporal movement" (764). Likewise, Barrows notes that "despite the seductiveness of Ayesha's discordant temporality, the general thrust of the narrative is to definitively date her by, bluntly, killing her off.… Transformed into a shriveled mummy, as…she should have been at two thousand years of age, she is also described as a 'monkey,' a clear indication of her own primitive empire's devolution in the eyes of the Western world" (80-1).

> In the insolence of her strength and loveliness, she lifts herself up against the Omnipotent. Therefore, at the appointed time she is swept away by It with every circumstance of "shame and hideous mockery." Vengeance, more heavy because more long-delayed, strikes her in her proudest part—her beauty; and in her lover's very presence she is made to learn the thing she really is, and what is the end of earthly wisdom and of the loveliness she prized so highly. (111)

By clarifying his Christian message, Haggard suggests that Ayesha's materialist temporality is also at fault: her investment in earthly life and her faith in cyclical time resist Christian linearity and the spiritual eternity that *She* advocates as the true temporality. As Barrows observes, "[t]emporal deviance is here represented as defiance of the Christian order, which dispenses with such upstarts at the precisely 'appointed time'" so that "the precisely timed elimination of temporal anachronism is presented as analogous with Heaven's work" (81). Ayesha succumbs to a temporal retaliation for her exceptional longevity and her amoral materialism.

Critics have argued that *She* reinstates temporal order as well as Christian, Western, and masculine authority following Ayesha's death. Barrows suggests that

> The narrative thrust of the imperial Gothic is to eliminate every vestige of the challenge these characters [Ayesha and Dracula] present to unified world time by temporally fixing them within familiar latitudes and longitudes. While dependent on the exotic thrill of these atemporal characters, the texts ultimately harness them within a comfortable narrative trajectory, ensuring readers that the threat they pose to the global temporal order is eminently manageable through readily available tools. (77)

Similarly, Murphy observes that "[t]hrough her death, She is forced to submit to and be conquered by linear time and, inferentially, the men who determine its course through their control over human history. Though temporarily a disruptive presence, She is ultimately contained and her threat dispelled" (768). While I agree with Barrows's and Murphy's readings of Ayesha as "temporarily…disruptive," I would argue that the novel does not reinstate temporal authority as readily and fully as they suggest. Ayesha may have been conquered by linear time and history, but not before she disrupts the morality and temporal perspective of her admirers. Both Leo and Holly have been morally compromised by their contact with Ayesha: Holly recalls how "with the corpse of his dead love [Ustane] for an altar, did Leo Vincey plight his troth to her red-handed murderess. For those who sell themselves into a like dominion, … throwing their soul into the balance to sink the scale to the level of their lusts, can hope for no deliverance here or hereafter. As they have sown, so shall they reap" (213). Holly similarly forsakes his Christian beliefs when he is overcome by the temptation of longevity and decides to enter the Flame of Life (259). And while the novel's Christian morality is ultimately upheld, Ayesha irrevocably destabilizes its temporality. Barrows acknowledges that "[i]n one sense her gendered defiance of the dictates of rational temporality is seductive to the British adventurers…. Ayesha briefly wins the explorers over to her conception of temporality. Holly, realizing that his three weeks in Kôr feel like thirty years, argues explicitly for an event-based method of dating" (80). Barrows refers to Holly's ultimate endorsement of Ayesha's experiential perspective on time, when he exclaims about their stay in Africa: "Three weeks—and only three weeks! Truly time should be measured by events, and not by the lapse of hours. It seemed like thirty years since we saw the last of our whaleboat" (278). Given that the above passage takes place near the end of Holly's narrative and after Ayesha's death, it seems to reflect a more permanent change in his concept of time, and it is

notable that Holly, aligned with rational, masculine, and British authority, ultimately endorses this experiential and affective temporality.

Moreover, despite the text's Christian outlook, *She* upholds the possibility of reincarnation through the identical appearances of Kallikrates and Leo, and by having Holly confirm Ayesha's beliefs. Holly concludes his narrative by asking, "Is Leo really a reincarnation of the ancient Kallikrates of whom the writer speaks? Or was Ayesha deceived by some extraordinary racial resemblance? The reader must form his own opinion on this as on many other matters. I have mine, which is that she made no such mistake" (280). Further, the narrative's structure itself functions to confirm a cyclical concept of time that bears resemblance to Ayesha's belief in reincarnation: Hinz notes that "[b]y making his travellers return to the same place, Haggard demonstrates that from the cosmic perspective all journeys are cyclic; by having them set out again he suggests that all adventures are really repetitions, with variations, of an original adventure" (425). The concept of deep time and instances of folding time which the British men have encountered on their expedition to Kôr are not diminished by Ayesha's death, and neither is her longevity. If anything, her insistence that her lifespan was a natural phenomenon and not a result of immortality has been substantiated by her death. Furthermore, the materialist deep time Ayesha embodies culminates in a devolutionary transformation that suggestively aligns her with Holly's simian features as well as his and Leo's easy reversion to primitivism. Alongside its depiction of reincarnation, *She* implies that one's animal ancestry might similarly reassert itself despite intervening evolutionary ages and civilizing influences.

Finally, the novel's conclusion fails to offer closure to the reader or Haggard's characters: as in *The Coming Race* and *The Time Machine,* we are left with an open-ended denouement that leaves us—along with the narrator—awaiting an uncertain future. Despite Ayesha's death, *She*

leaves her fate open for interpretation; Haggard's subsequent sequels would confirm her vow: "I shall come again, and shall once more be beautiful" (263).[20] Holly concludes his narrative by confirming his suspicion that the deep time he encountered through Ayesha will stretch into the future, writing: "And that is the end of this history so far as it concerns science and the outside world. What its end will be as regards Leo and myself is more than I can guess at. But we feel that it is not reached yet. A story that began two thousand years ago may stretch a long way into the dim and distant future" (280). Like Bulwer's and Wells's, Haggard's final paragraph presents a prophetic if uncertain future:

> Often I sit alone at night, staring with the eyes of the mind into the blackness of unborn time, and wondering in what shape and form the drama will be finally developed, and where the scene of its next act will be laid. And when that final development ultimately occurs, as I have no doubt it must and will occur, in obedience to a fate that never swerves and a purpose that cannot be altered, what will be the part played therein by that Egyptian Amenartas, the Princess of the race of the Pharoah Hakor, for the love of whom the ancient Kallikrates broke his vows to Isis, and…fled down the coast of Libya to meet his doom at Kôr. (280)

As in *The Coming Race* and *The Time Machine*, the narrator returns to daily life irrevocably changed and anticipating a potentially threatening future (as Holly previously notes, Ayesha in her full glory poses a considerable threat (233, 264)). Although *She* upholds Christian morality and criticizes Ayesha's materialism, it does not fully reinstate the authority of Christian temporality and Western history; instead, it adheres to its depiction of reincarnation, validates

[20] Haggard published three subsequent Ayesha stories, two prequels—*She and Allan* (1920) and *Wisdom's Daughter, The Life and Love Story of She-Who-Must-Be-Obeyed* (1923)—and one sequel—*Ayesha, The Return of She* (1905)—to *She: A History of Adventure* (Monsman 193).

Ayesha's experiential temporality, hints at the potential for degeneration, and describes how Holly's temporal perspective has changed as a result of his adventure.

"Thirty Million Years Hence": Deep Time in H. G. Wells's *The Time Machine*

In *The Time Machine: An Invention*,[21] time is inextricably linked to science: time travel is possible through scientific innovation, the future is understood through scientific theories, and time is explained in scientific terms. The novel extends deep time, in the term's "original geological meaning" (McGurl 538), into the future to illustrate devolution and thermodynamic dissipation. Gold writes that "science fiction has the capacity to give life to metaphor, to *literalize*" (89), and through the device of a time machine Wells brings the spatial metaphor of time travel apparent in *The Coming Race* and *She* to life. The chronometric technology of the time machine is predicated on the Time Traveller's mathematical understanding of time as a dimension, and his theoretical explanation represents a departure from the concepts of deep time in most nineteenth-century novels (including the other works studied in this dissertation). While Wells includes this mathematical angle on deep time and names the specific year of the Time Traveller's initial landing in the future, he also employs sensationalist and affective descriptions of the protagonist's journey to convey deep time in more novelistic terms: the Time Traveller's encounters with uncanny post-human species, his horror at the heat death of the sun, and his sensations during time travel represent some of the most memorable aesthetic and affective moments of the text and they depict deep time in relation to human experience. In this sense, Wells, like Hardy, draws on the novel's narrative resources as a means of expressing deep time; however, like Bulwer and Haggard, he draws from fantasy and horror literary traditions to

[21] Unless otherwise noted, I refer to *The Time Machine*'s first British book edition, published by Heinemann in 1895 (Ed. Ruddick, Broadview, 2001). See Bernard Bergonzi regarding the text's "complex bibliographical history" (42).

convey the terrors of the future in sensational terms. By using the novel as a vehicle to explore the deep time of the remote future and to represent inconceivably vast timeframes, *The Time Machine* literalizes the model of folding time apparent in other nineteenth-century novels in order to bring human consciousness into contact with the distant future.

These personal responses to deep time also reinforce Wells's portrayal of the subjectivity of human temporality. Since the Time Traveller's vivid descriptions of a post-human world are filtered through multiple perspectives and reveal numerous biases (and, ultimately, remain unconfirmed), *The Time Machine* also suggests that scientific knowledge and human experiences of time are inevitably limited and subjective. In this text Wells is sceptical of scientific claims to objectivity and he criticizes progressivist appropriations of scientific theory. While the Time Traveller's theory of deep time and chronometric technology is upheld, his ability to view deep time and the events of the future from an "absolute standpoint" ("Inventor" 94) is clearly compromised by his human perspective; instead, time is relative to one's position along "the Time-Dimension" (*TTM* 62). Caroline Hovanec proposes that the novel's "opening frame sets up empiricist assumptions about seeing, knowing, and believing in order to knock them down" (466) so that the novel "destabilizes scientific epistemology" (478). A parallel set-up occurs with regards to time as the Time Traveller initially proposes a scientifically-objective model of deep time which the events and narrative structure of the novel undermine. The narrative suggests the fallibility and partiality of human perspectives: this "true scientific standpoint" ("Inventor" 94) is not achievable but theoretical and is displaced by temporal relativity as the novel progresses. Thus, the novel critiques not only progressivist and anthropocentric models of science, time, and history, but the belief that humans can transcend subjectivity in order to achieve an objective scientific perspective and a complete grasp of deep time.

I include *The Time Machine* as a Victorian text due to its firm entrenchment within nineteenth-century scientific theories and its topicality, especially in relation to contemporary discussions about science and time. The novel draws on fin-de-siècle theories of degeneration and thermodynamics, and Wells's innovative portrayal of time travel develops concepts of deep time explored by other nineteenth-century novelists. In particular, *The Time Machine* shares Dickens's interest in chronometry and the technoscience of time-keeping as represented in *Dombey and Son*, and Wells seems to echo Eliot's epigram from *Daniel Deronda* which proposes that "[e]ven Science, the strict measurer, is obliged to start with a make-believe unit, and must fix on a point in the stars' unceasing journey when his sidereal clock shall pretend that time is at Nought" (3). Wells's novel also reflects Hardy's pessimistic materialism and similarly investigates characters' places in deep time and, with regards to *Two on a Tower*, the figure of the scientist-explorer. The parallels to *The Coming Race* and *She* are evident in the novel's adventure and travel format as well as its future-driven narrative: Cantor and Hufnagel remark that "[i]n many respects Wells's book is simply a Rider Haggard romance in science fiction dress" (38) and note that "it is deeply rooted in the Victorian era" (36). *The Time Machine* likely takes place a year before its publication in 1895 and Wells clearly intends to place the novel's events within a contemporary scientific context.[22] For instance, the Time Traveller notes that "Professor Simon Newcomb was expounding [the fourth dimension of time] to the New York Mathematical Society only a month or so ago" (61), while the Medical Man recounts having "seen a similar thing at Tübingen" when he meets the narrator "at the Linnaean" Society (69).[23]

[22] Nicholas Ruddick argues that the novel begins in February 1894 ("Topicality" 338): "everything that happens in Wells's 'invention' is deliberately and rigorously historicized by being placed in a specific temporal relation to a moment in history that corresponds very closely to the date of *The Time Machine*'s composition" (337).
[23] Ruddick notes that Newcomb was an "American mathematician, astronomer, and naval officer (1835-1909)" (*TTM* 61) and explains: "The Linnaean Society, a distinguished scientific society founded in London in 1788, [was] named for the great Swedish botanic taxonomist Carolus Linnaeus (Carl von Linné, 1707-78), and famous as the forum at which Charles Darwin in July 1858 first presented his theory of evolution" (69).

Wells's scientific background is evident in *The Time Machine*'s depiction of a future of biological regression and entropy.[24] The text's evolutionary and cosmic timescales are indebted to Victorian scientific conceptions of time, and the novel is divided into three separate time periods, each of which corresponds to a different scientific timescale. The opening scenes, in roughly 1894, depict human achievement and an era of human history; the main portion of the novel, set in 802,701 AD, focuses on a post-human world and showcases an evolutionary timeframe; and the final section, more than thirty million years in the future, represents cosmic time and thermodynamic dissipation.[25] *The Time Machine* develops, as Nicholas Ruddick puts it, "the grand theme of humanity's place in time" ("Topicality" 339) but from a future perspective. Echoing Darwin's observation that "[t]he whole history of the world, …will hereafter be recognized as a mere fragment of time" (*Origin* 396), the Time Traveller contrasts cosmic time with human history: "Looking at these stars suddenly dwarfed my own troubles and all the gravities of terrestrial life. … And during these few revolutions all the activity, all the traditions, the complex organizations, the nations, languages, literatures, aspirations, even the mere memory of Man as I knew him, had been swept out of existence" (123). Using language that recalls *Two on a Tower*—astronomy "dwarfs" Viviette's "personal matter[s]" (29)—Wells emphasizes the relative insignificance of humankind within geological, evolutionary, and cosmic timeframes.

Wells underscores this message with satiric effect in his depiction of the Palace of Green Porcelain, a dilapidated old museum containing human artefacts which the Time Traveller discovers in 802,701. Recalling the ruins of Kôr and, in particular, the Vril-ya's public museum,

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[24] From 1884-87 Wells attended the Normal School of Science on scholarship with the goal of becoming a science teacher. While there he heard T. H. Huxley, who would strongly influence his scientific views, lecture on zoology. In 1889 Wells received his B.Sc. with first class honours in zoology and became a Fellow of the Zoological Society (Ruddick, Introduction 16-19). For further information on Wells's scientific background, see Kelly Hurley (55- 64).

[25] Ruddick similarly identifies "the *historical*, the *evolutionary* (or *geological*), and the *astronomical* [time-scales]. These three time-scales correspond to the tripartite temporal structure of the work" ("Topicality" 339).

the Palace contains now-ancient religious "idols," technology, and fossils from around the world, including "the decaying vestiges of books" (131-2). The Time Traveller observes that "the thing that struck me with keenest force was the enormous waste of labour to which this sombre wilderness of rotting paper testified" (this prompts him to think with concern about his "own seventeen papers upon physical optics") (131). Like the trilobite fossil in *A Pair of Blue Eyes*, the relics of civilization represent an ancient and seemingly insignificant past. In the future, not only are these symbols of human achievement outdated enough to be housed in a museum, but the museum and its contents have fallen to ruin long after human civilization has ceased to exist. Science, religion, and culture are now the decaying relics of a forgotten, obsolete human species.

Wells's representation of the future actively confirms contemporary theories of biology and physics or, more specifically, degeneration and dissipation.[26] In his application of evolutionary theory to explain the Eloi and Morlocks, Wells builds on Darwinian natural selection but is chiefly indebted to Thomas H. Huxley. Huxley championed Darwin's theories and rejected the interpretation of evolution as progress. In "The Struggle for Existence in Human Society" (1888), Huxley insisted that "it is an error to imagine that evolution signifies a constant tendency to increased perfection" (199) and describes "the course of nature" as "a materialized logical process,…which, in the majority of cases, has not the slightest reference to moral desert" (202). Wells's representation of humanity's future is also informed by notions of degeneration prominent, for example, in E. Ray Lankester's *Degeneration: A Chapter in Darwinism* (1880). Lankester and Wells were friends, and passages like the following from *Degeneration* are echoed in *The Time Machine*: "Any new set of conditions occurring to an animal which render its food and safety very easily attained, seem to lead as a rule to Degeneration; just as an active healthy man sometimes degenerates when he becomes suddenly possessed of a fortune; or as Rome

[26] For further discussion of degeneration theory in *The Time Machine*, see Hurley (65-88).

degenerated when possessed of the riches of the ancient world" (33). In the years leading up to *The Time Machine*'s publication, Wells's essays reveal his impatience with anthropocentric readings of biology and particularly evolutionary theory. He is sceptical of human progress and critical of interpretations of evolution as advancement in "Zoological Retrogression" (1891):

> Perhaps no scientific theories are more widely discussed or more generally misunderstood among cultivated people than the views held by biologists …. Using their technical phrases and misquoting their authorities in an invincibly optimistic spirit, the educated public has arrived in its own way at a rendering of their results which it finds extremely satisfactory. It has decided that in the past the great scroll of nature has been steadily unfolding to reveal a constantly richer harmony of forms and successively higher grades of being, and it assumes that this "evolution" will continue with increasing velocity under the supervision of its extreme expression—man. (246)

Wells is scathingly critical of "[t]his belief, as effective, progressive, and pleasing as transformation scenes at a pantomime," and proposes that "[o]n the contrary, there is almost always associated with the suggestion of advance in biological phenomena an opposite idea," an "evolutionary antithesis—degradation" (246). He concludes "that before [man] lies a long future of profound modification, but whether that will be, according to present ideals, upward or downward, no one can forecast."[27] This prediction and, particularly, Wells's ensuing claim that "[t]he Coming Beast must certainly be reckoned in any anticipatory calculations regarding the Coming Man" (253) recall Bulwer's interest in "the Darwinian proposition that a coming race is destined to supplant our races" (qtd. in Lytton 465). Wells suggests that blind faith in human

[27] Wells echoes Huxley's claim that evolution "involves a constant re-modelling of the organism in adaptation to new conditions; but it depends on the nature of those conditions whether the direction of the modifications effected shall be upward or downward. Retrogressive is as practicable as progressive metamorphosis" ("Struggle" 199).

progress and superiority is problematic and scientifically unfounded, and his views on the unpredictability of evolution and the potential for human devolution are reflected in his works leading up to the publication of *The Time Machine*.

In 802,701, the Time Traveller realizes that the human race has degenerated and divided into separate species, the Eloi and the Morlocks (whom he assumes to be descendents of the Victorian upper classes and labourers, respectively). While the text's social message may be interpreted in various ways,[28] the evolutionary and biological message is clear. In a passage reminiscent of Darwin and Lankester, the Time Traveller explains: "It is a law of nature we overlook, that intellectual versatility is the compensation for change, danger, and trouble. An animal perfectly in harmony with its environment is a perfect mechanism.… There is no intelligence where there is no change and no need of change" (141). It is through an understanding of late-nineteenth century evolutionary and degeneration theory that the Time Traveller grasps the historical narrative of the Eloi and Morlocks, "[t]he two species that had resulted from the evolution of man [and] were sliding down towards, or had already arrived at, an altogether new relationship.… [C]learly, the old order was already in part reversed" (119-20). Wells's representation of the Morlocks as a dominant and technologically-advanced subterranean species recalls Bulwer's depiction of the powerful Vril-ya, who also evolved from humankind.

This scientifically-founded pessimism is also apparent in the novel's depiction of thermodynamic dissipation. In "The Further Vision," *The Time Machine*'s final section, Wells draws on contemporary physics and astronomy to depict, in Bruce Clarke's words, the "sublime terror of cosmic dissipation" (*Energy Forms* 1). After his time in 802,701, the Time Traveller voyages "more than thirty million years hence" only to witness the heat-death of the universe

[28]For instance, are the Morlocks revenging their oppression which began in the nineteenth century, or do they represent a grotesque embodiment of the labouring classes? Are the Eloi a satire on the effeminate and degenerate upper-classes, or do they represent the only vestige of humanity in the future?

through thermodynamic entropy (147). The second law of thermodynamics, particularly as developed by William Thomson, features prominently in the chapter, while the novel's temporal scale—and the solar system's expiration date at around thirty million years in the future—is largely derived from Thomson's assessments (Clarke 3). The parallels between degeneration and dissipation in this novel are characteristic of late-nineteenth-century scientific discussions, particularly in popular culture, in which the disparate theories of evolution and thermodynamics were used to bolster a sense of pessimism about the future. Gold notes that "evolutionary and thermodynamic narratives participated in the same larger cultural discussion, evinced similar anxieties, and drew on similar methods to assuage these anxieties" (29). In particular, and as *The Time Machine* attests, these anxieties were related to deep time, as "the irreversibility of evolutionary time" (Clarke 9) and the second law of thermodynamics suggested a bleak future for humankind. In this sense, it is not only *The Time Machine*'s scientific theories but the parallels that the novel draws between devolution and dissipation that are informed by late-Victorian science: "Twisting together powerful strands of defunct science, its complex of superannuated scientific concepts is clustered at a discursive node that connects two obsolete formations—biological degeneration and heat death. The very images that the science of *The Time Machine* projects upon the future—multiple scenes of entropic and devolutionary ruin—are now themselves in conceptual ruin" (Clarke 121-22). Indeed, in his preface to the novel's 1931 reissue, Wells characterizes it as a product of its scientific climate: "the geologists and astronomers of that time told us dreadful lies about the 'inevitable' freezing up of the world—and of life and mankind with it. The whole game of life would be over in a million years or less. They impressed this upon us with the full weight of their authority, while now Sir James Jeans in his smiling *Universe Around Us* waves us on to millions of millions of years" (*TTM* 1931, ix-x).

As this quotation suggests, scientific systems of knowledge contain a certain degree of instability; Wells recognizes, over thirty years later, that the science he drew on for *The Time Machine* is no longer current or completely reliable.

While *The Time Machine* relies heavily on scientific theories and uses a technoscientific invention as its premise, Wells employs affective, sensationalist, and aesthetic strategies to convey deep time. He illustrates the horror of deep time by having the Time Traveller confront the degeneration and dissipation effected over thousands and millions of years. Shortly before *The Time Machine*'s publication, Wells employed a similar affective strategy by emphasizing the feelings surrounding evolutionary obsolescence in his article entitled "On Extinction" (1893), which proclaimed: "This is the saddest chapter of biological science—the tragedy of Extinction" (623). He writes: "Surely a chill of solitude must strike to the heart of the last stragglers in the rout, the last survivors of the defeated and vanishing species. … For them the future is blotted out, and hope is vanity." Wells emphasizes, "These days are the days of man's triumph. The awful solitude of such a position is almost beyond the imagination. The earth is warm with men. We think always with reference to men. The future is full of men to our preconceptions, whatever it may be in scientific truth," and he concludes by describing "the most terrible thing that man can conceive as happening to man: the earth desert through a pestilence, and two men, and then one man, looking extinction in the face" (624). Evidently, Wells's bleak vision of the future rejects assumptions of enduring human supremacy and derides scientific anthropocentrism. Yet "On Extinction" also recognizes the terror that the notion of human extinction inspires, and foreshadows *The Time Machine* in it empathetic imagining of the last man on earth (and, indeed, the last of any species facing extinction).

The Time Machine illustrates the "awful solitude" of the last man standing through the Time Traveller, who, in "The Further Vision," voyages "more than thirty million years hence." There, he witnesses an eclipse on a desolate beach which he describes in affective terms:

> A horror of this great darkness came on me. The cold, that smote to my marrow, and the pain I felt in breathing overcame me. I shivered, and a deadly nausea seized me. Then like a red-hot bow in the sky appeared the edge of the sun. I got off the machine to recover myself. I felt giddy and incapable of facing the return journey home. As I stood sick and confused I saw again the thing moving upon the shoal—there was no mistake now that it was a moving thing—against the red water of the sea. It was a round thing, the size of a football perhaps, or, it may be, bigger, and tentacles trailed down from it; it seemed black against the weltering blood-red water, and it was hopping fitfully about. Then I felt I was fainting. But a terrible dread of lying helpless in that remote and awful twilight sustained me while I clambered upon the saddle. (148)

Alongside his rigorous depiction of science, Wells's affective strategy is to sensationalize the despair many felt over the vast timescales proposed by nineteenth-century scientific theories. His literary representation of this future gives voice to human consciousness facing the prospect of annihilation, acknowledging the hopelessness and dread embedded within these concepts of the future. This depiction of deep time aims to horrify the reader by producing a highly sensational and affective description of the heat death of the sun in terms that recall Swithin's discussion of astronomy and "the quality of decay" in *Two on a Tower* (30). "The Further Vision" is purely focused on the Time Traveller's experience in this future and conveys his sensations as well as highly memorable imagery. Hovanec discusses the artistic quality of such descriptions and notes

that "*The Time Machine* finds aesthetic inspiration in science" (461). Wells conveys deep time and the thermodynamic entropy through a sensationalized human perspective and affective, aesthetic descriptions. The Time Traveller's experience in the far-future suggests that this remote period is accessible to human consciousness, even if the text must literalize the device of folding time to bring such consciousness into contact with the distant future. Wells's turn to the novel as a means of communicating the vast scientific timescales he had previously articulated in essays suggests that the genre offers methods of conceptualizing deep time which are not available in non-fiction writing. Indeed, *The Time Machine* amplifies the literary and narrative elements already apparent in "On Extinction," extending a brief sketch into a narrative imbued with affect and sensationalism; like Hardy, Wells uses the resources that the novel provides to bridge the conceptual distance between human temporal scales and deep time.

The novel's literary representation of deep time, filtered through the Time Traveller's perspective, is one of the ways that Wells troubles claims to scientific objectivity. Although science is pervasive in *The Time Machine*'s fin-de-siècle world and Wells clearly subscribes to specific theories, the novel's representation of scientific perspectives and its narrative structure suggest that science—like other systems of knowledge—is ultimately subjective and partial. The scientific concepts which serve as premises for the novel and Wells's destabilization of scientific objectivity are not necessarily at odds: Hovanec proposes that "[t]he decay of empiricism staged in the novel reflects a longer history of epistemological skepticism internal to science, rather than merely imposed from without by artists and philosophers. In other words, the novel's dismantling of empiricism is a case not of two-culture oppositionality, but of a mode of thinking that is both literary and scientific" (461-62). In particular, the shifting hypotheses proposed by the scientifically-knowledgeable protagonist to explain the strange species he encounters in

802,701 expose the variable and limited nature of scientific interpretation. Initially, the Time Traveller assumes that a level of human progress has been attained, but soon acknowledges, "I must confess that my satisfaction with my first theories of an automatic civilization and a decadent humanity did not long endure" (102). He correctly "connects [the] wells" and "towers" he sees, but interprets them to be "an extensive system of subterranean ventilation" "associate[d]…with the sanitary apparatus of" the Eloi. "It was an obvious conclusion," he admits, "but it was absolutely wrong" (100). He soon recognizes "that my graceful children of the Upper World were not the sole descendants of our generation, but that this leached, obscene, nocturnal Thing, …was also heir to all the ages" (107), yet he severely misestimates the species' balance of power. The Time Traveller's deductions, founded in his late-Victorian perceptions, are once again incorrect: before realizing that the Morlocks have been harvesting the Eloi, he assumes that "above ground you must have the Haves, pursuing pleasure and comfort and beauty; and below ground the Have-nots; the Workers getting continually adapted to the conditions of their labour" (110). His hypotheses are frequently equal parts correct and inexact, revealing many possible interpretations of his environment and the ultimate inconclusiveness of his theories.[29] While his final explanation—that the Eloi are descendants of a decadent upper class while the Morlocks have evolved from labourers forced to work underground—is plausible within the context of the novel, the Time Traveller's shifting interpretations of his environment challenge the possibility of a unified, verifiable, and complete scientific account.

Although the Time Traveller's hypotheses and revisions might suggest a scientific examination of his surroundings, the novel soon emphasizes how his biases interfere with his

[29] Cantor and Hufnagel suggest that "Wells seems to be satirizing the way the typical Victorian explorer assumed that he could easily solve the mysteries of native life any place on the globe" (46): "as an anthropologist the Time Traveller displays his cultural arrogance…. Given the number of mistakes Wells shows [him] making, he seems to be criticizing his hero for precisely this overconfidence and overeagerness in thinking that native society is simply transparent to him" (45).

scientific perspective. He identifies with the human-like Eloi, so when he recognizes that "[they] were mere fatted cattle, which the ant-like Morlocks preserved and preyed upon—probably saw to the breeding of"—he is appalled. He explains:

> I tried to look at the thing in a scientific spirit. After all, they were less human and more remote than our cannibal ancestors of three or four thousand years ago. … I even tried a Carlyle-like scorn of this wretched aristocracy-in-decay. But this attitude of mind was impossible. However great their intellectual degradation, the Eloi had kept too much of the human form not to claim my sympathy, and to make me perforce a sharer in their degradation and their Fear. (125)

Despite his attempts at scientific objectivity, the Time Traveller's rational and impartial theories are undercut by his instinctive identification with the Eloi. When it comes down to it, he is unable to maintain his detachment or establish any objective scientific perspective.

Indeed, the Time Traveller's understanding of these post-human species is marked by "sympathy" and "fear," and it is through the Traveller's feelings (attachment and repulsion, respectively) regarding these species that Wells is able to convey evolutionary time. The Time Traveller's affective responses to these species reveal their evolutionary relations: the sympathy he feels for the Eloi is an admission of their descent, while the horror he feels towards the "abhuman ape-men" (Hurley 86) is characterized by an "uncanny" sense of recognition, to borrow Matthew Beaumont's term. His comprehension of their evolutionary history is founded less on scientific evidence than in his intrinsic reactions to these species.

Additionally, Wells uses his novel's narrative voice and form to emphasize the limitations of human perception. Notably, the narrative investigation of the partiality of perception—a feature often associated with the high realism of novelists like Eliot—is central to

Wells's investigation of human temporal experience and scientific knowledge in this romance. While investing the figure of the scientist with high-flown romance and adventure, Wells simultaneously brings him down to earth by showing him to be subject to the same flaws of perception, the same blinding self-interest, as all other ordinary individuals. Despite being an accomplished and forward-thinking scientist, the Time Traveller often has limited understanding of events and even, at times, of his own machine. His short-sighted trip to the future and his behaviour there reveal how little he considers the consequences of his own actions (most notably, when he starts the forest fire which presumably kills Weena (136-40)), and the ease with which he reverts to a primitive survival mode upsets his ostensibly detached scientific outlook. Much like Holly doing battle with the Amahagger, the Time Traveller's adventures expose a streak of bloodlust which reveals an intrinsic reversion to base survival instincts. He describes fighting the Morlocks and "feel[ing] the succulent giving of flesh and bone under my blows" and recalls how "[t]he strange exultation that so often seems to accompany hard fighting came upon me" (137). Moreover, despite his disgust at the Morlocks harvesting the Eloi like "cattle," his first request upon returning to his London home is "Save me some of that mutton. I'm starving for a bit of meat" (71).[30] Wells further underscores the Time Traveller's lack of self-awareness by suggesting that the protagonist's use of technology—his "weakness for mechanism" (129)—and his aggressive means of self-preservation align him with the violent, clever, and technologically-savvy Morlocks (129). He consistently underestimates the Morlocks (who are clever enough to steal, dismantle, and then repair his machine (143)), despite the fact that his own attributes—self-preservation, aggression, intellect, and mechanical ingenuity—suggest more commonality with them than the Eloi. Kelly Hurley observes that "the novel always emphasizes

[30] See also Hurley: "For if the Morlocks are savage 'beasts,' they are still not much worse than the Time Traveller, whose story is always bringing his own savagery to the forefront" (87). She also notes that "when he returns to his own present the first thing he does is wolf down a meal of red meat" (86).

his greater similarity to the abhuman ape-men…. For in contrast to their apish appearance, the Morlocks are exemplary Victorians: they are intelligent, shrewd, and industrious; they operate complex machinery; they are actively employed in the production of useful goods. They are energetically masculine, like the Time Traveller himself" (86-7). Evidently, the Time Traveller's prejudices inform his interpretation of events and the ensuing narrative.

Wells distances us further from the possibility of achieving an objective and stable representation of the future through his narrative form. The novel is presented as a frame narrative in which the events recounted by a fallible protagonist are related second-hand by one of his friends (a friend who doesn't know how the Time Traveller's story ends—only that he has vanished). *The Time Machine* implies that since human perspectives are inescapably partial, science—even well-informed science—is subject to similar limitations. Ultimately, the Time Traveller's account of events remains unverifiable, and while his narrating friend believes his story, the rest of his group—including the Medical Man, Editor, Journalist, and Psychologist—rejects his tale (151-3). Hovanec suggests that "[a]s in James's *Turn of the Screw* and Conrad's *Lord Jim*, the framing structure in *The Time Machine* works to cast doubts on the reliability of the enframed story and storyteller" (466). Without external confirmation, the Time Traveller's account cannot be substantiated and the novel's conclusion remains uncertain and open-ended.

The Time Traveller's subjective account and his compromised scientific perspective correspond to his ultimately relative temporality. If, as Hovanec proposes, "*The Time Machine*'s opening frame sets up empiricist assumptions about seeing, knowing, and believing in order to knock them down" (466), it similarly introduces a purportedly objective theory of deep time which ultimately remains unattainable via a human point of view. Wells introduces the topic of time travel early on as the protagonist explains the theory and philosophy behind his invention.

For the Time Traveller, time can be understood through scientific and mathematical knowledge, yet his explanations of time admit that human temporal perspectives tend to be subjective. He insists that "Scientific people…know very well that Time is only a kind of Space" (61), arguing that "any real body must have extension in *four* directions: it must have Length, Breadth, Thickness, and—Duration. … There are really four dimensions, three which we call the three planes of Space, and a fourth, Time." Time appears different than the other dimensions solely because of the human perspective: "There is…a tendency to draw an unreal distinction between the former three dimensions and the latter, because it happens that our consciousness moves intermittently in one direction along the latter from the beginning to the end of our lives" (60). To prove his theory, the Time Traveller uses the examples of a barometer, which records weather using mercury to trace a line "along the Time-Dimension," and of a series of portraits of an aging man which "are evidently sections, as it were, Three-Dimensional representations of his Four-Dimensioned being, which is a fixed and unalterable thing" (61). This latter observation recalls *The Coming Race*'s portrait gallery, which reveals the Vril-ya's evolutionary history. When his guests argue that the difference is that one can travel in space but not in time, the Time Traveller suggests that any form of travel in the four dimensions relies on technological innovation, noting that long ago man was unable to travel in the air: "But a civilized man is better off than the savage in this respect. He can go up against gravitation in a balloon, and why should he not hope that ultimately he may be able to stop or accelerate his drift along the Time-Dimension, or even turn about and travel the other way?" (62). This comparison reveals the imperial connotations of travel in the novel, as technoscientific advancement—and, as Hovanec observes, a machine constructed out of colonial resources such as ivory and brass (485)[31]—enables an unprecedented

[31] Hovanec explains "that the model Time Machine is not a *neutral* aesthetic object. Its materials—ivory and brass—emerge from a colonialist ivory trade in Africa, and from the mining and cementation of copper and zinc."

exploration**.** This spatialized concept of time also brings to mind Teufelsdröckh's imagined time journeys in *Sartor Resartus* courtesy of an innovative "Time-annihilating hat" (199). Advanced technology may allow humans to travel in the Fourth Dimension the way they move through space, and the protagonist proceeds to unveil a small model of just such a machine.

Evidently the opening chapters focus on the philosophy of time travel—specifically the idea of time as a fourth dimension of space—in great detail. The Time Traveller's discourse adds a hypothetical scientific perspective to a text that uses the idea of time travel to develop evolutionary and thermodynamic theories, but this context does not seem to justify such an extensive demonstration in a short text. Further, Wells consistently presents this introductory material in all versions of his text, suggesting its importance to the novel's themes.[32] While Philmus and Hughes propose that the time machine "serves as the premise for the 'voyage' of consciousness into th[e] future" (49), these philosophical digressions and the time machine itself serve another purpose: they enable Wells to propose a model of absolute scientific objectivity with regards to deep time—one which the Time Traveller emphatically fails to achieve. In an earlier version of *The Time Machine*,[33] the Time Traveller "propose[s] a wholly new view of things based on the supposition that ordinary human perception is an hallucination" ("Inventor" 93). He explains that,

> To an omniscient observer there would be no forgotten past—no piece of time as it were that had dropped out of existence—and no blank future of things yet to be revealed…. Indeed, present and past and future would be without meaning to such an observer: he would always perceive exactly the same thing. He would see…a

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Its "history [is] intertwined with the histories of colonialism and dangerous Industrial Age labor" (485).

[32] Cantor and Hufnagel note that "Wells's many false starts and the number of versions he went through before he published *The Time Machine* as we know it testify to the difficulty of his enterprise" (36). See also Philmus and Hughes's discussion of these versions in "Revisions of the Future" in *H. G. Wells: Early Writings* (47-56).

[33] "The Inventor." *New Review* 12 (Jan. 1895): 98-101.

> Rigid Universe filling space and time—a Universe in which things were always the same.… From the absolute point of view the universe is a perfectly rigid unalterable apparatus, entirely predestinate, entirely complete and finished.… [F]rom the absolute standpoint—which is the true scientific standpoint—time is merely a dimension, quite analogous to the three dimensions in space. Every particle of matter has length, breadth, thickness, and—duration. (93-4)

Notably, the possibility of achieving an objective scientific perspective is aligned with the ability to fully comprehend time: "from the absolute standpoint," the universe exists entirely and at once so that "present and past and future [are] without meaning." However, just as scientific knowledge is presented as unstable and partial in *The Time Machine*, a distanced understanding of time proves impossible for humans whose temporal perspectives are necessarily relative and limited by an individual's point of view. The notion of "an omniscient observer" is merely theoretical: an "absolute" and "true scientific standpoint" is impossible for humankind to access.

In fact, the time machine's numerical readings and the mathematical model of time upon which it is based serve to underline the relativity of human time. Hearkening back to the connections Dickens establishes between timepieces and science in *Dombey and Son* and prefiguring Conrad's use of Greenwich as a symbol of science in *The Secret Agent*, Wells draws on nineteenth-century chronometry for his representation of the time machine itself. The small-scale model of the invention is described as "a glittering metallic framework, scarcely larger than a small clock" (65), while on the full-size machine "[o]ne dial records days, another thousands of days, another millions of days, and another thousands of millions" (144). *The Time Machine*'s vast evolutionary timescale is ironically represented through the discrete measurements of days and years "recorded" by the "little dials" of his invention (87). The juxtaposition of this

diminutive chronometry with the sweeping stages of history emphasizes human insignificance and draws attention to the mechanical or constructed nature of our understanding of time; "Science…start[s] with a make-believe unit" and "his sidereal clock…pretend[s] that time is at Nought" (*Deronda* 3). However, the fact remains that the time machine is capable of measuring vast temporal change. This technology has the power to translate seemingly incomprehensible temporal distance into numbers, thereby enabling a human reading of deep time.

The machine's numerical readings of deep time approximate the theoretical principles expounded in the novel's opening and serve as a contrast to the protagonist's subjective experience of time travel and the relativity of time. Tellingly, the Time Traveller is focused on recounting the experience of his voyage rather than delineating it in mathematical or scientific terms. He describes his feelings during his journey: "I felt a nightmare sensation of falling.… I am afraid I cannot convey the peculiar sensations of time travelling. They are excessively unpleasant. There is a feeling exactly like that one has upon a switchback [a roller-coaster]—of a helpless headlong motion! I felt the same horrible anticipation, too, of an imminent smash" (76-7). Far from making him omniscient, the time machine blurs his surroundings, contributing to what Hovanec describes as the novel's "impressionistic style" (461): "The landscape was misty and vague. … I saw trees growing and changing like puffs of vapour, now brown, now green: they grew, spread, shivered, and passed away. I saw huge buildings rise up faint and fair, and pass like dreams. The whole surface of the earth seemed changed—melting and flowing under my eyes" (77). Hovanec remarks that "[t]he scene creates the same sense of vertiginous relative motion that must have followed Einstein's relativity theory, which shattered the idea that there could be any one absolute, stationary point of reference" (473). The Time Traveller is so preoccupied by describing the future that he delays announcing the year: "I resolved to mount to

the summit of a crest…from which I could get a wider view of this our planet in our year Eight Hundred and Two Thousand Seven Hundred and One, A. D. For that, I should explain, was the date the little dials of my machine recorded" (87). When he journeys once more "into futurity" his descriptions are similarly vague and personal rather than mathematically precise: "For an indefinite time I clung to the machine as it swayed and vibrated, quite unheeding how I went, and when I brought myself to look at the dials again I was amazed to find where I had arrived.… [W]hen I came to look at these indicators I found that the thousands hand was sweeping round as fast as the seconds hand of a watch—into futurity" (144). The Time Traveller disregards the numbers on his machine entirely and, ironically, has no sense of how much time has passed since he mounted it. At this point he is even more careless of the time to which he is going, and his dates become increasingly imprecise as he travels further in time: "So I travelled…in great strides of a thousand years or more, drawn on by the mystery of the earth's fate, watching with a strange fascination the sun grow larger and duller in the westward sky, and the life of the old earth ebb away. At last, more than thirty million years hence, the huge red-hot dome of the sun had come to obscure nearly a tenth part of the darkling heavens" (147). Because he has traversed deep time, the exact numbers no longer seem important and he measures years by the thousands and millions. While the machine's dials are capable of "record[ing] days" in the "thousands," "millions," and "thousands of millions," the Time Traveller remains focused on experiencing the deep time of the future rather than attempting to record a precise date. John McPhee contends that "geologists wonder sometimes…to what extent they truly sense the passage of millions of years. They wonder to what extent it is possible to absorb a set of facts and move with them, in a sensory manner, beyond the recording intellect and into the abyssal eons" (127-28). Wells attempts to depict just such a movement "into the abyssal eons" as his protagonist strives to

convey the overwhelming experience of deep time in literary terms, forgoing precise dates. By presenting a "sensory" experience of deep time alongside a rough numerical estimate, *The Time Machine* suggests that deep time might be understood through an affective human perspective.

Ultimately, the Time Traveller fails to achieve his vision of temporal omniscience and offers a subjective version of his experiences in the future. As a story-teller, he conveys his tale of the future in affective, sensational, and aesthetic terms, and the novel concludes by emphasizing human values in a post-human world. If, through the Time Traveller, Wells illustrates the horror of being the last man on earth, it is through the text's frame narrator that he considers the psychological implications of believing his experience. In the epilogue, the narrator writes that the Time Traveller "thought but cheerlessly of the Advancement of Mankind, and saw in the growing pile of civilization only a foolish heaping that must inevitably fall back upon and destroy its makers in the end." Such a belief provides little reassurance; the narrator can only propose: "If that is so, it remains for us to live as though it were not so. But to me the future is still black and blank—is a vast ignorance, lit at a few casual places by the memory of his story" (155-6). The narrator describes a gift the Time Traveller received from Weena, saying: "I have by me, for my comfort, two strange white flowers—shriveled now, and brown and flat and brittle—to witness that even when mind and strength had gone, gratitude and a mutual tenderness still lived on in the heart of man" (156). The weak reassurance the narrator attempts to gain from Weena's flowers seems an insufficient "comfort"; moreover, the very attributes the narrator associates with human nature—"gratitude and a mutual tenderness"—are ineffective survival skills and impotent means of self-preservation. *The Time Machine* concludes by focusing on what appears to the narrator to be an element of humanity found in the future's post-human world; like the Time Traveller, his interpretation of the future is founded on human

values. By returning to this narrative frame, Wells focuses on representing the human experience of deep time in literary terms: he depicts the psychological and emotional toll of the Time Traveller's story as well as the material and aesthetic symbolism of the dried flowers.

Perhaps more than any other nineteenth-century novel, *The Time Machine* is invested in communicating deep time, in the modern scientific sense, to its readers. Wells's use of the novel to express the scientific timescales he had previously considered in his essays suggests that this fictional genre offers means of conceptualizing deep time and making it accessible to human understanding in ways that are significantly different from those engendered by science or mathematics. While the time machine literalizes the model of folding time apparent in other nineteenth-century novels and develops from the geographical-temporal travel narratives apparent in romances like Bulwer's and Haggard's, the novel's narrative strategies—its first-person narration, frame narrator, and affective language—enable Wells to convey both the limitations inherent in human concepts of time and science as well as the psychological difficulties of grasping deep time effectively. Intriguingly, Wells uses the novel and its romance traditions to conceptualize significant scientific temporal theories—both the relativity of time and deep time—before they were specifically articulated and defined as such. Critics have identified Wells's exposition on time as a precursor to the theory of relativity: for instance, Hovanec situates Wells's depiction of subjective perspectives as part of a turn-of-the-century scientific context in which "scientists…beg[a]n to conceive differently of their own status as observers. Einstein's relativity theory dismantled the notion of an absolute, stationary point from which one could make measurements" (479). Cantor and Hufnagel suggest that "*The Time Machine* begins with a remarkable anticipation of Einstein and Minkowski…as Wells has his hero articulate a theory of four dimensions and in particular the equivalence of time and space"

(37-8). In a similar way, Wells's depiction of scientific deep time proves remarkably prescient. Even though, by his own admission, the theories on which he based his estimates of human (d)evolution and the death of the sun are no longer current, his model of deep time and vivid representation of an impermanent age of humans helped to conceptualize deep time and the Anthropocene. *The Time Machine*'s highly memorable aesthetic and affective descriptions represent some of the most recognizable imaginings of deep time from the nineteenth century.

Victorian Realism, the New Romance, and Modernism

Bulwer, Haggard, and Wells employ elements of imperial adventure, fantasy, and science fiction narratives to incorporate deep time in their romances. Although they depart from the realist approach of novelists like Eliot and Hardy, they clearly share many of their concerns regarding humankind's place within deep time and the human ability to grasp scientific timescales. Moreover, these popular texts explore subjective temporal experiences and the limits of human perception, themes which are more often associated with the high realism of authors like Eliot and Hardy, or the modernism of authors such as Conrad. When late-Victorian popular fiction is studied for its depiction of temporality, as has been the case with *The Time Machine*, it is often praised for its proto-modernist (or even postmodern) sensibilities. Instead, I am interested in how these romances emerge from a specifically Victorian context. Victorian popular fiction, and particularly the adventure novel or scientific romance prominent in the 1880s and 1890s, is often distinguished both from the "higher" modernist writing emerging in that period and the artistic or realist Victorian novel. Such distinctions are a testament to these works' notable originality and popularity; however, they belie the extent to which the fin-de-siècle romance develops from the nineteenth-century novel tradition and takes up its

preoccupations with time, and the ways in which the popular romance anticipates temporal and scientific issues later developed in modernist writing.

Despite the fact that many New Romances or proto-science fiction texts probe the effectiveness of chronometry and explore subjective temporality, these popular novels are often overlooked by critics in favour of modernist texts with more widely-recognized experimental and artistic aims. For instance, Barrows's claim that "modernist texts of the early twentieth century radically destabilized the coordinates of world standard time in their texts, [while] late nineteenth-century adventure novels rigidly enforced them" (14) discounts the many ways that Victorian fiction—both "literary" and "popular"—engages with and troubles cultural conceptions of time. Instead of upholding standardized and imperial time-systems, these romances challenge chronology, standard time, and assumptions of human (and specifically Western) progress. In this sense, the New Romance can be read as a precursor to modernist temporality rather than a genre which modernism reacts against. These texts anticipate a model of relative time that decentres the human species, acknowledges cultural temporal differences, and reveals the insufficiency of standardized time-keeping systems (even, perhaps, anticipating Einsteinian relativity, as some critics have claimed with regards to *The Time Machine*). These works use the imaginative power of the romance genre to explore non-human, non-chronological, and non-standardized time and history and convey deep time in innovative and significant ways. Employing adventure, fantasy, and horror devices, these romances illustrate how the novel's generic and narrative properties can be used to articulate seemingly incomprehensible temporal concepts. They demonstrate how the novel offers strategies for conceptualizing deep time that differ importantly from those available in non-fiction accounts or

numerical representations of deep time and render vast scientific timescales more accessible to human comprehension.

"The blackness of unborn time": Anticipating Anthropocene Studies

By looking ahead to a post-human world and recognizing technology as a significant evolutionary influence, these romances also anticipate the concerns of Anthropocene studies. The movement to future-oriented concepts of deep time represented in these scientific romances marks a shift in the cultural conception of the human species. This perspective acknowledges a likely end to the era of human existence and recognizes human history as a stage within geological time. As these romances depict confrontations between different time periods and species, they suggest that humankind must, in Dimock's words, "take our place as one species among others, inhabiting a shared ecology, a shared continuum" (6). This way of thinking about the human species anticipates the discussions surrounding "the age of humans" which inform contemporary theories regarding the Anthropocene. *The Coming Race* and *The Time Machine* in particular anticipate a future of regression, annihilation, or extinction for the human species. In this context, Bulwer's and Wells's interest in the role technology plays in evolution and environmental change appears especially prescient, given that the Anthropocene has been marked by the effects of pollution and artificial selection, among other factors; it appears that humankind's effect on the earth is indeed powerful enough to produce a geological influence. Dipesh Chakrabarty explains that "climate scientists posit that the human being has become something much larger than the simple biological agent that he or she always has been. Humans now wield a geological force'" (206). *The Coming Race*'s foreshadowing of atomic force in *vril*, *She*'s concern that Ayesha's incredible scientific powers may change the course of history, and

The Time Machine's notion that society informs evolution all suggest that while the human species may appear temporally insignificant within deep time, it may nevertheless be capable of effecting dramatic changes in history and scientific (evolutionary, geological, thermodynamic) processes. The deep-time scale necessary to understand the events of *She* also seems relevant here, since it suggests that historical events repeat themselves and can produce unintended and enduring consequences. This cyclical historical model foreshadows Dimock's call for "scale enlargement along the temporal axis" in order to properly comprehend historic events: "Some historical phenomena need large-scale analysis. They need hundreds, thousands, or even billions of years to be recognized for what they are: phenomena constituted by their temporal extension, with a genealogy much longer than the life span of any biological individual, and interesting for just that reason" (5). The events of *The Coming Race*, *She*, and *The Time Machine* are staged on an extended temporal scale, and they consider human histories in relation to vaster scales of history, evolution, and cosmic thermodynamics. By looking ahead to the future of the human species, these texts also render the present "uncanny." In his analysis of *The Time Machine*, Beaumont proposes that "The reader's culture and institutions are rendered unfamiliar…by intimating, disconcertingly, that they are already mutating, and that, consequently, they are mutant. The present is, from this angle, monstrous because it is already in the process of being ineluctably transformed into an unimaginable shape by the underlying historical logic of the future" (230). These romances blur the boundaries between human and future or post-human, suggesting that the future will be both unrecognizable and frightfully familiar as it derives from a transmutation of our world.

CONCLUSION
Looking Forward: Conrad, Modernism, and the Anthropocene

By concluding with a brief reading of Joseph Conrad and overview of recent perspectives on the Anthropocene, I hope to demonstrate the extent to which Victorian novels engage with matters that twentieth- and twenty-first-century critics now conceptualize as deep time. My analysis of *Heart of Darkness* (1899) and *The Secret Agent* (1907) demonstrates how what are often seen as modernist temporal concerns develop out of similar issues in nineteenth-century novels. However, beyond anticipating modernist temporal concerns, the Victorian novel imagines ways of conceptualizing deep time through strategies such as temporal folds that make vast scientific timescales more accessible to human understanding. The work these novels perform in their formulation of deep time influences as much as it popularizes scientific discourse, and many of the scientific temporalities that Conrad addresses reflect concepts produced by earlier novels. I read *Heart of Darkness* in relation to the previous chapter's scientific romances as it similarly explores deep time through travel and conceives of the ancient past through cross-cultural encounters brought on by colonial expeditions. *The Secret Agent*'s more specifically chronometric and scientific focus takes up the interest in formal temporal measures apparent in novels like *Dombey and Son* and *The Time Machine*. Indeed, Conrad dedicates the novel to Wells, whom he dubs "the historian of the ages to come" in apparent reference to *The Time Machine* (2),[1] and this influence is evident in Conrad's purposeful engagement with fin-de-siècle science and vast evolutionary and thermodynamic timescales. *The Secret Agent* takes Greenwich as a symbol of time and science but presents its public, politicized, and standardized temporality as distinct from the novel's fluctuating, often private, and pervasive

[1] The full dedication reads: "To H. G. Wells, the chronicler of Mr Lewisham's love, the biographer of Kipps, and the historian of the ages to come, this simple tale of the XIX century is affectionately offered" (2).

sense of deep time, which has much in common with *Heart of Darkness*'s primitive time. Although, as Ian Watt observes, "both in his own eyes and those of his contemporary critics his subjects and methods were distinctively modern" (359), Conrad's representation of subjective temporal experiences and evolutionary time develop out of the nineteenth-century novel's models of folding time and deep time. Ultimately, his modernist temporality is produced in part by shifting concepts of time in the aftermath of nineteenth-century chronometric standardization and the identification of evolutionary, geological, and thermodynamic deep time. Conrad employs similar narrative strategies to those used by earlier novelists to represent scientific temporalities and vast time; in this sense, his fiction serves as a hinge between the Victorian and modern periods, and his modernist temporality is produced less in reaction to his predecessors than through his continued engagement with their temporal preoccupations, representations of chronometry, and conceptualization of scientific deep time.

"Travelling back to the earliest beginnings of the world" in *Heart of Darkness*

In *Heart of Darkness* Marlow's journey up the Congo River for an ivory trading company is depicted as a voyage into a prehistoric world. His experiences in the Congo and encounters with its inhabitants represent moments of cultural and temporal intersection as the region seems to him to embody the remote past. Although a sense of deep time is apparent throughout the text, unexplored Africa is depicted as a place of primitive nature or pre-human time. The jungle reveals a primordial past and exposes deep time; it is suggestive of an era when nature—embodied primarily in the jungle's heavy vegetation—was dominant, and Conrad suggests that the jungle may yet reclaim the earth from humankind. Like *The Coming Race*, *She*, and *The Time Machine*, *Heart of Darkness* utilizes the structure of a travel narrative and cross-cultural

encounters to establish a sense of folding time and to incorporate deep time. Both Conrad's and Haggard's narratives recount the experiences of Englishmen whose journeys to Africa represent voyages into an ancient past. *Heart of Darkness* extends *She*'s historic timescale to evoke the primitive and pre-human history which Haggard gestures towards in his descriptions of regressive and animalistic behaviour as well as Ayesha's horrifying devolution. Conrad is also thematically and stylistically indebted to Wells's scientific romances, and although his psychological exploration has less in common with Bulwer's satire, *Heart of Darkness* nevertheless shares *The Coming Race*'s interest in imperialism, race, and Darwinism. If we read *Heart of Darkness* in relation to the scientific and imperial romances studied in the previous chapter, it becomes clear that the "novella that perhaps more than any other heralded the advent of literary modernism" (Dryden 214) has significant ties to contemporary scientific and imperial romances. Building on recent critical work that considers Conrad's canonical literary modernism in relation to his contemporaries' romance-writing, I propose that popular romances such as Bulwer's, Haggard's, and Wells's provided Conrad with a travel-narrative structure for translating vast timescales into geographical-temporal terms. *Heart of Darkness* borrows from its romance predecessors a narrative strategy for giving form to an otherwise incomprehensible temporal range and a model of folding time for depicting prehistory in relation to—and resurfacing in—contemporary settings.

In particular, it is likely that Haggard and Wells influenced *Heart of Darkness*. *She* depicts a similar journey in which Africa embodies the ancient past, and Haggard's hugely successful novel became an inevitable touchstone for imperial romances when it was published only a decade before *Darkness*. Evelyn Hinz acknowledges their narrative similarities and cultural associations when she cites D. H. Lawrence's misattribution: "There needs a centre of

silence, and a heart of darkness—to borrow from Rider Haggard" (qtd. in 416). Wells's influence on Conrad was notable:[2] *The Time Machine* (1895), *The Island of Doctor Moreau* (1896), *The Invisible Man* (1897), and *The War of the Worlds* (1898) have all been considered potential sources of inspiration for *Heart of Darkness* (among Conrad's other works). Conrad praised these scientific romances highly around the time he was working on *Darkness*, which may very well contain a reference to *War of the Worlds* (McCarthy 37). Patrick McCarthy, like Cantor and Hufnagel, acknowledges the similarities between *Darkness* and Wells's scientific romances, particularly *The Time Machine* and *The Island of Doctor Moreau*: "several of Conrad's themes—the moral ambivalence and degeneration of the self-appointed superman, the disastrous effects of a colonial policy based on the assumption of evolutionary superiority, and the relevance of the processes of entropy and atavistic regression to human affairs—are clearly set forth in Wells's novels of the time" (39). Linda Dryden advances *The Invisible Man* as another potential source and, in particular, proposes a comparison between Griffin, the invisible man, and Kurtz (227-28). Stylistically, Wells may have also influenced some of Conrad's modernist techniques. Some critics have recognized stylistic similarities between *The Time Machine* and *Heart of Darkness* as examples of impressionist aesthetics and "delayed decoding" (Cantor and Hufnagel 46-7, Hovanec 464)—a technique identified by Ian Watt in Conrad's work (175-79). Cantor and Hufnagel propose that these modernist techniques can be located in Wells's earlier, less canonical texts: "the technique of delayed decoding did not arise out of thin air; rather it seems to be rooted in the soil of late Victorian popular fiction, specifically Wells's scientific romances"

[2] The authors became acquainted after Wells anonymously reviewed Conrad's *An Outcast of the Islands* in 1896 (Karl 1051), much to Conrad's delight: "I wrote to the reviewer. I did!! And he wrote to me. He did!! And who do you think it is? ... Guess. Can't tell? – I will tell you. It is H. G. Wells. May I be cremated alive like a miserable moth if I suspected it! Anyway he descended from his 'Time-Machine' to be kind as he knew how" (*Letters* 1: 281). Their letters extended into a friendship which lasted over a decade before they grew apart (Karl 1055-64). For more information on their friendship and mutual influence, see Frederick Karl, Linda Dryden, and Patrick McCarthy.

(47). Certainly, like Wells, Conrad's sense of deep time is shaped by Darwinian and thermodynamic theories and fin-de-siècle preoccupations with concepts of degeneration, regression, and dissipation.

Heart of Darkness's narrative structure resembles that of *The Coming Race*, *She*, and *The Time Machine*. Namely, Conrad utilizes the adventure structure apparent in many imperial and scientific romances to conceptualize deep time through travel. These romances provide a spatial-temporal strategy for materializing remote eras, and Marlow's journey similarly functions as metaphorical time travel as he visits a foreign land representative of a prehistoric era. Like Wells, Conrad employs a frame narrative, introduced and briefly concluded by an unnamed first-person narrator, a friend of Marlow's who describes the protagonist and recounts the tale of his travels to the reader. *Darkness* is a colonial adventure with romance elements, as Marlow acknowledges when he explains that their journey "was beset by as many dangers as though [Kurtz] had been an enchanted princess sleeping in a fabulous castle" (147), and describes how he "tried to break the spell—the heavy, mute spell of the wilderness" that had enchanted Kurtz (173). Elaine Showalter observes that "[q]uest narratives all involve a penetration into the imagined center of an exotic civilization, the core, Kor, coeur, or heart of darkness which is a blank place on the map, a realm of the unexplored and unknown" (81), a format that applies equally to Bulwer's and Wells's scientific romances. The imperial context which is rendered explicit in *Darkness* is anticipated, albeit in more fantastic terms, in the Vril-ya's sense of imperial destiny, *She*'s British explorers, and the Time Traveller's self-centred invasion of the future. Moreover, like Bulwer's, Haggard's, and Wells's narrators (and Gulliver before them), Marlow returns to Europe disillusioned: "I found myself back in the sepulchral city [Brussels] resenting the sight of people hurrying through the streets to filch a little money from each other,

to devour their infamous cookery, to gulp their unwholesome beer, to dream their insignificant and silly dreams. They trespassed upon my thoughts" (179).[3] Finally, the novella's ambiguity and lack of closure—often attributed to Conrad's modernism[4]—recall the open-ended conclusions of *The Coming Race*, *She*, and *The Time Machine*, in which the narrators are left anticipating future events. Conrad's Author's Note explains that he intended *Darkness* to echo past its conclusion: "That sombre theme had to be given a sinister resonance, a tonality of its own, a continued vibration that, I hoped, would hang in the air and dwell on the ear after the last note had been struck" (57). The novella's first-person narrators, frame narrative, quest structure, and open-ended conclusion bear similarities to these recent popular romances.

Together with these formal parallels, Conrad correspondingly employs travel to denote movement through time. Marlow's voyage along the Congo River is represented as a journey into a primordial past, and Conrad's depiction of the jungle as a wilderness that existed before human life is analogous to the descriptions of different time periods in Bulwer, Haggard, or Wells.[5] For Marlow, "Going up that river was like travelling back to the earliest beginnings of the world, when vegetation rioted on the earth and the big trees were kings" (136). Similar descriptions of the area's prehistoric character abound, as when he exclaims: "The smell of mud, of primeval mud, by Jove! was in my nostrils, the high stillness of primeval forest was before my eyes" (128). For Marlow "this strange world of plants, and water, and silence" seems threatening

[3] Comparing this passage to *Doctor Moreau*'s conclusion, Cantor and Hufnagel suggest a line of influence from Wells to Eliot via Conrad: "In its vision of 'the sepulchral city,' this passage from *Heart of Darkness* is often viewed as pointing the way to much of twentieth-century literature and in particular the 'Unreal City' of T. S. Eliot's *The Waste Land*…. And yet Wells had already covered exactly this ground in *The Island of Doctor Moreau*" (52).

[4] For instance, Patrick Brantlinger remarks that "Conrad knows that his story is ambiguous: he stresses that ambiguity at every opportunity," and he proposes that Conrad's "evasion [of answering the questions that he poses], and the ambiguities it generates, reflect the patterns of reification underlying both commodity fetishism and literary modernism—the deliberate ambiguity and refusal of moral and political judgment at the heart of an impressionism and a will-to-style that seem to be ends in themselves" (263-64).

[5] Hinz also links *She* and *Heart of Darkness* through their corresponding sense of temporal regression (429), while Cantor and Hufnagel observe that "[t]ravelers to remote corners of empire often had the impression that they were entering the world of the past," as "Marlow views his voyage up the Congo as a journey into a prehistoric age" (37).

and inimical to humankind: “It was the stillness of an implacable force brooding over an inscrutable intention. It looked at you with a vengeful aspect” (137). He describes the jungle as a Darwinian entangled bank which threatens to overcome human life:

> We stopped, and the silence driven away by the stamping of our feet flowed back again from the recesses of the land. The great wall of vegetation, an exuberant and entangled mass of trunks, branches, leaves, boughs, festoons, motionless in the moonlight, was like a rioting invasion of soundless life, a rolling wave of plants, piled up, crested, ready to topple over the creek, to sweep every little man of us out of his little existence. And it moved not. A deadened burst of mighty splashes and snorts reached us from afar, as though an ichthyosaurus had been taking a bath of glitter in the great river. (132)

The imagined “ichthyosaurus” recalls similar dinosaur imagery in Dickens and Hardy—*Bleak House*’s imaginary “megalosaurus” (11) and *The Woodlanders*’s “ichthyosauri” (280) come to mind—and introduces a moment of folding time in which a specimen from the Mesozoic era seems to emerge in the present. However, it is the impression that this natural world may easily “sweep every little man of us out of his little existence” which is most striking: nature, which seems to have endured relatively unchanged since prehistoric times, has the potential to overwhelm humankind. This passage assesses humankind’s place in nature—“man” is “little” in relation to the “great wall of vegetation”—and, coupled with the depictions of the landscape as “primeval,” attributes a longevity to the vegetation compared to which the span of human existence (and, more particularly, civilization) pales.

Likewise, Conrad depicts cross-cultural encounters as moments of interaction between contemporary and remote times as the “darkness” of the Congo and its inhabitants represents a

primordial past. As he recalls how they "penetrated deeper and deeper into the heart of darkness," Marlow characterizes the region and its inhabitants as "prehistoric": "We were wanderers on a prehistoric earth.… The prehistoric man was cursing us, praying to us, welcoming us—who could tell? … We could not understand, because we were too far and could not remember, because we were travelling in the night of first ages, of those ages that are gone, leaving hardly a sign—and no memories" (138-9). This land and its people are depicted as existing in a state of pre-history or pre-memory which, while frightening and unrecognizable to an ostensibly "civilized" man like Marlow, represents a shared evolutionary origin and past. The inherent racism in *Heart of Darkness*'s representation of the Congolese is apparent in such passages,[6] and Marlow's notion that the natives represent a primitive stage of development echoes the encounters between modern-day adventurers and individuals representative of other times in Bulwer, Haggard, and Wells. As in Haggard, racial boundaries are murky, and Conrad suggests that all humankind shares an essential nature or memory of their deep past which links the purportedly civilized Europeans with the "savages" (167):

> The earth….was unearthly, and the men were—No, they were not inhuman. Well, you know that was the worst of it—this suspicion of their not being inhuman. It would come slowly to one. They howled, and leaped, and spun, and made horrid faces; but what thrilled you was just the thought of their humanity—like yours—the thought of your remote kinship with this wild and passionate uproar. Ugly. Yes, it was ugly enough; but if you were man enough you would admit to yourself that there was in you just the faintest trace of a response to the terrible frankness

[6] Conrad's racist depiction of the natives as essentially primitive and animalistic has been noted by many critics, most famously Chinua Achebe who famously asserted that "that Conrad was a bloody racist" (788). Although the novella's critique of imperialism has often been used to challenge these charges of racism, Conrad's anti-colonialism does not mitigate the fact that his descriptions of the Congolese people reflect racial prejudices.

> of that noise, a dim suspicion of there being a meaning in it which you—you so remote from the night of first ages—could comprehend. (139)

The distinction between Marlow and "them" is temporal: "The mind of man is capable of anything—because everything is in it, all the past as well as all of the future. What was there after all? Joy, fear, sorrow, devotion, valour, rage—who can tell?—but truth—truth stripped of its cloak of time" (139). This Carlylean notion of eternal truth[7] is overlaid with an evolutionary sense of time in which human ancestry can be recognized as a collective memory. Marlow proposes that when the civilizing effects of time and society are removed, humans are exposed to a true wilderness which represents a deep past. He asks: "how can you imagine what particular region of the first ages a man's untrammelled feet may take him into by the way of solitude—utter solitude without a policeman—by the way of silence—utter silence, where no warning voice of a kind neighbour can be heard whispering of public opinion? These little things make all the great difference" (154). Evidently Kurtz has been reclaimed by this wild past, and although Marlow "tried to break the…heavy, mute spell of the wilderness—that seemed to draw him to its pitiless breast by the awakening of forgotten and brutal instincts, by the memory of gratified and monstrous passions" (173), his "soul [is] satiated with primitive emotions" and it is his "fate…to be buried…in the mould of primeval earth" (176), like *Two on a Tower*'s Sir Blount before him.[8] Conrad's depiction of humankind's essentially animal or debased nature recalls similar themes in

[7] For instance, *Sartor Resartus* asks: "Is the Past annihilated, then, or only past; is the Future non-extant, or only future? Those mystic faculties of thine, Memory and Hope, already answer…. Yesterday and To-morrow both *are*. Pierce through the Time-Element, glance into the Eternal" (198).

[8] Lady Constantine's husband is an interesting precursor to Kurtz. Blount leaves Viviette to pursue "a mania for African lion-hunting, which he dignified by calling it a scheme of geographical discovery" (23). Although he is believed to have died from "dysentery and malarious fever, on the banks of the Zouga in South Africa" (72), Viviette eventually learns that he died at a later date and in very different circumstances. He had "dropped his old name altogether, and…married a native princess according to the rites of the tribe, and was living very happily with her" (195), until drink and depression lead him to "put an end to himself with his revolver. His princess was broken-hearted all that day" (196). Like Kurtz, he is buried in Africa.

She and *The Time Machine* as their protagonists revert to violence and self-preservation with surprising ease.

Although the book's title is ambiguous, the "heart of darkness" is generally associated with primitivism and the remote past.[9] However, Marlow insists that this primordial "darkness" has existed in all regions and that it can resurface in any purportedly "civilized" people and place. Conrad's descriptions of scenery enshrouded in "darkness" also evoke entropy and the death of the sun, which further connects "darkness" with vast timescales.[10] For instance, the narrator's language recalls Swithin's and the Time Traveller's descriptions of astronomical decay: "And at last, in its curved and imperceptible fall, the sun sank red, and from glowing white changed to a dull red without rays and without heat, as if about to go out suddenly, stricken to death by the touch of that gloom brooding over a crowd of men" (104). Like *Our Mutual Friend*, the novella opens with a description of the Thames under the setting sun while the narrator explains that "nothing is easier for a man who has, as the phrase goes, 'followed the sea' with reverence and affection, than to evoke the great spirit of the past upon the lower reaches of the Thames." For him, "[t]he tidal current" is "crowded with memories of men and ships it had borne" and "whose names are like jewels flashing in the night of time" (104). Just as he marvels, "What greatness had not floated on the ebb of that river into the mystery of an unknown earth!," his train of thought is interrupted: "'And this also,' said Marlow suddenly, 'has been one of the dark places of the earth'" (105). Marlow explains, "I was thinking of very old times, when the

[9] Cedric Watts observes that the "title has numerous referents: moral corruption, night, death, ignorance, and that encompassing obscurity of the pre-rational and pre-verbal which words seek to illuminate" (Introduction xx-xxi); the title "refers not only to the heart of 'darkest Africa' but also to Kurtz's corruption, to benighted London, and to innumerable kinds of darkness and obscurity, physical, moral, and ontological" ("Heart of Darkness" 47).

[10] For further discussion of entropy in *Darkness,* see Allen MacDuffie (75-6) and McCarthy (56-7), who connects its representation of entropy and decay to Wells's: "The process of entropy, as it is described in *The Time Machine,* has two important aspects: the cooling that results from the dying sun and the blurring of margins (between day and night, land and sea) that indicates the random dispersal of energy. These elements are reproduced in *Heart of Darkness,* which is narrated on the margin between land and sea, at a time between day and night" (56-7).

Romans first came here, nineteen hundred years ago—the other day.... Light came out of this river since…. Yes; but it is like a running blaze on a plain, like a flash of lightning in the clouds. We live in the flicker—may it last as long as the old earth keeps rolling! But darkness was here yesterday" (105-6). Marlow entreats his listeners to "imagine" a historic scene of "a commander of a fine…trireme in the Mediterranean, ordered suddenly to the north" in a time when London was "the very end of the world." He portrays England and the Thames in terms similar to those which he will use to describe the Congo as he envisions:

> Here and there a military camp lost in a wilderness, like a needle in a bundle of hay—cold, fog, tempests, disease, exile, and death,—death skulking in the air, in the water, in the bush. They must have been dying like flies here. … They were men enough to face the darkness. …Land in a swamp, march through the woods, and in some inland post feel the savagery, the utter savagery, had closed round him,—all that mysterious life of the wilderness that stirs in the forest, in the jungles, in the hearts of wild men. (106)

This introduction to Marlow's story sets up at once a sense of folding time, in which a pre-civilized ancestry of humankind, characterized as "darkness," has been apparent in all places, exists within all individuals, and might resurface at any moment.

Significantly, this primordial past materializes not just in the Congo but also in European cities. At the end of his narrative Marlow recounts his visit to Kurtz's widow when, in a powerful moment of folding time, Kurtz seemed to appear before him:

> I thought his memory was like the other memories of the dead that accumulate in every man's life,—a vague impress on the brain of shadows that had fallen on it in their swift and final passage; but before the high and ponderous door, between

> the tall houses of a street as still and decorous as a well-kept alley in a cemetery, I had a vision of him on the stretcher, opening his mouth voraciously, as if to devour all the earth with all its mankind. He lived then before me; he lived as much as he had ever lived—a shadow insatiable of splendid appearances, of frightful realities; a shadow darker than the shadow of the night, and draped nobly in the folds of a gorgeous eloquence. (182)

The "vision" that follows him includes not just Kurtz but his surroundings in Africa: "the stretcher, the phantom-bearers, the wild crowd of obedient worshippers, the gloom of the forests, the glitter of the reach between the murky bends, the beat of the drum, regular and muffled like the beating of a heart—the heart of a conquering darkness." Marlow interprets this hallucination as "a moment of triumph for the wilderness, an invading and vengeful rush" as he struggles with "the memory of what I had heard him say afar there, with the horned shapes stirring at my back, in the glow of fires, within the patient woods" (182). Marlow's vivid image of Kurtz entails a double sense of folding time: it represents at once a recollection of his memories and a materialization of the primordial time to which Kurtz succumbed. When Marlow meets Kurtz's widow his memories continue and he insists, "I saw her and him in the same instant of time—his death and her sorrow—I saw her sorrow in the very moment of his death. Do you understand? I saw them together—I heard them together" (183). As darkness mounts in the room while he speaks to Kurtz's fiancée (184), Marlow—like the narrators in *The Coming Race*, *She*, and *The Time Machine*—cannot escape his past experiences in his return to urban society. He re-experiences traumatic events much like Carker and Dombey do in *Dombey and Son*; however, the temporal scale of these memories expands to accommodate primordial deep time. These temporal folds are further complicated by the fact that Marlow is at once recounting the past and

describing how his memories of the Congo intruded following his return to Europe. In these passages Conrad employs a model of folding time similar to that which appears in Dickens's, Eliot's, and Hardy's novels to convey both the subjective temporal experience of memory and, on a vaster scale, to bring vastly disparate temporal moments together and depict the prehistoric "wilderness … invading" the present. Marlow's encroaching memories reveal that the primordial past he encountered in the Congo underlies European civilization and modern experiences of time.

"The Curse of Decay": Greenwich and Deep Time in *The Secret Agent*

The Secret Agent depicts two principal strains of scientific time: chronometric time, embodied by the Greenwich Observatory, and deep time, characterized by fluctuating evolutionary time and pervasive thermodynamic decay. Clock-time is more powerful than ever in *The Secret Agent*, and Conrad, unlike the previous novelists I've studied, addresses the political implications of Greenwich and standardization directly.[11] Greenwich and the implementation of standard time embody scientific ideals of objectivity and rational systems of classification. This ideal of objective scientific time is compromised, however, by the Observatory's obvious imperial and political implications, and Conrad suggests that standardized time fails to account for the evolutionary and thermodynamic timescales that inform his portrayal of London and individual temporality. *The Secret Agent* is consistently sceptical of science that purports to be objective and totalizing, and Conrad's depictions of folding time and his non-

[11] *Dombey*'s representation of intimidating chronometric authority reflects the establishment of standardized time in Britain (Barrows *Cosmic* 8) but does not acknowledge its political implications. While *Two on a Tower* associates Swithin's research with Greenwich as he joins an expedition to Cape Town, a British colony, and Blount's voyage to Africa suggests parallels which hint at the imperialist connotations of Greenwich's scientific expeditions, Hardy does not directly address the political motivations which might have informed the Observatory's research. In this sense *The Secret Agent*'s representation of Greenwich as a political site illuminates the imperial undertones of Swithin's voyage, which in all likelihood would have contributed to the search for longitude (Galison 132).

chronological narrative form challenge the authority of standard and linear time. The novel's sense of deep time is at once public and private: while Conrad evokes vast scientific timescales and collective human history, he also depicts individual temporal experiences in Darwinian terms, emphasizing natural processes and drawing on animalistic and thermodynamic imagery. The novel conveys a sense of inescapable decay at all levels—solar, imperial, and individual—which draws on theories including biological degeneration and thermodynamic entropy. Critics have acknowledged the importance of Darwinian theory, thermodynamics, and imperial energy distribution in the novel.[12] I will build on these readings to propose that Conrad's emphasis on the processes of time, duration, and decay alongside his evolutionary and thermodynamic language work to convey a sense of deep time akin to that in nineteenth-century novels. The vast scientific timescales and increasingly sophisticated chronometric systems which became widely accepted and ubiquitous in the nineteenth century produced the temporal-cultural milieu that Conrad explores in *The Secret Agent*.

Described by Conrad as a "simple tale of the XIX century" (2), *The Secret Agent* is set in 1886 (Watts "Degenerates," 72-3) and draws inspiration from French anarchist Martial Bourdin's 1894 attempt to blow up the Royal Observatory.[13] When secret agent Verloc endeavours to bomb Greenwich as part of an anarchist plot, his "idiot" brother-in-law Stevie is killed in the ensuing explosion, and the novel depicts the repercussions of this ill-fated bombing attempt in Verloc's domestic life and among a circle of anarchists, policemen, and foreign

[12] Ludwig Schnauder argues that the novel's "materialist-scientific" milieu is "informed by…Darwin and Darwinism" (97), and John Lyon notes its animalistic imagery (xxx). Michael Whitworth demonstrates its "relations to the thermodynamics of Lord Kelvin and Clerk Maxwell and the descriptionism of Ernst Mach and Karl Pearson" ("Inspector" 40), and MacDuffie discusses its representation of solar energy in relation to empire.

[13] Bourdin's attack was cut short when he fatally mishandled the bomb and it exploded in his hand (Sherry 233-34). Galison observes that "Conrad's version of the events…remains the canvas on which these events have been seen: a dark sketch of dupes, manipulators, and careerists from which no one emerges unsullied" (159-60). *The Secret Agent* also links Bourdin's attack to a more recent act of terrorism: "In 1996, the FBI reported that the Unabomber, known for his eighteen-year bombing campaign against scientific figures, modeled himself on another temporal anarchist [the Professor] in Joseph Conrad's *Secret Agent*, which he had read a dozen times" (289).

diplomats in London. Although *The Secret Agent* is a canonical modernist text, its treatment of these scientific-temporal threads develops out of similar representations in nineteenth-century novels. For instance, the novel's distorted chronology and fluctuating temporality, often interpreted as hallmarks of modernist temporality,[14] have much in common with models of folding time in earlier novels. Likewise, Conrad evokes deep time by employing folding time as well as evolutionary and thermodynamic imagery, strategies used by authors like Dickens, Eliot, and Hardy, while his juxtaposition of clock-time with deep time is apparent in novels going back to *Dombey and Son*. Like romances such as *She* and *The Time Machine*, *The Secret Agent* suggests that deep time, evolutionary ancestry, and primitive nature lurk within humankind and ostensibly civilized European cities. Even Conrad's engagement with standardized time is not entirely a departure from Victorian novels: it recalls the links between technology and time—particularly railroad time and authoritative public timepieces—proposed by Dickens in *Dombey*, while the connections Conrad draws between Greenwich and science are anticipated in Hardy's *Two on a Tower*. Finally, the links Conrad reveals between imperialism, science, and time-keeping systems reflect similar preoccupations with empire and technology in popular romances, particularly *The Coming Race*. Even the nihilistic and threatening temporality linked predominantly to the Professor—which seems distinctly modern in its eerie foreshadowing of the terrible technology of the First and Second World Wars—is grounded in social Darwinism and recalls the destructive "blasting" technology of the Vril-ya.[15] The purpose of this line of

[14] See for instance Kern, who writes that "The thrust of the age was to affirm the reality of private time against that of a single public time and to define its nature as heterogeneous, fluid, and reversible" (34).

[15] The anarchist Professor constructs Verloc's bomb and aims to create a detonator with no delay between activation and explosion, so that action and result—death—become instantaneous. He is a social Darwinist; like the Vril-ya, he is machine-like, disdainful of others, and possesses terribly destructive technology. He proclaims: "the weak, the flabby, the silly, the cowardly, the faint of heart, and the slavish of mind [are our sinister masters]. … Exterminate, exterminate! That is the only way of progress" (222). Through his nihilistic application of technology and espousal of eugenics, the Professor reveals a terrifyingly modern use of science that foreshadows the technology adopted and abused in the First and Second World Wars and the ideologies, both imperial and racial, that generated them.

argument is not to diminish *The Secret Agent*'s originality or deny its modernist sensibilities but rather to demonstrate how accepted modernist concerns regarding scientific time develop out of similar preoccupations in nineteenth-century literature, and to foreground the modernity of a body of fiction that has frequently figured, from the early twentieth century to our own moment, as little more than the old-fashioned narrative model against which the more experimental modernist novelists react.

In *The Secret Agent* scientific and standard time is embodied by the Greenwich Observatory, an edifice that reflects British success in controlling and centralizing time in the heart of the empire. Vladimir, the First Secretary of the Russian Embassy, views the Observatory as a symbol of science and instigates the bombing plot by suggesting to Verloc that "the demonstration must be against learning—science" (25). Like Swithin St Cleeve, Vladimir specifically links Greenwich to "astronomy" when he reflects: "it would be really telling if one could throw a bomb into pure mathematics. But that is impossible. … What do you think of having a go at astronomy?" (25). The idea that bombing science represents the ultimate political statement demonstrates just how culturally prominent the idea of "science" had become by the end of the century. Science is pervasive in *The Secret Agent* and is often described in terms that suggests its near-religious following. Vladimir argues that "any imbecile that has got an income believes in [science]. He does not know why, but he believes it matters somehow. It is the sacrosanct fetish" (24). Conrad is critical of the monolithic model of science, aligned as it is with a standardized model of time, that Vladimir invokes in this passage, and juxtaposes it to other temporal models in order to undermine its authority. He develops this critique by aligning science with religion in his depiction of Ossipon, who relies on his Lombrosian ideology in a way he considers scientific but which the narrator continually exposes as a replacement for

religion: he "invoke[s] Lombroso, as an Italian peasant recommends himself to his favourite saint," and "[i]f Comrade Ossipon did not recommend his terrified soul to Lombroso, it was only because on scientific grounds he could not believe that he carried about him such a thing as a soul. But he had in him the scientific spirit, which moved him to testify on the platform of a railway station in nervous jerky phrases" (217).[16] Conrad suggests that while "science," or an idea of science, has come to replace religion as a guiding cultural force, it has for many retained a spiritual function. We might consider the concept of deep time, as espoused in these novels, in a similar light: while Conrad's model, like Hardy's and Wells's, is purely scientific, it is nevertheless conveyed through earlier novelistic strategies more closely associated with Carlyle's spiritual sense of deep time.

Vladimir understands that Greenwich is internationally recognized not just as an embodiment of astronomy or, more generally, science, but also as a symbol of imperial and temporal governance; he believes that the bombing will guarantee a public reaction because "[t]he whole civilised world has heard of Greenwich" (26). By 1907 Greenwich functioned as a symbol of standardized and synchronized time and, in the novel, "Greenwich time is situated within its larger political, commercial, and imperial contexts, bearing evidence of the extent to which Greenwich, by the early twentieth century, had entered modernist consciousness as a powerful symbol of authoritarian control from a distance and of the management of diverse populations" (Barrows, *Cosmic Time* 14). Randall Stevenson explains that while "a national standard, Railway Time, [was] established more or less throughout the land by 1848," standard[ized] time "was further institutionalized as part of the new global standards set up by the International Meridian Conference of 1884, which answered the needs of travel, shipping,

[16] Italian criminologist Cesare Lombroso (1836-1909) was "[o]ne of the founders of modern criminology," although his theories have been largely discredited ("Lombroso"). His best-known work is *Criminal Man* (1876).

telegraphy, and other commercial interests by placing the Prime Meridian at Greenwich Observatory, also established as the centre of a world-wide system of time zones and Mean Time" (124-25).[17] By arbitrarily establishing zero degrees of longitude as the international meridian at Greenwich, the Observatory initiates a demarcation of space that privileges London, and the British Empire, as a place where time and space begin for the rest of the world. The very implementation of a meridian gives a false illusion of the possibility of objectivity in both temporal and spatial measurement; we might recall *Deronda*'s epigraph in which "Science, the strict measurer, is obliged to start with a make-believe unit" in order to establish "the make-believe of a beginning" (3).[18] Galison observes that "[w]ithout a doubt the first meridian stood as a powerful if highly contested symbol" (160), and the politics behind the establishment of Greenwich Meridian Time were apparent in the reluctance of other regions—particularly Ireland and France—to accept this new standardization (Stevenson 125). Universal acceptance of Greenwich as the prime meridian might be said to have reflected British success in ruling time in the empire's capital, and the establishment of such divisions echoes imperial projects which colonize territories and impose their own spatial and temporal calibrations on other nations. Thus, bombing Greenwich becomes a political manoeuvre against British control and temporal—or scientific—authority. Stephen Kern identifies *The Secret Agent*'s central act of bombing Greenwich as an "assaul[t] on the authority of uniform public time" with Greenwich acting as a "symbol of centralized political authority" (16). The Greenwich Observatory is linked with an empirical science which strives to understand and regulate time in the name of empire.

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[17] For further information on the International Meridian Conference, see Barrows (*Cosmic Time* 22-52), and Galison, who observes that "from the mid-1860s to the 1890s, France, Britain, and the United States raced to establish simultaneity over a sprawling network of undersea telegraph cables to fix longitudes and redraw the global map. This race for symbolic map-possession contributed to the explosive atmosphere surrounding the prime meridian showdown slated for October 1884 in Washington, D.C" (129).

[18] As Galison asserts: "*there was no natural prime meridian*. That is, a prime latitude—the equator—was picked out naturally by the spin of the earth. But 'nature' had selected no prime meridian of longitude" (145).

Conrad subverts the linear and uniform time embodied by Greenwich through his non-chronological narrative structure. Although his non-linear narrative strategies are often viewed as modernist attributes,[19] they have much in common with the examples of folding time apparent in nineteenth-century novels. *The Secret Agent* is a political mystery which deconstructs the traditional chronology of the detective story: instead of following the process of detection, the reader knows the circumstances of the crime before the police investigation begins, and the reader's suspense is not derived from the anticipation of a solution, but from waiting to see how characters will learn about and respond to events. Paul Wake observes that, "[c]haracteristically, …Conrad rarely presents events chronologically, instead circling around key moments, elongating stretches of time, and repeating certain events while compressing and omitting others." His narrative style presents a "challenge to clock time" (14) and, potentially, a challenge to readers' narrative expectations. Time in the novel is disjointed, and narrative leaps and flashbacks leave readers disoriented and questioning the sequence of events. Similarly, Watt describes Conrad's "very idiosyncratic chronological method": "Its break with linear temporal progression in the order of the narrative ultimately reflects Conrad's sense of the fragmentary and elusive quality of individual experience. In its objective and externalised form, this sense controls much of the action in the later works" (357). *The Secret Agent* eschews traditional narrative structure, and Conrad's technique results in a sense of malleable time that represents an implicit challenge to Greenwich and to imperial attempts to regulate or control time. Although Conrad's approach is more purposefully experimental, his method of taking up various narrative

[19] Malcolm Bradbury and James McFarlane explain that "[t]he Modernist novel" is "preoccup[ied] with the complexities of its own form, with the representation of inward states of consciousness, with a sense of the nihilistic disorder behind the ordered surface of life and reality, and with the freeing of narrative art from the determination of an onerous plot. In all of these areas what is being questioned is linear narrative, logical and progressive order, the establishing of a stable surface of reality" (393). Kenneth Graham describes *Darkness* as "specifically Modernist in that its technique as a narrative directly reflects its descent into the disorienting world of a new psychology" which is partly characterised by "[t]he dislocating achronological technique of frequent anticipation and flashback" (212).

threads, withholding information from the reader to establish suspense, and forgoing strict adherence to chronology recalls *Bleak House*'s narrative structure—along with the mystery and crime elements of *Mutual Friend*—as well as *Deronda*'s rearrangement of narrative chronology.

The novel's distortion of traditional narrative chronology is paralleled in its depictions of characters' subjective temporal experiences. Conrad contrasts Greenwich—symbol of empire's centralized, official, standardized, and ostensibly objective time—with private and fluid temporal experiences fraught with violence, fear, and death. He employs a form of folding time similar to that used by Dickens, Eliot, and Hardy to convey subjective temporal experiences: like Dombey and Carker, Esther in *Bleak House*, and Knight in *A Pair of Blue Eyes*, Conrad's characters experience subjective temporality most vividly when they come in contact with death. *The Secret Agent*'s recurring representations of characters considering death, the amount of time it takes to die, and the destruction of human life suggest that subjective conceptions of time are more intimately linked with the natural processes of decay and extinction than mechanical and standardized time-keeping. In this context, *Dombey*, which directly contrasts time-keeping with private temporal experience—"the waves," and Carker's temporal confusion, for instance—seems like a particularly relevant precursor. In particular, when Inspector Heat imagines Stevie's final moments and Winnie commits murder Conrad employs folding time to illustrate how individual temporal consciousness defies standard and linear time. When Inspector Heat looks over Stevie's dismembered body, he vividly imagines the temporal experience of his death:

> The shattering violence of destruction which had made of that body a heap of nameless fragments affected [the Inspector's] feelings with a sense of ruthless cruelty, though his reason told him the effect must have been as swift as a flash of lightning. ... Instantaneous! He remembered all he had ever read in popular

> publications of long and terrifying dreams dreamed in the instant of waking; of the whole life lived with frightful intensity by a drowning man as his doomed head bobs up, streaming, for the last time. The inexplicable mysteries of conscious existence beset Chief Inspector Heat till he evolved a horrible notion that ages of atrocious pain and mental torture could be contained between two successive winks of an eye. (65)

Involuntarily, Heat imagines how ages of anguish might gather into one brief moment.[20] Stevie's gruesome remains seem to represent the acceleration of the process of decay since his death is so swift, sudden, and grisly. This passage acknowledges the relativity of temporal experience and suggests that vast timespans might be experienced over a short duration: like Esther looking back on the periods of her life (*Bleak House* 513) or Ayesha advocating for an experiential model of time (*She* 193), Heat considers how Stevie might have experienced his final moments. This passage also recalls how Knight, facing death, imaginatively experiences ages in an instant (*A Pair of Blue Eyes* 199-201). By imagining how one might experience "ages of atrocious pain and mental torture" in seconds**,** Heat expands the recognizable private experience of folding time to encompass vast timeframes and brings the ancient and modern directly together in an instant.

Conrad links private temporal consciousness to evolutionary time in his description of Winnie's murder of her husband. She stabs Verloc when she learns that he was responsible for Stevie's death: "Into that plunging blow, delivered over the side of the couch, Mrs Verloc had put all the inheritance of her immemorial and obscure descent, the simple ferocity of the age of caverns, and the unbalanced nervous fury of the age of bar-rooms" (193). Following the murder,

[20] There is a similar moment in *Darkness* when Marlow witnesses Kurtz's death and wonders, "Did he live his life again in every detail of desire, temptation, and surrender during that supreme moment of complete knowledge? He cried in a whisper at some image, at some vision,—he cried out twice, a cry that was no more than a breath— 'The horror! The horror!'" (177-78). Marlow later considers: "perhaps all the wisdom, and all truth, and all sincerity, are just compressed into that inappreciable moment of time in which we step over the threshold of the invisible" (179).

Winnie becomes sensitized and susceptible to time, registering "a sound of ticking growing fast and furious like the pulse of an insane clock. At its highest speed this ticking sound changed into a continuous sound of trickling…. It was a trickle, dark, swift, thin. . . . Blood!" (194). This passage moves from the evolutionary history implicit in Winnie's blow to a subjective temporal experience associated with death and chronometry. Time expands for the narrator to describe the scene at length for the reader, while time seems to move at first too slowly and then too quickly for Winnie. Conrad emphasizes the gap between narrative time (the description of the murder) and story time (the few minutes it takes Winnie to kill her husband) to heighten the moment and explore Winnie's psychological state. Her subjective temporal experience defies standardized and linear time. In both this passage and Heat's assessment of Stevie's remains, ancestral experiences of violence and suffering overwhelm the Inspector and Winnie. Conrad employs folding time to depict the evolutionary past resurfacing in moments of violence and death (recalling, once more, *A Pair of Blue Eyes*) and connects both personal temporal experiences to vaster timeframes and, in Winnie's case, chronometry (as in *Dombey*).[21] Both scenes describe a brief moment of private folding time which seems to contain ages of experience and memory.

Winnie's uncontrollable evolutionary impulses evoke a Darwinian conception of time as something not subject to governance but instead linked to violence, inheritance, and death. Evolutionary time is disconcerting in two, seemingly contradictory ways: first, it opens the door to extinction, yet at the same time, it represents an interminable sense of history. In *The Secret Agent*, an individual's history is made up equally of personal experience and memory, and the evolutionary layers of the past: there is a sense of inheritance and animal descent from which the characters cannot escape, despite the fact that they live in London, capital of the "civilized

[21] Verloc's death recalls Dombey's suicidal fantasy, similarly located in the domestic sphere: he "think[s] that if blood were to trickle…. It would move so stealthily and slowly, creeping on" (801).

world." Thus, when Winnie kills her husband she displays not just her own emotions but a history of human savagery. Time endures and the past persists through individual, collective, and evolutionary memory.[22] Watt argues that "in the last half of the nineteenth century it was not the physical but the biological sciences which had the deepest and the most pervasive effect upon the way man viewed his personal and historical destiny" (155), and, as we've seen, evolutionary theory entailed hereditary continuity and vast timeframes to account for processes such as natural selection. Conrad clearly subscribes to a Darwinian model of human nature; in fact, he presents animalistic descriptions of virtually every character, whose desperate drives for individual survival override sympathy, morality, and intellect (Lyon xxx). Ludwig Schnauder argues that "the novel portrays a social system that seems to reflect the laws of Natural Selection, such as the struggle for survival and the survival of the fittest" (97); he parallels its characters' "animal instincts" to both *The Strange Case of Dr Jekyll and Mr Hyde* and *Doctor Moreau* and suggests that "Winnie's atavistic transformation is an extreme example of the way the bestial may at any time break through the surface of the ordinary" (99). To an extent *The Secret Agent* draws on late-nineteenth-century degeneration theory; as in *She*, *The Time Machine*, and *Darkness*, it becomes clear that despite technological advancements and supposed European superiority (which might arguably be expected to be most manifest in London, the imperial capital), citizens still revert to animal impulses. A sense of Darwinian destiny overwhelms the text, and evolution carries with it connotations of both passing time and inevitable decay. Thus although the connotations of both Greenwich and Darwinism are recurrently used to evoke scientific time in the novel, they function in very different ways: while Greenwich embodies an empirical,

[22] Henri Bergson's *Creative Evolution* (also published 1907) contains similar depictions of time to those in *The Secret Agent*. He proposes that "our duration is not merely one instant replacing another; if it were, there would never be anything but the present – no prolonging of the past into the actual, no evolution, no concrete duration. Duration is the continuous progress of the past which gnaws into the future and which swells as it advances" (4).

standardized and controlled temporal science, Conrad's Darwinist model of time continually suggests regression and a deep time which resists artificially standardized temporal imperatives.

Like Wells, Conrad links biological degeneration and thermodynamic dissipation, and a sense of decay is manifest in all facets of life in *The Secret Agent*. The threat of regression and deterioration characterizes the evolutionary and thermodynamic time that pervades *The Secret Agent*, a novel in which "[t]he inexorable dissipation of characters' energies is complemented by a preoccupation with all forms of gradual wearing away and the pointlessness of action in this world" (MacDuffie 85-6). Allen MacDuffie notes how "the ticking of the clock, the pacing footsteps, ... [are] sounds of dull repetition [that] keep an unceasing beat throughout the novel" and evoke a sense of time and passing life: for instance, he proposes that "the metronomic monotony is linked explicitly to ebbing life at novel's end when Winnie mistakes the sound of Verloc's blood dripping on the floor for the sound of the clock" (86). However, this sense of decay is also apparent over vaster timescales in *The Secret Agent*'s preoccupation with energy depletion, cosmic dissipation, and the earth's eventual end. David Cody observes that "many of the most prominent scientists of the [late-Victorian] period agreed that in the long term at least, the prospects for continued human existence were grim" (470). Indeed, in an 1897 letter discussing *The Nigger of the 'Narcissus,'* Conrad espouses this view, explaining, in terms that recall Swithin's lesson to Viviette, "Nothing can touch him but the curse of decay – the eternal decree that will extinguish the sun, the stars one by one, and in another instant shall spread a frozen darkness over the whole universe" (*Letters* 1: 423).[23] MacDuffie observes that "[a]lthough it is couched in elevated, almost mythic rhetoric, the reference to the heat death of the sun predicted by the second law of thermodynamics and disseminated in the popular Victorian press is unmistakable" (75). The passages in *The Secret Agent* that describe the sun are suggestive of

[23] MacDuffie (75) and McCarthy (56) also cite this letter to R. B. Cunninghame Graham (from 14 Dec.1897).

inevitable decay and entropy. After his description of "a peculiarly London sun—against which nothing could be said except that it looked bloodshot," for example, the narrator observes that

> The very pavement under Mr Verloc's feet had an old-gold tinge in that diffused light, in which neither wall, nor tree, nor beast, nor man cast a shadow. … There were red, coppery gleams on the roofs of houses, on the corners of walls, on the panels of carriages, on the very coats of the horses, and on the broad back of Mr Verloc's overcoat, where they produced a dull effect of rustiness. But Mr Verloc was not in the least conscious of having got rusty. (9)

The image of rust is one of decay and ineffectiveness, significant for both Verloc and the sun as a symbol of the earth's energy. Amidst the metallic colours, the missing shadows of "tree," "beast," and "man" suggest the inevitable extinction of life on earth, and a future where not even a shadow of former life will remain. Such passages are reminiscent of Dickens's entropic London in *Our Mutual Friend,* in which the sun is frequently seen bleeding out or failing to provide sufficient light, and of course *The Time Machine*'s depiction of solar entropy.

Finally, through his sun imagery Conrad seems to suggest a connection between deep time and resource depletion which resonates powerfully with contemporary environmental concerns. In his Author's Note (1920), which illuminates the relationship between sunlight and imperial resource use in *The Secret Agent,* Conrad writes:

> One fell to musing before the phenomenon—even of the past: of South America, a continent of crude sunshine and brutal revolutions, of the sea, the vast expanse of salt waters, the mirror of heaven's frowns and smiles, the reflector of the world's light. Then the vision of an enormous town presented itself, of a monstrous town more populous than some continents and in its man-made might

> as if indifferent to heaven's frowns and smiles; a cruel devourer of the world's light. There was room enough there to place any story, … darkness enough to bury five millions of lives. (231)

MacDuffie proposes that "Conrad draws [a distinction] between the tropics and the imperial center, between nature's power as it is experienced and nature as it is harnessed, channeled, and utilized by industrial civilization" (75), and he interprets this passage as a critique of British resource dependency on its colonies: "we can…see Conrad plotting the coordinates of an exploitative, directional, global economy imagined in the thermodynamic vocabulary of energy flow, efficiency, and waste" (76). He demonstrates how Conrad's thermodynamic imagery is associated geo-politically with the networks of the British Empire (which, as Galison shows, were instrumental to time synchronization[24]): energy is transformed and depleted as it moves from the colonies towards London. However, I would argue that this movement in space is also symbolic of a movement through time. As we saw in *Darkness,* Conrad associates the equatorial region—here the source of "crude sunshine" and "vast...waters" where resources are abundant and life is primitive—with the past; this decline of solar energy and natural resources is not only caused by imperial transport but more substantially aligned with the passage of time. Conrad's entropic images evoke the vast cosmic timescales associated with the sun's lifespan, and here they suggest a connection between cosmic dissipation and resource depletion. Along with *The Time Machine*, *The Coming Race*'s depiction of undiscovered energy sources, imperialism, and evolution-determining technology seems another significant forerunner (and, of course, the conditions of the Vril-ya's underground domain are largely determined by their lack of sunlight).

[24] Time coordination developed along imperial channels: "By 1880, ninety thousand miles of mostly British cable lay on the ocean floor, a ninety-million-pound machine binding every inhabited continent, cutting across to Japan, New Zealand, India, through the West Indies, the East Indies, and the Aegean. Competing for colonies, for news, for shipping, for prestige, inevitably the major powers clashed over telegraphic networks. For through major copper circuits flowed time, and through time the partition of the worldmap in an age of empires" (Galison 144).

In his Author's Note Conrad conceptualizes resource depletion and solar entropy as a direct result of imperial activity: he identifies empire, and specifically London's "man-made might," as a drain on the earth's natural resources. When he looks back on *The Secret Agent* and considers how human activity "devour[s]…the world's light," he associates human resource use with the future "darkness" of solar entropy.

Deep Time and the Anthropocene

While *The Secret Agent* draws on nineteenth-century novelistic strategies to represent deep time, its conceptualization of global energy resources—and the politics which determine their usage and distribution—gestures towards contemporary perspectives on environmental issues such as climate change. Recently the concept of deep time has become essential to our understanding of the Anthropocene. Despite the relative brevity of the period of human existence within geological time, our species has produced a startling impact on the earth. Studies on the Anthropocene have emphasized the necessity that we grasp geological timescales in order to appreciate the significance of humankind's effect on the planet. The Anthropocene, or "Age of Humans," is a proposed classification for our current geological epoch first suggested by Paul J. Crutzen and Eugene F. Stoermer in 2000 (Chakrabarty 209). Crutzen and Christian Shwägerl contend that "[t]he Anthropocene—human dominance of biological, chemical and geological processes on Earth—is already an undeniable reality" and explain that, at this time, "we are taking control of Nature's realm, from climate to DNA. We humans are becoming the dominant force for change on Earth." A satisfactory understanding of this epoch requires an ability to think outside human timescales and to consider much vaster timeframes and far-reaching implications. Dipesh Chakrabarty writes that "[t]he consequences [of climate change] make sense only if we

think of humans as a form of life and look on human history as part of the history of life on this planet. For, ultimately, what the warming of the planet threatens is not the geological planet itself but the very conditions, both biological and geological, on which the survival of human life as developed in the Holocene period depends" (213).[25]

In January 2016 Waters et al. published a review summary of the evidence supporting their view that "the Anthropocene is functionally and stratigraphically distinct from the Holocene," and in August the Anthropocene Working Group "decided to propose the postwar boom of the late 1940s and early 1950s as the Anthropocene's start date" (Voosen 852). Notably, one of the suggested dates of commencement for the Anthropocene was the beginning of the Industrial Revolution, which suggests the extent of the environmental changes underway during the nineteenth century.[26] In fact, Crutzen and Stoermer initially "propose[d] the latter part of the 18th century" as "a more specific date to the onset of the 'anthropocene'" since, "during the past two centuries, the global effects of human activities have become clearly noticeable" (17). In their review summary of the stratigraphic evidence for designating the Anthropocene, Waters et al. acknowledge that "[f]ormalization is a complex question because, unlike with prior subdivisions of geological time, the potential utility of a formal Anthropocene reaches well beyond the geological community" (137). They conclude with the observation that "[n]ot only would this represent the first instance of a new epoch having been witnessed firsthand by

[25] Gold compares contemporary environmental concerns to the Victorian preoccupation with the death of the sun: "We are, after all, in many ways like the Victorians—only more so. In fact, our best scientific efforts predict a much more imminent doom than theirs ever did. While Victorian estimates for the death of the sun placed the event at least thousands and often billions of years away, our scientists predict that we will run out of fossil fuels in roughly 30 to 100 years at our current rate of consumption" (23).

[26] Voosen reports that the Anthropocene "working group, a mix of 35 geologists, climate scientists, archaeologists, and others, considered multiple start dates. There were votes for an early start to the Anthropocene, 7000 years ago, when humanity began converting forests en masse to pastures and cropland, perhaps causing carbon dioxide (CO2) to spike, and also for 3000 years ago, when lead smelting tainted the ground. More recently, they considered 1610, when pollen from the New World appeared in Europe, and the early 1800s, the start of the Industrial Revolution. But the most votes went to the Great Acceleration" (852).

advanced human societies, it would be one stemming from the consequences of their own doing" (145). Evidently, geological and human time periods are no longer considered to be distinct, and various disciplines in science, social sciences, and the humanities are considering the implications of the Anthropocene as a concept and formal stratigraphic or geological designation.

The concept of geological deep time and the understanding of an age of humans—and, significantly, much vaster ages without human life—that gained prominence in the nineteenth century continues to inform anthropogenic interpretations of history today. By shifting the literary concept of "deep time" from its spiritual origins to a scientifically-founded model associated with biology, geology, and astrophysics, nineteenth-century novels helped to produce a cultural understanding of vast scientific time. Significantly, whether they imagine human extinction or prehistory, these novels situate the human species within vast timeframes. Dickens's megalosaurus, Hardy's trilobite, and Bulwer's evolutionary past place the human species in relation to earlier periods of existence, while the sense of infinite temporal expansion evoked in *Daniel Deronda*'s epigraph, *The Time Machine*'s journey "thirty million years hence" (147), and *The Secret Agent*'s awareness of expiring resources anticipate post-human epochs. The literary model of folding time represents a powerful strategy to convey immense timeframes while unveiling relations between remote periods. This sense of continuity between distant eras is key to our understanding of the Anthropocene as we attempt to situate our impact on the environment within generations, centuries, and millennia to come.

Moreover, by frequently depicting deep time in relation to private temporal experience, nineteenth-century novels implicate humankind in vast temporal processes. These texts are informed by a sense of duration that extends the novel's traditional scale of memory and

inheritance to account for vast timespans: the past is embodied within the present, as are the germs of the future. Finally, these novels consider the effects that humans have on the world around them, and some even anticipate contemporary environmental concerns. In the wake of the Industrial Revolution, novelists addressed the impact of technology on the environment long before these concerns would be conceptualized as a catalyst for geological change. In *Dombey and Son* and *Bleak House* Dickens imagines industrialization—and particularly the installation of railways, which also constituted a key juncture in time standardization—as a new geological era, and it seems he wasn't far off. While *Middlemarch* considers the diffusive future potential of individual behaviour, Hardy's depiction of individuals like Tess Durbeyfield and Giles Winterborne working within nature suggests the symbiotic—and potentially destructive—relationship of humans and their habitats or resources. The later scientific romances anticipate these environmental issues more directly, as Bulwer, Haggard, and Wells imagine ways in which human activity and technology might shape one's environment as well as history. *The Coming Race* and the unmitigated destructive potential of vril seem especially prescient here, as does its idea that technology will shape evolution, while *The Time Machine* proposes a future in which contemporary social and technological systems are determining evolutionary factors. These three romances also imagine the potential destruction of humankind via technology, a concept that, moving into the twentieth century, *The Secret Agent* develops in its depiction of bombs and political warfare. These novels illustrate the impact that humans can have on their environment and, by incorporating a vastly extended temporal scope, enable readers to conceive of an epoch of humans within deep time.

Appendix A: Darwin's "Tree of Life" Diagram from *On the Origin of Species*

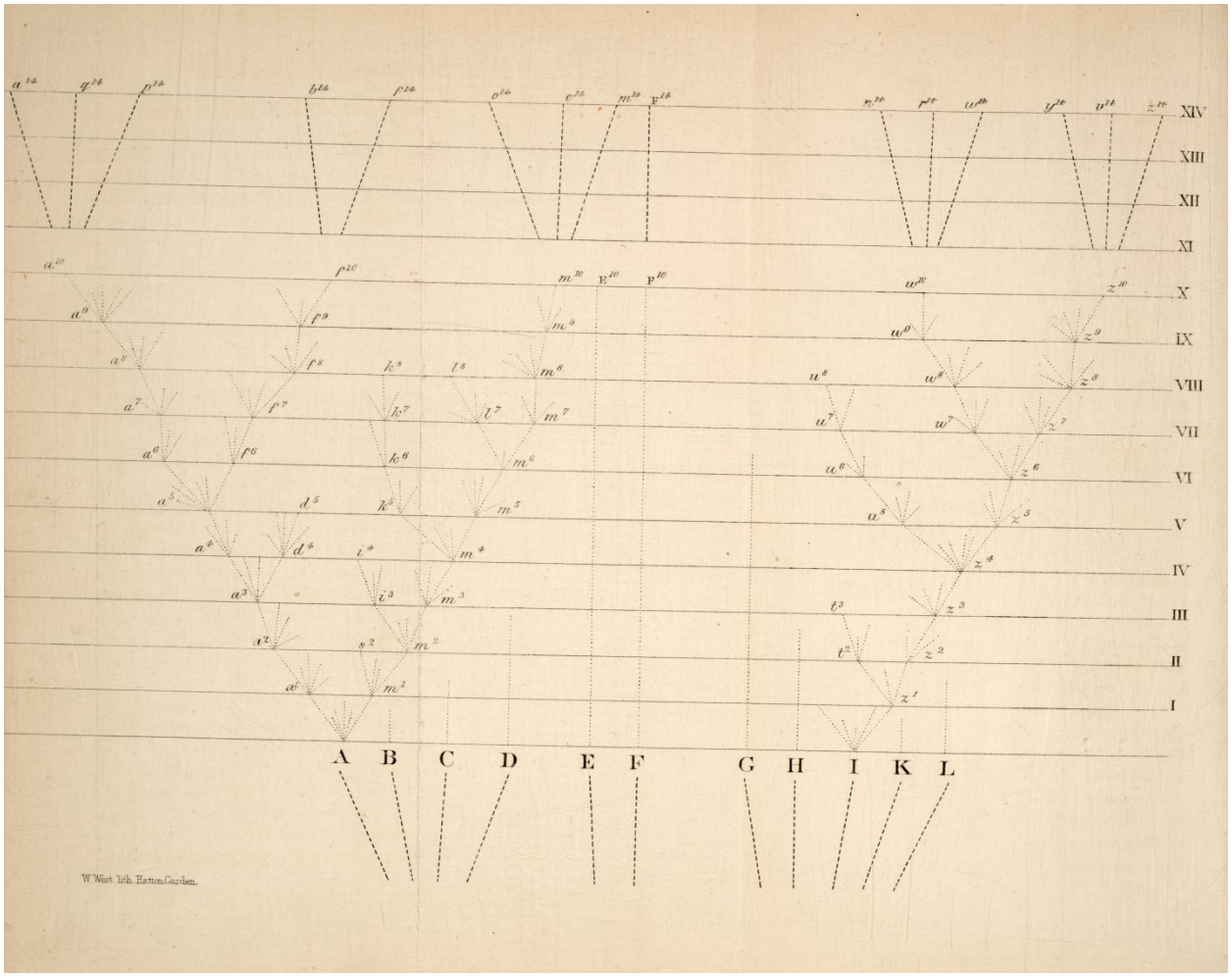

Diagram by Charles Darwin in *On the Origin of Species by Means of Natural Selection, or, The Preservation of Favoured Races in the Struggle for Life* (London: J. Murray, 1859. Between pgs. 116-117. Print)

Courtesy of The Thomas Fisher Rare Book Library, University of Toronto.

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