

Passing Forms:
Decay and the Making of Victorian Culture

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Abstract

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From sociological studies of urban squalor and sanitary reform, to critiques of the politics of prostitution, pathology, poverty, and criminology, criticism has tended to read nineteenth-century “decay” as an ideological apparatus keyed to the discursive policing of wayward, diseased, and abnormal body. Read through the Victorian theories of degeneration and decadence, on the one hand, and the contemporary discourses of defilement and abjection, on the other, criticism has tended to cast decay as a symbolic register for the period’s ideological investment in normative progressive development, such that backwardness, depravity, and devolution are reified and read as symptomatic fears of taxonomic transgression. As my project demonstrates, however, in their minute and sustained attentions to the periodic pattern of dissolution and re-formation, the Victorians came to view decay as the conditional possibility for form’s continual emergence. Decay was not “matter out of place.” It was matter ceaselessly reforming itself on the stream of time. This conception of decay, in turn, reconfigures our critical interpretation of the Victorian ideologies of life, growth, progress, and reform. Decay does not pathologically mark the failure of progressive ideology; instead, it expresses the plasticity necessary for ceaseless growth.

Recuperating the temporal dynamics of *formation-in-decay*, this project rethinks the categorical coordinates of abjection and defilement. In a world where *everything*—the pulsations of electromagnetic waves, the geomorphic crust of the earth, the mineralogical components of crystals, and, of course, the cellular tissues of biological bodies—was constantly dissolving and recombining, it does not make sense to speak of the singular, delimited subject’s confrontation with the contaminating, liminal object. Rather, we must speak of the multiple, heterogeneous, and simultaneous “interabsorption” of subjects and objects. In their investigations of this horizontal relationality, the Victorian theorists of decay emphasized the rhythms of doing and undoing and, thus, folded the abject processes of expulsion and rejection into the experience of growth and development. Accordingly, this project focuses on the self-formation of the porous individual in relationship to the ever-dissolving and ever-renewing world. I argue that these manifold entities mutually emerged through the shared rhythms of decay – eddies and rests, drifts and advances – revealing the possibilities that linger in formlessness. Decay’s negations, thus, allowed for radical conceptions of receptivity, as the individual pocketed and secreted temporal absences that allowed for potent possibilities – ethical rebirth, transhistorical connectivity, exquisite moments of ecstasy. Turning to the tremulous self-formations of Esther Summerson and Richard Carstone in Charles Dickens’ *Bleak House* (1852-53), the nubile girls of Winington Hall in John Ruskin’s *The Ethics of the Dust* (1865), the budding aesthete in Walter Pater’s *Studies in the History of the Renaissance* (1873), and the doomed Lucian Taylor in Arthur Machen’s *The Hill of Dreams* (1907), this project reframes critical debates about abject materiality to address the environmental affordances of formlessness.

For Ellen,
who took me up mountains and across continents,
but whose love remains larger still.

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1. *Introduction*
*Formless Without Rest*¹

The links between dead matter and animation drift everywhere unseen.

— John Ruskin²

It is in the ground on which you tread, in the water you drink, in the air you breathe. Incipient life, in fact, manifests itself throughout the whole of what we call inorganic nature.

— John Tyndall³

In literary and cultural studies of the nineteenth century, “decay” tends to disappear into two dominant interpretational frameworks: degeneration and decadence. While criticism of degeneration often discloses anxieties about abnormal simplification, viz. the bourgeoisie’s dread of a descent into the low, the base, the brute, criticism of decadence tend to uncover misgivings about abnormal sophistication, viz. the philistines’ preoccupation with the depravity of the aristocratic, the civilized, the cultured.⁴ Nevertheless, both critical apparatuses emphasize the period’s fixation upon the concept of decay as a natural propensity toward decline or collapse. Degeneration theory hypothesizes the decay of species specificity—the loss of differentiation in the organism—as the natural result of adaptation to less varied and less complex conditions. Even within the artificial realm of decadence, over-refinement, often represented as a congenital condition, possesses an inherent compulsion toward morbid enfeeblement and collapse. Accordingly, both critical traditions tend to view decay as a symbolic register for the period’s ideological investment in normative progressive development. Moreover, as indicated by the moral judgment affixed to the classification of ‘high’ and ‘low,’ decay’s symbolic gauge of the temporalities of progress tends to get hypostatized and read as a symptomatic fear of taxonomic transgression.

Mediating between theories of degeneration and decadence are structuralist and post-structuralist conceptions of rotting matter’s transgression of symbolic boundaries. In *Purity and Danger*, Mary Douglas famously reads dirt as “matter out of place” – an offense against the symbolic order that guards against the defilement of the sacred through the codification of concepts of purity and pollution.⁵ While Douglas suggests that dangerous power lurks in “the inarticulate area, margins, confused lines” of the social order, these dangerous margins are the special provenance of Julia Kristeva’s *Powers of Horror* and her theory of abjection (99). Literally meaning the ‘cast away’ or ‘cast under,’ abjection designates the horror the human subject experiences when confronted with those vile materialities—the open wound, excrement, the corpse—that threaten to break down the distinction between subjects and objects.⁶ In their shared interest in the obtruding presence of waste matter (rubbish, scraps of food, nail trimmings, pus, excrement, blood, and corpses), both Douglas and Kristeva map the physical breakdown of matter unto the symbolic breakdown of the social order. These categorical coordinates, in turn,

have tended to dominate critical analyses of Victorian representations of decay. From Lynda Nead's *Victorian Babylon* and Anne McClintock's *Imperial Leather*, to Susan Navarette's *The Shape of Fear* and Kelly Hurley's *The Gothic Body*, the critical deployment of the double helix of material foulness and symbolic transgression reads decay as a boundary crossing that immediately subsumes its multiple meanings into the logic of disgust and horror – with, of course, the proviso of the “attraction of repulsion.”⁷

This dissertation, accordingly, has two related goals. First, taking Victorian decay on its own terms, it recovers the primary modality of material dissolution – its temporality. Mining the rich and nuanced investigations of decay in nineteenth-century science and literature, I discover the era's profound interest in the periodic pattern of decay and re-formation. This temporal dynamic, in turn, recasts the process of decomposition as the conditional possibility of form's continual emergence – what I refer to as the dynamic of *formation-in-decay*. From geology's reevaluation of eroded sedimentation as fodder for future worlds to T. H. Huxley's proclamation that living protoplasm is “always dying,” multiple nineteenth-century scientific discourses converged on a single principle: all bodies are made of decomposing and recomposing matter. Decay is not matter out of place. It is matter ceaselessly reforming itself on the stream of time. This conception of decay, in turn, reconfigures our critical interpretation of the Victorian ideologies of life, growth, progress, and reform. Decay does not pathologically mark the failure of progressive ideology; instead, it expresses the plasticity necessary for ceaseless growth.

Second, by attending to decay's ceaseless temporal processes, this dissertation rethinks the categorical coordinates of abjection and defilement. In a world where *everything*—the pulsations of electromagnetic waves, the geomorphic crust of the earth, the mineralogical components of crystals, and, of course, the cellular tissues of biological bodies—is constantly dissolving and recombining, it does not make sense to speak of the singular, delimited subject's confrontation with the contaminating, liminal object. Rather, we must speak of the multiple, heterogeneous, and simultaneous “interabsorption” of subjects and objects.⁸ As in the opening vignette of Dickens' *Bleak House* where horses, dogs, and pedestrians are “undistinguishable in mire,” persons, animals, and things exist along a porous horizontal continuum. Moreover, in their investigations of this horizontal relationality, the Victorian theorists of decay emphasized the rhythms of doing and undoing that constitute the experience of *formation-in-decay*, as the porous subject undergoes, in Pater's description, a “strange perpetual weaving and unweaving.” That is, the Victorian theorists of decay fold the abject processes of expulsion and rejection into the experience of growth and development, such that the continually self-forming individual flickers into form as a “tremulous wisp” (Pater, 119).

Accordingly, this project focuses on the self-formation of the porous individual in relationship to the ever-dissolving and ever-renewing world. I use “individual” in the broadest sense possible, placing the development of human beings alongside the modification of the earth's crust, the growth of crystals, the undulation of ethereal waves, and the association of microbes. Tracing the imbrications and interpenetrations of these manifold entities, I argue that they mutually emerge through the shared rhythms of decay – eddies and rests, drifts and advances – revealing the possibilities that linger in formlessness. While these ubiquitous currents of dissolution and recombination occur at the utmost fringes of conscious perception, the Victorian theorists of decay urged their readers to cultivate a keen attention to the subtle influences of decay's unseen operations. In their heightened attention to its subtractive and negating forces, the Victorians imagined decay as a productive hollowing or emptying of the individual. Decay's negations, thus, allowed for radical conceptions of receptivity, as the

individual pocketed and secreted temporal absences that allowed for potent possibilities – ethical rebirth, transhistorical connectivity, exquisite moments of ecstasy. Turning to the tremulous self-formations of Esther Summerson and Richard Carstone in Charles Dickens’ *Bleak House* (1852-53), the girls of Winnington Hall in John Ruskin’s *The Ethics of the Dust* (1865), the budding aesthete in Walter Pater’s *Studies in the History of the Renaissance* (1873), and the doomed Lucian Taylor in Arthur Machen’s *The Hill of Dreams* (1907),⁹ this project reframes critical debates about abject materiality to address the environmental affordances of formlessness.

I. Unseen Matters of Fact

“Things fall apart”: it is a scientific and axiomatic truth that all material objects decay. It is the way of our moldering, fragile world. Accordingly, it is easy to understand why the historical development of the concept of decay can and does operate as the under-examined inevitability upon which the paradigms of degeneration and decadence rest. Decay is the quintessential ‘matter of fact.’ However, as demonstrated by Steven Shapin and Simon Schaffer in their seminal study of the Robert Boyle’s pneumatic experiments, *Leviathan and the Air Pump*, “matters of fact” are *produced* through a complex process of literary and social mediation:

An experience, even of a rigidly controlled experimental performance, that one man alone witnessed was not adequate to make a matter of fact. If that experience could be extended to many, and in principle to all men, then the result could be constituted as a matter of fact. In this way, the matter of fact is to be seen as both an epistemological and a social category. The foundational item of experimental knowledge, and of what counted as properly grounded knowledge generally, was an artifact of communication and whatever social forms were deemed necessary to sustain and enhance communication. (25)

In the historical interval between the performances of Robert Boyle’s seventeenth-century pneumatic experiments and the nineteenth-century investigations into the temporalities of decay, the “social forms” of communication necessary for the establishment of “matters of fact” had flourished and multiplied. Scientific societies had proliferated, running the gamut from the urbane meetings of the highly professionalized, e.g. the British Association for the Advancement of Science, to the regional gatherings of the enthusiastic lay, e.g. the Annual Fungus Meeting of the Woolhope Club. Scientific journals had also proliferated, and, what is perhaps more important for the establishment of “matters of fact,” journalistic reports of the discoveries of the sciences of decay found their way into the ever-widening distribution of the periodical press. In highlighting the explosive development of public forums for the “virtual witnessing” of empirical facts in the nineteenth century, I do not mean to suggest that I aim to establish the definitive facticity of decay (Shapin and Schaffer, 60).

To the contrary, I want to underscore the extent to which the findings of decay were debated and contested in multiple, heterogeneous discursive forums, as science and literature worked together to discursively produce decay’s “matters of fact.” Before turning to the specific relationship between the literary and scientific study of decay, I want to sketch the methodological assumptions that animate my work in the historically contested domain of science and literature. This project’s methodological strategies are guided by the following

assumptions: 1) although I do not argue for a singular, monolithic “culture,” I see both the discourses of science and literature as expressions of overarching intellectual climates and socio-historical trends; 2) as such, it is not only possible but also fruitful to consider the relationships between literary and scientific discourses; and 3) finally, as to these relationships, the directionality of influence between these discourses runs both ways.¹⁰ Literature influences science; science influences literature. Based upon these guiding assumptions, this project has discovered finer points of connection between science and literature as they mutually explored the temporalities of decay in the nineteenth century.

In Victorian Britain, the production of decay’s “matters of fact” was eminently social. Scientists, journalists, lay enthusiasts, scientific popularizers, and literary writers produced innumerable articles—often in dialogue with each other—for the periodical press on the curious operations of decay. Not only did the scientific and the literary intermingle in the pages of the periodical press, but so also did the categories of the epistemological and the social as the press ran articles on the mercantile, cosmic, and quotidian operations of decay. For example, a very partial list of decay’s “artifacts of communication” include commercial accounts of the perils of dry rot for the shipbuilding industry; housewifely guides to food preservation; scientific treatises on the dissolving waves of interstellar ether; medical reports on the forensics of bodily decomposition; and political commentary on the labor “associations” of microbes.¹¹ So, while many of decay’s operations were still deemed furtive and inexplicable, flickering at the fringes of human perception, Victorian writers across the disciplines, as well as across the divides of gender and class, were engaged in formulating, discussing, and debating decay’s “matters of fact.”

Moreover, seminal articles on the sciences of decay appeared in leading intellectual journals alongside literary explorations of decay’s temporality. For example, in the course of the same year (1869), *The Fortnightly Review* published T. H. Huxley’s theory of the protoplasm as “The Physical Basis of Life” and Walter Pater’s essay on “Leonardo da Vinci,” subsequently reprinted in *The Renaissance* (1873).¹² In the former, Huxley puts forth his view that the “living protoplasm” is “always dying” and “could not live unless it died” (136).¹³ Meanwhile, in a celebrated passage that later became a calling card of aestheticism, Pater describes the Mona Lisa as a revenant: “she is older than the rocks among which she sits; like the vampire, she has been dead many times, and learned the secrets of the grave” (507).¹⁴ Like the “always dying” protoplasm, the Mona Lisa is composed of a dying beauty “wrought out from within upon the flesh, the deposit, little cell by cell of strange thoughts” (506). The periodical press, thus, constitutes an intermediary ‘structure of feeling’ that mediates between the overarching currents of intellectual thought and isolated instances of direct “influence” between particular scientists and literary authors.¹⁵

Indeed, the authors of this study – Charles Dickens, John Ruskin, Walter Pater, and Arthur Machen – were all engaged in producing “artifacts of communication” for the periodical press that bridged the realms of science and literature.¹⁶ As he was preparing his geological monstrosity, *Bleak House* (1852-3), for serial production, Charles Dickens, in his capacity as editor of *Household Words*, oversaw the publication of articles on geological time travel, “Our Phantom Ship on an Antediluvian Cruise” (1851), and the devastations of coastal erosion, “What is to Become of Us?” (1852).¹⁷ While working on his genre-bending Socratic dialogue *The Ethics of the Dust* (1866), which blends together the genres of mineralogical guidebook, geological treatise, and female education manual, Ruskin was writing articles not only on the practice of line etching for the *Art Journal* (Jan-July 1866) but also a two-part geological study

“On the Shape and Structure of Some Parts of the Alps” (February and May 1865) for the *Geological Magazine* based upon his lifelong observation of geological phenomena.¹⁸ While Walter Pater did not pen science articles for the periodical press, the essays that came to constitute the bulk of *Studies in the History of the Renaissance* (1873) were first published in the *Westminster* and the *Fortnightly Review* (1867-71). These essays ran alongside pieces by T. H. Huxley, Herbert Spencer, and John Tyndall, and, as Pater’s biographer, Gerald Monsmon notes, his writings “draw imaginatively on biological, chemical, physical, and geological terminology” popularized in these periodicals (28).¹⁹ But the connection between the sciences of decay and literary writing in the Victorian era runs deeper than a shared terminology. Decay and writing exist in the same medium: they are the stuff of time.

Victorian literature and the sciences of decay converge in the figure of the writer, who epitomizes the dynamic of *formation-in-decay* in the recursive processes of writing. Writing and rewriting, editing and amending, wording and rephrasing, the Victorian writer *is* a decomposer. In the endless circumlocutions of the Court of Chancery’s legal dribble, Dickens’ *Bleak House* presents a maniacal vision of writing’s recursivity: purposeless writing begets more purposeless writing. Meanwhile, in his lifelong work as an amateur geologist, Ruskin meticulously documented his investigations of geological decay, vacillating between apocalyptic and redemptive interpretations of the ruination of the mountains. In the end, the aging Ruskin eventually dissolves the decaying earth into the body of his own senescent writing. Meanwhile, Pater explicitly figures the aesthetic critic as a decomposer. In his Preface to *Studies*, he figures the work of art as a “receptacle,” which contains “powers or forces,” comparable to “natural elements” (3). Accordingly, it is the work of the critic to “distinguish, analyze, and separate” the virtue that produces the sensation of beauty and pleasure, “reducing it to its element,” such that the critic’s work is only done when he has “noted [the virtue] as a chemist notes some natural element” (4). In a perverse fulfillment of Pater’s critical decomposer, the protagonist of Machen’s bildungsroman *The Hill of Dreams* tries again and again to become a writer but, in the ceaseless efforts of self-formation, destroys himself in the process, leaving behind an indecipherable manuscript – the record of his decomposing prose.

This representation of the correlation between the processes of writing and those of decay may sound like a Derridean deconstruction of textuality, and, accordingly, the idea that the Victorian writer is a decomposer may sound too facile, since, within the textual universe of endless regression, *all* texts contain the self-contradictory impulses of their own destruction. However, it is not simply the case that Victorian authors dithered on the threshold of composition, beginning and re-beginning their stories, in the manner of that great decomposer Laurence Sterne in *Tristram Shandy*. Rather, the age-old propensity for textual decomposition takes on a new urgency and new relevance in the Victorian era. In their production of decay’s “matters of fact,” the endlessly de-composing Victorian text spoke directly to the discoveries of decay’s temporalities, i.e. the perpetuities of geological time, the continuous recombination of elemental matter, the infinite conductivity of atmospheric ether, and the immortality of microbial life.

II. Crystals, Fungus, Men

At the heart of this project is, thus, a conception of decay as the condition necessary for matter’s ceaseless self-formation. In many ways, the Victorian interest in decaying matter’s ‘vital’ ability to create itself anew was a latter-day expression and extension of Johann Friedrich

Blumenbach's concept of *Bildungstrieb* (1781). Employed by Kant in the *Critique of Judgment* to distinguish mechanical from organic form, Blumenbach's *Bildungstrieb* (formative drive) postulated the existence of a developmental force latent in the embryo's material structure.²⁰ Contra the doctrine of preformation, Blumenbach's self-forming organism did not simply unfurl according to a predetermined design implanted in the seed.²¹ The organism, reacting and responding to its environment, impelled its own development. Blumenbach speculated that this "inborn, life-long" drive existed "in all living creatures, from men to maggots and from cedar trees to mold" (67).²² Nearly a century later in 1868, T. H. Huxley echoes Blumenbach in his expansive location of vitality, but with a critical difference, as he connects the capacity for self-organization to the processes of disintegration: "under whatever disguise it takes refuge, whether fungus or oak, worm or man, the living protoplasm not only ultimately dies and is resolved into its mineral and lifeless constituents, but is always dying, and, strange as the paradox may sound, could not live unless it died (136)."²³ The ceaseless self-formation of the organic individual necessitates its physical decomposition, as the organic body continually dissolves into "its mineral and lifeless constituents." Furthermore, it is not simply a matter of post-mortem composting and recycling. Rather, the vitally self-forming organism grows *because* it is deliquescing.

Not only did the Victorians attach the temporality of organic development to the rhythms of decomposition, but also they expanded the concept of self-formation to include inorganic matter. In an address delivered in 1868, John Tyndall put forth the idea that inorganic matter was capable of self-formation as evidenced by the intricate structure of "crystalline architecture" (12).²⁴ Likening molecular organization to the building of "little pyramids," where "the clustering together of innumerable molecules" creates a "definite form," Tyndall argues that the crystal "seems a mimicry of architecture of Egypt" (10).²⁵ Unlike the "swarming" slave labor that built the Egyptian pyramids, "these molecular blocks of salt are *self-posed*" through the powers of molecular attraction and repulsion (11). Self-formation emerges through the interaction of both forces: "the pyramidal form is the result of this play of attraction and repulsion" (11). Hence, in the same year that Huxley fused together the processes of growth and decay, Tyndall linked the magnetic sway of molecular attraction (growth) to the dispersive energies of molecular repulsion (disintegration). Indeed, when he argues that the "formative power," which he describes as the "tendency on the part of matter to organize itself, to grow into shape, to assume definite forms," is "all-pervading" and present "throughout inorganic nature," Tyndall transfers the language of Romantic organicism (*Bildungstrieb*'s "formative power") to the realm of minerals and rocks. (11).

Three years earlier, Ruskin employed exactly the same analogy in *The Ethics of the Dust* (1865). Illustrating the contested, discursive production of decay's "matters of fact" across the disciplines of science and literature, Ruskin enacts Tyndall's argument *avant la lettre*. However, with his embrace of vitalism, Ruskin endows inorganic matter with a distinctly organic capacity for self-organization. Like Tyndall, Ruskin analogizes crystallization to pyramid building. However, he conflates molecular arrangement with architectonic structures *and* organic swarms. Initially, the "bricks," or atoms, are "heaps of clay," but when they rise into the air, they mimic "flights of locust" and "great ranked crowds" (18.230). When asked to further explain "the flying of the bricks," he uses organic metaphors: the "uncrystallized" atoms exist in a solution where they are "separated from each other, like a swarm of gnats in the air, or a like a shoal of fish in the sea" (18.234). Ruskin imagines the movement of dead matter as a living,

dynamic fluid process. Indeed, both Ruskin and Tyndall are adamant in their assertions that rocks “grow” and take “shape” in the same manner as organisms.

In this way, it is possible to view the Victorian theorists of decay as anticipating the recent call of the “new materialisms” to attend to the active participation of nonhuman actors in shaping our socio-political world. Indeed, the Victorian conception of formation-in-decay would seem to answer, at least, one half of Jane Bennett’s hope to find a materialism “in which matter is figured as a vitality at work both inside and outside of selves, and is a force to be reckoned with without being purposive in any strong sense” (62).²⁶ In their extension of self-formation to inorganic matter, the Victorian theorists of decay certainly figured the patterns of growth and disintegration as working “inside and outside of selves” – self-formation worked in little pyramidal crystals, in fungus, and in men. However, as this dissertation demonstrates, this newly forged connection between the organic and the inorganic is thinkable precisely because of the attribution of dissolution to the growing organism. That is, while the Romantics inserted time into the form of the individual with the concept of *Bildungstrieb*, the Victorians—realizing that material bodies could not grow, unchecked and unimpeded, forever—enfolded inorganic dissolution into the emerging organism. Decomposition allowed the Victorians not only to imagine ceaseless self-formation, but also to directly connect the formal rhythms of the inorganic and organic realms. So, if we truly desire to articulate a connection between the organic and the inorganic, the human and the nonhuman, the Victorians teach us that we must think it through the vital temporalities of growth and decay, dissolution and recombination.

Victorian theorists of decay also suggest that it might be impossible to imagine a nonpurposive materiality that also has the power to “work.” Although decay would seem to quash purposive, teleological development, the Victorians repurposed its purposeless destruction: dead matter yearned for self-organization. Not only did decay have a purpose, but also this purpose was compatible with mechanical and vitalist interpretations of the “work” of materiality, as we see in the issue of the “swarm” in Tyndall and Ruskin’s accounts of crystalline self-formation. Unlike the swarming Egyptian laborers, who had to be directed by a pharaonic ruler, Tyndall’s crystalline (proletarian) molecules organize of their own accord. In Tyndall’s explanation of crystalline form, his mechanical molecules—deprived of a divine telos—create their own purposive order. Meanwhile, in his use of organic metaphors to explain the powers of molecular attraction, Ruskin links the flux of inorganic form to the motions of vitalistic life, effectively opening a backdoor for the divine springs of self-formation. Nevertheless, irrespective of its mundane or divine origins, the mechanist and the vitalist concur on one key point: dead matter works toward self-formation. If the aim of the new materialisms is to account for the active participation of nonhumans in *shaping* our world, the Victorian theorists of decay suggest that such participation happens constantly through the purposive “work” of decaying materiality. However, in order to continually keep the subtractive and expulsive power of decay in view, I argue that we need to conceive of this work as we would the work of a sculptor. The work of decay inheres in its ability to chip away, to chisel, and to hollow out, as it labors to create the receptivity necessary for continual development.

III. The Empty Beat

In the Victorian era, decay’s “matters of fact” were produced by scientists and literary writers, who, in their debates about matter’s self-formation, drew public attention to subtle processes of dissolution outside the range of human perception. These geological, chemical,

molecular, and biological processes were either too slow or too minute for the human to perceive in the course of her medium-sized, medium-duration life. Indeed, it might seem unlikely that the Victorians paid much heed to these debates about the infinitely slow and infinitesimally small influences of decay on human life. Even granting the existence of decay's ceaseless agitations, what possible role could 'gradual' geological and minute biochemical operations play in the development of the human subject? And even if developmental biology and literary convention concur in granting 'the environment' a determining influence on human subjectivity, how can processes that occur at the utmost fringes of consciousness shape, or worse yet, shatter human formation? Accordingly, this project formulates a theory of human development that substantiates the sway of the infinitely small and the indefinitely slow based upon the effects of decay's negations.

In *Fateful Beauty* Douglas Mao establishes the Victorians' interest in the influence of unseen and unfelt forces on human development. Mao argues for the "extraordinary depth" of the Victorian era's interest in "the scarcely registered workings of environment on the developing human being," which he attributes to the period's "tendency to conceive of human development as a series of transactions between an organism and its environment" (6). Mao refers to these subtle operations as "stealthy environments." In a statement that speak directly to this project's aims, Mao argues that: "by the middle of the nineteenth century, science was pressing very hard the point that daily life itself is permeated by mystery in the form of the countless physiochemical transactions shaping each one of us, only a fraction of which can be analyzed or known" (65). However, Mao does not include decay in his account of the Victorian interest in surreptitious influences on human development, focusing almost exclusively on the fluctuations of chemistry – i.e. the "perpetual motion" of the "phosphorus and lime" in Pater's "Conclusion" to *The Renaissance*. But, as this project demonstrates, we cannot understand the power of Pater's "pulsations" to shape human development without taking account of their propensity toward dissolution and decay.

While this project aims to recover the full gamut of decay's stealthy influence on human life, there was perhaps no better nineteenth-century symbol of the furtive influence of environment on human development than the microbe. With the rise of germ theory, it became common knowledge that microbes were everywhere — and everywhere *unseen*. The scientific community had been aware of tiny creatures since the seventeenth-century, when Antony van Leeuwenhoek, observed "animalcules" on everything from the muscle fibers of a whale and the hairs of sheep, to the head of a fly and the eye of an ox (6).²⁷ However, Leeuwenhoek's observations remained little more than a scientific curiosity; there was little speculation about the chemical, biological, or medical implications of the "animalcules" (13).²⁸ In the nineteenth century, advances in microscope technology and staining techniques allowed for more accurate observation. But advances were met by new difficulties.²⁹ For example, while the innovation of the oil immersion lens allowed for the highest magnification with the least chromatic aberration, this technique brought the center of the field into focus "at the expense of having the periphery of the field out of focus" (20).³⁰ Even with advances in microscopic technology, the furtive microbe resisted capture, its motile bodies dancing on the fringe of human perception.

Due in equal measure to their invisibility and their ubiquity, an aura of mystery clung to the microbe. In Eliza Priestley's striking description, microbes are veritably stealth incarnate:

We must allow our minds to carry us into the region of the invisible, for we have to realize the fact that the air round us is crowded with the germs, in every stage of vitality,

of small organisms which are noiseless, intangible, unseen. While sleeping, waking or drinking, they steal so insidiously upon us that we are unconscious of their presence until illness give the first note warning. (811)³¹

Silent and undetected, microbes “steal so insidiously upon us” that we do not know they are there until it is too late – until we are infected. Not only does the microbe embody the idea of “stealthy” influence, but also its invisible presence encourages its human counterparts to cultivate an appreciation for its “scarcely registered workings.” Unseen and unfelt, the microbe’s presence not only requires an imaginative visualization—“we must allow our minds to carry us into the region of the invisible”—but also re-sensitizes the affective interface of the body, as our slumbering sensations are roused to an impossible vigilance.

The microbe provides an easy case in point. However, what made the Victorian environment especially stealthy was the unseen influence of multiple, overlapping flows of disintegrating and recombining particles and forces: geologically slow erosion weathered the surface of things, as tiny drifts of dust entered crevices and electromagnetic pulsations streamed off decaying stars. That is, while decay’s effects were too slow and too minute to witness, the Victorians increasingly learned to feel their lurking, mysterious presence thanks to the Victorian theorists of decay, who roused their readers to a heightened awareness of decay’s furtive influences upon human development. In calling for a discriminating and amplified attention to decay’s subtle influences, it could be said that the Victorian theorists of decay offered the human subject the opportunity to aestheticize the experience of dissolution – to turn the moment of loss into something beautiful. However, for the Victorian theorists of decay, the moment of dissolution not only mattered because it could be transformed into an aesthetic experience – precisely through the aesthetic possibility latent in decaying matter’s continual self-formation – but more importantly because the moment of negation created a momentary respite in the torrent of time’s unfolding.

I claim that the Victorians imagined decay’s subtle influence as creating an environmental affordance through the pause – the empty beat in the flood of time. Ultimately, that which lacks form—emptiness itself—reshapes the contours of the self, notching moments of receptivity into its developmental unfolding. Hence, in his representation of coal’s vast geological story, Dickens plotted Lizzie Hexam’s narrative abilities onto “the hollow” of the burning nugget of coal (38). In tracing the “perpetual circulation” of dust (elementary matter), Ruskin taught his readers to admire the dust’s “repose,” urging them to seek the moment of “rest” between the beats: “there’s no music in the rest,” says Ruskin, “but there’s the making of music in it. And people are always missing that part of the life-melody” (18.247). Meanwhile, in response to the ether theories of the 1860s, which revealed the frenetic possibility that “solid bodies which to the senses are at perfect rest, may be the arena of incessant and violent motion,” Pater theorized aesthetic appreciation as a mode of detachment, figured variously as “pulses,” “receptacles,” and “blanks,” that ruptures the onslaught of ethereal commotion (287).³² In these cases, the self’s experience of rest or rupture is charged with potent possibilities, as the voided space becomes an opportunity for a new repletion. For Dickens, the hollow radiates with narrative potential. For Ruskin, the dust’s repose embodies patient suffering, which, in turn, holds out the promise of ethical rebirth. For Pater, the diaphanous blank becomes a conduit for transhistorical connectivity that links modernity to the rejuvenating influences of the Renaissance. By the end of the century, the empty beat becomes the all-consuming throb of microbial life: Machen envisions the consummation of decay’s formlessness in the annihilation

of his youthful protagonist, whose death signals the passage from the pliant pulsations of youth into the absolute plasticity of microbial life.

In moving from decay's ceaseless self-formation to "rest" and "receptacle," it may appear that we have arrived once again at a hypostatized conception of decay, viz. that we have only moved from a notion of "matter out of place" to a view of "matter out of time," such that the designation of "out" reintroduces a spatial grid and we are thrust back into the domain of abjection and defilement. However, as I am at pains to demonstrate in my chapters, these moments still exist *in* time. For example, in Ruskin's depiction of the "rest," the life-melody still "scrambles" on. The rest must be felt, howsoever fleetingly, in the flow of restless time. In this way, the voided beat within the stream of time could be said to bespeak the formlessness always lurking in temporality, with its incessant, indifferent, pulverizing course. Hence, I want to end this introduction with a consideration of how Georges Bataille's concept of *l'informe* (the formless) and its category of the "pulse" might illuminate the radical temporal possibilities of the Victorian idea of decay's empty beat.

Bataille's concept of the *informe* has recently been revived, largely in the realm of contemporary art criticism, as an alternative to the critical embrace of abjection and the vogue for abject art. The concept was first introduced by Bataille in "the strange 'dictionary'" he published serially in the surrealist journal *Documents* (1929-30).³³ In this dictionary, Bataille proposed four basic categories of formlessness: base materialism, horizontality, pulse, and entropy. In *Formless: A User's Guide*, Yve-Alain Bois and Rosalind Krauss describe how Bataille employed the concept of "pulse" as a critique of "the modernist exclusion of temporality from the visual field" (32).³⁴ For Bois, the pulse "involves an endless beat" that "incites an irruption of the carnal"; for Krauss, this endless beat is also an erotic "throb." In the thrilling touch of Ruskin's crystalline girls, in the "delicious recoil" of Pater's summer rain, and in the throbbing intercourse between Lucian Taylor and the fungal earth in Machen's *The Hill of Dreams*, the endless beat of decay pulses with illicit, carnal energies.

While I argue that the formless, empty beat constitutes decay's primary environmental affordance, my analysis of this radical receptivity emerges from my engagement with the many 'matters of facts' of decay in the nineteenth century, as these facts reshaped the relationship between 'high' and 'low,' between organic and inorganic, between human and nonhuman. As such, the project answers Rosalind Krauss's call to attend to the four categories of the *informe*:

The other word to which Bataille turned to evoke this process of "deviance" was *informe*, a *déclassement* in all senses of the term: in the separations between space and time (pulse); in the systems of spatial mapping (horizontalization, the production of the lower-than-low); in the qualifications of matter (base materialism); in the structural order of systems (entropy). As this entire project has worked to demonstrate, these processes marked out by the *informe* are not assimilable to what the world of art currently understands as abjection. And further, it is our position that the *informe* has its own legacy to fulfill, its own destiny—which is partly that of liberating our thinking from the semantic, the servitude to thematics to which abject art seems so relentlessly indentured. The present project is only one chapter in that continuation. (105)³⁵

I echo Krauss in believing that formlessness can help "liberate" us from the categorical coordinates of abjection and defilement. In this project's analysis of decay's empty beat (pulse), its porous continuum of relationality (horizontality), its exploration of amorphous slurries, jellies,

and slimes (base materialism), and its study of the recursive text's precarious tilt toward oblivion (entropy), this project offers four chapters in the continuation of the legacy of formlessness.

My first chapter, "Climatic Reversions," traces the incongruous appearance of the Megalosaurus on the streets of London in Dickens' *Bleak House* (1853) to Lyell's *Principles of Geology* and his theory of climatic reversion. Hypothesizing that the cyclical destruction and redistribution of landforms could return the earth to its prehistoric climate and trigger the "return of the iguanodons," Lyell's theory of climatic reversion not only anticipates the return of the Megalosaurus from the deep past, but also accounts for the novel's fatalistic representation of the Court of Chancery and endless regressions. While it threatens to naturalize Chancery's systemic ruin and regressive temporality, climatic cyclicity holds out the novel's only hope: that "implacable November weather" will eventually bring spring. In this way, the novel acquiesces in systemic violence in the hope that ruin may yield the path to redemption, thus modeling the sufferance that it seeks to validate – the fortitude born from fragility, illness, and grief.

Chapter Two, "Ruskin's Dust," probes the connection between the aesthetics of self-formation in Ruskin's *The Ethics of the Dust* (1865) and mid-century debates about inorganic matter's vital forms in order to elucidate the ethical value of dust. In the 1860s, contentious debates erupted over the status of the *Foraminifera*, an animal confused with a mineral, and the *Eozooön Canadense*, a mineral mistaken for an animal. The two cases reveal that Ruskin was not alone in locating formative power in minerals. Offering a reappraisal of dust's role in Ruskin's oeuvre and Victorian culture more broadly, this chapter argues that "dust" signifies decay's release of chemical potentiality and encodes inorganic matter's formative power as it ceaselessly circulates through countless forms. Dust's ethical import, thus, inheres in matter's susceptibility—its vulnerability to the erosive effects of wind and water; to the sudden and unexpected violence of landslides; and to the subtle, insidious effects of contamination—because this "weakness" becomes the "rudiment," literally the unwrought element, that defines its strength.

Attending to the play of air and evacuated space in Walter Pater's *Studies in the History of the Renaissance* (1873), chapter three, "Pater and the Air Pump," turns to the scientific debates in the 1860s about "ether"—a rarefied and elastic substance believed to permeate all space and serve as the medium for the propagation of light, heat, and electromagnetism—to situate Pater's conception of historical subjectivity as a form of ethereal embeddedness. While Pater's conception of historical change is premised upon the propagation of physical forces through a "common" medium, Pater's historiography withdraws his subjects from their historical context. In order to understand the relationship between "common air" and "empty space," I argue that we must turn to the history of the air-pump, a device that secured a methodology of detachment and isolation and played an important role in the ether debates of the 1860s, specifically, in John Tyndall's lectures on *Heat considered as a Mode of Motion*. I argue that the air-pump not only empties space but also figures receptivity as a heightened sensitivity to the affordances of emptiness, giving us a method to think through the politics of emptiness, not just as the site of abandonment, neglect, or ruination, but also as the site of auspicious rupture and break.

My fourth chapter, "Pulpy Fiction," turns to Arthur Machen's bildungsroman, *The Hill of Dreams* (1907), and the history of mycology to understand why the youthful protagonist's encounter with an "abominable fungus"—that leaves the earth "black and unctuous, and bubbling" and "pulp under the feet"—constitutes a life-shattering event. Recovering the little-known fact that microbes were originally classed with fungi (they were *Schizomycetes*, fission

fungus), this chapter argues that *The Hill of Dreams* carries “the novel of formation” to its logical and terrible conclusion: only the fungal microbe can survive the process of endless self-formation. By joining Lucian’s plot of development to the growth of microbial fungi, the novel reveals the fault line between form and formation that characterizes the ideological contradiction at the heart of the bildungsroman. *Bildung* implies self-modifying processes that are, by definition, ceaseless; the novel, meanwhile, must end. Lucian bodies forth the fragile logic of the bildungsroman in his failed and fatal attempt to become a writer. Toiling endlessly over the cadences of phrases, the selection of individual words, and, worse yet, starting story after story and laying them aside unfinished, Lucian’s writing is continually beginning. Ultimately, this chapter reads this “failed” bildungsroman as the perverse consummation of the genre’s idealization of ceaseless self-formation.

NOTES

¹ My title highlights the idea that decay is “without” rest – it is ceaselessly negating the contours of form – and points toward two works that have influenced my thinking about dissolution: Rosalind Krauss’s “Informe Without Conclusion” and Timothy Morton’s *Ecology Without Nature*. See Krauss, Rosalind. “‘Informe’ Without Conclusion.” *October* 78 (1996): 89-105 and Morton, Timothy. *Ecology without Nature: Rethinking Environmental Aesthetics*. Cambridge: Harvard University Press, 2007, especially p. 24.

² John Ruskin. *Queen of the Air* in Ed. E. T. Cook and Alexander Wedderburn. London: George Allen, 1903-1912, vol. 19, pp. 362.

³ Tyndall, John. “On the Methods and Tendencies of Physical Investigation.” *Scientific Addresses*. New Haven: Charles C. Chatfield & Co., 1870, pp. 11-12.

⁴ For studies of degeneration and the discursive power of biological and medical theories of devolution to police the abnormal body, see Brantlinger, Patrick. *Rule of Darkness: British Literature and Imperialism, 1830-1914*. Ithaca: Cornell University Press, 1988; Carlson, Eric T. “Medicine and Degeneration: Theory and Praxis.” in *Degeneration: The Dark Side of Progress*. New York: Columbia University Press, 1985; Gilman, Sander L. “Sexology, Psychoanalysis, and Degeneration.” *Difference and Pathology: Stereotypes of Sexuality, Race, and Madness*. Ithaca: Cornell University Press, 1985; Nordau, Max. *Degeneration*. Trans. from the 2nd German edn. New York: D. Appleton and Company, 1895; and Pick, Daniel. *Faces of Degeneration: A European Disorder, c.1848 - c.1918*. Cambridge University Press, 1989. For studies of decadence and the discursive instability of the rhetorics of perversity to contain the dissolute body, see Bernheimer, Charles. *Decadent Subjects: The Idea of Decadence in Art, Literature, Philosophy, and Culture of the Fin De Siècle in Europe*. Baltimore, MD: Johns Hopkins UP, 2002; Boyiopoulos, Kostas. *The Decadent Image: The Poetry of Wilde, Symons and Dowson*. Edinburgh: Edinburgh UP, 2015; Constable, Liz, Dennis Denisoff, and Matthew Potolsky, eds. *Perennial Decay: On the Aesthetics and Politics of Decadence*. Philadelphia: U of Pennsylvania, 1999; and Dowling, Linda C. *Language and Decadence in the Victorian Fin De Siècle*. Princeton, NJ: Princeton UP, 1986.

⁵ Douglas, Mary. *Purity and Danger: An Analysis of the Concepts of Pollution and Taboo*. London: Routledge and Kegan Paul, 1966.

⁶ Kristeva, Julia. *Powers of Horror: An Essay on Abjection*. Trans. Leon S. Roudiez. New York: Columbia University Press, 1982.

⁷ The Victorians, of course, beat the Victorianists to the study of social transgressions. For the Victorian ur-text on the classification of social disorder, see Mayhew, Henry. *Selections from London Labour and the London Poor*. London: Spring Books, 1851. For Victorianist analyses of foul transgressions, see Davidoff, Leonore. “Class and Gender in Victorian England: The Diaries of Arthur J. Munby and Hannah Cullwick.” *Feminist Studies* 5.1 (1979): 86-141; Hurley, Kelly. *The Gothic Body: Sexuality, Materialism, and Degeneration at the Fin De Siècle*. Cambridge: Cambridge UP, 1996; McClintock, Anne. *Imperial Leather: Race, Gender, and Sexuality in the Colonial Contest*. New York: Routledge, 1995; Navarette, Susan J. *The Shape of Fear: Horror and the Fin De Siècle Culture of Decadence*. Lexington: U of Kentucky, 1998; Nead, Lynda. *Victorian Babylon: People, Streets and Images in Nineteenth-century London*. New Haven: Yale UP, 2000.

⁸ In her analysis of toxicity, Mel Chen argues that: “the constant interabsorption of animate and inanimate bodies in the case of airborne pollution must account for the physical nonintegrity of individual bodies and the merging of ‘life’ and ‘nonlife’” (11). See Chen, Mel Y. *Animacies: Biopolitics, Racial Mattering, and Queer Affect*. Durham, NC: Duke UP, 2012.

⁹ While Machen’s *The Hill of Dreams* was published in 1907, it was composed during the late 1890s (1895-97) and bares the stamp of fin de siècle decadence and aestheticism.

¹⁰ While Adelene Buckland’s *Novel Science* and Allen MacDuffie’s *Victorian, Literature, Energy, and the Ecological Imagination* have proved invaluable for their insights into the literary cultures of nineteenth-century geology and Victorian thermodynamics, respectively, I owe my methodological moorings to the pioneering work of Gillian Beer’s *Darwin’s Plots* and George Levine’s *One Culture*. See Buckland, Adelene. *Novel Science: Fiction and the Invention of Nineteenth-century Geology*. Chicago: University of Chicago, 2013. MacDuffie. *Victorian Literature, Energy, and the Ecological Imagination*. Cambridge: Cambridge University Press, 2014. Beer, Gillian. *Darwin’s Plots: Evolutionary Narrative in Darwin, George Eliot, and Nineteenth-century Fiction*. Cambridge: Cambridge University Press, 2009. Levine, George, ed. *One Culture: Essays in Science and Literature*. Madison: University of Wisconsin Press, 1987.

¹¹ For the commercial concerns of dry rot, see “The Cause of Dry Rot Discovered; with a Description of a Patent Invention for Preserving Decked Vessels from Dry Rot, and Goods on Board from Damage by Heat.” *Westminster Review* April 1829: 414-28. For the housewifely “Warning for the Home-Bread Bakers” on the “noxious compound” known as “yeast,” see “Household Treasures” *The London Journal* 28 April 1855: 140. For the medical identification of the “signs of putrefaction” in dead bodies, see “Lectures on Medical Jurisprudence, Now in Course of Delivery at the University of London by Professor A. T. Thomason.” *The Lancet* 29 April 1837: 177-183. For the “incessant tremors” of interstellar space, see Tyndall, John. “The Constitution of the Universe.” *Fortnightly Review* (1865): 129-44. For the communal “labor of microbes,” see Kropotkin, Peter. “Recent Science.” *The Nineteenth century: a monthly review*. Aug. 1893: 248-66.

¹² While we often imaginatively place Pater alongside Wilde in the 1890s, Pater was writing and publishing the essays that would come to constitute *The Renaissance* in the 1860s. His articles were, in fact, contemporaneous with Matthew Arnold’s *Culture and Anarchy* and Ruskin’s social criticism of the 1860s. We can best understand Pater’s quiet deviance when we see *The Renaissance* as emerging out of the Victorian debates not only about Hellenism and Hebraism, but also about the temporalities of decay.

¹³ Huxley, T. H. "On the Physical Basis of Life," *Fortnightly Review* Feb 1869: 129-45. Pater, Walter H. "Notes on Leonardo da Vinci." *Fortnightly Review* Nov 1869: 494-508.

¹⁴ In Oscar Wilde's *The Critic as Artist*, Gilbert describes how, whenever he is in the Louvre, he stands before the Mona Lisa and ecstatically chants Pater's prose: "I murmur to myself, 'She is older than the rocks among which she sits; like the vampire, she has been dead many times...'" (262). See *Oscar Wilde: The Major Works*. Ed. Isobel Murray. Oxford: Oxford UP, 2000.

¹⁵ In *The Long Revolution*, Williams gives the following definition of *structure of feeling*: "it is as firm and definite as 'structure' suggests, yet it operates in the most delicate and least tangible parts of our activity...it is the particular living result of all the elements in the general organization" (64). In its tenuous mediation and dynamic relay between the firm and the delicate, Williams' term is particular apt for my study of the ceaselessly dissolving and reappearing currents of Victorian decay. See Williams, Raymond. *The Long Revolution*. Orchard Park, NY: Broadview, 2001.

¹⁶ While Arthur Machen also wrote short fiction pieces for journals and magazines throughout his literary career, his relationship to science was more personal. He sat for and failed the preliminary examination of the Royal College of Surgeons. His immersion in the study of medicine, however brief and failed, palpably influenced his horror fiction, which is populated by a variety of Faustian doctors and Frankensteinian experimenters. For the reference to his failed exams, see his autobiography, Machen, Arthur. *Far Off Things*. London: Martin Secker, 1922, p. 92.

¹⁷ See "Our Phantom Ship on An Antediluvian Cruise" *Household Words* 16 Aug 1851: 492-6; and "What is to Become of Us?" *Household Words* 26 June 1852: 352-6.

¹⁸ Ruskin, John. "Notes on the Shape and Structure of Some Parts of the Alps, with Reference to Denudation." *Geological Magazine* 2.08 (1865): 49-54 and Part II. *Geol. Mag.* 2.11 (1865): 193-96.

¹⁹ Monsman, Gerald. *Walter Pater*. Boston: Twayne, 1977.

²⁰ Kant deploys *Bildungstrieb* to distinguish the motive force of the mechanical from the formative force of the organism. Using a watch as his example, he highlights its mechanistic form. While one gear may cause another gear to move, the watch cannot reproduce or mend its parts. Moreover, it does not develop *in* time: "the former part is not there as a result of the latter" (§ 65, #374). That is, *Bildungstrieb* marks the insertion of time into the form of the self-organizing entity. Kant, Immanuel, *Critique of Judgment*. Trans. Werner S. Pluhar. Indianapolis: Hackett, 1987.

²¹ For Blumenbach's role in the embryological debated of the late eighteenth century, see Gigante, Denise. *Life: Organic Form and Romanticism*. New Haven: Yale UP, 2009, pp. 16-25.

²² Blumenbach, Johann Friedrich. *Über den Bildungstrieb und das Zeugungsgeschäfte* (1781), qtd. in Bennett, Jane. *Vibrant Matter: A Political Ecology of Things*. Durham: Duke UP, 2010.

²³ Huxley, T. H. "On the Physical Basis of Life."

²⁴ Tyndall, John. "On the Methods and Tendencies of Physical Investigation." *Scientific Addresses*. New Haven: Charles C. Chatfield & Co., 1870. Tyndall delivered the address to the Physical Section of the British Association for the Advancement of Science on 19 August 1868 in Norwich.

²⁵ Significantly, the unaided human eye cannot see these tiny swirling molecules. The miniature pyramid, thus, illustrates what I mean by decay's unseen "matters of fact." For a discussion of the "issue of scale in literary studies", see the following exchange of articles: McGurl, Mark. "The Posthuman Comedy." *Critical Inquiry* (2012) 38: 533-553. Dimock, Wai Chee. "Low

Epic.” *Critical Inquiry*. (2013) 39: 614-631. McGurl, Mark. “Neither Indeed Could I Forebear Smiling at My Self”: A Reply to Wai Chee Dimock.” *Critical Inquiry* (2013) 39: 632-638. For a discussion of minuteness, see especially McGurl’s discussion of “Horrible Minimalism” in “The Posthuman Comedy”: “It is worth remembering that the scale of the posthuman resides both on the small side of the human and on the large...For every gelatinous green immensity we could hope to see, there are untold legions of insects and mollusks, seething billions of microbes, trillions of atoms no less disturbing, from a certain perspective, to the dignity of humankind than old Cthulhu. In them, the problem of absolute largeness that preoccupies weird fiction is converted into a the differently scaled problem of manyness” (551-552). But the distinction between these two scales is blurred. As he points out “those gelatinous green immensities contain multitudes” (547).

²⁶ Bennett, Jane. *Vibrant Matter*.

²⁷ Kruif, Paul. *Microbe Hunters*. New York: Harcourt, Brace, and Company, 1926. Kruif offers an enjoyable, diverting biographical history of microbiology.

²⁸ Collard, Patrick. *The Development of Microbiology*. Cambridge: Cambridge University Press, 1976.

²⁹ For example, Tyndall blamed the microscope for reviving the idea of spontaneous generation in the nineteenth century. While Francesco Redi’s seventeenth-century experiments debunked the notion that putrefying flesh bred maggots, Tyndall describes how “the discovery and improvement of the microscope...[brought] into view a world of life formed of individuals so minute—so close as it seemed to the ultimate particles of matter—as to suggest an easy passage from atoms to organisms” (23). In the blur of the microscope’s imperfect view, it was easy to mistake cells for atoms. See Tyndall, John. “Spontaneous Generation” *The Nineteenth Century* January 1878: 22-47.

³⁰ Collard, Patrick. *The Development of Microbiology*.

³¹ Priestly, Eliza. “The Realm of the Microbe.” *The Nineteenth Century*. May 1891: 811-31.

³² Smith, William Henry. “La Physique Moderne.” *Blackwood’s Edinburgh Magazine* (1867): 281-93.

³³ Grauer, Victor. “Formless: A Review.” *Other Voices* 2.2. March 2002.

³⁴ Bois, Yve-Alain, and Rosalind E. Krauss. *Formless: A User’s Guide*. New York: Zone, 1997.

³⁵ Krauss, Rosalind. “‘Informe’ Without Conclusion.” *October* 78 (1996): 89-105.

2. Climatic Reversions

Time is infinite, but the things in time, the concrete bodies, are finite...All configurations which have previously existed on this earth must yet meet, attract, repulse, kiss, and corrupt each other again.

—Heinrich Heine¹

Of what we may call cosmical weather, in the interstellar spaces, little is known. Of the general cosmical effects of the opposing actions of heat and gravitation, the great dispersive and concentrative principles of the universe, we can at present only form vague conjectures; but that these two principles are the agents of vast countermovements in the formation and destruction of systems of worlds, always operative in never-ending cycles and in infinite time, seems to us to be by far the most rational supposition which we can form concerning the matter.

—Chauncey Wright²

Early reviewers of Charles Dickens' *Bleak House* were bewildered, nonplussed, and even enraged by what they took to be the novel's utter lack of plot.³ In a notorious review, nineteenth-century critic and essayist, George Brimley, inveighs against the novel: "*Bleak House* is, even more than any of its predecessors, chargeable with not simply faults, but absolute want of construction." Brimley angrily continues his assault: "Mr. Dickens discards plot, while he persists in adopting a form for his thoughts to which plot is essential, and where the absence of coherent story is fatal to continuous interest." Outraged by this breach of narrative form, he goes on to specify his displeasure: "So crowded is the canvas which Mr. Dickens has stretched, and so casual the connexion that gives to his composition whatever unity it has, that a daguerreotype of Fleet Street at noon-day would be the aptest symbol to be found for it."⁴

Where early reviews saw a "want of construction," a failure to turn random connections and profuse detail into a proper "unity," later critics saw the opposite: "artistic maturity, control, clarity" (92). T. S. Eliot calls *Bleak House* "Dickens's finest piece of construction." G. K. Chesterton, remarking on Dickens' development as an artist, calls his earlier novels "rambling tales," but asserts that "when Dickens wrote *Bleak House* he had grown up." Building on Chesterton's assessment, contemporary critics tend to read Dickens' maturity as mastery and *Bleak House* as the acme of his literary achievements. Modern critical opinion reverses Victorian critical reception of *Bleak House*.

At stake in the critical reception of *Bleak House* is the novel's "construction." Split between two narrators—a present-tense, third-person narrator and a past-tense, first-person

narrator—the novel’s temporal complexity is either a mark of its failure or its maturity. The critical ambivalence is understandable. Torn between past and present, the novel’s form is often at odds with its own censorious critiques of “backward” social conditions. Disparaging the worlds of Chancery and Fashion as worlds of “precedent and usage,” worlds mired in their own pasts, the novel’s structure intimates the inescapable pull of the past – a past that keeps finding its way into the present as the novel continually switches between its two narrative voices – even as it decries and laments these backward-looking social spheres. Epitomizing the narrative’s split temporal energies, the seemingly inexplicable appearance of the Megalosaurus on the streets of modern London on the first page of the novel represents the incursion of an unwanted past into a fragmented present.

What is the reader to make of this bizarre reptilian anomaly? While we may be tempted to shrug off the Megalosaurus as yet another Dickensian oddity, this chapter contends that we can only make sense of the novel’s length, complexity, and dual narrative structure when we read the dinosaur as a figure for geology’s vast, cyclical temporality – for the “cosmical weather,” to use Chauncey Wright’s phrase, that erodes and restores the world. In order to grasp the implications of erosive weather for the novel’s complicated narrative structure, this chapter traces the development of geological weather through James Hutton’s *Theory of the Earth* (1788) to Charles Lyell’s theory of climatic reversion as articulated in *Principles of Geology* (1830-33), which predicted that the earth’s climate would, eventually, return to the same prehistoric “summer” conditions that produced the dinosaurs.⁵ Lyellian time not only anticipate Dickens’ saurian return, but also illuminates the novel’s viciously regressive temporality. In Hutton’s and Lyell’s representation of geological change, incomprehensibly vast timescales fold back on themselves. Primeval pasts become modern futures. Cyclical time reverts and circles back on itself, and dinosaurs lumber up modern thoroughfares.

But to be clear, I turn to geology not because the novel is *about* geology or *about* the fossil record. But rather because the novel attempts to work through the psychic and affective limits of geological temporality: the novel is *about* the confrontation of human and nonhuman timescales, the meagerness of human life weighed against the vast eons that form and deform the earth’s surface, and the vulnerability of the human to the indifference of the cosmical weather.⁶ From the discourses of geology, I extrapolate a theory of climate – an erosive atmosphere that dissolves the distinction of persons and things. By conflating the glacially slow work of geologic decomposition with that of the Court of Chancery, *Bleak House* erodes the climatic distinction between human and nonhuman forces, such that the novel’s ubiquitous fog and mud seem to be the by-product of *both*. In the end, the novel gets caught in its own climatic metaphors. In a nightmarish world where humans are both the victims and the agents of decomposition, the novel cannot adjudicate betwixt the cosmic operations of the weather and the quotidian machinations of its characters. Only a frail hope remains in the form of the novel itself, which, like Lyellian time, folds back on itself with Ester’s famously unfinished last sentence.

I. Boring Weather

Incommensurate timescales, the conflation of the human and the nonhuman, the wreck of a decaying world: this is the work of *Bleak House*’s opening vignette. In its description of a barely recognizable London—a London slipping into the oblivion of a muddy wasteland—the opening vignette resides in a strange temporal flux, where the fixtures of quotidian life lose their hold:

LONDON. Michaelmas term lately over, and the Lord Chancellor sitting in Lincoln's Inn Hall. Implacable November weather. 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 snowflakes—gone into mourning, one might imagine, for the death of the sun. Dogs, undistinguishable in mire. Horses, scarcely better; splashed to their very blinkers. Foot passengers, jostling one another's umbrellas in a general infection of ill temper, 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 this 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. (13)⁷

In the space of two dense, fragmented sentences, the “newly retired waters” of a Biblical Flood give way to “the death of the sun.” In this strange, funereal London, beginnings and ends coincide. Against this conflation of cosmic renewal and destruction, smaller temporal cycles roll in their course. “Michaelmas,” the autumnal judicial session, is recently finished. “November” brings foul weather. Seasonal terms, months of the year, geological cycles: these divisions and sub-divisions mark time as recurrent even as they try to fix its position in a linear order. Even if November comes before December and after October, it will come again next year. Like those unfortunate foot passengers who keep “losing their foot-hold,” the reader struggles to get a hold on time. Like the slippery mud encasing this London scene, time seems to have gone squishy. But against this squishy profusion, time strikes into a gloomy linearity with the imagined “death of the sun.” Puncturing cyclical time with an ultimate finality, the death of the sun promises the end of all earthly things. But what then of those “newly retired” waters? Has the world just been remade, washed clean by a Biblical Flood? Or is the world about to peter out in an entropic slid into oblivion? In this opening scene, the novel dramatically overlays destruction and renewal. The end and the beginning of the world coincide in an imagistic rendering of geology's cyclical time as “mud” and “fog,” that is, as weather. In this meteorological overlay of beginnings and ends, horses, dogs, and pedestrians become “undistinguishable” in the mire. Existing in a single, porous continuum, humans and nonhumans exist side by side as they confront a world of geological dissolution and sedimentation – the twin processes of Huttonian and Lyellian geology.

While the street sweeper, Jo, whose illiteracy, ignorance, and vagrant homelessness, offers a paradigmatic example of the breakdown of the distinction between human and nonhuman life, such dissolution infects both high and low, as epitomized by Lady Dedlock's “boredom.” At once a psychic state and a meteorological condition, Lady Dedlock's boredom dissolves subjective and objective states of being. Patricia Meyer Spacks argues that Lady Dedlock's “psychic deadness” provides a “central image of death-in-life for a work preoccupied with various forms of death-in-life generated by the operations of the law” (197, 198).⁸ While I agree that her “spiritual deadlock” provides a “central image of death-in-life,” I think her character's symbology has a more literal dimension: she is “*bored* to death” by a process of slow erosion. Read as a meteorological phenomenon, Lady Dedlock's boredom links her “death-in-life” to the law's deadly atmosphere of mud and fog. Significantly, Lady Dedlock's “place”—her rank, her house, her state of mind—are slowly washing away:

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. My Lady Dedlock's 'place' has been extremely dreary...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. On Sundays the little church in the park is mouldy; the oaken pulpit breaks out into a cold sweat; and there is a general smell and taste as of the ancient Dedlocks in their graves... My Lady Dedlock says she has been "bored to death." (20)

The passage opens onto a scene of watery ruination and aqueous disintegration that mimics the "newly retired waters" of the opening vignette. With the ground converted into a "stagnant river" that becomes "a surface punctured all over, all day long, with falling rain," the passage aligns the lady's "place" with the violence—the slow, boring and puncturing violence—of watery erosion. The rain, driving her from her "place," represents her displacement as both a psychic state and a material reality. Figured as an enmeshment in a puncturing atmosphere, Lady Dedlock's "boredom" links her psychic deadness to the climatic forces that produce the mud and mire of Chancery. Similarly, the "—drip, drip, drip—" links her boring atmosphere to the suitors' anguish, who experience Chancery as a slow torture: "it's being ground to bits in a slow mill; it's being roasted at a slow fire; it's being stung to death by single bees; it's being drowned by drops" (71). Written large as an inescapable meteorological condition, the boring rain dissolves the distinction between My Lady's physical place and her psychic state.

In my reading of the novel's erosive atmosphere, I draw upon a large body of critical scholarship that has addressed the novel's notoriously foul urban conditions. Drawing upon psychoanalytical theories of abjection, a number of studies have addressed the novel's filth. In "Dickens's Excremental Vision" Michael Steig argues "the imagery of anality, and its structural ramifications in the multiple progressions from blockage to actual or potential explosion, represents a level of unity deeper than any previously brought to light."⁹ Reading through the lens of liminality and abjection, Robert E. Lougy likewise analyzes "the significance of filth in *Bleak House*, especially its presence in the form of excrement, mud, ooze, and corpses" (475-6).¹⁰ Drawing upon the work of Peter Stallybrass and Allon White, who, in their essay, "The City: the Sewer, the Gaze and the Contaminating Touch," argue that it was in "the reforming text as much as in the novel that the nineteenth-century city was produced as the locus of fear, disgust and fascination," critics have turned to the history of sanitary reform to explain *Bleak House's* putrefactive foulness.¹¹ For example, Christopher Hamlin's "Providence and Putrefaction: Victorian Sanitarians and the Natural Theology of Health and Disease" situates Dickens' novel in debates about sanitary reform and zymotic contagion, arguing that "Dickens's description of the London slum, Tom-all-Alone's and its effects on the rest of the society, is a striking example of how the zymotic analogy sanctioned sanitary reform" (n. 27, 390).¹² While there is no doubt that *Bleak House* depicts a deliquescent urban landscape, these readings of filth, while providing us with invaluable historical context, cannot account for the novel's characteristic form: its monstrous length and its split narrative structure.

Like Caroline Levine, I think the novel's sprawling length constitutes a key element of its form. In her reading of the affordances of long narratives, Levine argues that "the expansive form of the long, loose, baggy triple decker" affords interconnections (517).¹³ In her reading of

Bleak House, she specifies that “law, disease, philanthropy, the space of the city, class, gossip, and the family tree” provide modes of connection (518). Absent from this account of interconnectivity, however, is the novel’s famously bleak climate. However, in “The Novel as Climate Model,” Jesse Oak Taylor reads *Bleak House* as “climate model” that “performs a kind of fictional ‘greenhouse effect’ in which the real is severed from its stabilizing lifeline to the natural” (1).¹⁴ Taylor’s essay resuscitates the literary history of “atmosphere” and “climate,” urging us to read them as contributing to Barthes’ reality effect: “those largely intangible and diffuse aspects of form and content that create the overall mood and experience of the text without entering into conscious awareness” (3). Whereas Taylor turns to the history of the Victorian glasshouse in order to gauge the novel’s artificial atmosphere, I contend that the history of geological climate, specifically in its representation of ceaseless erosion, not only helps situate the “overall mood” of the text but also elucidates the novel’s problematic formal structure.

While Brimley, as quoted above, inveighed against the novel’s “want” of form, formlessness might be better understood as the formal complexity engendered by nonhuman timescales. As a gauge for that complexity, let’s consider just the first serial number. In this installment, *Bleak House* first opens in London “In Chancery” (Ch. 1); it then opens in Lincolnshire “In Fashion” (Ch. 2); it then progresses to “A Progress” (Ch. 3) where we meet Esther who, as yet, has no connection to the first two chapters. Moreover, in introducing us to Esther, the novel introduces us to its second narrator. Whereas the first two chapters are narrated by a disembodied present-tense narrator, “A Progress” introduces us to Esther and her retrospective autobiography. No wonder Victorian reviewers were skeptical about the novel’s construction: the triadic opening, split between two narrators, narrating from different points in time, with seemingly no connection between characters or locations is disorienting, to say the least. But this over-production of beginnings maps unto a geological worldview premised upon endless cyclicity, where, in Hutton’s famous phrase, there is “no vestige of a beginning,—no prospect of an end (200).”¹⁵ In this way, length, complexity, and even repetitiousness are not obstacles to form: they constitute the novel’s form. Operating at the level of global atmosphere, length, complexity, and recurrence can be best explained by geology. If geology cast the world into “the abyss of time,” Dickens, I contend, casts his novel into a temporal abyss modeled upon geology’s cyclical repetitions.

Cyclically repetitive, global in scope: *Bleak House*’s foul weather is more than just weather. It is a temporal structure. It is an affective state. It is an ecological condition. Lady Dedlock cannot escape her boredom: corrosive atmosphere enfolds the planet. And so the rain never stops: “while Esther sleeps, and while Esther wakes, it is still wet weather down at the place in Lincolnshire. The rain is ever falling—drip, drip, drip—by day and night upon the broad flagged terrace-pavement” (103). Even after Lady Dedlock has fled in shame, the rain “is falling still; upon the roof, upon the skylight, even through the skylight, and drip, drip, drip, with the regularity of the Ghost’s Walk, on the stone floor below” (899). While the Ghost’s Walk gives a Gothic dimension to Lady Dedlock’s doom, the novel materializes the gloom of the Gothic and renders the melodrama of “exposure” in meteorological terms.¹⁶

II. Tasting the Air

I have argued that *Bleak House*’s climatic metaphors dissolves the distinction between subjects and objects as people and things are subsumed within an erosive atmosphere. *Bleak*

House's notoriously foul, funereal air—with “smoke lowering down from chimney-pots, making a soft black drizzle, with flakes of soot in it as big as full-grown snowflakes”—is more than a metaphor. Prior to Krook's spontaneous combustion, the air is so loaded with emanations from “the slaughter-houses, the unwholesome trades, the sewerage, bad water, and burial-grounds,” that the air might “give the registrar of deaths some extra business.” The novel not only represents foul air as a thematic critique of urban squalor, but also employs it as formal structure. In the novel's representation of Krook's death by “spontaneous combustion,” the horror of this scene inheres in the formal structure of cyclicity, as the reader only realizes retrospectively that the characters have been “tasting” Krook's decomposed and aerosolized body in the foul air. That is, the reader only realizes the scene's foulness when she circles back to the beginning of the chapter – a cyclical structure that mirrors that of geological decay. To explain this structure, I want to turn to a popular nineteenth-century figure for decay's cyclicity – the mouth – which becomes the locus of the earth's peristaltic consumption of rotting matter.

In an early representation of decay qua mouth, Gilbert Thomas Burnett figures decay as an endless re-consumption.¹⁷ Published in *The Saturday Magazine* in 1844, Burnett's article, “Decay and Renovation,” asks us to imagine a world without decomposition: “the myriads of generations of plants and animals that have lived and died, and *added* their substance to the soil, would be sad encumbrances on the face of this fair world.” *Bleak House* opens on an oblique version of Burnett's world: myriads of foot passengers, “adding new deposits to the crust upon crust of mud,” do indeed make “sad encumbrances on the face of this fair world.” But a world without decomposition is not simply a messy, unaesthetic world cluttered with useless dead matter. It is a fatally *unidirectional* world, where life's stock of vital powers, once given, could never be replenished. Hence, Burnett argues “were it not for such natural transmutators; were matter once eaten, uneatable again; were it not that the present generation lives upon the past, as succeeding generations will live upon the present; were it not that the same atoms are digested over and over again, the whole earth might be in time devoured, and its inhabitants starve amidst the wreck they had made.” In Burnett's gastro-intestinal metaphor, decomposition gets figured as a digestive system writ large, enfolding the living and the dead into an ongoing process of consumption and re-consumption. The edibility of decayed matter, appearing in Burnett's article, reaches its apotheosis in the work of the agricultural chemist, James Finlay Weir Johnston. In his work, *The Chemistry of Common Life* (1855), he devotes a section to “The Circulation of Matter,” where he traces the movements of plant and animal matter that pass peristaltically through decomposition's vast digestive system:

Thousands yearly perish in the sea, and are at once swallowed, digested, and built into the forms of marine animals. Thousands more die and decay in waste places, where vegetable forms soon cover and feed upon them. Armies of fighting men strew, as they march over a thousand fields, the relics of their wasting strength. A single battle restores to the soil of a populous district, materials enough to build up the bodies of its inhabitants for many succeeding generation. (436)¹⁸

The holistic efficiency of the earth depends upon the ability of the living to feed upon the dead, or less vampirically, the ability of one generation to feed upon the renewed remains of the preceding. Vampiric or not, the process of decomposition, nonetheless, passes through the figure of the mouth. In the Johnston passage, the sea is depicted as a mouth that “swallows, digests and builds” new life. Meanwhile, Burnett configures decay as the process that “digests [atoms] over

and over again.” Swallowing dead matter in order to remake life, decomposition digests so that we can digest again; it devours so that “the whole earth” is not “devoured.”

While Burnett thought that the wreck and ruin of starvation could be avoided through decay’s regenerative work, Thomas Hawksley, a London medical practitioner, thought that decay’s good work had its limits and, so, envisioned the wreck of consumption *otherwise*. In his pamphlet, *Matter,--Its Ministry to Life in Health and Disease: and Earth,--As the Natural Link Between Organic and Inorganic Matter*, published in 1866, Hawksley extols the virtues of dirt: “the most admiral provision is made in the chemical structure of the earth of our globe for dissolving and absorbing all refuse organic matter and of transforming it into the fresh and healthy food of plants” (11).¹⁹ Despite his confidence in the “admirable” soil, Hawksley declares that “the air we breathe and the water we drink have become so loaded with the discarded particles of our own bodies that we cannot use those first essentials of our existence without being guilty of a grosser act than the cannibalism of the savage” (4). While Hawksley contends that these gross acts of inhalation are due to “mismanagement,” no amount of urban planning can fully overcome the uncomfortable truth that air and water always contain rotting matter. No matter how the system is managed, the system will always circulate matter through the mouth.

When Krook spontaneously combusts and his viscous, slimy remains circulate within the closed space of the city, Hawksley’s fear of cannibalistic consumption becomes a reality. Quite dramatically, Krook’s death enters through the mouth, as his rotting body is inhaled and digested by the unsuspecting Mr. Snagsby. When Mr. Snagsby asks Mr. Weevle if he is “airing [himself],” the following conversation ensues:

“Why, there’s not much air to be got here; and what there is, is not very freshening,” Weevle answers, glancing up and down the court.

“Very true, sir. Don’t you observe,” says Mr. Snagsby, pausing to sniff and taste the air a little, “don’t you observe, Mr. Weevle, that you’re—not to put too fine a point upon it—that you’re rather greasy here, sir?”

“Why, I have noticed myself that there is a queer kind of flavour in the place to-night,” Mr. Weevle rejoins. “I suppose it’s chops at the Sol’s Arms.”

“Chops, do you think? Oh! Chops, eh?” Mr. Snagsby sniffs and tastes again. “Well, sir, I suppose it is. But I should say their cook at the Sol wanted a little looking after. She has been burning ‘em, sir! And I don’t think”—Mr. Snagsby sniffs and tastes again and then spits and wipes his mouth—“I don’t think—not to put too fine a point upon it—that they were quite fresh when they were shown the gridiron.”

Upon first reading, this passage seems innocuously humorous. The herbaceous Mr. Snagsby, fond of his nocturnal prowls and his teatime meals, “sniffs and tastes the air.” However, upon finishing the chapter, this humorous sniffing and tasting take on a macabre dimension: Mr. Snagsby is literally sniffing and tasting Mr. Krook’s “humors.” As Hawksley suggests, when the atmosphere is so loaded with the particles of other human bodies, inhalation constitutes an act of cannibalism.

But this act of cannibalism only appears upon re-reading. At this point, the reader cannot know that it is not “chops” that Mr. Snagsby tastes. It is only after the reader finishes the chapter

and circles back to this scene that the full, horrific implication of Mr. Snagsby's "spit" – an attempt to expel the already inhaled and digested remains of Krook. That is, the horror of this scene inheres in the formal structure of cyclicity. Krook's death encapsulates more than a thematics of decay, a social critique of Chancery, or a moral judgment of urban filth. The novel's emplotment of Krook's death inhabits and mimics the temporal form of decay – a looping recursivity that materializes at the moment of recoil.

III. The Abyss of Time

Burnett, Johnston, and Hawksley: the botanist, the chemist, and the doctor figure decay's cyclicity through the humanized trope of the mouth. This figure, in effect, scales down the long, slow temporality of decay. While *Bleak House* scales down geological time to compress its eons into its pages, the novel's investment in cyclical is, nevertheless, global in scope. In a chapter entitled, "Beginning the World," Richard, on his deathbed, broken by Chancery, neurotically repeats his desire to start anew: "I have to begin the world"; "I will begin the world"; and asks Ada if she will forgive him "before I begin the world?" (977, 979). Richard's repetitions, serving as a linguistic substitution for the reform he never actualized in life, encapsulates his ambivalent relationship to cyclical renewal. From the point of view of the individual's narrative arc, it is decidedly too late to begin the world. From the point of view of geological temporality, it is precisely the moment—when death releases the body into decay's cosmical weather—to begin anew. Richard's desire to commence "the world," thus, conflates his life's emplotment with that of the planet's, such that Richard's fate, and the fate of the novel's world, hinges upon how we interpret the "world" and its possible "beginnings." With Richard's deathly beginning and the novel's three beginnings in mind, let us turn to the work of James Hutton, Scottish Enlightenment philosopher and scientist, who famously declared that, in the endless decay and renovation of the world, he saw "no vestige of a beginning,—no prospect of an end."

Published in 1795, *Theory of the Earth: or an Investigation of the Laws observable in the Composition, Dissolution, and Restoration, of Land upon the Globe*, Hutton's theory of the earth posits and reasons from two key propositions. The first is that, "when we trace the parts of which this terrestrial system is composed, and when we view the general connection of those several parts, the whole presents a machine of a *peculiar construction* by which it is adapted to a certain end" (3). Embedded in his first proposition are several key sub-propositions: the earth is a system; this system is composed of parts; these parts are connected. Despite the mechanistic overtones of his "machine" metaphor, Hutton's conception of the earth as composed of intertwined parts articulates an organic or even a proto-ecological view of the globe as one, immense "whole." In his second proposition, Hutton insists this whole is designed for a purpose: "this globe of the earth is a habitable world; and on its fitness for this purpose, our sense of wisdom in its formation must depend (4)." Crucial to Hutton's argument, the teleology of the earth, its fitness for life, determines the earth's "peculiar construction."

The earth is fit for life; but life depends on death and decay. What is "peculiar" about the earth is its systemic need for decay. Nowhere is this peculiarity seen more clearly than in Hutton's analysis of soil: a substance necessary to the maintenance of life, a substance necessarily composed through destruction and dissolution. In *Time's Arrow, Time's Cycle*, Stephen Jay Gould refers to this problem as Hutton's "paradox of the soil": why should a globe teleologically designed to support our habitation undergo erosive changes that deplete the very

source of our continued existence, viz. the substrate of cultivable soil upon which human life depends? (76). That is, the soil presents an *empirical* problem for Hutton's *a priori* rationalization's the earth's purposive "fitness" for habitation. Moreover, in his famously prolix prose, Hutton highlights not only the unremitting erosion of the earth but also the dissolution of its purposive design, as decay strips away the fertile field and carries them to sea:

The surface of this land, inhabited by man, and covered with plants and animals, is made by nature to decay, in dissolving from that hard and, compact state in which it is found below the soil; and this soil is necessarily washed away, by the continual circulation of the water, running from the summits of the mountains towards the general receptacle of that fluid. The heights of our land are thus levelled with the shores; our fertile plains are formed from the ruins of the mountains; and those travelling materials are still pursued by the moving water, and propelled along the inclined surface of the earth. These moveable materials, delivered into the sea, cannot, for a long continuance, rest upon the shore; for, by the agitation of the winds, the tides and currents, every moveable thing is carried farther and farther along the shelving bottom of the sea, towards the unfathomable regions of the ocean. (13-14)

The earth, quite simply, is "made by nature to decay," but the process of decay is not so simple. Hutton's labyrinthine and belabored description of the process of erosion speaks to the complex "agitations" of decay.²⁰ Hutton's proliferation of verbs illustrates and performs the accumulative effect of ceaseless motion: the rain "dissolves," "washes away," "levels" and "forms" the land; the streams "pursue" and "propel" this matter; and the winds and tides "carry" this matter "farther and farther" out to sea. At the outset of his treatise, Hutton insists that "we are not to look for nature in a quiescent state; matter itself must be in motion, and the scenes of life a continued or repeated series of agitations and events" (4). In Hutton's system, the erosive loss of the soil not only demonstrates the churning movement of geological matter, but also would seem to reveal its terminal movement *away* from that purposive design, as the very foundation of terrestrial life washes into watery oblivion.

In the unremitting ebb of the soil to its watery doom, we can sense the restlessness and hopelessness of *Bleak House's* tense temporality. Endless decay describes both the fate of the individual suitors and the society sucked into Chancery's cyclical degeneration. It becomes an inescapable social condition that finds expression in a slurry of present participles. Hence, when Mr. Jarndyce describes Tom-All-Alone's to Esther, his language's temporality is that of an endless rotting: "it is a street of perishing blind houses...with the bare blank shutters tumbling from their hinges and falling asunder, the iron rails peeling away in flakes of rust, the chimneys sinking in, the stone steps to every door (and every door might be death's door) turning stagnant green, the very crutches on which the ruins are propped decaying." In a harrowing image of instability, slimy green stones prop up a shifting array of decaying objects, "tumbling," "falling," "peeling" and "sinking" into oblivion. While the novel's recurrent use of the present participle speaks to the interminability of decay, the recurrent use of the phrase "dead and dying" speaks specifically to the novel's representation of geological cyclicity. Appearing at several key points in the novel, this phrase—"dead and dying"—is at once a banal way to write off deaths which are not our own and a telling insight into the temporal moment that tries to contain the doneness of death *and* the blank certitude of its endless repetition. "Dead and dying" first appears when Mr. Snagsby accompanies Mr. Bucket to Tom-All-Alone's, where they travel

down “a villainous street, undrained, unventilated, deep in black mud and corrupt water,” a street so foul that “Mr. Snagsby sickens in body and mind and feels as if he were going every moment deeper down into the infernal gulf.” “Dead and dying” appears again when Mr. Jarndyce reports the news of Allan Woodcourt’s shipwreck. It also attends Jo’s deathbed scene. This phrase, like a trite song refrain, pronounces and re-pronounces the temporal wrenching of an infinitely repeating finality.

The interminability of decay results in a vexed relationship to the *now*: it is a *now* that never seems to come and yet it is, in its present narration, a *now* that the novel inhabits. In *How Soon Is Now?*, Carolyn Dinshaw argues for a nonlinear “asynchrony,” which she defines as “different time frames or temporal systems colliding in a single moment of *now*” (5).²¹ Dinshaw argues for this version of “now”—a *now* constituted through a temporal heterogeneity of memories, attachments and desires—against a hollowed out linear *now* because “the problem with “now” is that it’s...*now*. Or it’s *now*. Or it’s right *now*. The denoted moment shifts, it slips, it is deferred, potentially infinitely, along an endless timeline of moments” (2). Dinshaw offers us a full *now*, replete with temporal dissonance, to counter the emptiness of a linear *now* whose place in a deictic system of meaning is one of infinite deferral. Dinshaw’s reflections on *now* are crucial to bear in mind when trying to parse *Bleak House*’s split narrative structure. On the one hand, the worlds of Chancery and Fashion are caught in the infinite feedback loop of the past. They are absolutely cut off from the present. On the other hand, they occupy the same temporally vexed moment of now-ness that defines the present tense assumptions of one half of the novel. That is, even as the novel explicitly wants to jettison these worlds of “precedent and usage,” the novel resolutely locates this backwardness within the present, within the temporal heterogeneity of the novel’s *now*. Moreover, the novel seems to cling to their backwardness since neither of these worlds emerges from their backwardness at the novel’s end. Sir Leicester, after his shock and fright upon the revelation of Lady Dedlock’s secret and her demise, seems, if anything, to retreat more into his own cloistered world. And Chancery, after the revelation that legal expenses have consumed all the assets of Jarndyce and Jarndyce, seems to continue in its self-same rut of ruin. In this way, the novel holds on to a violent, destructive, and sorrowful past even as it tries to free itself from it. Cyclical decay punctures and returns the present to the past. Like Dinshaw’s “now,” the novel’s dual temporal structure reveals the temporality heterogeneity and asynchronicity of its present tense desires. Like Hutton’s geological system, the “ceaseless agitations” of decay transform the novel’s desire for closure into violent, but perhaps redemptive, visions of endlessness.

The endlessness of decay ultimately salvages Hutton’s *Theory of the Earth* from ruination. With “the continual circulation” of water and the “agitation of the winds,” decay does not simply serve as an illustration of that ceaseless motion which undergirds Hutton’s long, slow temporality. Decay, rather, epitomizes the earth’s beautiful design. Summarizing and exemplifying the additive “effects of steady causes,” decay ultimately point back to that ultimate cause, the “end” to which the “machine” of the earth is adapted:

If the vegetable soil is thus constantly removed from the surface of the land, and if its place is thus to be supplied from the dissolution of the solid earth, as here represented, we may perceive an end to this beautiful machine; an end, arising from no error in its constitution as a world, but from that destructibility of its land which is so necessary in the system of the globe, in the economy of life and vegetation. (15)

By following the convoluted paths of decay—by tracing the decayed elements that have been, in Wordsworth’s apt phrase, “rolled round in earth’s diurnal course,/With rocks, and stones, and trees”—we return again to the “end” for which the machine is adapted (147).²² Like the cycle he seeks to describe, Hutton’s argument cycles back upon itself. While this looping logic returns us to the same end, the nature and meaning of that end has been amplified. If the *end* of the earth is its constitution as a habitable globe, this *end* is only possible in light of decay’s *endless* recycling of matter. This peculiar earth creates a peculiar teleology: the end of the earth recedes in the endless cyclicity of “dissolution” and “restoration.” Moreover, this endlessness locates Richard’s deathbed scene, a death that “begins the world,” within the continual feedback loop of the earth’s cyclicity.

Hutton’s belief in the earth’s endless cyclicity was, according to Gould, a “revolutionary concept” that is difficult for us to grasp. A truism of modern thought, the interminable age of the earth barely makes us pause – much less marvel. However, Gould reminds us that “the revolution lies in a comparison with previous geological theories that included no mechanism for uplift and viewed the history of our planet as a short tale of uninterrupted erosion, as the mountains of an original topography foundered into the sea” (63). Hutton’s cyclical view of time invalidated “the history of our planet as a short tale” and instead cast that history into “the abyss of time,” or so were the immortal words of John Playfair. Upon viewing the evidence that proved Hutton’s theory, Playfair memorably described how:

On us who saw these phenomena for the first time, the impression made will not easily be forgotten...We often said to ourselves, What clearer evidence could we have had of the different formation of these rocks, and of the long interval which separated their formation, had we actually seen them emerging from the bosom of the deep...Revolutions still more remote appeared in the distances of this extraordinary perspective. The mind seemed to grow giddy by looking so far into the abyss of time.²³

Like Playfair’s “giddy” view of geological time, *Bleak House* stages its entry into Chancery as an act of vertiginous gazing: “chance people on the bridges peeping over the parapets into a nether sky of fog, with fog all round them, as if they were up in a balloon and hanging in the misty clouds” (13). The thick atmosphere dissolves the distinction between sky and world. As the fog erodes all moorings, the passage balloons into the stratosphere, plunging the world into an abyss. Like Playfair’s, it is a temporal abyss. Like Hutton’s geological system, the novel’s temporal abyss is carved by Chancery’s endless ruination. Illustrating Chancery’s yawning chasm, Miss Flite’s ill-fated birds, who will be “restored to liberty” when her suit is adjudicated, “die in prison,” because “their lives, poor silly things, are so short in comparison with Chancery proceedings that, one by one, the whole collection has died over and over again” (73-4). In Chancery’s abyss of time, only the successive deaths of a “whole collection” that dies “over and over again” can keep pace with the long, slow proceedings of decay.

In the place of individual death and decay, the novel envisions the destruction of entire species – a view of systematic destruction substantiated by Hutton’s *Theory of the Earth*, which routinized and normalized the violence of ceaseless erosion. In Hutton’s view, not only does the subterranean earth burn and quakes, spewing fiery flows of lava, forcing extrusions to the surface, driving intrusions into buried depths, but also the terrestrial surface is pulverized and “leveled” by the denuding effects of wind and rain. In *Illustrations of the Huttonian Theory of the Earth*, Playfair claims that the mind struggles to comprehend the “mighty changes” that take

place in those terrestrial and subterranean regions “which our imagination erroneously paints as the abode of everlasting silence and rest” (62). In his account, Playfair figures the problem as one of scale, viz. the mind is too small to grapple with such mighty scenes: “the greatness of the objects which [Hutton] sets before us, alarms the imagination.” But the “alarm” caused by temporal vastness metonymically fills the void—the eviscerated silence—of the now un-quiet grave. Writing in 1802, Playfair cannot conceal his disquiet that Hutton’s violent earth does violence to the dead, literally upturning the place of the dead and the living. Writing in 1852-3, Dickens depicts a world *acclimatized* to Hutton’s systemic violence. It is world where Chancery doles out death and decay, as routinized operations, with the blameless, cruel indifference usually reserved for the weather.

IV. Recursive Climates

Through the ceaseless effects of geological weather, *Bleak House*’s eroding climate mimics Hutton’s cyclical temporality. The novel, however, translates this cyclical time into a geometric shape: the circle. Circles pervade *Bleak House*. “Fashion” revolves as a “brilliant and distinguished circle” (181). The Jellybys and the Smallweeds are members of their respective “family circles” (79, 338). Dysfunctional and more than a little deranged, these familial circles are harmless enough when compared to that great circle – Chancery. Jarndyce and Jarndyce whirls in a “circle of evil,” where suitors are “broken, heart and soul, upon the wheel of Chancery” (18, 559). Chancery spins out death and destruction on a geological scale. Like Miss Flite’s birds, the legal suitors can only be reckoned as a deathly collection: “innumerable children have been born into the cause; innumerable young people have married into it; innumerable old people have died out of it.” In its vast geological scope, Chancery subsume the individual in the “innumerable.” Infinite time transforms humans into infinitesimals – little particles “undistinguishable in the mire.” As I have argued, this violence reveals itself most starkly at the level of atmospheric, meteorological exposure.

That the novel was *about* our vulnerability to meteorological dissolution is starkly revealed in E. Moses & Son’s advertisement for “fashionable and substantial clothing” that appeared on the back-over of the first monthly number of *Bleak House*’s serial publication in March 1852 (see fig. 1).²⁴ In this clever marketing ploy, E. Moses and Son position their haberdashery as “ANTI-BLEAK HOUSE” such that *Bleak House* becomes (already is?) synonymous with not simply bad weather but also with one’s exposure to that weather as a resident of the titular world.²⁵

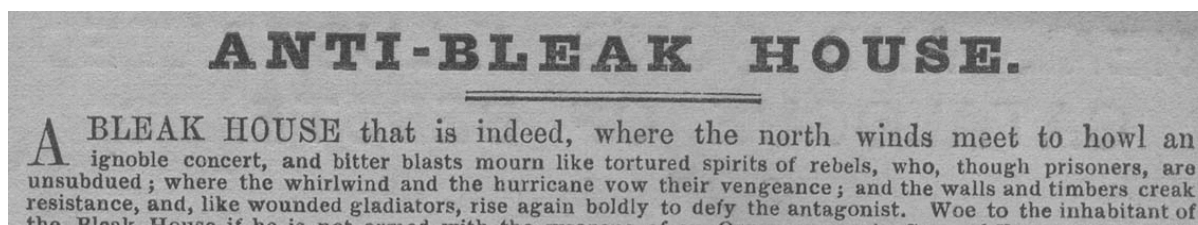


Fig. 1. From the back cover of first monthly installment of *Bleak House*’s serial publication (March 1852), E. Moses & Sons promises to “arm” buyers with “the weapons of an overcoat and suit of fashionable and substantial clothing” to protect against the weather.

Calling out to the reader with the warning, “woe to the inhabitant of the Bleak House,” the ad interpolates the reader as a resident of this wind-blown house. But is it a house? Beginning with an indefinite article, “*a* Bleak House,” the ad proceeds to define it as a place “where the north winds meet to howl”; “where the whirlwind and the hurricane vow their vengeance”; and where “the walls and timbers creak resistance.” The ad reveals that “Bleak House” is not so much a place as it is a positionality, a relationship to weather, a vulnerability to exposure. That is, “Bleak House” is not just a house: it is a space of co-habitation defined by the weather of the north (“north wind”) and the south (“hurricane”). Global in scope, “Bleak House” comes to signify a form of repetitive, violent meteorological exposure. In a word, *Bleak House* defines the place where *weather* (local, daily happenstance) becomes *climate* (global, systemic pattern). In order to grasp the novel’s exploration of climatic exposure, I want to turn now to Lyell’s theory of climatic reversion, which translates the erosive force of weather into a globalized vision of climate. Mobilizing Hutton’s “succession of worlds,” Lyell’s theory of climate change postulated endless “revolutions” – temporal returns – that not only explain the return of the Megalosaurus but also provides a model for the novel’s violent circularity.

In a letter dated 15 February 1830, Lyell tantalized his fellow geologist, Gideon Mantell, with a “receipt” for a number of botanical and zoological anomalies that send antipodal species to the opposite side of the hemisphere, and, as if these environmental inversions were not sufficiently provoking, Lyell also declares that “iguanodons” (a type of dinosaur) will “live again” in southern England. He writes: “I will give you a receipt for growing tree ferns at the pole, or if it suits me, pines at the equator; walruses under the line, and crocodiles in the article circle...All these changes are to happen in the future again, and iguanodons and their congeners must as assuredly live again in the latitude of Cuckfield as they have done so.”²⁶ A provoking letter, indeed, to send to the man who had found fossilized teeth of a giant reptile in a quarry in Cuckfield in 1822 and who was responsible for naming this newly discovered species the “iguanodon” in 1825. But with the publication of the first volume of *Principles of Geology* in July 1830, Mantell, and the reading public, would soon learn that Lyell’s “receipt” was none other than his controversial theory of climate change, which predicted that the earth’s climate would, eventually, return to the same prehistoric “summer” conditions that produced the dinosaurs.

Responding to mounting evidence that the earth used to be warmer, Lyell’s theory of climate attempted to reconcile the *unchanging* agencies of uniformitarianism with a *change* in global temperature. Lyell proposed that climate depends—and *only depends*—on the relative proportion of land to sea. In a long thought experiment, Lyell sinks and raises landmasses until he arrives at the mean temperature to account for the “winter” of the “Great Year,” that is, a period of cooling during a geological cycle. He begins with Italy: “let us suppose those hills of the Italian peninsula and of Sicily...subside again into the sea” (61).²⁷ Because Lyell’s earth, like Hutton’s, endlessly recycles the same matter, Lyell’s thought experiment becomes a balancing act. If the ocean engulfs Sicily, then a land “of equal area and height” must “rise up in the Arctic ocean” (61). After Sicily, Mexico is “converted into sea” (62). After Mexico comes the Himalaya mountains, which, along with Hindostan, “sink down” and become “occupied by the Indian ocean” (62). Lyell seems utterly unperturbed that his experiment drowns the populations of Sicily, Mexico, and Hindostan. While Lyell’s theory of climate imagines devastating geomorphic change, his balanced and redistributed landmasses offset that change, producing a surprisingly static, non-progressive view of the world. If Hutton’s theory of the earth normalizes geomorphic violence, Lyell’s theory makes geomorphic violence the *status quo*.

Once he approximates the correct ratio of land to sea to achieve the mean temperature for the “winter” of the “Great Year,” he treats the reader to that species of imaginative reversion which he tantalizingly displayed in his letter to Mantell:

They who should then inhabit the small isles and coral reefs, which are now seen in the Indian ocean and South Pacific, would wonder that zoophytes of such large dimensions had once been so prolific in those seas; or if, perchance, they found the wood and fruit of the cocoa-nut tree or the palm silicified by the water of some mineral spring, or incrustated with calcareous matter, they would muse on the *revolutions* that had annihilated such genera, and replaced them by the oak, the chestnut, and the pine. With equal admiration would they compare the skeletons of their small lizards with the bones of fossil alligators and crocodiles more than twenty feet in length, which, at a former epoch, had multiplied between the tropics. (65)

Through a series of “revolutions,” the muggy, hot climate of the South Pacific will re-cycle and return to the frosty conditions of an ancient Ice Age. While the presence of deciduous trees and drifting icebergs in the South Pacific is assuredly meant to be shocking, the presence of curious, but astute humans works as a heuristic device for the reader. Serving as a didactic proxy for the reader, these sagacious islanders do more than “wonder” at the immense size of former animals and “muse” upon the “revolutions that had annihilated such genera.” Like scrupulous natural historians, they “compare” skeletons from the past to those of the present. By drawing conclusions about the past based on observation from the present, these canny islanders, like good Newtonians, reason via *vera causae*. Accordingly, when confronted with a pine tree frozen into a drifting iceberg, they recognize this oddity not as some kind of botanical marvel but as “proof” that “forests had once grown where nothing could be seen in their own times but a wilderness of snow” (65).

Primed by this heuristic account of the winter of the Great Year, Lyell turns to the summer of the Great Year. Through a similar, but reversed process, Lyell sinks the Arctic and Antarctic landmasses and covers them with water and then “transfers” this same land to the Torrid Zone. Through this redistribution of land and sea, Lyell contends that warmer mean temperatures would prevail globally and, thus, “we might expect” corresponding zoological and botanical changes:

There would be a great predominance of tree-ferns and plants allied to palms and arborescent grasses in the isles of the wide ocean, while the dicotyledonous plants and other forms now most common in temperate regions would almost disappear from the earth. Then might those genera of animals *return*, of which the memorials are preserved in the ancient rocks of our continents. The huge iguanodon might reappear in the woods, and the ichthyosaur in the sea, while the pterodactyl might flit again through umbrageous groves of tree-ferns. Coral reefs might be prolonged beyond the arctic circle, where the whale and the narwal now abound. Turtles might deposit their eggs in the sand of the sea beach, where now the walrus sleeps, and where the seal is drifted on the ice-floe. (67)

Making good on his promise to Mantell, Lyell cashes his receipt for the climatic “return” of the iguanodon. As shocking as Lyell’s vision of a future ice age with humans clinging to equatorial isles as the last outpost of civilization, Lyell’s summer trumps it. Despite the fact that both the

summer and the winter of the Great Year map the future onto ancient climactic seasons, Lyell's chilly future at least accommodates the temperate needs of humanity. In the summer of the Great Year, the jungle's steamy heat seems to augur the future annihilation of humanity: conspicuously absent from this humid scene are those canny islanders who, in cooler climes, were wont to wonder, muse, and compare.

In the famous cartoon of "Professor Ichthyosaurus" (1830), Sir Henry De la Beche, inverting the relationship between the geologist and the fossil record, imagines a swampy, reptilian lecture, in which a bespectacled and robed dinosaur discourses on the form and function of a human skull (fig. 2). De la Beche's "Professor Ichthyosaurus" was long considered to be a parody of the eccentric, eminent geologist William Buckland, who was known to use (coprolite) fossil specimens in his Oxford Lecture. However, through a comparative analysis De la Beche's other caricatures in which he mocks Lyell's eyewear, viz. his absurd geological "visions," the earth-science historian, Martin J. S. Rudwick has established that the bespectacled Professor Ichthyosaurus represents Lyell and, thus, critiques his theory of climatic reversion.²⁸ Indeed, De la Beche lampoons Lyell's cyclical return of the dinosaurs through a careful application of Lyell's own logic. What is relevant here is the way "Professor Ichthyosaurus" reveals the narrative power of Lyell's geological theory. De la Beche closely follows and mimics Lyell's argumentative structure. In Lyell's vision of the winter of the Great Year, humans study fossilized relics of the past (a pine tree); in De la Beche's mock vision, monstrous reptiles study fossilized relics of the past (a human skull).

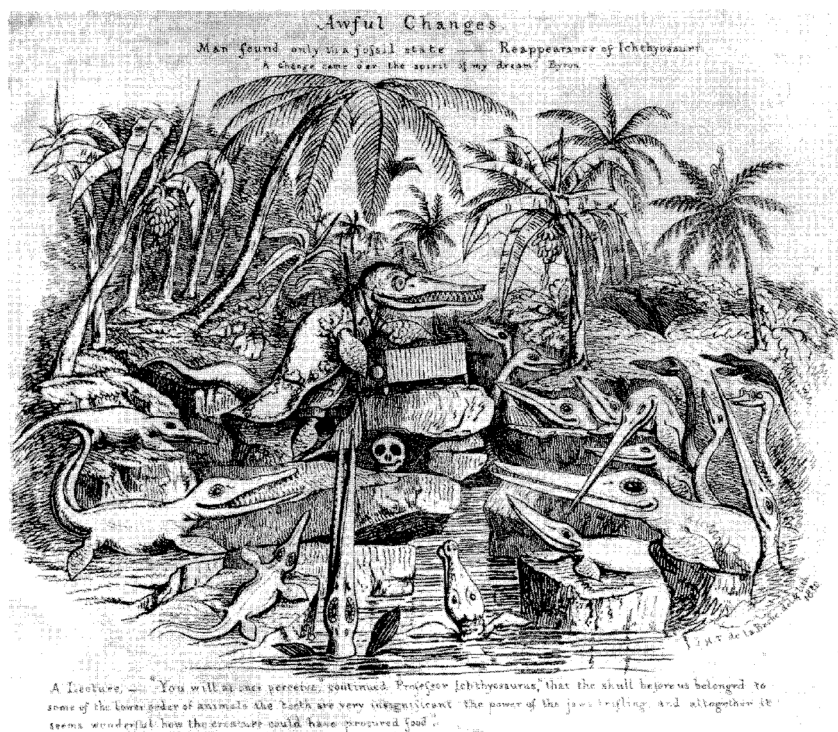


Fig. 2. The top caption reads: "Awful Changes. Man only found in fossil state, — Reappearance of Ichthyosauri. 'A Change came o'er the spirit of my dream.' Byron." The bottom caption reads: "A Lecture. 'You will at once perceive,' continued Professor Ichthyosaurus, 'that the skull before us belonged to some of the lower order of animals the teeth are very insignificant the power of the jaws trifling, and altogether it seems wonderful how the creature could have procured food.'"

of animals, the teeth are very insignificant, the power of the jaws trifling, and altogether it seems wonderful how the creature could have procured food.”

In carrying Lyell’s theory to its absurd and logical conclusion, De la Beche’s cartoon strives to depict Lyell’s theory of climate change as just that: an irrational theory of a dreaming lunatic. Across the top of the cartoon, De la Beche has written: “Awful Changes. Man found only in a fossil state. Reappearance of Ichthyosauri” under which is quoted, from Byron, “A change came o’er the spirit of my dream.” De la Beche’s mockery is not subtle: Lyell’s theory is a fanciful delusion. However, in giving *derisive* shape to Lyell’s claim for the reappearance of giant amphibious reptiles, De la Beche also gives it *decisive* shape. That is, the cartoon can’t help but work against itself: by picturing these piercingly long-billed, platypus-footed, doll-eyed lizards (as well as one bespectacled bird in the bottom right corner), the cartoon reveals the sway of Lyell’s argument, its power to generate a worldview – to regenerate the world of colossal reptilian life.²⁹

In his translation of geo-history into geomorphic land redistribution, Lyell’s theory of climate change, thus, provides a scientific precedent for the lumbering Megalosaurus and his return from the deep past *through* the mysterious dissolutions and redistributions of sediment. The past literally rises out of the mud. But more importantly, Lyell’s worldview elucidates the punishing circular logic of *Bleak House*: Lyell’s world is ceaselessly violent *and* completely static. Hindostan may fall into the oceans. Dinosaurs might roam the earth again. But these climatic “revolutions” are not “revolutionary.” They revolve in an elliptical arc. Climatic reversion, thus, offers a powerful explanation of *Bleak House*’s frantic actors that produce no action. Chancery, of course, epitomizes this form of ceaseless inaction. Take, for example, the case of Jarndyce and Jarndyce, where people are born into and die out of a “cause” that, nonetheless, lives on:

Innumerable children have been born into the cause; innumerable young people have married into it; innumerable old people have died out of it. Scores of persons have deliriously found themselves made parties in Jarndyce and Jarndyce without knowing how or why; whole families have inherited legendary hatreds with the suit. The little plaintiff or defendant who was promised a new rocking-horse when Jarndyce and Jarndyce should be settled has grown up, possessed himself of a real horse, and trotted away into the other world. Fair wards of court have faded into mothers and grandmothers; a long procession of Chancellors has come in and gone out; the legion of bills in the suit have been transformed into mere bills of mortality; there are not three Jarndyces left upon the earth perhaps since old Tom Jarndyce in despair blew his brains out at a coffee-house in Chancery Lane; but Jarndyce and Jarndyce still drags its dreary length before the court, perennially hopeless.

In her analysis of Gertrude Stein’s language, Sianne Ngai argues that, “repetition of particular words and clauses produces a layered or ‘simultaneous’ effect” (250).³⁰ Here, the repetition of “innumerable” produces an eerie simultaneity, where, all at once, the various developments of life are rehearsed in a chilling moment that overlays the cradle and the grave. “Innumerable” people are born, married, and die in the simultaneity generated by the layering of this immense but uncountable population. Despite the fact that the passage attempts to winnow such innumerableness into more specific categories, moving from the numerically defined “score” of

unnamed “persons,” to units of kinship, “whole families,” and down to the individual, “the little plaintiff,” the passage can only pass back into the innumerable in the shape of “bills of mortality.” Unlike the modern death certificate, which records the passing of an individual life, Bills of Mortality recorded death in mass. Published weekly, these bills emerged in England in the sixteenth-century as an early pseudo-bureaucratic tool to track the staggering number of deaths produced by the plague.³¹ Chancery, in literally failing to count individual deaths, fails to account for individuals who are “undistinguishable in the mire.” The cause does not care if it is little Jonny, the plaintiff, or little Harry, the defendant, who was promised a new rocking-horse. For that matter, the cause does not distinguish between one Lord Chancellor and the next. In the sheer interchangeability of the “innumerable,” Chancery expresses the violence of indeterminable, cyclical decay.

Moreover, in the interchangeability of the “innumerable,” Chancery reduces individual lives to decomposable pieces. Just as decomposition describes the process whereby complexity is reduced to increasingly smaller, simpler parts, Chancery reduces the complexity of individuation to nominally indistinct parts. This disintegration of individuation takes its most satirical, pointed form when the narrator refers to the solicitors, “Mr. Chizzle, Mizzle, or otherwise,” who endlessly protract the business of seeing “what can be done for Drizzle” (17). “Drizzle,” embodying the court’s slow breakdown of matter into misty particles, is barely bodied forth. Less fleshed out than the most minor of minor characters, Drizzle, like Chizzle and Mizzle, appear as pure linguistic slush, a nominal slide, a slip of designation that can only designate the collapse of designation.³² Here, then, is the circle of Chancery. It is circle where individuals are dragged into the categorical and where, language, trying to stem the tide of undifferentiated goo, can only raise its head above the slush in the form of a rhyming dribble. It is a circle where such de-individuated muck, encoded in the “innumerable,” creates a simultaneity that cannot differentiate between past and present, before and after. We are told that Jarndyce and Jarndyce “drags its dreary length before the court.” If we read this as a temporal preposition as well as a spatial one, the case, waddling in *preposterously*, epitomizes the backward lurch of the court: the case always belongs to the time preceding itself. Dragging itself *before* the court, Jarndyce and Jarndyce collapses into an abyss of precedentlessness: it arrives before its time and its time will never come. Caught forever on the threshold of a future that will never come, in the grasps of an endless process of decay, Chancery’s circularity rhymes with Lyell’s backward looking theory of climatic revision and the earth’s future return to a primordial past.

Caught, like the other suitors, in Chancery’s viscous circle, Richard’s plot mirrors and bodies forth the geometry of geological time. Tellingly, Richard’s hopes for the future mimic the form of Lyell’s static cyclicity: he repeatedly declares that, “we are beginning to spin along”; “we spin along now”; “we are really spinning along” (592, 606, 785). Like Lyell’s violently crashing continents that produce no net change in the globe’s total landmass, Richard spins circles that produce no effect. Dickens’ human actors, dwarfed by their meteorological and atmospheric conditions, by the ceaseless agitation of aqueous disintegration, are more often than not rendered impotent, irrelevant, and pointless. The novel clings to the “poor little lives” of its human actors—these begetters of waste and want, rack and ruin—while it simultaneously disavows them in a begrudging recognition of the categorical, the innumerable. Because of this deep ambivalence about the place of the human in a geological world order, the return of the Megalosaurus offers a bleak assessment of humanity’s futurity: the return of the iguanodon signals the unspoken annihilation of the human species.

V. Endless Endings

Above, I suggested that Lyell's islanders living in the Winter of the Great Year serve as a heuristic device for the reader of *Principles of Geology*, teaching her how to read and reason from *vera causae*. But the reader of *Bleak House* does not benefit from a heuristic lesson. She simply opens a novel set in London to discover a dinosaur waddling down Holborn Street. The novel does not prepare her—cannot prepare her—to be a good Newtonian when the hulking lizard appears after three notoriously short, fragmentary sentences: there is next to nothing to reason from. The past, in the form of a giant prehistoric lizard, comes before the present, comes *into* the present before we know how to read the present. Like Jarndyce and Jarndyce, the novel drags itself *before* the court of the reader's mind: it happens—is happening—before we know how to make head's or tail's of it. However, following the logic of Lyell's climatic reversion, I contend that *Bleak House*, like Joyce's *Finnegan's Wake*, invites a cyclical reading.

The novel famously does not end. Esther cuts off her own narrative, mid-sentence, leaving us with two long dashes that enclose two words: “—even supposing—” (989). The violence of these dashes, revealing perhaps her own woundedness, her disfigurement, the grief she tries but cannot hide, also mimic another set of violent dashes the “—drip, drip, drip—” of her mother's slow erosion and eventual death by exposure. So even as *Bleak House* ends, it cycles back on itself. Specifically, it cycles back on itself in the shape of the titular house: “Bleak House.” As Carolyn Denver notes, the teleology of *Bleak House* is “Bleak House.”³³ The novel ends where it begins: with a world called “Bleak House.” The novel ends when the Mr. Jarndyce gives Esther a home called “Bleak House,” a home that replicates his home, the original “Bleak House.” Mr. Jarndyce's gift of the substitute “Bleak House”—a home given as a relinquishment of his rights to marry Ester and, hence, as a sign of his own displacement by the replacement husband—is at once an act of generosity that salvages *Bleak House* from its own bleakness and a melancholic fetishization that reveals the pathological repetition at the heart of the novel's structure. At once a repetition and a miniaturization, the teleological structure of the novel creates a cycle that recapitulates itself even as it undermines its reforming ambitions.

While I agree that the teleology of *Bleak House* is “Bleak House,” I contend that the teleology of *Bleak House* is also *Bleak House*. If Carolyn Denver's interpretation casts the novel into a mise-en-abyme of its own titular making, my reading of Climatic Reversion casts that mise-en-abyme into that other abyss: the temporal chasm that holds a succession of worlds. While the novel embraces cyclical renewal less as a form of regeneration and more as a form of prolonged torture, the novel invites us to infinitely prolong the torment, or the pleasure, of our reading. In the place of agricultural renewal, social reform, or divine regeneration, *Bleak House* holds out the slender hope of aesthetic renewal: the novel recoils upon itself so that it can endlessly remake it. Ester's long dashes—perhaps tracing the Megalosaurus's reptilian tail across the mired page—revert us to the beginning, where, Ouroboros-like, the saurian beast emerges again from the deep.

NOTES

¹ Quoted in Kaufmann, Walter. *Nietzsche: Philosopher, Psychologist, Antichrist*. Princeton: Princeton UP, 1975, 318. See Heine, Heinrich. *Letzte Gedichte und Gedanken*. Hamburg, Hoffmann und Campe, 1869.

² Wright, Chauncey. "A Physical Theory of the Universe." *North American Review* 99 (1864): 8-10.

³ I am indebted to Hilary Schor's, "Dickens and Plot," for pointing me to these early reviews, as well as for noting the stark contrast between these early fulminations and the later encomiums. See Schor, Hilary M. "Dickens and Plot." *Palgrave Advances in Charles Dickens Studies*. Eds. John Bowen and Robert L. Patten. New York: Palgrave Macmillan, 2006, 90-110.

⁴ After quoting Brimley, Schor notes that, "the crowded canvas and the random daguerreotype return as a kind of visual anxiety throughout the criticism of *Bleak House*." My chapter explores this overcrowding, not from a visual angle, but rather from an atmospheric interest in the recurrent "closeness" of the novel's air.

⁵ Hutton's *Theory of the Earth; or an Investigation of the Laws Observable in the Composition, Dissolution, and Restoration of Land upon the Globe* was first read to meetings of the Royal Society of Edinburgh in March and April 1785. It went virtually unnoticed even after its publication. It was latter popularized by Lyon Playfair and then became the cornerstone of Charles Lyell's view of cyclical climatic return. While, in *Time's Arrow, Time's Cycle*, Stephen Jay Gould debunks the privileged place of Hutton as the discoverer of "deep time," showing that, in fact Thomas Burnet's Sacred Earth already articulated a vision of cyclical temporality, I turn to Hutton his vision of geological infinity is inseparable from the dissolution and movement of sedimentation. As I will discuss, the "paradox of the soil" is the key to Hutton's theory of the earth's infinity in much the same way that the accumulation of "mud"—and muddled language—constitutes the infinite delays of the Court of Chancery.

⁶ By reading *Bleak House* in tandem with James Hutton's *Theory of the Earth* and Charles Lyell's *Principles of Geology*, I draw out the pulverizing effects of geological time—as a recursive plot—for the novel's human actors. In this way, I take the obverse position of Adelene Buckland's claim that "plots were problems from geologists, not proofs, and they could hardly be used as uncontroversial frameworks for novelistic stories" (11). I contend that the theory of cyclical climatic return was a "problem" for Dickens and Lyell precisely because of its plot-like structure. Indeed, Lyell had to substantially revise his non-progressive "plot" of climatic change after Darwin published *Origin of Species* (1859). That is, Lyell had to revise his plot when a more compelling plot (a narrative of progressive development) made his own obsolete. See Buckland, Adelene. "Losing the Plot: The Geological Anti-Narrative." *19: Interdisciplinary Studies in the Long Nineteenth Century* 11 (2010): 1-16. For the revision of *Principles of Geology* after the publication of *Origin of Species*, see footnote 24 below.

⁷ Dickens, Charles. *Bleak House*. Penguin: New York, 1996. All subsequent citations are from this edition.

⁸ In "Society and Its Discontents: Cultural Contexts of Nineteenth Century Boredom," Spacks argues that Victorian male novelists "stress the direct connection between a decadent society and the boredom of its participants," and thus, in Dickens' "sociological" account of boredom, Lady Dedlock's boredom registers "aristocratic moral decay" even as it signal her own psychic

anguish (191, 195). See Sparks, Patricia Meyer. *Boredom: The Literary History of a State of Mind*. Chicago: University of Chicago Press, 1995.

⁹ Steig, Michael. "Dickens Excremental Vision." *Victorian Studies* 13.3 (1970): 339-354.

¹⁰ Lougy, Robert E. "Filth, Liminality, and Abjection in Charles Dickens's *Bleak House*." *ELH* 69.2 (2002): 473-500. For a spatial interpretation of reading of filth in *Our Mutual Friend*, see Gilbert, Pamela. "Medical Mapping: The Thames, the Body, and Our Mutual Friend." *Filth: Dirt, Disgust and Modern Life*. Ed. William A. Cohen and Ryan Johnson. Minneapolis: University of Minnesota Press, 2005.

¹¹ Stallybrass, Peter and Allon White. "The City: The Sewer, the Gaze and the Contaminating Touch." *The Politics and Poetics of Transgression*. Ithaca, NY: Cornell University Press, 1986. 125-48.

¹² Hamlin, Christopher. "Providence and Putrefaction: Victorian Sanitarians and the Natural Theology of Health and Disease." *Victorian Studies* 28.3 (1985): 381-411. See also Hamlin, "Good and Intimate Filth." *Filth: Dirt, Disgust and Modern Life*. Ed. William A. Cohen and Ryan Johnson. Minneapolis: U of Minnesota Press, 2005.

¹³ Levine, Caroline. "Narrative Networks: Bleak House and the Affordances of Form." *Novel* 42.3 (2009): 517-523.

¹⁴ Taylor, Jesse Oak. "The Novel as Climate Model: Realism and the Greenhouse Effect in Bleak House." *Novel* 46.1 (2013): 1-25.

¹⁵ Hutton, James. *Theory of the Earth With Proofs and Illustrations in Four Parts*. Edinburgh: William Creech, 1975. All subsequent citations are from this edition.

¹⁶ I am obliquely drawing on Peter Brook's conception of melodrama as "a world where what one lives for and by is seen in terms of, and determined by, the most fundamental psychic relations and cosmic ethical forces. The polarization of good and evil works toward revealing their presence and operation as real forces in the world...Man is seen to be, and must recognize himself to be, playing on a theater that is the point of juncture, and of clash, of imperatives beyond himself that are non-mediated and irreducible" (13). In my reading, the novel's melodramatic bent finds expression in "cosmic" forces that are material and meteorological rather than ethical, and thus complicate the novel's more overt moralizing. See Brooks, Peter. *The Melodramatic Imagination: Balzac, Henry James, Melodrama, and the Mode of Excess*. New Haven: Yale UP, 1995.

¹⁷ Gilbert Thomas Burnett was the first professor of botany at King's College London. While the article is an extract from his book, *Outlines of Botany* (1835), Burnett's title appears to be a reference to Hutton, who subtitled Section IV of *Theory of the Earth, System of Decay and Renovation observed in the Earth*. See "Decay and Renovation." *The Saturday Magazine* 9 March 1844: 93 and Burnett, Thomas Gilbert, *Outlines of Botany: Including a General History of the Vegetable Kingdom, in Which Plants Are Arranged According to the System of Natural Affinities*. London: John Churchill, 1835.

¹⁸ Johnston, James Finlay Weir. *The Chemistry of Common Life. Volume 2*. London: William Blackwood and Sons, 1855. For an excerpt from his *Elements of Agricultural Chemistry and Geology* (1842), see Johnston, James Finlay Weir. "The Circulation of Matter." *Blackwood's Edinburgh magazine* May 1853: 550-60.

¹⁹ Hawksley, Thomas. *Matter,--Its Ministry to Life in Health and Disease; and Earth,--as the Natural Like Between Organic and Inorganic Matter*. London: John Churchill and Sons, 1866.

²⁰ It is a critical commonplace to blame Hutton's cumbrous, unwieldy style for his theory's lack of popular support. For example, Adelene Buckland argues that, "Hutton rendered a system premised on the elegant design of the earth in prolix and ungainly prose" (36). In the standard account, Hutton's ideas gained credence when John Playfair, Hutton's friend, published *Illustrations of the Huttonian Theory of the Earth* (1802) in elegant prose. Stephen Jay Gould, thus, casts Playfair as Hutton's Boswell (61). See Buckland, Adelene. *Novel Science: Fiction and the Invention of Nineteenth-century Geology*. Chicago: University of Chicago, 2013. See Gould, Stephen Jay. *Time's Arrow, Time's Cycle: Myth and Metaphor in the Discovery of Geological Time*. Cambridge: Harvard University Press, 1987. See Playfair, John. *Illustrations of the Huttonian Theory of the Earth*. Edinburgh: William Creech, 1802.

²¹ Dinshaw, Carolyn. *How Soon Is Now?: Medieval Texts, Amateur Readers, and the Queerness of Time*. Durham: Duke University Press, 2012.

²² These two lines conclude William Wordsworth's "A Slumber did my spirit seal," which imagines a girl's death that signals her subsumption into the inhuman realm of "rocks, and stones, and trees." The poem stages an absolute revocation of human individuality. It is not simply that the human is deprived; the human has become indistinct from all the other matter "rolled round in the earth's diurnal course." The status of the human in a system of general decay will emerge below as a central concern for the Victorian inheritors of Hutton's theory of the earth. See Wordsworth, William. *William Wordsworth: The Major Works*. Ed. Stephen Gill. Oxford: Oxford UP, 2000, 147.

²³ Playfair, John. "Hutton's Unconformity." *Transactions of the Royal Society of Edinburgh* V:III Edinburgh: Royal Society of Edinburgh, 1805.

²⁴ This advertisement is accessible online via the Glasgow University Library Special Collection. See Gardham, Julie. "Bleak House." *Book of the Month*. Glasgow University Library Special Collection, Nov. 2004. Web. 07 Aug. 2016.

²⁵ The fact that this ad, with its canny assessment of the novel's dreary weather, appears in the first monthly installment suggest that either the good folks at E. Moses & Sons were extremely prescient marketers or that Dickens pre-circulated drafts as part of a public relations campaign.

²⁶ *Life, Letters, and Journals of Sir Charles Lyell, Bart*. London: John Murray, 1881, Vol. 1, ch. xi, pg. 262.

²⁷ Lyell, Charles. *Principles of Geology*. Ed. James A. Secord. New York: Penguin, 1997.

²⁸ I have reproduced the drawing from the frontispiece of Francis T. Buckland, *Curiosities of Natural History* (1859). But, according to Rudwick, the original drawing is pasted into a scrapbook that belonged to Roderick Murchison now housed in the Archives of the Institute of Geological Science London (GSM1/558, p. 3). The drawing is also reproduced in Richard J. Chorley, Anthony J. Dunn, and Robert P. Beckinsale, *The History of the Study of Landforms* (1964), Vol. I, p. 104. See p. 537, footnote 12, Rudwick, Martin J. S. "Caricature as a Source for the History of Science: De la Beche's Anti-Lyellian Sketches of 1831." *Isis* 66.4 (1975): 534-560. See the frontispiece of Buckland, Francis T., *Curiosities of Natural History*. London: Richard Bentley, 1858.

²⁹ In *Novel Science*, Buckland argues that Lyell's *Principles* "was not about the overall nature of geological change, but about the methods by which geology could come to be considered an exact science" (110). While I take her point about Lyell's methodological ambitions, I do not think it is possible to divorce these methodological ambitions from their equally ambitious content. Moreover, if Lyell were merely trying to prove a methodological point with his theory

of cyclical climate change, he would not have substantially revised the theory after the publication of Darwin's *Origin of Species*. But, in fact, he did. By 1859, the anti-progressionist gist of his cyclical theory was no longer tenable in the face of such a stout defense of evolution. For analysis of Lyell's revision after the publication of *Origin*, see, Ospovat, Dov. "Lyell's Theory of Climate." *Journal of the History of Biology* 10.2 (1977): 317-39.

³⁰ Ngai, Sianne. *Ugly Feelings*. Cambridge: Harvard University Press, 2005. See her chapter on "Stuplimity" for a full discussion of "thick" language, 248-298. For the "vertigo" and "chaotic accumulation" of Dickensian lists, see Orestano, Francesca. "Charles Dickens and the Vertigo of the List: A Few Proposals." *Dickens Quarterly* 28.3 (2011): 205-14.

³¹ The Penguin Edition merely mentions that Bills of Mortality were "published weekly returns of death in London." In "Final Forms," Kathryn Schultz traces the history of the modern death certificate back to the Bill of Mortality, a form that emerged in response to "death itself, on an epic and horrifying scale" (33). The earliest known Bill of Mortality, dated 1512, "states that in the city of London, between the sixteenth and the twenty-third of November, thirty-four people died of 'the plague' and thirty-two of unspecified 'oder dyseases'" (33). Unlike the modern death certificate, this document gives "no information about the dead...not even their names" (33). See Schultz, Kathryn "Final Forms: What Death Certificates Can Tell Us, and What They Can't." *New Yorker* 7 April 2014: 32-37.

³² Just as Chizzle, Mizzle and Drizzle typify the slush of Chancery, Boodle, Coodle and Doodle, along with Buffy, Cuffy and Duffy, signify the reduction of difference to nominal sludge within the sphere of Fashion. (190).

³³ Denver, Carolyn. "Broken Mirror, Broken Words: Autobiography, Prosopopeia, and the Dead Mother in *Bleak House*." *Studies in the Novel* 27:1 (1995): 42-62.

3. Ruskin's Dust

A person turning to stone is usually bad, while a stone coming to life is desirable. But perhaps it is in the confusion of the two realms that is really, and unavowedly, attractive.

—Barbara Johnson, *Persons and Things*

Dust was on the Victorian mind in 1865. This year saw the publication of two notable texts centered on the intimacies of dust and human life: John Ruskin's *The Ethics of the Dust* and Charles Dickens' *Our Mutual Friend*. Exploring the circulation of dust as principles of chemical and social economy, Ruskin and Dickens insert their human characters into complex systems of inorganic exchange. Presented as mineralogical lectures on "The Elements of Crystallization," delivered in the form of a Socratic dialogue between an Old Lecturer and a group of schoolgirls, *The Ethics of the Dust* constructs an ethical system modeled upon the ceaseless movement of elements in a chemical economy. Meanwhile, *Our Mutual Friend* plots the relations that emerge through the perpetual exchange of dead matter in a social economy, as epitomized by the protagonist's inheritance of giant mounds of dust. This chapter brings these two texts together through a sustained study of the chemistry of decomposition that informs Ruskin's ethical system and, as we shall see, Dickens' social economy.

In his conception of dust as elemental particles, Ruskin asks us to imagine crystals not only as unyielding stones, but also as dynamic systems that move through states of dissolution and decay, solution and confluence.¹ In "Form Things," Stefanie Markovits finds in the crystalline diamond a unique test case for an analysis of "form" and "thing" as the diamond's material structure encompasses both lyrical compression and narrative duration. Following the elements of crystallization through periods of disintegration and recombination, this chapter expatiates on the crystal's long geo-narrative in order to develop a conception of form that can account for the shaping power of subtraction, dissolution, and latent repose. Namely, this chapter envisions diamonds as dust – as amorphous slurries of carbon molecules – so as to consider specific shapes and forms, patterns and structures, as the products of an environmental dynamism that draws the not-yet-formed and the recently un-formed into new combinations and arrangements.

Tracing the connection between dust and form in the Victorian era, I place Ruskin's scientific writings on decomposition's chemistry in dialogue with contemporary debates about inorganic matter's self-formation.² In the 1860s, contentious debates erupted over the status of the *Foraminifera*, an animal confused with a mineral, and the *Eozooön Canadense*, a mineral mistaken for an animal. The two cases reveal Ruskin was not alone in locating formative power in rocks. Because these scientific disputes were part of a larger cultural debate about the persistence of form in a world of molecular flux, I turn to the mid-century revival of Lucretian atomism as an index to Victorian attitudes toward molecular science's ascent and, thus, toward the problem of form as it became increasingly pixelated, fluid, and unstable.

Ultimately, the turn to contemporary science reveals that, while surprisingly conversant with the science of his day, Ruskin outstrips his contemporaries in revealing the aesthetic and ethical implications of decay – a topos which many Victorians and Victorianists take to be the terrain of moral corruption or immoral fascination.³ Nevertheless, I argue that an examination of the scientific study of decay produces a new framework for understanding the ethical value of dissolution – a reappraisal of forms of unwilled undoing that challenge the idea that ethics must be understood in terms of will or moral energy.⁴ Attending to decay’s ceaseless agitations, *The Ethics of the Dust* chronicles the “earth-agonies” of geomorphic decay, claiming that it is only through the earth’s “torture and grieving” that the dust “finds in its weakness the first rudiments of a perfect strength” (18.331, 358).⁵ In lieu of moral action, dust awaits the recombinant affinities that will transform grief into resplendent form.

In this way, dust not only serves a moral purpose but also takes on a socio-political dimension: the promise of mineralogical renewal assuages fears about resource depletion. Decay’s recycling of elemental matter provides Ruskin with proof of nature’s provision against exhaustion. Matter is not destroyed. It is recombined. Dust holds out the slim hope that the earth’s scant supply of resources can be renewed. I say slim because Ruskin’s belief in the regenerative power of dust was short-lived – a brief burst of enthusiasm in the 1860s, bracketed on either side by skepticism and despair. Nevertheless, Ruskin’s dust flickers into form at a key moment in the history of science and literature, revealing the Victorians’ desire to reassess their relationship to what is least – but, hopefully, not lost.

Standing at the nexus of these debates about form and futurity is the figure of the young girl. Through its constant personification of crystals and petrification of girls, *The Ethics of the Dust* genders dust’s endless rearrangement of matter. Signifying inorganic matter’s feminized capacity for “infinite of change,” the young girl becomes the vehicle for Ruskin’s vision of geochemical renewal and socio-political regeneration (18.311). Taking carbon’s ability to manifest as diamonds, graphite, and coal as a prime instance of dust’s “infinite of change,” the chapter moves from Ruskin to Dickens as it tracks the affinities between the figure of the young girl and Britain’s “black diamonds.” Accordingly, the chapter closes with a meditation on the gender of changefulness as it bears upon mid-century debates about resource depletion by looking at Dickens’ *Our Mutual Friend*, and Lizzie Hexam’s unique relationship to that precious chemical agent: coal.⁶

I. Girl-Dust

At the beginning of the second lecture, the Old Lecturer establishes the central conceit of *The Ethics of the Dust*: girls are “dust” and dust represents inorganic matter’s formative power.⁷ The lecture opens with a lesson drawn from life. The girls have just run in from the garden, jostling each other in the hallway, jockeying for position, eventually settling into their proper places. According to the mineralogist, when they sat in their “orderly rows,” they became “crystalline” (18.221). Each schoolgirl, however, *is* an atom: the girls’ movement from “a state of solution” to “gradual confluence” is explained by molecular attraction. The girls are “arranged by atomic forces” (18.221). Musing on the atom’s power for self-organization, the Old Lecturer reconsiders his choice of diction: “I will not call you atoms any more. May I call you—let me see—“primary molecules”?” (*General dissent indicated in subdued but decisive murmurs.*) No! not even, in familiar Saxon, “dust”?” (18.222).

Dust was a freighted word for Ruskin and his Victorian audience. Kate Flint has shown that dust occupied an ambivalent place in Victorian culture, suggesting ideas about disease, hygiene, class, waste reclamation, and atmospheric effects (47). Intensifying its negative cultural associations, Ruskin's Evangelical faith endowed dust with a gloomy significance: dust is proof of humanity's corruption and God's punishment as pronounced in Genesis 3.19. Even after his "unconversion" in 1858, the Biblical formulation of "dust to dust" continued to give Ruskin his essential coordinates: dust describes the fate of material existence (decay) and the form that fate takes (the molecular).⁸ Although the Old Lecturer calls the girls "dust" as a "familiar" substitute for "primary molecules," dust is more than a mere synonym for other, equally serviceable terms. Dust taps into a wellspring of unstable cultural, social and religious significations that complicates the text's apparent investment in purity as an ethical objective. It is, after all, *The Ethics of the Dust*, not *The Ethics of Crystalline Purity*. Indeed, the text weds its "ethics" to the dust when the Old Lecturer commands the girls to "always behave at least as well as dust" (18.222).

Despite critical attempts to read the girls as occupying a state of absolute purity, the text makes a vivid and voyeuristic exhibition of the girls' decay when the Old Lecturer asks the girls to imagine what it would be like to have transparent skin:

L. It would not at all be good for you, for instance, whenever you were washing your faces, and braiding your hair, to be thinking of the shapes of the jawbones, and of the cartilage of the nose, and of the jagged sutures of the scalp?

(*Resolutely whispered "No's."*)

L. Still less, to see through a clear glass the daily processes of nourishment and decay?

(*No.*)

L. Still less, if instead of merely inferior and preparatory conditions of structure, as in the skeleton,—or inferior offices of structure, as in operations of life and death,—there were actual disease in the body; ghastly and dreadful. (18.271-2)

Stripping the flesh from the girls' pretty faces, the passage exposes "the shapes of the jawbones," "the cartilage of the nose," and "the jagged sutures of the scalp." In exposing their skulls—the archetypal symbol of death and the consummate *memento mori*—the passage, at first, makes the usual connection between death and decay. But the passage also exhibits the girls' internal organs – those "offices" of digestion, respiration, and circulation that aid in "the daily processes of nourishment and decay." In other words, the passage disrupts the notion that decay is something that happens to the body after it dies. Decay is with us every step of the way. It is a "daily" process, as much an "operation" of life as of death. In this way, the girls' status as "dust" signifies the fact that molecular organization cannot be separated from processes that are simultaneously vital *and* moribund.

Because the girls embody the text's project of self-formation, the bio-chemical flux of their bodies has immediate implication for the ethical assumption that triangulates the good, the beautiful, and the formed. Ostensibly, the text is committed to precisely this triangulation, where crystallization exemplifies the beauty and virtue of formation. Here, this constellation breaks down. Beautiful form does not just hide ugly instabilities. Beautiful form derives its structure from processes that are subtractive and negative. As seen in the concurrent processes of absorption and excretion, formation entails contemporaneous making *and* unmaking. Hence, the

command to “behave at least as well as dust” implies more than “get into order.” It intimates the ethical value of the chaotic unmaking that precedes and companions the act of making.

II. Elementary Ethics

While the principle of molecular attraction endows dust with a virtuous capacity for attachment and orderliness, the ethical import of dust’s “bonds of affection” lies, in fact, in the dissevering of those bonds, which not only generates the raw stuff from which crystalline form emerges but also evinces the fortitude of that formation (18.222). By tracing the influence of Justus Liebig’s organic chemistry on Ruskin’s conception of dust, I show that Ruskin’s knowledge of decomposition’s chemistry elucidates his attribution of ethical value to the process of dissolution. Several letters, along with an accompanying “Essay on the Fall,” addressed to Reverend Edward Clayton written in 1843 display Ruskin’s early knowledge of decay’s chemistry.⁹ As Mark Frost demonstrates, these little-known letters establish Ruskin’s embrace of dynamic processes, challenging the critical history that views Ruskin’s science as a descriptive taxonomy derived from a typological view of nature.¹⁰ While Frost reveals the influence of Lyell’s geology and Cuvier’s comparative anatomy on Ruskin’s “dynamic materiality,” he virtually passes over Ruskin’s use of Liebig’s chemistry.¹¹

Drawing upon Liebig’s research on decay and agricultural productivity, Ruskin’s “Essay on the Fall” argues for death’s prelapsarian existence, claiming that decay releases dead matter’s chemical potential into a system of complex exchanges that replenish food supplies. Figured as an economy, inorganic chemicals circulate and trade with other chemicals. Take, for example, the case of ammonia. When animal bodies decompose, ammonia is released into the atmosphere, where it combines with “carbonic acid” which is then “dissolved into rain water and presented in this form to the root of the plant” (1.482). But the release of carbonic acid requires a previous chemical interaction: “we are machines for turning carbon and oxygen into carbonic acid; the plant is a machine for turning carbonic acid into carbon and oxygen” (1.483). While uncharacteristic for the organic-minded Ruskin, the “machine” metaphor drives home the chiasmic efficiency of decay’s chemical exchanges. In the economy of decomposition where “the inorganic constituents of the earth are left in a state of perpetual circulation from death to life, and *vice versa*,” plant and animal life are held in balance by the ceaseless rearrangement of inorganic matter (1.483).

Crucially, for *The Ethics of the Dust*, Ruskin, in his treatise on mountain geology in *Modern Painters*, Volume IV (1856), locates the same chemical potential in rocks as he does in plants and animals. Crystalline rocks are “a kind of storehouse” (6.136). When these stones are “ground down into impalpable dust,” their cache of “sandstone and clay, together with potash, magnesia, and the metals of iron and manganese” is released and “the plants and animals which require them [are] sustained in health” (6.157, 136). Like the “perpetual circulation” of inorganic matter in “Essay on the Fall,” the friable mountain enters into a system of “perpetual renovation” (6.125). “Cast down in sheets of massy rock,” mountains undergo violent spasms of mass wasting (6.125). Aqueous erosion, then, pulverizes and distributes the crushed rocks: “each filtering thread of summer rain” carries with it an allotted portion of the substances “necessary for the nourishment of plants” (6.125). *Modern Painters*, thus, brings the geomorphic agencies of slope movement and erosion to bear on Ruskin’s earlier articulation of “perpetual circulation.”

The Ethics of the Dust brings decay’s agencies to fruition. When Mary asks, “what is [Tourmaline] made of,” the Old Lecturer responds: “there’s always flint, and clay, and magnesia

in it; and the black is iron and there's boracic acid, potash, and soda" (18.325-6). Crystals are made of dust: crystallization begins when the rock's raw materials are "slowly wrung, or ground to pieces," releasing the chemical potential of decomposed matter (18.328). From the fragments of pulverized dust, crystals slowly emerge:

The soft white sediments of the sea draw themselves, in process of time, into smooth knots of sphered symmetry...The dark drift of the inland river, or stagnant slime of inland pool and lake, divides, or resolves itself as it dries, into layers of its several elements; slowly purifying each by the patient withdrawal of it from the anarchy of the mass in which it was mingled. Contracted by increasing drought, till it must shatter into fragments, it infuses continually a finer ichor into the opening veins, and finds in its weakness the first rudiments of a perfect strength. Rent at last, rock from rock, nay, atom from atom, and tormented in lambent fire, it knits, through the fusion, the fibres of a perennial endurance. (18.358)

The passage, at first, plots an uncomplicated movement from decay to formation. Pulverized oceanic remains coalesce into "knots of sphered symmetry." "Stagnant slime" resolves into elemental purity. But this movement from decay to formation is overturned in the next sentence when these forms suddenly "shatter into fragments" and are "rent at last, rock from rock, nay, atom from atom." In the perpetual circulation of matter, the broken dust "infuses *continually*." As Zwierlein argues, Ruskin presents crystalline formation as "alternately assimilating and repelling materials" (321). Like the girls' decaying-growing bodies, crystals are simultaneously undergoing processes that are expulsive and incorporative. Indeed, the "ichor" which pours into the "opening veins" can either signify a 'bloodlike fluid that flows through the veins of the gods' or a 'watery, fetid discharge from a wound.' Both meanings are operative. The Old Lecturer insists that the "crystalline power principally exerts itself" in the earth's wounds: "wherever the earth is torn, it heals and binds; nay, the torture and grieving of the earth seem necessary to bring out its full energy" (18.329). While *The Ethics of the Dust* proffers crystallization as a model of virtuous self-formation, it exposes the "pure" self's enmeshment in processes that are fetid and supplicative and, therefore, curative and shaping.

Viewed through the lens of decay's chemistry, dust's ethics comes into focus. Ceaselessly undergoing geomorphic decay, dust withstands the "torture and grieving" of dissolution and, thereby, models the patient endurance of rocks. But geological torture is only one half of the equation. Although decay shreds and grinds the earth, its dissevered atoms recombine to produce exquisite crystalline formations, and, thus, through chemical recombination, dust "finds in its weakness the first rudiments of a perfect strength." Ultimately, dust's ethical value inheres in matter's susceptibility—its vulnerability to the erosive effects of wind and water; to the sudden and unexpected violence of landslides; and to the subtle, insidious effects of contamination—since this "weakness" becomes the "rudiment," literally the unwrought element, that defines its strength. To behave as well as the dust is, thus, to emulate the patient suffering of the elements of the earth, which "must passively wait the appointed time of their repose, or their restoration" (18.360).

Although Ruskin tries to counterbalance the passivity of the dust with the vigor of human action, his call for human vitality is subverted by his blurred intermingling of personified stones and petrified girls. Besides the archetypal "wicked" and "good" crystals, the text moralizes on: "indulged crystals," "fat crystals," "converted crystals," "foolish crystals," "impatient crystals,"

and, significantly, “little child crystals put to school like school-girls” (18.334-5). As Barbara Johnson suggests, it is a text that finds “the confusion” of girls turning to stones and stones coming to life “attractive.” Analyzing this attraction, Catherine Robson argues that the crystalline girl is not only “an object of desire” but also the figure for Ruskin’s “lost self of childhood” (14). Indisputably, erotic desire inflects the depiction of the schoolgirls, who give the Old Lecturer kisses, crawl into his lap, and engage in coy coquetry.¹² But Ruskin’s identification with the crystalline girl shades into another erotic impulse: a desire to become stone, to experience the petrification that redeems dissolution.¹³ It is this desire for passive restoration that undermines the Old Lecturer’s attempt to define crystalline virtue through its vitality, and leads him to the conclusion that ethical value inheres in the dust’s “weakness.” Hence, when it comes to the gender politics of vulnerability, Ruskin’s sympathy for the rocks challenges our critical reception of his notorious chivalry. That is, I think we can approach Ruskin’s idealization of female self-sacrifice in “Of Queen’s Garden” – or, closer to our sedimentary terrain, his idolization of female perseverance, in *The Cestus of Aglaia*, as “Patience...the submission to the eternal laws of Pain and Time, and acceptance of them as inevitable, smiling at the grief” – as deflection or misdirection from his masculine identification with passivity (19.86).¹⁴ That is, Ruskin’s respect for the grieving earth intimates a desire to validate forms of passive expectancy and silent suffering that did not easily square with Victorian notions of manly vigor.¹⁵

So, while Ruskin tries to preserve humanity’s “nobler,” more vigorous life, his identification with stoniness leave us with a frail sphere of action: Ruskin calls for “the activity of our hope [and] our labour, for the time when the Dust of the generations of men shall be confirmed for the foundations of the gates of the city of God” (18.360). Modeled upon the ethics of dust’s “repose,” the text transfers ethical action to the realm of affect, while it figures seemingly active labor as a species of apocalyptic waiting. In the erotic confusion of animate stones and inanimate girls, dust’s passive suffering joins together the “restoration” of geo-chemical recombination with that of divine resurrection. In this way, girl-dust merges the erotics of objectification with the ethics of passive suffering through dust’s unwrought elemental potential.

III. Animal or Mineral?

The possibility that dead matter possesses life comes to a head when Dora declares that the Old Lecturer “talks as if the crystals were alive,” to which he responds that “things are not either wholly alive, or wholly dead. They are more or less alive” (18.340, 346). The Old Lecturer’s belief in a spectrum of liveliness echoes the tenets of vitalism, the idea that “life” inheres in a superadded principle that cannot be reduced to physical and chemical forces.¹⁶ While the object of vitalistic study is, by definition, organic, Ruskin’s extension of vitality to crystals reflects the “flexible” location of life in the Victorian period, where life could be “latent in the whole of inorganic, or inanimate, matter” (189).¹⁷ Although Denise Gigante argues that the rise of cell theory in the 1830s “killed off” living form, organicism survived cell theory’s compartmentalization of life into semi-autonomous citadels (35).¹⁸ Similarly, vitalism survived Wöhler’s artificial synthesis of urea in 1828.¹⁹ Both notions persisted well into the latter half of the nineteenth century. This is especially true in Britain, where T. H. Huxley, the Victorian scientist most associated with scientific materialism, criticized German cell theory and promoted an epigenetic view of the organism derived from Wolff’s vitalistic *Theory of Generation* (1759).²⁰

But, along vitalism's newly broadened frontier, it became increasingly difficult to distinguish between organic and inorganic form.²¹ While the watchword for organic life was "self-formation," the presence or absence of form, perceived under the microscope, could not always adjudicate between animate life and inanimate matter.²² While expanding the domain of the visible, microscopic science blurred the boundary between organic and inorganic since, as John Tyndall notes, it brought "into view a world of life formed of individuals so minute—so close as it seemed to the ultimate particles of matter—as to suggest an easy passage from atoms to organisms" (23).²³ *Foraminifera* are single-celled animals with jellylike bodies that "suggested an easy passage" to mud. *Eozoön Canadense* is a rock with reticulated tubular formations that was mistaken for an organism. If the "vital" power of self-formation is at stake in *The Ethics of the Dust*, these two cases reveal that self-formation was no longer the exclusive domain of the living. Dust and its inorganic fellows – so it seemed – possessed the power of form.

In 1863, a review of William Carpenter's *Introduction to the Study of the Foraminifera* (1862) sparked a rapid-fire exchange of articles in *The Athenaeum* between two prestigious Victorian scientists, Richard Owen and Charles Darwin.²⁴ Carpenter, an expert in invertebrate zoology and physiology, describes the *Foraminifera* as "a little particle of apparently homogeneous jelly" capable of "laying hold of its food without members, swallowing it without a mouth, digesting it without a stomach, [and] moving from place to place without muscles" (vii-viii). In his review (March 1863), Owen seizes upon these blobs of jelly to put forth his own belief that "the exuviations, ejections, and decay of organisms" provide the "raw materials" for "the ooze or mud" which "[manifests] the vital form of force" (417). In an angry retort, published in April 1863, Darwin censures Owen for conflating living jelly with dead slime: "a mass of mud with matter decaying and undergoing complex chemical changes is a fine hiding place for obscurity of ideas" (554). But Owen was not the only Victorian scientist who speculated upon slime's formative potential. In 1868, T. H. Huxley championed *Bathybius haeckelii* as providing the link between inorganic and organic matter.²⁵ In samples of what proved to be nothing more than deep-sea mud, Huxley observed "granule-heaps" embedded in a "transparent gelatinous matter" (210). He proposed that this "colourless and structureless matrix" represented "masses of protoplasm" which "very nearly" resembled the *Urschleim* proposed by Ernst Haeckel (205, 210).²⁶

Both Owen and Huxley identified a formal potential in formless goo. For Owen, rotting slime provides the raw materials for the "manifestation" and "modification" of atomic form. Similarly, Huxley's "structureless matrix" conveys the latency of formlessness to give birth to form. Even Darwin speculated upon the generative potential of inorganic matter. While, in the article, Darwin ridicules the idea that inorganic matter could produce a living creature, several years later in his private correspondence he imagines a "warm little pond" where "all sorts of ammonia and phosphoric salts, light, heat, electricity etc." interact such that "a protein compound was chemically formed, ready to undergo still more complex changes" (202).²⁷ In the 1860s, the study of microorganisms decoupled life from form and located a powerful formative drive in living jelly *and* dead ooze. In this light, the suppurative 'ichor' of Ruskin's crystals was yet another strangely vital substance that revealed the organic-inorganic borderland to be a murky shadowland populated by amorphous jelly, vital slime, womblike ooze and incubating ponds.²⁸

While *Foraminifera* exposes the problematic formlessness of organic structure, the *Eozoön Canadense*'s intricate inorganic formation offers a convenient counterpoint. In 1864,

John William Dawson and William Logan announced to the Bath meeting of the British Association for the Advancement of Science that they had discovered, in fossil beds of Laurentian limestone, the first signs of life on earth with the *Eozoön Canadense*, or the ‘dawn animal of Canada.’ The London-based scientific establishment quickly embraced their discovery. Charles Lyell concluded his Presidential Address at Bath with some glowing remarks about this discovery and confirmed Dawson’s view that the Laurentian limestone “[contained] organic remains” (lxxv). In the 1866 edition of *Origin of Species*, Darwin describes the discovery of the *Eozoön* and concludes that “it is impossible to feel any doubt regarding its organic nature” (371). Carpenter, called upon to verify Dawson and Logan’s findings, confirmed their assessment that the *Eozoön Canadense* was a “gigantic *Foraminifera*” (66). Meanwhile, William King and Thomas Rowney, professors of geology and chemistry at Queen’s College, Galway, who attended the Bath meeting, disputed Dawson’s claim that the *Eozoön* was fossilized organic remains. They insisted that the specimens in question were “solely and purely of crystalline origin” (215).²⁹

The debate over the status of the *Eozoön* hinged on the interpretation of microscopic tubules found in several limestone specimens. Describing the tubes, Dawson seizes on organicism’s tropes of elegance and complexity: his prose highlights the branching intricacies of “numerous minute tubuli,” arranged “in bundles of great beauty and complexity, diverging in sheaf-like forms, and in their finer extension anastomosing so as to form a network” (51).³⁰ Meanwhile, veins of carbonate of lime, “in their *entire absence of structures* other than crystalline, present a striking contrast to the fossil” (52). King and Rowney, however, claimed that, “every one of the structures diagnosed for *Eozoön Canadense* by Dawson and Carpenter is purely of inorganic origin” (508).³¹ They argued that the ‘chamber casts’ are “simply granules of serpentine”; that the ‘intermediate skeleton’ is a “calcareous matrix”; that the canal system is “nothing more than forms of metaxite”; and that the ‘nummuline layer’ is “a film of chrysotile” (508). Serpentine, metaxite and chrysotile are minerals. According to King and Rowney, the *Eozoön* was a rock.

How could minerals create such complex “organic” structures? King and Rowney theorized that the *Eozoön*’s structure could be explained by two mineralogical phenomena: allomorphism and pseudomorphism. Allomorphism (*allo*– “other” + *morphe*– “form”) describes how the same chemical composition can manifest in different crystalline forms. Serpentine’s ability to morph into metaxite and chrysotile explained the *Eozoön*’s “organic” tubular formations. But allomorphism could not account for the presence of the “calcareous matrix.” King and Rowney proposed that “the replacing carbonate...is likewise nothing more than a pseudomorph after serpentine” (530-31). A pseudomorph is a mineral with a “false” form resulting from a substitution process where one mineral replaces another. In this case, calcium carbonate replaced the serpentine producing a form that was doubly “false”: the calcite mimics the form of the serpentine and it mimics the “organic” skeletal form of *Foraminifera*.

The *Eozoön* debate was not settled swiftly or politely. “The controversy outlived all of the original participants,” writes Charles O’Brien, “and the decorum lasted only a few months” (209). Attacks, from both sides, became increasingly personal and nasty. Dawson accused King and Rowney of “defective observation—in failing to distinguish in the Canadian limestones themselves, between organic and crystalline forms” (252).³² But, if the protracted debate over the *Eozoön* proves anything, it proves the difficulty of distinguishing “between organic and crystalline form.” Scientists from Britain, Europe, and the United States bickered for over fifty years about the structure of branching tubes and canals that were deemed organic by some and

crystalline by others. In the end, King and Rowney were right. The *Eozoön Canadense* was not “the dawn animal.” It was a rock – a gorgeous, lifelike crystalline formation.

As the cases of *Foraminifera* and *Eozoön* illustrate, the Old Lecturer has good reason for giving Dora an ambiguous answer to her query about crystals’ vitality. In the 1860s, it was not always clear whether something was dead or alive. While living jelly was virtually bereft of the differentiation necessary to lay claim to the title of organ-ism, crystalline rocks branched into beautiful reticulations that vibrantly suggested the living powers of self-formation. With its mineralogical ability to mimic organic structures, the *Eozoön* provides a striking scientific precedent for Ruskin’s girl-dust analogy, especially since dust makes this mimicry possible. Allomorphism and pseudomorphism owe their formal transformations to inorganic matter’s polyvalent combinations: dust destabilizes formal fixity. As I will discuss below, the Victorian public followed the developments of microscopic science with mingled awe and trepidation as form became increasingly mutable and unstable.

IV. Lucretius’ Falling Forms

While advances in molecular science worked to establish the formative power of inorganic matter, this power was a little promiscuous. Inorganic matter could enter into endless rearrangements, shifting, kaleidoscopically, into many forms. The title of Lindley Kemp’s 1855 treatise on modern chemistry, *The Phasis of Matter*, summarizes this idea. While crediting Liebig for the idea’s inception, Kemp declares that “what is now understood by chemistry” depends upon “the ascertained fact” that all bodies “consist of a variety of elements which, by continually changing their combination, constitute all the substances cognisable to our senses, living or dead” (10). Thus far, I have considered individual cases of molecular flux. Ruskin’s dust, Owen’s slime, King and Rowney’s minerals: these substances reveal inorganic matter’s ability to move and morph into seemingly “vital” forms. But these individual cases were part of a larger cultural debate about the persistence of form in a world of molecular flux, and this debate came to a head in the mid-century revival of Lucretian atomism.³³

Lucretius’ epic poem, *De Rerum Natura*, describes Epicurus’ atomic theory, which posits that the world is composed of atoms that fall through a void; their falling occasions chance collisions that bring atoms together; and these atomic combinations explain the forms of the world. The world of *De Rerum Natura* is one of constant mutability. Atoms are continually coming together and drifting apart. Everything is perishable, except the atoms, which are indestructible and eternal. This, I think, should sound familiar. With the advances of molecular science in the nineteenth century, *De Rerum Natura* gained credence as more than a poetic description of an ancient philosophy, but also as an accurate description of scientific principles.³⁴ One Victorian reviewer enthusiastically remarked that, “the first two books of the *De Rerum Natura* read almost like a modern treatise on the atomic and kinetic theories of matter!” (190).³⁵ The poet and literary critic J. A. Symonds claimed that, “modern theories of evolution and of molecular structure may be stated in language which...is singularly like that of Lucretius” (58).

More specifically, the Lucretian principle, “nothing is ever annihilated, but simply dissolved into its first bodies” speaks directly to the “perpetual circulation” of inorganic matter that this chapter has been tracing.³⁶ In his article for *The Gentleman’s Magazine* (1894), E. W. Adams refers to this principle as “a statement which modern chemistry has done so much to illustrate,” since it confirms Lucretius’ view “that the atoms can accomplish a vast deal by a mere change of arrangement.” Anticipating Liebig’s findings, Lucretian atomism maintained that

a body resolved “into its constituent elements” is reformed “into fresh compounds,” such that “the death of the one combination is the birth of a new order of things, the case being one, not of annihilation, but of transformation” (191).³⁷ While Adams takes a sanguine view of this incessant change, other Victorians were ruffled by this world of ceaseless turmoil. One Victorian reviewer summarizes Lucretian atomic theory as “one vast simultaneous shuffle” (321).³⁸ Another reviewer emphasizes the “fearful shocks” and “the strain of eternal combinations from atoms to things, and dissolution from things back to atoms” (344).³⁹ More prosaically, Fleeming Jenkins describes “the great wear and tear” of material existence (215). In Tyndall’s lyrical description, the Lucretian atom stands “amid the wreck of composite matter”(30).⁴⁰

While Tyndall takes solace in the indestructibility of the atom, other Victorians experienced the ascent of molecular science as a tumultuous upheaval. Writing about Lucretius in 1882, John Masson reflects upon the recent past as a time when people “felt old truths almost slipping from beneath their feet and, along with this, a unique sensation of universal unsteadiness and falling like that of men in an earthquake, when the solid earth which they have known all their lives, and which has ever been firm under their step, even the earth begins to be unsteady and shake under them” (333).⁴¹ While Masson’s “earthquake” symbolizes the psychological disturbance inflicted by scientific materialism, his depiction of the earth as a slippery, shifting substratum literalizes the atomism he critiques. Masson’s prose manifests the “falling” flux of Lucretian atomism. The contentious revival of Lucretian monism provides us with an index to Victorian attitudes toward the advancement of molecular science. While Tyndall and his scientific brethren marveled at the indefatigable might of the tiny atom, the Victorian public reeled as they tried to get their bearings amid the “shuffle,” “shock,” and “strain” of molecular instability. This, then, is the world of Victorian dust. Form atomized into quaking drifts. Humans scrambling without traction. Girls and dust, alike, falling in a void.

V. A Fragile Hope

While the ascent of molecular science revealed form’s troubling instability, this same molecular flux held out the promise of regeneration. Before turning to the gendering of dust’s formal mutability, I want to stress that the stakes for Ruskin’s aesthetic and ethical reclamation of decay are nothing less than the expenditure of planetary resources and the annihilation of the human species – stakes that shape Dickens’ representation of Lizzie Hexham and her coal-inspired narratives in *Our Mutual Friend*. In *Modern Painters* Vol. IV, Ruskin was convinced that the constant process of decomposition would lead to planetary ruination:

For us the intelligible and substantial fact is that the earth has been brought, by forces we know not of, into a form fitted for our habitation: on that form a gradual, but destructive, change is continually taking place, and the course of that change points clearly to a period when it will no more be fitted for the dwelling-place of men. (6.179)

While Ruskin acknowledges that other geologists have attempted “to prove that destruction and renovation are continually proceeding simultaneously in mountains as well as in organic creatures,” he “cannot assent to such a conclusion” (6.177-8). Despite his belief in mountain erosion’s “perpetual renovation” of the soil, Ruskin could not imagine the renovation of the mountains themselves.

However, in the 1860s, Ruskin began to imagine the redemption of these losses. Specifically, he reversed his previous opinion that “no retrospection can raise [the mountains] out of their ruins” (4.210). In his article “On the Forms of the Stratified Alps of Savoy” published in *Geologist* in 1863, Ruskin concludes with an optimistic speculation: “immeasurable periods of time would be required to wear these [Alps] away; and to all appearances, *during* the process of their destruction, others were rising to take their place, and forms of perhaps far more nobly organized mountain would witness the collateral progress of humanity” (26.11). Published two years before *The Ethics of the Dust*, Ruskin’s contribution to *Geologist* foregrounds the revolution in his thinking about decay’s temporality: formation occurs “during” the process of decay. In *The Ethics of the Dust*, Ruskin pursues this logic, locating the mechanism for the simultaneity of decay and formation in the geochemistry of dust:

The great laws which never fail, and to which all change is subordinate, appear such as to accomplish a gradual advance to lovelier order, and more calmly, yet more deeply, animated Rest. Nor has this conviction ever fastened itself upon me more distinctly, than during my endeavor to trace the laws which govern the lowly framework of the dust. (18.357)

By applying the chemical principles he learned from the economy of decomposition, Ruskin reconciles the losses of environmental degradation through the commensuration of “the lowly dust.” Decay’s recycling of elemental matter provides Ruskin with proof that decomposition leads to re-composition – the loss of form is not absolute – form will come again.

But Ruskin’s vision of planetary regeneration is short-lived. Ten years later, in *Deucalion* (1875-1883), Ruskin jettisons principles foundational to his earlier geological writings and reverts to his view of an irremediably decaying earth. Confining himself to what is perceptible to the naked eye during the course of a human life, *Deucalion* refuses Lyell’s deep time and the geological principle of “denudation,” i.e. aqueous erosion.⁴² Forgetting or suppressing his fieldwork of the 1850s in which he attempted to calculate the rate of Mont Blanc’s denudation, Ruskin supplants his belief in erosion’s regenerative potential with a linear logic of decay.⁴³ Ruskin argues: “there are, broadly, three great demonstrable periods of the Earth’s history. That in which it was crystallized; that in which it was sculptured; and that in which it is being unsculptured or deformed” (26.117). With illogical bravado, Ruskin rejects deep time and denudation’s gradual processes, because he has not, in his geologically long life, witnessed them.⁴⁴

In *Deucalion*, Ruskin’s personal geological record collapses into a geological view of the self. In this way, the authority derived from his accretive collection of materials dovetails with his own senescence and with the earth’s equivalent decrepitude. It is precisely this unbounded identification of corrupted self, corrupted times, and corrupted earth that produces the staggeringly cataclysmic tone of *The Storm Cloud of the Nineteenth Century* (1884). However, *Storm Cloud* stands apart from Ruskin’s earlier work not because he apocalyptically blurs human industries and natural economies, but rather because he can no longer foresee the transformation of that admixture into a beautiful, synthetic whole (162).⁴⁵ My point here is neither to call into doubt the reality of industrial pollution, nor to question Ruskin’s meticulous observation of that reality. Rather, by placing *Storm Cloud* in a genealogy of Ruskin’s writings on geo-chemical decomposition, we see that his dire pronouncements about industrial pollution coincide with his schismatic rejection of modern geological principles and his vision of the earth as *naturally*

tending toward ruination. That is, without the assurances of dust's regenerative potential, Ruskin loses his aesthetic and ethical foothold on the putrid and the corrupting. Moreover, this genealogy reveals that Ruskin's writings about dust in the 1860s are fragily poised between his youthful dismissal and his aged refusal of decay's formative potential. Their value lies in this fragility – a fleeting flicker of hope held against the wreckage of the world.

VI. Coal, Graphite, Diamonds

Whether the earth shall renew itself or fall into total ruination was a question as pressing to the Victorians as it is to us. While Ruskin, elsewhere in his oeuvre, squarely engages with Victorian Britain's economic reliance upon coal, *The Ethic of the Dust* explores neither the rapacious rate of coal consumption nor its potential exhaustion. Rather, coal appears in relation to the chemical properties underwriting its mineralogical existence. As I have argued, *The Ethics of the Dust* constructs a formal model based on dust's infinite recombination. Routed through the girl-crystal analogy, the text's formal ideal is expressed by the girls, "who are crystalline in brightness, as well as in caprice, charm infinitely, by infinitude of change" (18.311). Taking up coal's "infinitude of change," *The Ethic of the Dust* represents coal in relation to the principle of allotropy (the "other" forms an element can take): carbon can manifest as coal, graphite, or diamonds. Accordingly, this final section surveys mid-century peak coal debates from the perspective of mineralogical otherness. As we shall see, Ruskin and Dickens gender coal's geochemical history, such that debates about the future of Britain's coal-dependent economy affix to the figure of the young girl and her allotropic possibilities.

For Samuel Taylor Coleridge, allotropy reveals matter's oneness: "so water and flame, the diamond, the charcoal, and the mantling champagne are convoked and fraternized by the theory of the chemist" (471). Even from the practical perspective of the *Library of Useful Knowledge*, allotropy instills wonder: "that the diamond should be made of the same material with coal...these surely are things to excite the wonder of any reflecting mind" (193). In *The Ethics of the Dust*, wonderment attends carbon's ability to "make itself" into pointedly dissimilar forms:

L. Some say it was once a vegetable gum; it may have been charred wood; but what one would like to know is, mainly, why charcoal should make itself into diamonds in India, and only into black lead in Borrowdale.

SIBYL. Are they wholly the same, then?

L. There is a little iron mixed with our black lead; but nothing to hinder its crystallization. Your pencils in fact are all pointed with formless diamonds, though they would be HHH pencils to purpose, if it crystallised. (18.219)

But wonder blends with disappointment: the Old Lecture wants to know why carbon "only" makes itself into lead in his native land. Cheated of carbon's "other" form, the Old Lecturer sounds a melancholic note when he tells the girls that their pencils are "pointed with formless diamonds" (18.219). Since graphite is a legitimate form of carbon, calling a pencil a "formless diamond" speaks to the felt loss of form that attends dust's kaleidoscopic rearrangement of elementary particles. Dust's morphic ability to take on "other" forms conjures a negative space, the empty outline of what is not—but might have been—present. Given Ruskin's investment in girls as symbols of dust's formative potential, I want to conclude this chapter with a meditation on the gender of changefulness. To do so, I turn to the other great Victorian text about dust,

Dickens' *Our Mutual Friend*, where the connection between gender and mineralogical change intersects more pointedly with the question of resource depletion.

The plot of Charles Dickens' *Our Mutual Friend* revolves, of course, around the inheritance of giant dust heaps. Like Ruskin's dialogue, *Our Mutual Friend* explores the transformative potential of dust, symbolically keyed to the novel's many resurrections, as characters die to be reborn into better lives. In large part, the metamorphic quality of Dickens' dust inheres in its status as inherited wealth, through which it represents the power of dead matter to perpetually circulate in an economy of scavengers, scam artists, social climbers and leeches, that is, an economy that exploits the absolute fungibility of all matter and trades in dust as the true "universal solvent." Dust, thus, comes to embody the abstract interchangeability of animate and inanimate matter so characteristic of Dickens' novels.

Critics have long noted Dickens' habit of turning people into things and things into people: John Bowen calls it a "key signature of Dickens' works" and John Carey claims it is "the hallmark of his imagination" (207, 101).⁴⁶ While critics have interpreted these transformations in psychoanalytic, economic and, most recently, energetic terms, inorganic matter's transformative potential has been under-theorized.⁴⁷ Rather than describing the taxonomic collapse of "person" and "thing," which often only reinscribes the taxonomic order it purports to overturn, chemistry can account for the amalgamations and expulsions that merge matter into conjoined person-things. While dust's sinuous flux describes *Our Mutual Friend*'s world of abstract interchangeability, it is, as Catherine Gallagher argues, a man's world: "only the men are capable of holding 'Life in abeyance'...Bella and Lizzie have no such out-of-body possibilities, and hence they are debarred from the process of releasing value and being released as value, as pure vital potential" (116).⁴⁸ Since Ruskin intimately connects girls to the "vital potential" of dust, I want to consider how a chemical reading of dust might change our view of the novel's gendered economy of transformation.

While the female characters in *Our Mutual Friend* may not undergo the rituals of drowning and rebirth endured by their male counterparts, Lizzie's kinship with coal links her to its transformative chemical potential. As Adelene Buckland argues, "Dickens often based plots of fictional transformation on the fantastic metamorphoses embodied in the lump of coal itself." *Household Words* and *All the Year Round* featured many articles on coal and its transformations.⁴⁹ In "The True Story of a Coal Fire," published in *Household Words* in April 1850, a dissolute young man named Flashley is propelled through a fireplace to an "antediluvian forest" to witness its transformation into coal; he is jammed into a modern mine to observe its cramped working conditions; he boards a collier and works as a cabin boy; he lands on a wharf and works as a coal-sifter; and, in this manner, he travels and travails the full circuit of coal's history. Like *The Ethics of the Dust*, "True Story" relies upon the perpetual circulation of inorganic matter to enact its tale of self-formation. Just as all living things "undergo a gradual transmutation into other bodies and things of the most opposite kind," the indolent Flashley transforms into a toiling laborer (28). Specifically, Flashley learns to mimic coal's chemical potentiality:

Under the chemical process of ages...these huge ferns, these trunks, and stems, and towering fabrics of trees, shall all crash down—sink deep into the earth with all the rank enfolding mass of undergrowth—there to be jammed and mashed up between beds of fiery stone and grit and clay, and covered with oozy mud and sand...not rotting in vain, nor slumbering uselessly in darkness, but gradually, age after age, undergoing

transmutation by the alchemy of Nature, till verdure becometh veriest blackness, and wood is changed to coal. (30)

Coal is given a similar, albeit briefer, chemical introduction in *Our Mutual Friend* when Charley reminds Lizzie that coal contains “gas” that is “coming out of a bit of a forest that’s been under the mud that was under the water in the days of Noah’s Ark” (37). In both “True Story” and *Our Mutual Friend*, coal represents decay’s transformative potential. Thanks to “the chemical process of ages,” the superabundant foliage of the geological past does not “rot in vain”: “wood” becomes the “coal” that warms Lizzie’s impoverished hearth and fires her imagination. Gazing into a transmuted forest, Lizzie’s coal-narratives insert her into this erstwhile male history of chemical transformation.

But Lizzie’s narratives also locate her at the center of debates about coal’s depletion. In “True Story,” exhaustion will be forestalled by exhaust: when coal is burned, the same gases that fed antediluvian forests “are liberated” into the atmosphere, where they “form a portion of those elements which are again to assist in the growth of forests” (95). In Dickens’ journal, the coal-forest cycle repeats itself and futurity is guaranteed a bright, warm existence. Not all Victorians shared this optimistic assessment. By the 1860s, the “inexhaustible” coalfields had come up against the rapacious scale of human consumption. Published in 1865, dust’s banner year, William Stanley Jevon’s *The Coal Question* predicted that Britain had reached peak coal production.⁵⁰ To write about coal in 1865 was to enter into a debate about abundance and scarcity, resource renewal and depletion. While MacDuffie argues that *Our Mutual Friend* “stages a conflict” between cyclical renewal and an “entropy-centered economy” in which waste represents “the end of transformation itself,” I think Buckland is right in suggesting that Dickens refused to “countenance either coal exhaustion [or] its economic consequences” (126, 24). Amid the panic, Dickens refused to relinquish coal’s transformative power. Accordingly, Lizzie’s coal reflects fears about resource scarcity even as it continues to materialize fantasies about renewal.

Like Ruskin’s pencils that shadow forth “formless diamonds,” Lizzie’s coal conjures lost forms—antediluvian forests, layers of sedimentation, the Deluge—in the negative. Reinforcing the connection between chemical potentiality and empty space, Lizzie narrates possible futures by gazing at “the hollow down by the flare” (38). This hollow is a world of narrative plentitude, or, as Charley styles it, “there seems to be the deuce-and-all in the hollow down by the flare” (38). The connection between the “hollow” and its infinitude would seem to confirm Gallagher’s reading: Lizzie imagines transformations for her brother, not herself. However, later in the novel, Lizzie narrates another tale in the hollow, imaging a lady who will love Eugene Wrayburn and will announce her love with a curious phrase: “only put me in that empty place” (344). The “empty place” ostensibly refers to the vacuous Mr. Wrayburn. But as Lizzie narrates her tale, she ventriloquizes her longing to put herself in the “empty place” carved out by the imaginary “lady rich and beautiful that [she] can never come near.” In the capacious fullness of the “empty place,” Lizzie taps into the pure potential of dust’s changefulness.

Even though the text does not convert Lizzie into coal (or diamonds), Lizzie’s affinity with coal gives her access to the “empty place” that allows her to imagine her allotropic other. She accesses Gallagher’s “out-of-body” possibility. But, like the Old Lecturer’s melancholic attachment to the pencil’s absent other, Lizzie’s narrative internalizes her attachment to that which she can “never come near.” That is, dust creates a formal model that can only ever be a melancholic fetishization. When form echoes all the forms it ever was and bespeaks all those it could still be, our attachment to form can only be partial, a fragment that substitutes for an

overabundant whole. That the figure for the melancholic fetishization of form should be the young girl seems to predictably confirm the commodification of the female body. And yet the melancholia that attends Lizzie's coal and Ruskin's graphite is less a sexualized longing and more an environmental yearning for abundance in a world of finite scarcity. Indeed, both *Our Mutual Friend* and *The Ethics of the Dust* enact fantasies wherein scant resources are limitlessly recycled and reborn.⁵¹ Girl-dust represents Victorian fantasies of resource plenitude, fueling socio-political desires for rebirth, i.e. that the "Dust of generations of men" will lay the "foundation" for a redeemed "city."

In this light, Lizzie's "hollow" would seem to activate the tradition that views the female body as receptacle.⁵² But, in the end, neither Ruskin nor Dickens simply recapitulates girl as organic fecundity. Lizzie is, after all, childless at the end of *Our Mutual Friend*, and Ruskin weds his nubile girls to inorganic matter. While Ruskin's erotic interest in "girls" suggests an implicit embrace of procreative domesticity, girl-dust subverts heteronormative expectations by emphasizing the aesthetic and ethical value of asexual, inorganic recombination. In this way, dust disrupts biological reproduction and the political structures invested in reproducing the state as such, what Lee Edelman has termed the politics of "reproductive futurism." Although Edelman argues that heteronormativity structures *any* fantasy of reproduction, dust regenerates through ambient, inorganic affiliation, a mode of propagative futurity that challenges organic duplication's hegemony. Girl, then, is the apt figure for dust less because she breeds from a hollow within, more because her hollow prefigures the combination and containment of unruly materiality that holds dust's restless transformations in a state of "animated Rest." "There's no music in a 'rest,'" advises the Old Lecturer, "but there's the making of music in it. And people are always missing that part of the life-melody; and scrambling on without counting" (18.247). It is easy to miss the "rest" in *The Ethics of the Dust* and to discount the streaming dust in a rush toward crystalline form. But, by tracing dust's formative power and its ceaseless circulation, we may bring the pause between making and unmaking into focus. Or rather, as I have argued, form is itself a pause, a transient coming together in the whirligig of molecular life. Both are true. Form is a pause (a compositional respite between decompositions); form emerges in the pause (decomposition nourishes composition). Hence, "the ethics of the dust" should not be summarized as "get into order"; rather its motto is better stated as: "mind the Rest." Mind that empty place—that melancholic girl—where dust's infinite combinations lurk.

NOTES

¹ While my thinking about form springs from nineteenth-century science, especially in relation to Johann Friedrich Blumenbach's *Bildungstrieb* (formative power), my work also engages with the recent return to formalism. From Angela Leighton's *On Form*, I draw upon her insistence to attend to "the dynamics of form itself" (16). From Caroline Levine's *Form*, I draw upon her mobilization of design theory's notion of "affordances" to think through the aesthetic and ethical affordances of decay.

² Ruskin's idiosyncratic science has been a topic of much critical debate. For a general overview, see Alexander, "Ruskin and Science." For Ruskin and Tyndall's glacier debate, see Sawyer, "The Poetry of Matter and the Poetry of Spirit." For Ruskin's use of Biblical typology, see Spear, "Typological Science" in *Dreams of an English Eden*, 40-51. For Ruskin's natural history

textbooks of the 1880s, see Kirchoff, “A Science Against Science: Ruskin’s Floral Mythologies” and Birch, “Ruskin and the Science of Proserpina.”

³ My reading of decay is indebted to a number of studies on dirt, filth, and the abject. These include: Mary Douglas’ *Purity and Danger*; Julia Kristeva’s *Powers of Horror*; Eileen Cleere’s “Victorian Dust Traps” and Pamela K. Gilbert’s “Medical Mapping: The Thames, the Body, and Our Mutual Friend” in *Filth: Dirt, Disgust, and Modern Life*; Christopher Hamlin’s “Providence and Putrefaction: Victorian Sanitarians and the Natural Theology of Health and Disease”; Lynda Nead’s *Victorian Babylon*; and Anne McClintock’s *Imperial Leather*. My work takes up this critical tradition—which has established the Victorian obsession with the taxonomic classification of waste and dirt, as well as their transgressive desire to revel in such foulness—and seeks to uncover an alternative discourse about Victorian decay, a discourse that embraced disintegration for its aesthetic, ethical, and environmental affordances.

⁴ In his study of “The Matter of Matter,” Levine argues that Ruskin “bows to Lamarckian evolution” because it allows for “will, intention, love, and hate” (243). Similarly, in Zwierlein’s reading of *The Ethic of the Dust*, she stresses the connection between Ruskin’s “moral concept of energy” and Victorian debates about personal will power (322).

⁵ All Ruskin citations are from the Cook and Wedderburn edition with the volume number followed by the page number.

⁶ In addition to the triangulated connection between coal, dust, and gender performed by Lizzie’s fireside narratives, *Our Mutual Friend* links the economies of coal and dust through the figure of the dustman, who, in Henry Mayhew’s *London Labour and the London Poor*, collects waste “principally from the residuum of fires, the white ash and cinders, or small fragments of unconsumed coke” (345).

⁷ Scholarship on *The Ethics of the Dust* emphasizes the girl-crystal analogy, paying little attention to the role of “dust” in facilitating this cross-kingdom transformation. Paul Sawyer argues that “the central analogy of the book” is that “the girls are themselves crystals” (246). Catherine Robson likewise argues that “the central conceit of *The Ethics of the Dust* can be expresses quite simply: girls are crystals and crystals are girls” (115). Expanding upon these assertions, Sharon Aronofsky Weltman argues that “Ruskin’s continual identification of the girls with the crystals...builds the case for the feminine nature of crystallization itself ” (46). Accordingly, these critics have drawn similar conclusions about the text’s “ethics.” Sawyer argues “crystallization is the chemical analogue to the absolute distinction in the moral life between purity and decay” (246). Reading Sawyer’s “absolute distinction” as a temporal division, Robson argues that the girl-crystals are “the creations of a long-lost past” that is completely severed from modern life, which has “foundered into decay, corruption and confusion” (120). I do not disagree that the text likens girls to crystals. However, the girls’ identification with “dust”—a synonym for molecular organization *and* a sign of corruption—dissolves the “absolute distinction” between purity and decay.

⁸ Even in Ruskin’s “pagan” exploration of Greek mythology in *The Queen of the Air* (1869), dust continues to derive its authority from Genesis 3.19: Demeter’s rule is over the earth “as the origin of all life” and “as the receiver of all things back at last into silence—‘Dust thou art, and unto dust shalt thou return’” (19.304).

⁹ According to Van Akin Burd, the occasion for these letters was a sermon delivered January 1839 by William Buckland, Ruskin’s former geology teacher (306). Written to help clergymen reconcile Romans 5:12, “As by one man sin came into the world, and death by sin,” with fossil

evidence that extinct races of animals had roamed the earth before the fall of man, this sermon expresses Buckland's conviction, explored at length in his *Bridgewater Treatise* (1836), that geological discoveries were "consistent" with "sacred history."⁹ In his letters to Clayton, Ruskin takes up his teacher's position but, expanding the scope of Buckland's providential geology, defends it with evidence drawn from biology, chemistry, comparative anatomy and paleontology.

¹⁰ With the exception of Frost's essay, the scientific content of these letters has received little critical attention. Other scholars have commented almost exclusively on Ruskin's unorthodox interpretation of Genesis. Conner describes these letters as a "significant" departure for Ruskin who "came down against the literal Biblical version" (19). See Patrick Conner, *Savage Ruskin*. Spear argues that they reveal Ruskin's belief that the Bible should be "constantly reinterpreted in the light of scientific discoveries" (372). See Spear, *Dreams of an English Eden*. For Ruskin's use of typology, see Landow, "Ruskin's Language of Types," and *Aesthetic and Critical Theory of John Ruskin*; and Finely, *Nature's Covenant*.

¹¹ Ruskin refers directly to Liebig later in the letter: "Liebig says that the source of this ammonia is sufficiently evident by its peculiar odor" (1.486). While Cook and Wedderburn do not footnote this reference, it seems likely that Ruskin read Liebig's *Organic Chemistry in its Application to Agriculture and Physiology*, which was translated into English in 1840 by Lyon Playfair. In 1840, the British Royal Society elected Liebig a Foreign Fellow and Copley medalist. When he visited London in 1842, Playfair escorted Liebig to Oxford to meet Charles Daubey and William Buckland. See Brock, "Liebig and the British" in *Justus Von Liebig*, 94-114.

¹² Ruskin's "girls" have received much scholarly attention. For the girls' erotic depiction and the Old Lecturer's "pedophilia," see Robson, *Men in Wonderland*. For the discrepancy between the submissive girls in the text and the more unruly behavior of the real girls at Winnington Hall, see Birch, "Ruskin's Authorities." While Paul Sawyer argues that the text recapitulates Victorian gender norms, where women are to be "chaste, pious, and passive," Weltman recuperates the girls' potency, reading crystallization as a distinctly feminine power (248-9).

¹³ For an analysis of the haptic erotics of being "stone," see Mel Chen *Animacies* pp. 216-217. Chen defines "stone butch" as an erotic economy of affect "in which the butch's sexual pleasure can emerge from the touch instigated by her, whereas she prefers not to be touched by her lover," and argues that it is "simply wrong" to see the stone butch as "affectless." Similarly, it would be wrong to read Ruskin's desire to petrify little girls (or himself) as a deprivation of affect. Rather, this desire for objectification curiously probes the affective life of stones and their geomorphic traumas.

¹⁴ For a scathing critique of "Of Queens' Gardens" and Ruskin's "compulsive masculine fantasy" about "insipid goodies," see Millett. For a sympathetic reading that places "Of Queens' Gardens" in dialogue with the historical context of Queen Victoria's reign, see Weltman's "Queen Victoria and Mythical Queenship" in *Ruskin's Mythic Queen*.

¹⁵ My reading of Ruskin's dust, thus, concurs with Birch's reading of Ruskin's "womanliness" and his feminized critical voice. See Birch, "Ruskin's Womanly Mind."

¹⁶ For the vitalist debate in the 1850s and 60s, see Geison, "The Protoplasmic Theory of Life."

¹⁷ Gallagher and Greenblatt, *Practicing New Historicism*.

¹⁸ Laura Otis also reads the advent of cell theory as ushering in new concepts of enclosure. See Otis, *Membranes*.

¹⁹ Alan J. Rocke emphasizes that there were artificial syntheses of "organic" materials before 1828 and that "total" syntheses were only performed long after that date: "Wohler's

accomplishment in no way refuted vitalism at a stroke” (239). See Rocke, *The Quiet Revolution*. Boyd Hilton argues that Wöhler’s synthesis of urea “might even have given vitalism ‘a new lease on life.’” See Hilton, “The Politics of Anatomy and an Anatomy of Politics.”

²⁰ In “The Cell Theory,” Huxley declares that he has “maintained the broad doctrine established by Wolff.” Marsha Richmond argues that Huxley’s conception of the organism is “developmental and epigenetic rather than reductionist and morphological” (270). See Richmond, “T. H. Huxley’s Criticism of German Cell Theory.”

²¹ Rocke argues that, “there were as many varieties of vitalism as there were of materialism,” and “there is no simple—nor even any sophisticated—correlation between vitalistic and metaphysical, teleological, or theological habits of thought” (239). See Rocke, *The Quiet Revolution*.

²² While Gigante argues that the Romantic rejection of preformation meant, “Life now denoted power, rather than structure,” vital power was certainly not divorced from structure in most Romantic accounts of life, especially since Blumenbach’s *Bildungstrieb* (formative power) was a touchstone for Kantian aesthetics (16).

²³ Tyndall, “Spontaneous Generation.”

²⁴ The review was anonymous, but Darwin and his circle immediately suspected the author’s identity. J. D. Hooker made some inquiries and concluded that it was Richard Owen. Hooker’s sleuthing has since been confirmed by the editors of Darwin’s correspondence: “The publisher’s marked copy of the *Athenaeum* at the City University, London, reveals the author to have been Richard Owen” (754). After Owen’s review on 28 March, Carpenter made a swift response on 30 March, distancing himself from Darwin. Darwin’s angry retort appeared 25 April, to which Owen responded on 2 May. Darwin responded again on 5 May. But in a letter to Darwin dated 7 May, Hooker begs him to acquiesce: “I cannot abide this lugging of Science before the public...& implore you my dear fellow not to do so again. Owens answer to you is so triumphant in the eyes of the public (who you wish to enlighten) as Manchester is over Natal.” For an overview of this debate, see *The Correspondence of Charles Darwin*, 745-55.

²⁵ For a full account of the *Bathybius*, see Rehbock, “Huxley, Haeckel, and the Oceanographers.”

²⁶ Huxley, “On Some Organisms Living at Great Depths in the North Atlantic Ocean.”

²⁷ Charles Darwin. Letter to J. D. Hooker 1 February 1871. *The Life and Letters of Charles Darwin*. p. 202.

²⁸ Even the lay public entered into the debate. See “Some Aspects of Mud.” The anonymous reviewer ventures his opinion that “earth and water in combination, and acted on by the heat of the sun, seem in truth to contain the germinating principle of vitality” (199).

²⁹ King and Rowney, “On the So-Called ‘Eozoonal’ Rock.”

³⁰ Dawson, “On the Structure of Certain Organic Remains in the Laurentian Limestones of Canada.”

³¹ King and Rowney, “On ‘Eozoon Canadense.’”

³² Dawson, “On new specimens of *Eozoon Canadense*, with a reply to the objections of Professors King and Rowney.”

³³ According to Martin Priestman, “the first great Lucretian moment in Britain was the end of the seventeenth century,” while a flurry of new editions between 1790 and 1820 marked “the second British Lucretian moment.” For a compelling account of Lucretius’ influence on British Romantic poetics, see Goldstein, “Growing Old Together.” But, as Priestman acknowledges, scholars have traditionally placed the “epicenter” of Lucretius’ nineteenth-century influence

“firmly after *The Origin of Species* in 1859.” See Priestman, “Lucretius in Romantic and Victorian Britain.”

³⁴ Mid-century Victorian interest in Lucretius began with H. A. J. Munro’s new translation of *De Rerum Natura* in 1860 and W. Y. Sellar’s *The Roman Poets of the Republic* in 1863. Frank M. Turner argues that the publication of Tennyson’s “Lucretius” in 1868 marks “the beginning of a new appreciation for Lucretius” since that year also witnessed the publication of Fleeming Jenkin’s “The Atomic Theory of Lucretius,” the first article linking “the ancient writer to contemporary scientific thought” (335). See Turner, “Lucretius Among the Victorians.” For Victorian scholarship on Lucretius’ atomism as it related to modern science, see the following: E. W. Adams, “Lucretius and His Science”; Benn, “Epicurus and Lucretius”; Buchanan, “Lucretius and Modern Materialism”; Cayley, “Lucretius on Nature”; Jebb, “Lucretius”; Jenkin, “The Atomic Theory of Lucretius”; Masson, “The Atomic Theory of Lucretius” and “Lucretius, Tyndall, Picton, Martineau: Some Theories of Matter and Its Relation to Life”; and J. A. Symonds, “Lucretius.”

³⁵ Adams, “Lucretius and His Science.”

³⁶ Jenkin, “The Atomic Theory of Lucretius.”

³⁷ See also Jenkin, “The Atomic Theory of Lucretius,” 213.

³⁸ Benn, “Epicurus and Lucretius.”

³⁹ Masson, “The Atomic Theory of Lucretius.”

⁴⁰ Tyndall, “Atoms, Molecules, and Ether Waves.”

⁴¹ Masson, “Lucretius, Tyndall, Picton, Martineau: Some Theories of Matter and Its Relation to Life.”

⁴² For Ruskin’s refutation of the geological concept of denudation in *Deucalion*, see 26.121-22 and 26.247-255.

⁴³ In *Modern Painters* Vol. IV, Ruskin collects the runoff water from an Alpine stream in order to measure the rate of decay of Mount Blanc. He calculates a staggering loss: “eighty thousand tons of mountain must be yearly transformed into drifted sand” (6.176).

⁴⁴ Ruskin makes multiple references to his agedness: he began his geological work “thirty years ago” (26.101); his dabbling-places “have not changed in fifty years” (26.122); he has returned to Switzerland and revisited the same scenes “forty years” later (26.126); the scenes he has revisited in Switzerland are “unchanged since I knew it first, when I was a boy of fifteen, quite forty years ago” (26.151); and he has gathered “fifty years’ experience of brooks” (26.250).

⁴⁵ “The Work of Iron” (1858) is a paradigmatic example. In this lecture, he declares that rusted iron is “Living” and folds its chemical decomposition into a natural economy (16.376). For a reading of rust’s dynamic materiality, see Frost (378-80). For a reading of iron in relation to energy consumption, see MacDuffie (159).

⁴⁶ Bowen argues that Dickens’ novels are “full of living people thought to be dead, inanimate objects made animate, human beings who become things before our eyes” (5). John Carey perceives a similar population of “stilled life and the still enlivened” (101).

⁴⁷ For a psychoanalytic account, drawing upon Freud’s concept of the uncanny, see Bowen, *Other Dickens*. For an economic account of vitality, see Gallagher, *The Body Economic*. For an energetic account of entropic loss, see MacDuffie, *Victorian Literature, Energy, and the Ecological Imagination*.

⁴⁸ Gallagher, *The Body Economic*.

⁴⁹ I am indebted to Buckland for pointing me to these articles. See, for examples, “The True Story of a Coal Fire.” April 6, 1850: 26-31, April 13, 1850: 68-72, and April 20, 1850: 90-96; “The Black Diamonds of England.” June 8, 1850: 246-50; “King of the Hearth.” November 30, 1850: 229-33; “A Coal Miner’s Evidence.” December 7, 1850: 245-50; “Chip: History of a Coal Cell.” December 10, 1853: 354-55; Samuel Sidney, “Chip: Coal Mining on the Ohio.” September 8, 1855: 141; “Lost in the Pit.” November 1, 1856: 361-66; “A Collier at Home.” March 28, 1857: 289-92.

⁵⁰ For the historical origins of the peak coal debate, see Jonsson, “Coal Exhaustion in 1789” in *Enlightenment’s Frontier*.

⁵¹ For the vexed relationship between fantasies of limitless energy and the realities of finite resources in Victorian Britain, see MacDuffie, *Victorian Literature, Energy, and the Ecological Imagination*.

⁵² The long literary-scientific tradition that views the female body as a receptacle takes on a new significance in the nineteenth century when Buffon put forth a theory of generation based on his conception of “moules intérieures,” an “internal mold” or hollow container that impresses each life with its characteristic form. See Gigante, 14-15.

4. Pater and the Air-Pump

There is much to be said about that same vacuum, especially when contrasted with a Plenum, which means (if it mean anything) the exact opposite of a vacuum. In other words, a “jam,” a “block,” a “fix.” But, on the whole, I lean to a vacuum. The other idea is oppressive. It does not allow one to breathe. There is no elbow-room.

— J. W. F. Herschel¹

In her unsigned review of Walter Pater’s *Studies in the History of the Renaissance* (1873), published in the *Westminster Review* in April 1873, Francis Pattison leveled the charge that “the title is misleading” because “the historical element is precisely that which is wanting, and its absence makes the weak place of the whole book” (639).² While Pattison may curry little favor with contemporary Pater critics, since her review may have prompted Pater to retitling the second edition, published in 1877 as *The Renaissance: Studies in Art and Poetry*, let us give air to Pattison’s evaluation of the “weak place” of Pater’s *Studies*:³

The work is in no wise a contribution to the history of the Renaissance. For instead of approaching his subject, whether in Art or Literature, by the true scientific method, through the life of the time of which it was an outcome, Mr. Pater prefers in each instance to detach it wholly from its surrounding, to suspend it isolated before him, as if it were indeed a kind of air-plant independent of the ordinary sources of nourishment (639-40).

Pater’s failure, according to Pattison, is a methodological one. He fails to adopt the “true scientific method” of the historian. In lieu of a proper account of “the life of the time,” Pater opts for an alternative methodology – one characterized by Pattison as a preference for detachment, suspension, and isolation – a methodology, in sum, that transforms the historical subject into an “air-plant.” This chapter, somewhat perversely, takes up Pattison’s comparison of Pater’s historical subject to an “air-plant” so as to recover the airy medium that envelops the Paterian subject and, thereby, to uncover the relationship between history’s “common air,” as Pater styles it in the “Preface,” and his method of detachment (6).

To do so, I turn to the scientific debates in Britain in the 1860s about “ether”—an all-pervading fluid that was believed to fill the universe and serve as the medium for the propagation of light, heat, and electromagnetism—to situate Pater’s conception of historical subjectivity as a form of ethereal embeddedness. Building on the work of Billie Andrew Inman and Donald R. Benson, who have established the connection between Pater and the nineteenth-century sciences of light, heat, and ether, I argue that the ether theories of the 1860s embed the Paterian subject in a tumultuous medium and, thus, foreground the incessant perturbations of a physical life constantly receiving the vibrations of light, heat, and electromagnetism.⁴ While indebted to Benson’s study of ether, I depart from him in his view that ether is “the perfect fiction of

continuity” and, thus, it is “vital” to Pater’s art, “which aims to connect, to resolve in particular the isolation of consciousness from the world around it” (149, 157). Lest we follow Lord Kelvin in his susceptibility to “fits of ether dipsomania,” I want to place two checks on our critical assessment of the aesthetics of ethereal continuity.⁵ First, if all the phenomena of the universe “are only different manifestations of the various modes of motion of one all-pervading medium,” then we cannot ignore, because Pater certainly did not, the experience of loss that attends this dissolution of discrete material existence.⁶ Ether constitutes a tragedy of impermanence as well as a fiction of continuity. Second, while the undulations of an all-pervading medium form the inescapable material conditions of modern tenuity, Paterian aesthetics privileges, as Pattison is quite right in detecting, the critical capacity to detach, suspend, and isolate the exquisite moment from the dross.

One unlikely model for this methodology of detachment is the experimental techniques engendered by the technology of the air-pump. I say unlikely because Pater never mentions the air-pump in *Studies*; Robert Boyle’s seminal air-pump experiments were conducted a full two hundred years prior to the composition of *Studies*; and the air-pump, as I will discuss below, had become so fully domesticated and incorporated into the fabric of nineteenth-century industrial life as to render its status as an experimental device almost invisible. Nevertheless, the air-pump played an important experimental function in the ether debates of the 1860s. Specifically, in John Tyndall’s celebrated lectures on *Heat considered as a Mode of Motion*, delivered at the Royal Institute in 1862, the air-pump is the crucial apparatuses called upon to “make the indication of heat and cold visible” to his audience (14). Whereas, in his “aether-wind” experiments of the 1660s, Boyle employed his air-pump to determine if ether’s effects can be witnessed *in vacuo* and concluded that the ether is “such a body as will not be made sensible,” in his experiments of the 1860s Tyndall used the empty space of the exhausted receiver to make Boyle’s insensible “body” sensible to his audience.⁷ Meanwhile, in *Studies*, Pater construes aesthetic objects as “receptacles,” as “delicate instruments [through which] one becomes aware of the subtler forces of nature” (3, 65). Via this experimental “instrument,” the observer can witness the subtle “modes” of nature – all that is “magnetic,” “nervous, electric, faint” in it – and feel “powers at work in the common air unfelt by others” (66). The art object, like the exhausted receiver of the air-pump, makes insubstantial and invisible processes perceptible. Like the scientific experiment, Paterian aesthetic experience formalizes techniques of receptivity, premised, howsoever paradoxically, upon the detachment and isolation available *in vacuo*.

For the artist and the aesthetic critic, the “true scientific method” is the method of the air-pump, a rarefying engine, which not only empties space but also figures receptivity as a heightened sensitivity to the aesthetic and ethical affordances of emptiness.⁸ That is, the air-pump gives us a method to think through the politics of emptiness, not just as the site of abandonment, neglect, or ruination, but also as the site of auspicious rupture and break.⁹ If, in “Diaphanéité,” Pater laments that, for most of mankind, “the one happy spot in our nature has no room to burst into life,” the voided space of the exhausted receiver inserts pockets of vacuity into the plenum that just might give those happy spots “room” to burst into being. Hijacking a phrase from Levinas, we might say that “this leak within the plenum,” this vacuity pocketed within the “common air,” figures the Renaissance as a series of atmospheric niches, niche inside niche, air-plants within air-pumps, thriving in the rarefied and depressurized air of luminous blankness.¹⁰ Hence, if the ether theories of the 1860s succeed in re-fashioning the void, turning its emptiness into a stifling plenum, then Pater’s aestheticized historiography deflates the plenum, here and there, poking little holes in the ubiquity of a pressurized, homogenous atmosphere, pocketing

those strange epiphytic, rootless plants in pellucid terrariums that transform the onward march of historical time into transhistorical bubbles.

I. Touching the Void

Before turning to the ether theories of the 1860s and the methodology of the air-pump, on the one hand, and Pater's representation of the flux and his scientific detachment, on the other, I want to begin with a closer evaluation of the transhistorical bubbles that emerge in the play of "common air" and evacuated space in Pater's historiography. In the opening essay of *Studies*, "Aucassin and Nicolette," later expanded and retitled, "Two French Stories," Pater opts to begin his history of the Renaissance in the middle ages, or, as he describes it, "a Renaissance within the limits of the middle age itself" (9). Nestled within the so-called "limits" of the middle ages, this pocketed Renaissance allows Pater to redefine historical periodization. The lines to be drawn are amorous and aesthetic: the Renaissance names "the love" of intellectual pursuits and "the desire" for liberality (10). What concerns us here is the way such a historiography of desire folds the process of historical development back upon itself such that this "outbreak" of feeling at the end of the twelfth century re-embeds its own desires: "the rude strength of the middle ages turns to sweetness; and the taste for sweetness generated there becomes the seed of the classical revival in it" (9-10). Chiastic symmetry shades into syntactic redundancy, as the hunger for sweetness is grown "there" and planted "in it," redoubling and returning this revenant spirit to its medieval roots. But this looping, involuted historiography summons its Hellenic antecedents: this pocket of sweetness, cultivating its own atmosphere, traverses its own historical moment. It becomes a transhistorical bubble.

But this detached atmosphere travels. It circulates in the common air. Even as Pater leads us into yet more rarefied airs, he envisions these subtle atmospheres as diffuse and migratory. Describing the well-known story of Abelard and Héloïse, Pater not only highlights Héloïse's recondite education which allows her "to penetrate into the mysteries of the older world," but also positions his lovers as sequestered "in that shadowy home," a world of "dreamy tranquility," which is located "amid the bright and busy spectacle of 'the Island'" (10-11). Islanded in the Seine, secluded in the ethereal home, the story of the isolated Héloïse and Abelard, nevertheless, circulates and diffuses itself in the common air: "and so from the rooms of that shadowy house by the Seine side we see that spirit going abroad" (11). Such historical and sociological configurations of isolated yet diffused rarefaction find their aesthetic counterpart in the titular tale which takes the form of a *cantefable*, "a tale told in prose, but with its incidents and sentiment helped forward by songs, inserted as irregular intervals" (12). Against this view of the relatively stable, complete prose tale, Pater suggests an alternative interpretation: "in the junctions of the story itself there are signs of roughness and want of skill which make one suspect that the prose was only put together to connect a series of songs,—a series of songs so moving and attractive that people wished to heighten and dignify their effect by a regular framework or setting" (12). Imposing a frame, after the fact, Pater's reading of *Aucassin and Nicolette* lays bare the gaps in the story that not only reveal the retroactive revision that shapes his aestheticized historiography, but also uncovers the singular pleasure crafted in those airy junctures — stories born in the interstitial silences of the tenuously connected songs. Breathing form into the murmuring silence, Pater's historiography uncovers a "common air"—a shared medium that transmits sound's undulatory vibrations—even as it relishes the "irregular intervals" of silent abstinence.

Niches within niches, gaps within frames, my account of Pater's historiography chimes not only with recent studies of Pater's queer (theory of) history but also with critical attempts to reclaim the "epistemology of the closet," the "open secret," and the "epistemology of the vestibule" – those hidden, recessive, and deferred forms of knowing that shirk or shrink from world-mastering epistemologies.¹¹ These critical attempts share a common interest: a desire not simply to recast Pater's admittedly "dreamy" aesthetics as a secreted form of political engagement, but rather, dwelling with the languid, to cultivate an alternative relationship to the political, as such. Sensitive to the affect of secrecy and shame that attends his marginalized queerness, Heather Love argues that we might understand Pater's "drowsy, shrinking form of revolution" "not only as an aesthetic mode but also as a 'mode of living' – as an alternative form of political subjectivity" (69). Recasting Pater's withdrawal as "retreat," Rachel O'Connell recuperates the affective and aesthetic possibilities of self-effacement, arguing that Pater presents us with a "subject formed in fundamental ways by its profoundly intimate and invested relationship with the very suppressions and prohibitions by which it is beset," who transforms the experience of retreat "toward some more comforting and welcoming connotations: retreat as refuge and shelter, as a site of peace and calm, and as a space of one's own" (970, 971).¹² Along similar lines, Matthew Burroughs Price argues Pater needs not be understood as "asocially withdrawing," or in Love's terms, "breaking with the future" (649). Rather, Price suggests "the works of Pater and other queer modernists create a balancing act between engagement with and withdrawal from history that characterizes queer theory today," making Pater "the de facto theorist" of "queer detachment" (649).¹³ While my invocation of interstitial aesthetic charms and niched historical developments resonates with critical attempts to reappraise the politics of Pater's withdrawal, my work in the history of science finds another register for Pater's vacuous theory of history. Namely, in his engagement with the physics of the ether and the methodology of the air-pump, Pater inserts his work into an "antinomian" history of vacuity that is not only experimental and subversive but also transhistorical. The vacuum makes room for furtive, transgenerational connections.

There is perhaps no better place to look for such transhistorical bubbles—and their formal manifestation in voided space—than Pater's invocation of Heinrich Heine's "Gods in Exile" at the beginning of his essay on Pico della Mirandola. Heine's essay describes "how the gods of the older world at the time of the definite triumph of Christianity, that is, in the third century, fell into painful embarrassment" and "had to take flight ignominiously, and hide themselves among us here on earth under all sort of disguises" (18, 19). Crafting "vulgar handicrafts" and letting themselves "out for hire as wood-cutters," the exiled gods were forced into ignoble labor. Apollo found employment and enjoyment "under graziers" but his pastoral contentment was short-lived (19). Outed by his beautiful singing, Apollo was tortured and forced to confess on the rack that he was, in fact, a god. Before his execution, he was granted the wish to sing one last song – a song so hauntingly beautiful that the women who listened to it "shortly afterward fell sick" (19). The final outrage against this abjected deity came when the people attempted to "drag him from the grave again, that a stake might be driven through his body, in the belief that he had been a vampire, and that the sick women would by this means recover. But they found the grave empty" (19). As Love suggests, Heine's story reveals Pater's persistent interest in modes of exclusion, exile, and victimization, as well as "the strategic value of disappearance under a regime in which vigilance takes the form of identification and surveillance" (62). But bearing in mind Pater's pain-staking attention to the form of his prose,

the essay's structure casts Apollo's disappearance in a different light.¹⁴ Pater opens his essay with Apollo's "empty grave" and closes his essay with Pico "alive in the grave":

While his actual work has passed away, yet his own qualities are still active, and he himself remains, as one alive in the grave, *caesiis et vigilibus oculis*, as his biographers described him, and with that sanguine clear skin, *decentri rubore intersperse*, as with the light of morning upon it. (28)

Apollo's evanescence from his cruel grave becomes the opening—the historiographical gap—to be filled by the scholarly efforts of Pico, who, at the end of his botched labors to unite pagan and Christian systems, not only remains "alive in the grave" but also radiates the "light of morning," bearing, as it were, the mantle of the displaced god of light. So, while Pico's texts may have slipped into oblivion, Pater's prose, deftly weaving the dead language into the living, stages a historiography where vacuity—and the suffering encoded therein—becomes the transhistorical node for uncanny regeneration and resurrection. When Pater argues that the Renaissance of the fifteenth century "was great rather by what it designed to than by what it achieved" and that "much which it aspired to do, and did but imperfectly or mistakenly, was accomplished in what is called the *éclaircissement* of the eighteenth century, or in our own generation," he not only validates forms of queer failure but also, via this moments of failure, inserts gaps into the plenum of history (19). Attending, thus, to formal patterning, the essay on Pico reveals a distinctive structure: historical continuity emerges in the voided space of the empty grave.

Before leaving Pico to his luminous afterlife, there is one more vacuous element in this essay that bears further attention. In Pater's account of Pico's oration, "On Human Dignity," he draws attention to Pico's humanistic cosmology, where "the earth is the center of the universe" and man is "the bond or copula of the world" (23). Pater likens his modern encounter with this outdated cosmology as "a glance into one of those ancient sepulchers, upon which the wanderer in classical lands has sometimes stumbled" (24). Significantly, this image of the death-chamber's fortuitous unsealing corresponds to the happy intrusion of the diaphanous type, who is "like a relic from the classical age, laid open by accident to our alien modern culture" (138). Laid open to the airs of modern atmosphere, Pico's pre-Copernican system becomes a transhistorical node of vacuity:

For Pico the world is a limited place, bounded by actual crystal walls, and a material firmament; it is like a painted toy, like that map or system of the world, held, as a great target or shield, in the hands of the grey-headed father of all things, in one of the earlier frescoes of the Campo Santo at Pisa. How different from this childish dream is our own conception of nature, with its unlimited space, its innumerable suns, and the earth but a mote in the beam; how different the strange new awe, or superstition, with which it fills our minds! 'The silence of those infinite spaces,' says Pascal, contemplating a starlight night, 'the silence of those infinite spaces terrifies me'—*Le silence eternal de ces espaces infinis m'effraie*. (24)

In this passage, Pater gives us two versions of the abyss – the pictorial and the interstellar. Describing Pico's worldview, Pater refers us to an image (a "map or system of the world") couched within another image (a "target or shield") that is held by another image ("the father of all things"). With the clever reduplication of a heraldic shield, Pater's prose casts Pico's quaint

universe into a pictorial abyss. Contra this *mise en abyme*, the modern universe with its “unlimited space” and “innumerable suns” defies imagistic containment. In this vast dilation of spatial scale, the earth is “but a mote in the beam.”¹⁵ I take this “mote” to be a reference to Lucretius’s epic poem, *De rerum natura*. In Book II, Lucretius offers his readers a quotidian symbol for the movement of atoms falling through the void – motes of dust dancing in the sunbeam.¹⁶ In the vasty swirl of cosmic dust, the earth is a mere speck. And this scalar diminishment of the human world provokes Pascal’s horror. Quoting Pascal’s posthumously published *Pensées* (1670), Pater reveals his early interest in Pascal, whose life would become the subject of his last and unfinished essay, “Pascal,” posthumously published in February 1895 in the *Contemporary Review*. That is, in a passage dealing with the abyss of space, Pater refers to a man who, in his experiments with the Torricelli barometer, furthered the science of the air-pump and helped prove the experimental validity of the vacuum.

While perhaps best known for his famous “wager,” Blaise Pascal (1623-1662) conducted several important pneumatic experiments and published, in 1646, *Expériences nouvelles touchant le vide* (“New Experiments Concerning The Void”). In this treatise, Pascal built upon the work of Italian physicist Evangelista Torricelli, who, in 1644, performed an experiment that became central to the air-pump debates of the seventeenth century. In this experiment, “a tube of mercury, sealed at one end, was filled and then inverted in a dish of the same substance. The resultant “Torricellian space” left at the top became a celebrated phenomenon and problem for natural philosophers” (41).¹⁷

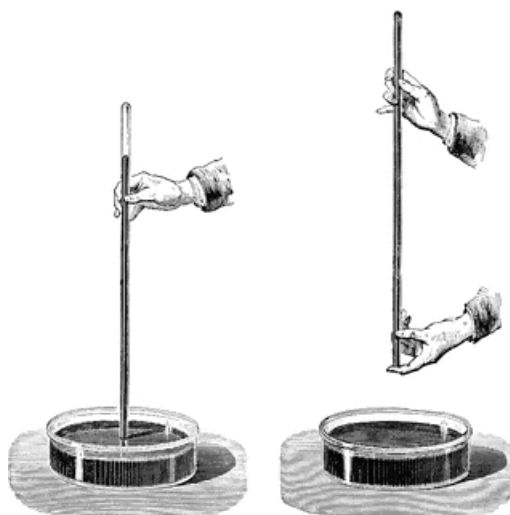


Fig. 3 Torricelli’s Barometer Experiment (1644)

A. Privat Deschanel, *Elementary Treatise on Natural Philosophy Part I. Mechanics, Hydrostatics, and Pneumatics*, New York: D. Appleton and Company, 1884, p. 141.

Seizing upon this vacuous space, Pascal repeated Torricelli’s experiment and conducted several of his own, the most famous of which was the Puy-de-Dôme trail, in which the Torricellian apparatus was carried up a mountain. The resultant dip in the level of the mercury at the top of the mountain offered experimental proof of the weight of the atmosphere.¹⁸ As Shapin and Shaffer explain, “both Torricelli and Pascal held that space was empty, and that the mercury was sustained by atmospheric weight” (41). Juxtaposing Pico’s heraldic *mis en abyme* with Pascal’s interstellar abyss, Pater evokes the ancient debate about the properties of space – its

extension, its weight, its substantiality – a debate that had been recently revived by the ether theories of the 1860s.¹⁹

The Renaissance pocketed in the middle ages, the doubly sequestered Héloïse and Abelard, the interstitial silences of *Aucassin and Nicolette*, the evacuated grave of Apollo, and, now, the interstellar space of Pascal: these historical topoi share an underlying structure. In his treatment of historical connection and causality, Pater's method is vacuous and transhistorical: blanks in the history of human culture are left for subsequent generations to fill. These blanks afford affective and aesthetic possibility, making room for modern minds to be filled with a "strange new awe" or "superstition," offering a capacious reprieve from the world of unremitting dissolution and flux described in the famous "Conclusion." To understand the aesthetic and affective stakes of these vacuous experiments, it is necessary to turn to the vacuum's antithesis – the plenum and the pervasive ether.

II. A Brief History of Ether

In the famous "Conclusion" to *Studies*, Pater describes the physical and psychological dissolution of human existence, which he characterizes as the "strange perpetual weaving and unweaving" of our elemental bodies and the "continual vanishing" of our conscious thoughts, such that human life dwindles to a "tremulous wisp" (119). While the epigraph invokes the Heraclitean flux, "all things give way: nothing remaineth," the first sentence connects this ancient philosophy to the modern tendency "to regard all things and principles as inconstant modes or fashion" (118). The key word in this sentence is "mode" – a word that encodes the latest developments of Victorian physical science. In an article fittingly titled, "La Physique Moderne" (1867), William Henry Smith explains these developments in one succinct phrase: "all material phenomena are resolvable into modes of motion" (287).²⁰ But this motion required a medium. Enter the ether. All-pervading and continuous, ether allowed for the propagation and dissemination of the motion of light, heat, and electromagnetism. However, in order to understand what was unique to the ether theories of the 1860s, I want to briefly sketch the history of ether before addressing the Victorian conception of ether in the following section.

Theories of a ubiquitous, primeval essence or ur-matter can be traced back to the sixth century B. C. with the Greek philosophies of elemental matter, such as Anaximenes's air and Heraciltus' fire.²¹ However, Aristotle's fifth element is usually given pride of place in histories of ether. In addition to earth, air, fire and water, Aristotle adds a fifth element, *aither*, which, unlike the other elements, does not undergo transmutation or combination. This *quinta essentia*, the origin of our "quintessence," has only one property – motion. Communicating the motion of the heavens to the earth, Aristotle's ether fills space and mediates between terrestrial and celestial agencies. With this space-filling substance comes the famous phrase, *horror vacui*, encapsulating the postulate that "nature abhors a vacuum." While Aristotle's refutation of the physical possibility of empty space held sway for nearly 2,000 years, the atomic theories of Democritus, Epicurus, and Lucretius offered an alternative to the Aristotelian tradition, positing the existence of a void through which tiny, indestructible atoms fell.²² With his passing allusion to the Lucretian "mote" explored above, Pater gives an oblique nod to Lucretius's vacuist atomic theory – a theory that not only challenged Aristotelian physics but also, in its early modern and modern reception, disrupted theological interpretations of the plenum's divinity.²³ While the subversive charge of Lucretius' vacuist philosophy reverberates with Pater's appreciation of the "antinomianism" of the Renaissance – "its spirit of rebellion and revolt against the moral and

religious ideas of the age” – seventeenth-century supporters of Lucretian atomism were careful to avoid the charge of atheism (16).²⁴

Nevertheless, the heterodox void became the subject of heated debate in the seventeenth century, when Robert Boyle’s pneumatic experiments and Isaac Newton’s mechanical physics challenged the established orthodoxy of the Aristotelian plenum. Boyle’s air-pump created an experimentally operative vacuum, while Newton’s principle of universal gravitation operated in the vacuum of space. However, as Shapin and Shaffer insist, Boyle never set out to prove the metaphysical existence of a vacuum.²⁵ Rather, Boyle was determined to demonstrate the experimental efficacy of his “engine” and the vacuous integrity of his receiver. Meanwhile, Newton’s ideas about the vacuum and the possible existence of ether were fuzzy. While it is generally acknowledged that the mechanical theories put forth in Newton’s *Principia* were based upon the assumption of empty interstellar space, Newton, at various points in his career, also expressed belief in the existence of all-pervading ether. In a famous letter to Boyle, Newton acknowledged the existence of “an exceedingly subtle and elastic aethereal substance, which is diffused through all places, fills the pores of gross bodies and forms a large constituent of their bulk or volume.”²⁶ That is, the two prodigious challenges to the Aristotelian plenum in the late-seventeenth and early-eighteenth centuries, Boylean pneumatics and Newtonian mechanics, were neither decisive nor incontrovertible in overthrowing the existence of the ether.

Accordingly, in the eighteenth century, ether theories, called upon to account for a variety of physical and physiological phenomena, flourished and multiplied. As J. R. R. Christie notes, eighteenth-century ether “appeared in a proliferating variety of guises and performed a bewildering number of roles” (85).²⁷ Indeed, the great difference between the ether theories of the eighteenth century and the ether theories of the second half of the nineteenth is the multiplicity of the former and the singularity of the latter. In an article in the *Fortnightly Review*, published in 1866, G. H. Lewes confidently expresses the acceptance of this new universal medium: “how the phenomena of Light, Heat, Electricity, and Chemical Affinity—once supposed to be distinct Forces—have been reduced to one common term, and shown to be Modes of Motion, every reader is aware” (894). According to Lewes, by 1866, “every reader” knew that all physical forces were “reduced” to “modes of motion.” That is, by the time Pater published his unsigned review, “Poems by William Morris,” the article from which the “Conclusion” is adapted, in the *Westminster Review* in 1868, the idea that all physical phenomena were attributable to undulatory ripples in an all-pervading medium had gained widespread credence. Indeed, as early as 1862, the Victorian writer, Anne Gilchrist, exclaimed: “Empty space! it is a delusion. Between us and the sun, between us and the remotest star whose beams strike upon human eye, there is no void” (342).²⁸

What prompted this transformation from a multiplicity of mysterious fluids to one all-pervading medium? According to M. Norton Wise, it was not until the late 1840s that the “many ethereal media” (electric, magnetic, caloric, luminiferous, and gravitational) found “a common foundation” (269).²⁹ According to Wise, three mid-nineteenth-century developments – the wave theory of light, the theory of conservations of force, and the mechanical theory of heat – coalesced to give new credence to the theory of an all-pervading medium. While Wise argues that the wave theory of light was “too limited in its range of applications to compel general assent,” in the Victorian press the “luminiferous ether” was frequently singled out as the catalyst for the popularization of the theory of an all-pervading *Urstoff* (269). In “La Physique Moderne,” Smith claims that “the branch of science which ought first to be mentioned in connection with our [ether] theory is evidently optics, because to this we are indebted for our belief in the

existence of matter in that condition we call ether” (286). Similarly, in his massive treatise, *Cosmos*, Alexander von Humboldt distinguishes between ancient and modern ether theories based upon the latter’s rigorous study of light: modern physicists have explained, “on purely mathematical principles, the propagation of light, with all its properties of double refraction, polarization, and interference” (39).³⁰ With multiple articles on “The New Theory of Light” appearing in the periodical press during the 1860s, the Victorian reader would have become familiar with the theory of an all-pervading medium through the wave theory of light and the luminiferous ether.³¹

Accordingly, when Pater refers, seemingly in passing to “the study of light” in the Preface, it is likely that that his Victorian audience would have seen this as a reference to the luminiferous ether and the theory of light’s undulatory vibrations in a pervasive material medium (3). Coming at a crucial juncture in the Preface, where Pater turns Matthew Arnold’s dictum—“to see the object as in itself it really is”—on its head, overthrowing Arnold’s objectivity in favor of a discriminating subjectivity, the scientific authority invoked by this brief mention of “the study of light” impacts how we assess the ethics of Pater’s decadent aesthetics:

What is this song or picture, this engaging personality presented in life or in a book, to *me*? What effect does it really produce on me? Does it give me pleasure? and if so, what sort or degree of pleasure? How is my nature modified by its presence and under its influence? The answers to these questions are the original facts with which the aesthetic critic has to do; and, as in the study of light, of morals, of number, one must realise such primary data for oneself or not at all. (3)

That Pater’s solipsism—registered in that emphatic “to *me*”—is but the logical extension of a rigorous (and skeptical) empiricism has been forcefully argued, in different terms, by a number of critics.³² However, I contend that Pater’s empiricism owes its particular flavor, its penchant for the “influence” of subtle vibrations, to “the study of light” and the all-pervading ether. With the emplacement of the human in a sea of undulatory, concussive vibrations, the notion that “my nature” might be “modified” by a song or picture is not a fanciful or egotistical flight from objective reality. Rather, by heeding the physical impact of acoustic and luminous waves on the human frame, Pater probes the aesthetic and ethical consequences of the new universal plenum and its pulsations.

III. Good Vibrations?

Submitted to rigorous mathematic and experimental investigations by James Clerk Maxwell, Lord Kelvin, and John Tyndall, the ether theories of the 1860s recast the ancient, metaphysical notion of a plenum as a scientifically verifiable concept. Not only is this ethereal medium inescapable, it is constantly aquiver with vibrations and pulsations that leave no room for rest. “To the conception of space being filled,” remarked John Tyndall, “we must now add the conception of its being in a state of incessant tremor” (142).³³ While such ceaseless frisson introduces a tone of titillation to Tyndall’s portrayal of the universe’s pulsating energies, the unavoidable “conclusion” to be drawn from humanity’s enmeshment in an inescapable, quaking medium is simply this: the human being is an instrument played by – a receptacle attuned to – an impersonal field of forces. It is against the inescapable tumult of this space-filling fluid that Pater’s vacuous historiography pokes its holes.

Pulsation and impression, two words closely associated with Paterian aesthetics. Two words repeatedly invoked by physicists and the Victorian popular press in their description of the ether. “Bodies whose particles vibrate,” writes the physicist C. K. Akin, “impress their motions on the surrounding ether, which propagates the same through space” (615).³⁴ The “whose” in Akin’s sentence is misleading. According to the regime by which all physical phenomena are reducible to “modes of motion,” all bodies vibrate. All bodies pulse and quake in the redounding tumult of the ether. Besides Lord Kelvin and his “fits of ether dipsomania,” no other Victorian scientist grew more ecstatic about the ether’s pulsations than John Tyndall.³⁵ Across multiple articles about light and heat published in the 1860s, Tyndall waxes poetic about “the thrilling of pulses” in an all-pervading ether (132).³⁶ Take, for example, this particularly suggestive passage from “The Constitution of the Universe”:

This all-pervading substance takes up their molecular tremors, and conveys them with inconceivable rapidity to our organs of vision. The splendour of the firmaments at night is due to this vibration. It is the transported shiver of bodies countless millions of miles distant which translates itself in human consciousness into the aspect of the stars. (130)³⁷

It bears repeating: “the transported shiver of bodies.” In Tyndall’s representation of the new universal plenum, the night sky carries the caress and throb of far distant bodies to “our organs.” Visual perception never sounded so sexy. Stargazing, for the enthusiastic Tyndall, is quite literally thrilling.

The thrill, however, might be lost in translation. In her triumphant declaration of the death of the void and the advent of the ether, Anne Gilchrist concedes that, “our organs are not so finely attuned to catch so subtle a reality” (342). In subjunctive longing, Tyndall wishes for finer organs: “could we see the motion of the ether—had we organs fine enough to observe its waves, we should notice this thrilling of pulses to and fro” (132). While Victorian ether commentators admit the limitations of the human sensory apparatus, they nevertheless stress the physiological reception of ether pulsations. Indeed, since it claimed universal applicability and material ubiquity, the Victorian conception of ether necessarily drew the human frame into its matrix. Hence, Tyndall begins his lecture “On Radiation” by foregrounding the fact that “between the mind of man and the outer world are interposed the nerves of the human body, which translate, or enable the mind to translate, the impressions of that world into facts of consciousness and thought” (5).³⁸ Crude as they may be, our nervous bodies “interpose” between subjective experience and the material universe: they operate as interpretative interfaces for the impressions and pulsations of ether-waves. In this way, the ether’s ceaseless motions not only affected Victorian conceptions of the constitution of the material universe, but also the constitution of human perception.

Turning the entire physical universe into an agitated field of forces, extending beyond and reverberating back upon the human with “inconceivable rapidity,” the pervasive ether tantalizes but it also disturbs human existence. Tyndall describes how such titillation brings the possibility of overstimulation: “we on the earth’s surface live night and day in the midst of ethereal commotion” (132). “The medium,” writes Tyndall, “is never still” (132). Indeed, as another Victorian commentator notes, seemingly solid bodies, which to all appearances lie in repose, may be “the arena of incessant and violent motion” (287).³⁹ While such disruptions and agitations occur at the utmost fringe of human perception, for Pater, the subtle violence of these perturbations dissolve the human subject. In his famous description of the physical experience of

the “delicious recoil” of rain on a summer day in the “Conclusion,” Pater casts “the whole physical life” in this moment as but “a combination of natural elements” that dissolves and merges the human subject into its elemental surroundings:

But these elements, phosphorus and lime and delicate fibres, are present not in the human body alone: we detect them in places most remote from it. Our physical life is a perpetual motion of them—the passage of the blood, the wasting and repairing of the lenses of the eye, the modification of the tissues of the brain by every ray of light and sound—processes which science reduces to simpler and more elementary forces. Like the elements of which we are composed, the action of these forces extends beyond us; it rusts iron and ripens corn. Far out on every side of us those elements are broadcast, driven by many forces (118).

While the passage dissolves the human body into its physical constituents (phosphorus and lime), these chemical elements are reducible to “simpler and more elementary forces.” That is, Pater’s chemistry gives way to the new physics that conceives of all matter as “modes of motion,” such that “our physical life is a perpetual motion” of “forces.” Building upon the Preface’s gesture toward “the study of light,” the passage intimates its ties to the new physics of “light and sound” and, thus, to the study of vibratory waves in a pervasive medium. Indeed, the frail, decomposing human frame is enmeshed in forces that “extend beyond us,” merging it with “places most remote from it.” Like Tyndall’s reception of the “transported shiver of bodies countless millions of miles distant,” Pater’s disintegrating subject is similarly embedded in processes that “broadcast” her elements “far out on every side.” Prefiguring the language of radio and television transmission, Pater and Tyndall tune our bodies to the transmission and reception of “transported” signals and “broadcasted” energies.

While the dissolution and absorption of the human in a field of endless pulsations figures the human body as radically open to the world, in another famed passage from the “Conclusion,” Pater describes the absolute isolation of individual subjectivity, where “experience” is “ringed round for each one of us by that thick wall of impersonality” such that each mind is left “keeping as a solitary prisoner its own dream of a world” (119). Is human life coextensive with a vast, turbulent universe? Is it utterly discontinuous with that universe? Or could it be that our existence is “dwarfed” to “its narrow chamber” because it is too exposed, too vulnerable to the perpetual motions of the physical world (119)? Before committing us to our individual prison cells, Pater remarks that, “experience seems to bury us under a flood of external objects, pressing upon us with a sharp importunate reality, calling us out of ourselves in a thousand forms of action” (118). As noted above, in “Diaphaneité,” Pater decries the constriction of space that forbids the flourishing of the “one happy spot in our nature.” He goes on to characterize that impediment as a condition of “our collective life, pressing equally on every part of every one of us,” which “reduces us to the level of a colourless, uninteresting existence” (139). While our solitary “uninteresting” existence emerges in the “press” of “our collective life,” these “impressions” exposes and connect the individual to the collective life of the universe.

Pater was not alone in deriving utter solitude from the experience of raw exposure. In a review of Tyndall’s lecture “On Radiation,” one Victorian reviewer, responding to Tyndall’s portrayal of the interposition of the nerves “between the mind of man and the outer world,” expresses a sentiment remarkably similar to Pater’s: “we can no more transcend the reports furnished to our consciousness by these external watchmen than a man imprisoned in a stone

building can contemplate the aspect of the surrounding country in any other direction than that in which its windows look out” (468).⁴⁰ Exposed to the ceaseless perturbations of radiant heat, the human subject can only receive “reports” and such reception, invoked in the repeated trope of imprisonment, containerizes existence. It turns human life into “colourless” rooms. In the Victorian embrace of the new universal plenum, we are already “receptacles” – containers and instruments that receive sensory data. At the end of “On Radiation,” Tyndall offers a striking image of the human being tuned for constant receptivity:

If you open a piano and sing into it, a certain string will respond. Change the pitch of your voice; the first string ceases to vibrate, but another replies...Now, in altering the pitch, you simply change the form of the motion communicated by your vocal chords to the air, one string responding to one form, and another to another. And thus is sentient man sung unto by nature, which the optic, the auditory, and other nerves of the human, are so many strings differently tuned and responsive to different forms of the universal power. (47-48)

Riffing on Coleridge’s “Aeolian Harp,” Tyndall depicts “sentient man” as trembling, not on an intellectual breeze, but with the incessant vibrations of light, heat, and electromagnetism. If Coleridge’s breeze, “plastic and vast,” spiritualizes his “organic Harp,” Tyndall’s “universal power” is distinctly material, communicating its vibrations via “the optic, the auditory, and the other nerves of the human.” Nevertheless, both images configure human beings as instruments strung for and “sung unto” by nature, turning us into passive, yet “responsive” containers of the universal music. While Tyndall thrills to the touch of this all-pervading medium, Pater reveals the claustrophobic compression of nature’s relentless strumming. Flooded, pricked, and plucked by “importunate reality,” is it really a wonder that the human mind takes refuge in its “narrow chamber”? However, such an involuntary retreat or withdrawal from the “strange perpetual weaving and unweaving” of our turbulent lives must be distinguished from the cultivated withdrawal performed in Pater’s vacuous historiography. The former defines the constrictions of empiricism; the latter, the elevation of art. To move beyond the constrictions of empirical data and its cruel pressings, we need “finer” instruments. To witness the ether’s subtle modes of motion, Tyndall employs the air-pump. To subtilize the atmosphere and escape a stifling homogeneity of experience, Pater employs a vacuous historiography.

IV. A Chill and Empty Atmosphere

At the beginning of the chapter, I traced the relationship between common and rarefied air in Pater’s representation of the Renaissance, arguing that Pater constructs a vacuous historiography where “leaks in the plenum” become transhistorical bubbles – ancient blanks left to be filled by modern minds. Having placed this vacuous historiography in dialogue with the Victorian conception of the universal ether, I want to turn now to the air-pump so as to draw out Pater’s methodology of detachment – a method associated, by turns, with the work of the critic and the genius of the artist. Both work through a process of selection, isolating the elemental data that becomes the subject of their works. But to the artist goes a special task – he must recombine the elemental data in a new, delightful ways. Indeed, we might say that the artist recomposes, while the critic decomposes. But between the work of the artist and that of the critic falls the composition of the art object, which is the receptacle of elemental recombination, channeling and

containing the subtle forces of nature. But the subtle forces of the new universal plenum are simultaneously overbearing and undetectable – outside the range of our feeble organs and yet inside every intimate gap of the universe. How then does the artist access *and* disengage this tenuous, ensnaring mesh of forces? Like Winckelmann, who Pater credits with laying open a “new organ” for the study of art, the artist and the critic need a new instrument to isolate nature’s subtleties. That instrument is the air-pump. In the space of the exhausted receiver, the air-pump gives the experimentalist the power to select, isolate, and detach nature’s most subtle forces. In what follows below, I place Pater’s methodology of critical detachment in dialogue with Tyndall’s heat experiments of the 1860s. These experiments, as I show, brought the air-pump out of its domesticated and industrialized retreat into the arena of experimental performance.

While Pater represents the critic as decomposing, and the artist as recomposing, the elementary data of aesthetic experience, both practices require an underlying capacity for isolation and detachment. In the Preface, Pater argues that “the function of the aesthetic critic is to distinguish, analyse, and separate from its adjuncts” the power of art to produce its “special impression of beauty or pleasure” (4). The critic’s end is reached when “he has disengaged that virtue, and noted it, as a chemist notes some natural element” (4). While the critic decomposes art’s elemental virtues through a process of chemical separation and analysis, the artist practices a craft of recombination that begins with a process of isolation. For example, Sandro Botticelli’s genius lies in his manipulation of “the data,” “rejecting some and isolating others, and always combining them anew” (31). While Botticelli’s practice of data-isolation, cast as a capricious desire “to play fast and loose with those data,” might construe such a methodology as idiosyncratic, Pater comes to define *all* artistic genius in terms of the wedded skills of isolation and recombination. Hence, in the essay on “Winckelmann,” Pater argues:

The base of all artistic genius is the power of conceiving humanity in a new, striking, rejoicing way, of putting a happy world of its own creation in place of the meaner world of common days, of generating around itself an atmosphere with a novel power of refraction, selecting, transforming, recombining the images it transmits, according to the choice of the imaginative intellect (106-7).

Herein lies the difference between the artist and the critic: the artist creates a world that “generates” its own “atmosphere.” Such atmosphere-generating power is not explicitly granted to the critic. However, as I have suggested, Pater’s aesthetic historiography constructs its own interstitial atmosphere. Like Pater’s rarefied historiography, the artist generates an atmosphere defined by its internal rupture: it is defined by its power of “refraction,” breaking and deflecting the path of its own luminous airs through a process of selection that creates a kaleidoscopic transformation of redounding images. But how does the artist create this atmosphere? It comes down to a matter of “choice,” a process of atmospheric manipulation: the modern artist must “define in a chill and empty atmosphere the focus where rays, in themselves pale and impotent, unite and begin to burn” (107). The artist makes his “choice” via the “chill and empty” space of the exhausted receiver. His method is the method of the air-pump.

While the air-pump enjoyed a place of notoriety in the seventeenth-century, by the nineteenth-century, it had become benignly absorbed into the practices of professional and amateur science and readily adapted to a number of industrial applications. In *Consolations in Travel*, Humphry Davy, proselytizing the study of chemistry to his lay audience, claims that “the apparatus essential to the modern chemical philosopher is much less bulky and expensive than

that used by the ancients” (250). At the top of Davy’s list of affordable and transportable apparatus is “an air-pump” which can be easily “contained in a small-traveling carriage” and transported for a “few pounds” (250).⁴¹ Davy’s travel-size air-pump is hardly the stuff of scientific controversy. In a similar vein, the Victorian mathematician and philologist, Alexander John Ellis urges Alpine travelers to bring “a barometer of some sort—at the least a good aneroid barometer which has been graduated under the air-pump to a pressure of 13 inches” with them on their explorations so as to take accurate barometric readings on mountain-tops (17).⁴² Not only domesticated for travelling chemists and meteorological Alpinists, the nineteenth-century air-pump was put to work, contributing both rarefaction and compression to the mechanization of labor. Prior the invention of the “injector condenser,” the exhaust from steam engines was channeled into a “condenser” and pumped out by a large “air-pump” (197).⁴³ From this basic application in the steam engine, the air pump found its way into more specialized applications, including sugar-refining, the sizing and wetting of paper, the dyeing of fabric, the ventilation of crowded ships, and perhaps, most intriguingly, the so-called “atmospheric railway” – a pneumatic transportation system designed, tested, and aborted in the 1840s.⁴⁴ With the exception of the atmospheric railing, which caused a brief stir, the history of the air-pump in the first half of the nineteenth century was distinctly uncontroversial. Experimental controversy gave way to industrial application and dilettante observation.

However, with John Tyndall’s experiments on heat in the 1860s, the space of the exhausted receiver became once again the space of experimental inquiry and philosophic debate. Tyndall’s *Heat Considered as a Mode of Motion* and *On Radiation* were first delivered first as lectures given, respectively, at the Royal Institution in 1862 and at Cambridge in 1854. Subsequently published in book editions with detailed illustrations, Tyndall’s heat experiments were extensively reviewed and discussed in the periodical press. In these reviews, the role of the air-pump is highlighted. In an article published in *The London Reader*, the reviewer describes how “in Tyndall’s classic experiments on the absorption of heat by vapours and gases, he takes as his unit of comparison the amount of heat which passes through a perfectly exhausted cylinder” (355).⁴⁵ Similarly, in an article in *The Reader*, the reviewer reports on the introduction of vapors into an “airtight” tube, from which “the air was exhausted” (537).⁴⁶ Referring to an experiment I will discuss in detail below, another article in *The Reader* reports how “the gas in the radiating chamber was heated by the collision of its own particles against the inner surface of the tube when they rushed in to fill the vacuum” (66).⁴⁷ After a century and a half of unassuming labor, the air-pump once again became the focus of experimental notice.

In both *Heat as a Mode of Motion* and *On Radiation*, the air-pump functions as an “organ” or instrument of perception, allowing Tyndall’s audience to observe the subtle forces of nature. Because the air-pump is called upon to help his audience and readers observe phenomena outside the range of human perception, Tyndall meticulously describes his experimental system in a way that chimes with Shapin and Shaffer’s account of Boyle’s prolix narratives – a “technology” designed to establish “virtual witnesses” (60). According to Shapin and Shaffer, the technology of virtual witnessing “involves the production in a reader’s mind of such an image of an experimental scene as obviates the necessity for either direct witness or replication” and was “the most powerful technology for constituting matters of fact” because “the multiplication of witnesses could be, in principle, unlimited” (60). In imitation of Boyle’s technology of virtual witnessing, Tyndall, at the outset *Heat as a Mode of Motion*, highlights his “anxious” desire to facilitate his audience’s ability to see and observe his experiments:

It is my first duty to make you acquainted with some of the instruments which I intend to employ in the examination of this question [the philosophy of Heat]. I must devise some means of making the indications of heat and cold visible to you all, and for this purpose an ordinary thermometer would be useless. You could not see its action; and I am anxious that you should see, with your own eyes, the facts on which your subsequent philosophy is to be based. (14)

Employing a direct address, Tyndall calls upon “you” to observe the operations of heat. “You” must see. “You” must gather your own facts with “your own eyes.” To facilitate such virtual witnessing, Tyndall describes even the most complex experiments with remarkable clarity and precision, guiding his reader through the design, construction, and operation of each “instrument.” In addition to his lucid verbal descriptions, the text is illustrated with elegant and fastidiously labeled images of his experimental devices, including the release of air from a pressurized vessel (Figure 4) and variety of glass receivers (Figures 5-7).

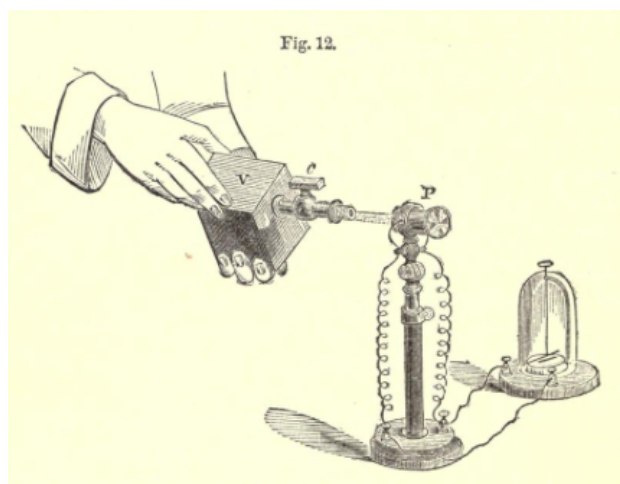


Fig. 4

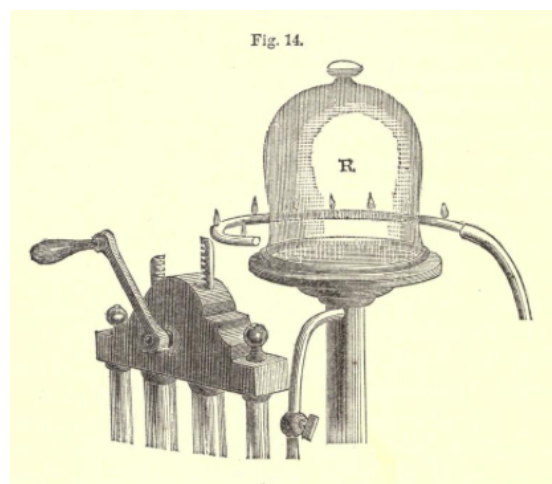


Fig. 5

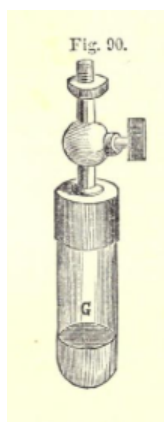


Fig. 6

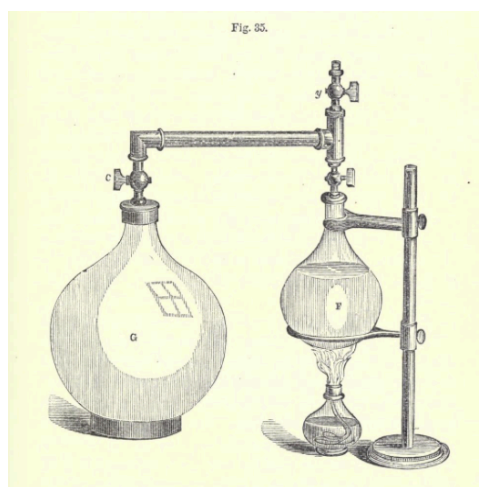


Fig. 7

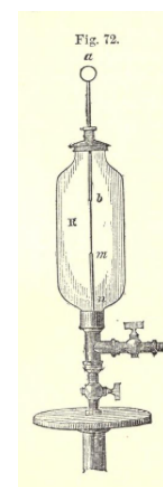


Fig. 8

John Tyndall, *Heat Considered as a Mode of Motion*, New York: Appleton and Company, 1869.
 From left to right, figures refer to images on p. 27, p. 46, p. 358, p. 133, and p. 72.

Over the course of thirteen lectures in *Heat Considered as a Mode of Motion*, Tyndall performs a number of increasingly complicated experiments to reveal the invisible operations of heat. Indispensable to these experiments is the thermoelectric “pile,” *P*, represented in Figure 4. A series of plates of dissimilar metal laid one on another to produce an electrical current, the “pile” receives heat as an electrical current. Connected via copper wires to a “galvanometer,” the current moves a magnetic needle (contained in the bell-jar in the background of Figure 4). The swinging of the needle registers—and thus makes visible—the change in temperature. Employing the pile and the galvanometer, Tyndall first performs several simple experiments designed to show that heat is generated by the expenditure of mechanical force. He next endeavors to demonstrate the inverse, that is, “the consumption heat in mechanical work” (26). To do so, he employs an air-pump – not to evacuate air, but to compress it. After compressing the air into vessel, *V*, he allows the vessel to rest so that the temperature of the air within the vessel is the same as the air in the room (Fig. 4). When Tyndall turns the stopcock, allowing the air to rush out of the vessel and to strike the face of the pile, the rushing air performs mechanical work and, thus, it consumes the heat that had been generated as it pressed against the sides of the vessel. The air is “chilled” (28). In this basic experiment, Tyndall isolates the mechanical work of air. In essence he detaches one property of the air – its elasticity – and makes that otherwise invisible property visible thanks to the isolation of effects achievable with the air-pump.

Since we are particularly concerned with Pater’s definition of aesthetic labor as the practice of placing an aesthetic subject in “a chill and empty atmosphere,” I want to examine a few more of Tyndall’s air-pump experiments that center upon the chilling of air *in vacuo*. In an experiment designed to illustrate “the thermal effect produced in air by its own mechanical action,” Tyndall takes a tin tube, stopped at both ends, and connects it to an air-pump (43). Before evacuating the air, he brings the face of the pile up against the tube to show that the air within the tube is warm. Then, his assistant works the air pump, removing the air from within the tube, and the needle swings in the direction of cold. Reversing the experiment, Tyndall turns the stopcock; the air to rush back into the tube; it “hits the inner surface of the tube like a projectile”; and the needle swings in the direction of heat (44). Here, then, Tyndall isolates the air’s concussive force – its pressure – and makes its mechanical action, and its related effect on temperature, visible. In order to further demonstrate “this chilling of the air by rarefaction,” Tyndall elaborates upon the previous experiment, by manipulating the aqueous vapor latent in the air – vapor that remains invisible unless it drops below a certain temperature (45). When the air is chilled, the vapor “will instantly condense, and form a visible cloud” (45). To make this cloud of chilly air visible to a large audience, Tyndall rings his glass receiver, *R*, with six little gas jets (Fig. 5). Accordingly, when the cloud forms, “the dimness which it produces will as once declare its presence” (46). The pump is worked; the vapor forms; the cloud dims the light. Reversing the experiment, the air is released back into the receiver; it is heated; the cloud melts away; and the lights shine clearly. Here, then, Tyndall isolates the air’s aqueous vapor – its elemental composition – and makes it visible. Moreover, this experiment demonstrates how air, through its own admixture, can generate “its own atmosphere” – an atmosphere capable of dimming and deflecting the light of the ringed flames. Indeed, in the illustration, a shimmering cloud hovers within the receiver, *R*, blurring and bending the tapered flame (Fig. 5). Crucially, for my reading of Pater’s methodology of detachment, the isolation of atmospheric qualities allows us to see that rarefied air *is* chilled air. Or, in Pater’s language, an empty atmosphere *is* a chill atmosphere. While these experiments with chilled air make use of flames, I think we must

look to another experiment by Tyndall to comprehend Pater's curious description of the ignition of a flame in an empty atmosphere – curious because fire needs oxygen to ignite.

Not only does the airless ignition of fire sound like an experimental absurdity fit for the inhabitants of Laputa, but also, and more problematically, Boyle's air-pump experiments of the 1660s were decisive in identifying the necessity of air for ignition. In Victorian representations of the air-pump experiments of the 1660s, the extinction of fire is mentioned alongside crueler extinctions – animal test subjects suffocate and “fire is extinguished” in the exhausted receiver (56).⁴⁸ In his chapter on Boyle in *Religio-Chemici*, George Wilson notes that, while “the necessity of air to the maintenance of combustion” has been perceived since “the earliest times,” Boyle's experiment help to “dissipate some of the vagueness” (222-3).⁴⁹ Wilson describes how Boyle encloses in his engine “lighted candles, portfires, loaded pistols, which he fired by dexterous contrivances, and many other arrangements of combustible bodies” (223). Through these tireless experiments, Boyle could “infallibly demonstrate that without air, flame could not exist” (223). Despite the seeming impossibility and illogicality of an airless ignition, two Victorian developments help remove these obstacles. First, electric lamps existed in Victorian Britain, and electric lamps do not require oxygen to ignite. But the question then becomes how can we see an airless ignition? How can light and heat travel through a vacuum? As discussed above, the second Victorian development in question is that mysterious, space-filling fluid: ether.

In Lecture VIII, originally delivered 13 March 1862, Tyndall introduces the concept of ether, heretofore excluded from his lectures, through an experiment originally performed by Humphry Davy. In this experiment, Tyndall uses an elongated glass receiver (see Fig. 8) fitted at the bottom with a metal rod, *m n*, and at the top with a metal rod, *a b*, which “can be moved up and down through an air-tight collar” (257). Tyndall, then, attaches “a bit of retort carbon” to each of the ends *m n* and *a b* (262). (Retort carbon is the residual remains of coal when the gas has been extracted by heating; it is a good conductor of heat and electricity.) Tyndall exhausts the receiver; he brings the coal points together and sends a current from point to point: “the moment I draw the points a little apart, the electric light blazes forth” (262). Receiving a “portion of the rays,” the galvanometer needle flies into action, showing the presence of heat. “And this,” writes Tyndall, “has been accomplished by rays which have crossed the vacuum” (262). How does light and heat travel through a vacuum? It travels, like those transported shiver of distant bodies, via the universal plenum. If Tyndall laments that we lack organs “fine” enough to perceive the quivering ether, then, through the experimental space of the exhausted receiver, he develops a method of detachment and isolation that refines his – and his audience – senses. While medial extensions, per the logic of Marshall McLuhan, expand human sensation only to numb and desensitize it, the air-pump just might be the original “cold” medium – a medial extension that cools and refines the senses as it chills and rarefies the air.

Cooling and refining the senses, the methodology of the air-pump allows the artist and the critic not only to detect those subtle forces that lie beyond the scope of human perception, but also to disengage an element from the tumultuous mesh of the universal plenum. If, at the beginning of the chapter, I argued that Pater's vacuous historiography looks to the blanks and gaps in history as points of aesthetic and ethical affordance, it now becomes possible, at this juncture, to appreciate the particular value that inheres in those blank spaces. Transhistorical vacuity – wedded to and achieved through critical detachment – presents a form of freedom still tenable in a modern world increasingly enmeshed in far-flung chains of influence and inescapable waves of causality.

V. Approximate Freedoms

In Lucretius' atomic theory, the void is the precondition for atomic movement. While the *clinamen* – the atom's unpredictable swerve – occasions chance collisions that bring form into being, the void gives the atoms the opportunity to deviate, dance, crash and enter into formal configurations. In his article, "The Atomic Theory of Lucretius," published in *The North British Review* in 1868, Fleeming Jenkin pinpoints, via a vivid description of the void's antithesis, the void's significance:

Lucretius thought that, in order to explain the properties of matter, it was absolutely necessary to admit the existence of vacuum, or empty space containing nothing whatever. If there were not void, he says, things could not move at all! And it does seem, at first sight, that in a universe absolutely full, like a barrel full of herrings, so shaped as to leave not a cranny between them, no motion whatever would be possible. (213-4)

"Like a barrel full of herrings," a universe devoid of void would be a world of absolute constriction and compaction. In his jeering description of the plenum as a "jam," "block," or "fix," J. F. W. Herschel registers his disdain for the ether and his discomfort with the logical implications of an all-pervasive, ubiquitous substance. For Herschel, the idea is "oppressive." While Tyndall and Kelvin seized upon the ether as an elegant solution to mechanical and mathematical problems, other Victorians were less enthusiastic about the prospect of life in a barrel full of herring.

For these other Victorians, the vacuum was not simply no-thing. The vacuum was the precondition for movement – for freedom – and so when Pater, like Herschel, "leans to the vacuum" in his conception of history and art, he leans toward freedom. However, for all his dreamy celebration of ancient ideas, and certainly the vacuum is a relic of a former age, Pater was too much a man of his times not to appreciate the extent to which the vacuum had been squeezed out by the physical sciences and their many "modes of motions" and their all-pervading ether. Hence, at the end of "Winckelmann," Pater speculates on what freedom is left to modern man:

The chief factor in the thoughts of the modern mind concerning itself is the intricacy, the universality of natural law, even in the moral order. For us, necessity is not, as of old, a sort of mythological personage without us, with whom we can do warfare: it is a magic web woven through and through us, like that magnetic system of which modern science speaks, penetrating us with a network, subtler than our subtlest nerves, yet bearing in it the central forces of the world. Can art represent men and women in these bewildering toils so as to give the spirit at least an equivalent for the sense of freedom?

By attending to the history of the Victorian plenum, we can appreciate the full significance of Pater's seemingly oblique reference to "that magnetic system" that binds and permeates modern man. Transmitting light, sound, and electromagnetism, the all-pervading ether is, indeed, "woven through and through us." It is inescapable and oppressive. Noticeably, Pater does not ask if art can inspire or create freedom. No, he only asks if art can give "at least an equivalent for the sense of freedom." The air-pump approximates the freedom of the void.

Keenly aware of modern man's enmeshment in a turbulent field of forces, an entanglement always threatening to dissolve man's fragile existence, Pater turns to the air-pump and its methodology of isolation and detachment as a way to insert chilly, quiet blanks into that oppressive plenum. It is our modern approximation of the Hellenic repose – the *Heiterkeit* – that characterizes Winckelmann's indifferentism and impassivity. While the Hellenic idea of *Heiterkeit* implies blitheness and repose, the modern approximation of this ideal veers from blithe to bleak. Let us recall the tale of Apollo and Pico. Transhistorical vacuity, I contend, emerges in the empty grave. Indeed, the freedom expressed in the history of the Renaissance is a form of quiescence that not only borders on the deathly, but owes its structural rhythms to the grave. As Pater remarks in his discussion of Hellenic repose, "that high indifference to the outward, that impassivity, has already a touch of the corpse in it" (113). We might say more than a "touch" of the corpse. Botticelli's Venus is "cadaverous" (33). Michelangelo's "true mistress" is "Death" (50). Leonardo's Medusa is "the head of a corpse" (60). And, of course, there is Leonardo's vampiric La Gioconda, who "has been dead many times, and learned the secrets of the grave" (70). But this deadly or decadent penchant for the cadaverous is but the outward expression of an underlying structure. In the conclusion to "Winckelmann," Pater expands and generalizes the structure of the "Pico" essay such that the history of the Renaissance becomes the opening of the grave: "when the actual relics of the antique were restored to the world, it was to Christian eyes as if an ancient plague-pit had been opened: all the world took the contagion of the life of nature and of the senses" (114). It is perhaps unsurprising that the Renaissance, that great cultural "rebirth," should spring Lazarus-like from the grave. Nevertheless, Pater construes the historical continuity between ancient and Christian culture as a gruesome transhistorical vacuity – the "leak in the plenum" is figured as a mass grave and its rarefied atmosphere is the breath of contagion. But this unsealing of the "plague-pit" is the unsealing of "the life of nature and of the senses." The empty grave is not just a symbol of renewal; it is the precondition for the pleasures and freedom of sensual life, for the swerves and deviances of a queer theory of history. By turning to that unlikely "relic" – the air-pump – we see that the historical gaps and interstitial pleasures of Pater's historiography poke holes in the Victorian plenum. Rarefying and depressurizing the oppressive atmosphere, the "chill and empty atmosphere" of the exhausted receiver – an apt name, I think, for Pater's modern man – allows for the critical isolation and detachment of the elemental forces that define aesthetic experience. In this way, the air-pump affords a delicate form of receptivity, an openness defined, howsoever paradoxically, by its isolation. It is precisely this paradoxical play of isolation and openness that typified those transhistorical bubbles – seemingly self-contained – yet sent forth to comingle with the "common air."

NOTES

¹ Herschel, J. F. W. "On Atoms," *Fortnightly review* 1 (1865): 81-4.

² "Art." *Westminster Review* 43.2 (1873): 638-46. In A. C. Benson's biography, *Walter Pater*, he identifies the author of this review as Mrs. Mark Pattison (37). See Benson, Arthur Christopher. *Walter Pater*. New York: Macmillan, 1906.

³ In his "Note on the Text" to the latest Oxford edition of Pater's text, the editor, Matthew Beaumont, suggests that it was "no doubt" Pattison's critique of the text's "weak" historiography that prompted Pater to retitling the second edition (xxx). Pater, Walter. *Studies in the History of the*

Renaissance. Ed. Matthew Beaumont. Oxford: Oxford University Press, 2010. All subsequent citations are from this edition.

⁴ Inman argues that Tyndall's "On the Relations of Radiant Heat to Chemical Constitution, Colour, Texture" provides "a scientific source that can explain" the flame image from the "Conclusion" (23). See Inman "The Intellectual Context of Walter Pater's 'Conclusion.'" *Prose Studies* 4:1 (1981): 12-30. Elaborating on this scientific context, Benson links Pater's impressionism to contemporary physics, arguing that both participate in "cultural fictions" of continuity. See Benson "'Catching Light': Physics and Art in Walter Pater's Cultural Context" in *One Culture: Essays in Science and Literature* edited by George Levine. See Tyndall, John. "On the Relations of Radiant Heat to Chemical Constitution, Colour, Texture." *Fortnightly Review* 15 Feb 1866: 1-15.

⁵ Kelvin's self-proclaimed intoxication with ether is from a letter addressed to George Fitzgerald dated 9 April 1896. See S. P. Thompson, *The Life of William Thomson, Baron Kelvin of Largs*, Vol. II., p. 1065. Steven Connor explains that Thomson's joke is "made possible by the practice of what was called 'ether-drinking,' which was still prevalent among 1890s decadents and bohemians such as Jean Lorrain, whose *Sensations et Souvenirs* of 1895 had been translated as *Nightmares of an Ether Drinker*. It suggests a connection between the inebriation of the ether idea and the more literal kinds of intoxication by the substance that, not entirely by coincidence shares its names" (159-60). See Connor, *The Matter of Air: Science and Art of the Ethereal*.

⁶ A. A. Michelson, *Light Waves and their Uses*, Chicago: University of Chicago Press, 1903, p. 162.

⁷ In the Preface to Experiment 38, titled "About an Attempt to examine the Motions and Sensibility of the Cartesian Materia subtilis, or the Aether, with a pair of Bellows (made of a Bladder) in the exhausted Receiver," Robert Boyle, in a characteristic gesture, alludes to the metaphysical debate prompting his experiment even as he distances himself from and denies his participation in such philosophical dispute: "I will not now discuss the Controversie betwixt some of the Modern Atomists, and the *Cartesians*; the former of whom think, that betwixt the Earth and the Stars, and betwixt these themselves there are vast Tracts of Space that are empty, save where the beams of Light do pass through them; and the later of whom tell us, that the Intervals betwixt the Stars and Planets (among which the Earth may perhaps be reckon'd) are perfectly fill'd, but by a Matter far subtler than our Air, which some call Celestial, and others *Aether*. I shall not, I say, engage in this controversie" (128). However, Boyle is willing to try to test, via his experimental method, the effects of this subtle matter: "wherefore I thought it might very well deserve a heedful Enquiry, whether we can by sensible Experiments (for I hear what has been attempted by Speculative Arguments) discover any thing about the Existence, or the Qualifications of this so vast Aether: and I hoped our Curiosity might be somewhat assisted by our Engine" See Boyle, *A continuation of new experiments physico-mechanical, touching the spring and weight of the air and their effects* (128-132). For this experiment's place in the debates between Boyle and Hobbes, see Shapin and Schaffer's discussion in *Leviathan and the Air-Pump* (182-4).

⁸ This, I think, should feel intuitively true for the critic who is always on the hunt for the little gap in the critical dialogue that affords her footing for an "intervention," that is, a vacant place to come between the others.

⁹ My thinking about emptiness and vacuity draws upon Alain Badiou's reading of Beckett's "return to the void" (101); Blanchot's conception of literature as "the silent void" (22); and Levinas' exploration of "existing without existents" (45-6) and his vision of nothingness as "an

atmospheric density, a plentitude in the void” (46). In reference to the politics of emptiness, I am thinking of Judith Halberstam’s reading of the collaborative artwork of Cabello/Carceller, whose photographs of empty pools and empty bars prompts an analysis of the “longing and melancholy” as well as the “cycles of wealth” that fill the emptied-out space that, in turn, “demand that the viewer fill in the blanks.” See Halberstam, *The Queer Art of Failure*. Durham: Duke University Press, 2011, pp. 110-13. See also Badiou, Alain. *Handbook of Inaesthetics*. Trans. Alberto Toscano. Stanford, CA: Stanford UP, 2005. See Blanchot, Maurice. *The Space of Literature*. Trans. Ann Smock. Lincoln: University of Nebraska, 1989. See Lévinas, Emmanuel. *Time and the Other and Additional Essays*. Pittsburgh: Duquesne University Press, 1987.

¹⁰ Emmanuel Levinas, *Time and the Other*, Pittsburg: Duquesne University Press, pp. 51.

¹¹ I am referring here, respectively, to Eve Kosofsky Sedgwick’s *Epistemology of the Closet*, University of California Press, 1990, Anne-Lise François’s *Open Secrets: The Literature of Uncounted Experience*, Stanford University Press, 2008 and Heather Love’s *Feeling Backward: Loss and the Politics of Queer History*, Harvard University Press, 2007.

¹² Rachel O’Connell, “Reparative Pater: Retreat, Ecstasy, and Reparation in the Writings of Walter Pater.” *ELH* 82.3 (2015): 969-986.

¹³ Price, Matthew Burroughs. “A Genealogy of Queer Detachment.” *PMLA: Publications of the Modern Language Association of America* 130.3 (2015): 648-665.

¹⁴ In reference to Pater’s fastidious and laborious writing process, Ward describes “the little squares of paper he shuffled about there, each with its idea, attempting to form sequence and pattern” (21). See Ward, *Walter Pater: The Idea in Nature*. London: MacGibbon & Kee, 1966.

¹⁵ In his notes to the Oxford edition, Matthew Beaumont, suggests that this “mote” might be a reference to Matthew 7:3 and the proverbial mote in one’s eye (148). Given this scene of interstellar quiescence, it seems more likely that it alludes to the Lucretius’ void than to a condemnation of religious hypocrisy.

¹⁶ This image of motes dancing in a sunbeam has become a popular shorthand for Lucretius’s atomic theory. Greenblatt uses this image to introduce Lucretian atomism: “the stuff of the universe, Lucretius proposed, is an infinite number of atoms moving randomly through space, like dust motes in a sunbeam, colliding, hooking together, forming complex structures, breaking apart again, in a ceaseless process of creation and destruction” (5). This image was already in circulation in Victorian Britain. In his 1868 article, “The Atomic Theory of Lucretius,” Fleeming Jenkin seizes upon this same image to explain Lucretius’ atomic theory: “the never-ending restlessness of his atoms, tossed like motes in a sunbeam, which he describes to illustrate the motion of the atoms in void” (220). See Greenblatt, *The Swerve: How the World Became Modern*, Norton, 2011 and Jenkin, “The Atomic Theory of Lucretius.” *North British Review* (1868): 211-242.

¹⁷ Steven Shapin and Simon Schaffer, *Leviathan and the Air-Pump: Hobbes, Boyle, and the Experimental Life*. Princeton UP, 1985.

¹⁸ For Pascal’s role in the air-pump debates of the seventeenth century, see Shapin and Shaffer, pp. 41-2, 55, 67, 85-6, 161, and 164.

¹⁹ Even if Pater did not read *Experiences nouvelles touchant le vide*, Pascal refers to his belief in the vacuum in the fragment on “Imagination” in *Pensées*. In this fragment, Pascal ventriloquizes his critics who censure him for his believe in the vacuum: “ ‘Because,’ say some, ‘you have believed from childhood that a box was empty when you saw nothing in it, you have believed in the possibility of a vacuum. This is an illusion of your senses, strengthened by custom, which

science must correct.’ ‘Because,’ say others, ‘you have been taught at school that there is no vacuum, you have perverted your common sense which clearly comprehended it, and you must correct this by returning to your first state.’ Which has deceived you, your senses or your education?” (55). *The Thoughts of Blaise Pascal*, trans. C. Kegan Paul. London: George Bell & Sons, 1901.

²⁰ Smith, William Henry. “La Physique Moderne.” *Blackwood’s Edinburgh Magazine* (1867): 281-93.

²¹ In what follows, I draw upon two very different texts for my understanding of the history of ether. Frank Close’s *The Void* provides a concise and accessible overview—from the perspective of a working physicist—of the history of “No-thing,” as he styles it in his introduction. Meanwhile, the anthology of essays collected in *Conceptions of Ether: Studies in the History of Ether Theories 1740-1900* offers detailed and nuanced accounts of modern ether theories. Both were invaluable in shaping my understanding of this curious subject. See, *Conceptions of Ether*, ed. G. N. Cantor and M. J. S. Hodge, Cambridge: Cambridge University Press, 1981. For a clear, bare-bones account of the physics of ether, see chapter 4, “Waves in What?” in Frank Close’s *The Void*, Oxford: Oxford University Press, 2007.

²² As Frank Close explains, “although the ideas of the atomist more nearly describe our modern picture of matter, it was Aristotle’s contrarian ideas that held sway for 2,000 years” (9). See Close, *The Void*.

²³ Martin Priestman provides a useful overview of Romantic and Victorian responses to Lucretius’ critique of religion and the charges of atheism brought against his modern supporters. See Priestman, “Lucretius in Romantic and Victorian Britain.” Eds. Stuart Gillespie and Philip Hardie. *Cambridge Companion to Lucretius*. Cambridge: Cambridge University Press, 2007. For an in-depth account of the Victorian debates surrounding Lucretian atomist, see Frank Turner, “Lucretius Among the Victorians.” *Victorian Studies* 16 (1973): 329-48.

²⁴ In seventeenth-century Britain, Lucretius atomism became more palatable to Christian readers thanks to Pierre Gassendi’s bowdlerized *Philosophiae Epicuri syntagma* (1649). As Robert Kargon explains, “whereas the ancient atomic hypothesis posited the inherency of motion in matter, thus removing God as a necessary efficient agent, Gassendi maintained that God was required to impress motion upon the atoms” (184). With this alteration, Epicurean philosophy experienced a revival that, according to Kargon, shaped the development of Robert Boyle’s “corpuscular” theory of matter. See Kargon, “Walter Charleton, Robert Boyle, and the Acceptance of Epicurean Atomism in England.” *Isis* 55.2 (1964): 184–192.

²⁵ Arguing against those who insist that Boyle was a “vacuist,” Shapin and Shaffer insist that: “Boyle was not ‘a vacuist’ nor did he undertake his *New Experiments* to prove a vacuum. Neither was he ‘a plenist,’ and he mobilized powerful arguments against the mechanical and nonmechanical principles adduced by those who maintained that a vacuum was impossible” (45).

²⁶ As I am interested in the Victorian reception of this history, I am citing Newton’s letter as it appeared in “Science.” *The Literary gazette: A weekly journal of literature, science, and the fine arts* 7.171 (1861): 327-9. However, for an account of this letter in relationship to the Hobbes-Boyle debates, see Shapin and Shaffer pp. 199-200.

²⁷ J. R. R. Christie, “Ether and the Science of Chemistry: 1740-1790,” pp. 85-110, in *Conceptions of Ether*.

²⁸ Anne Gilchrist. “The Indestructibility of Force.” *Macmillan’s Magazine* 6.34 (1862): 337-44.

²⁹ M. Norton Wise, “German Concepts of Force, Energy, and the Electromagnetic Ether: 1845-1880,” pp. 269-307, in *Conceptions of Ether*.

³⁰ Alexander von Humboldt, *Cosmos: A Sketch of a Physical Description of the Universe*, Trans. E. C. Otté, Vol. 3, London: George Bell & Sons, 1892.

³¹ For example, C. K. Akin writes: “it is well known to all that what is called light consists in certain kind of motion, which emanates from bodies called luminous, is propagated by a media called ether, and the impact of which on the retina gives us the sensation of light” (613). See, Akin “New Views on Light” *Fortnightly review* 4.23 (1866): 613-22. That this “new theory of light” was the foundation for the new universal ether of the 1860s is further suggested by John G. MacVicar who, referring to Clerk Maxwell’s “theory of the electro-magnetic field,” describes how, “with regard to light,” Maxwell’s theory “sanctions the idea that it is an electro-magnetic phenomenon.” See MacVicar, “On the New Theory of Light,” *The Reader* 5.119 (1865): 403. Additionally, in “Science,” the anonymous reviewer credits “the theory of Young that light consists in a vibration of the aether” with affirming “more powerfully than any previous argument to the adoption of the aether hypothesis” (328). “Science.” *The Literary gazette: A weekly journal of literature, science, and the fine arts* 7.171 (1861): 327-9.

³² For readings of Pater’s empiricism, see George Levine’s “Two Ways Not to be a Solipsist: Art and Science, Pater and Pearson.” *Victorian Studies* 43.1 (2000): 7-41; Peter Allen Dale, *The Victorian Critic and the Idea of History: Carlyle, Arnold, Pater*, Harvard University Press, 1977, pp. 173-85; Jonathan Loesberg, *Aestheticism and Deconstruction: Pater, Derrida, and de Man*, Princeton University Press, 1991. Loesberg argues that, “in desiring an ideal form within sensation, Pater does not contradict empiricism. Rather, he responds to the problem within the empirical definition of sensation” (20).

³³ John Tyndall, “The Constitution of the Universe.” *Fortnightly review* 3.14 (1865): 129-44.

³⁴ Akin, “New Views on Light.”

³⁵ In another lyrical moment, Tyndall describes the wash of the ether’s interstellar touch: “The ether which conveys the pulses of light and heat not only fills the celestial spaces, bathing the sides of suns and planets, but it also encircles the atoms of which these suns and planets are composed” (3). Tyndall, John. “On the Relations of Radiant Heat to Chemical Constitution, Colour and Texture,” *Fortnightly review* 4.19 (1866): 1-15.

³⁶ Tyndall, “The Constitution of the Universe.”

³⁷ Ibid.

³⁸ John Tyndall, *On Radiation, The Rede Lecture Delivered in the Senate House, Before the University of Cambridge, England, on Tuesday, May 16, 1865*. New York: Appleton & Co., 1871.

³⁹ Smith, “La Physique Moderne.”

⁴⁰ “On Radiation.” *The London review of politics, society, literature, art, and science* 11.278 (1865): 468-70.

⁴¹ Humphry Davy, *Consolations in Travel, or The Last Days of a Philosopher*. London: John Murray, 1830.

⁴² Alex J. Ellis. “On the Barometric Measurement of Heights.” *The Reader* 4.79 (1864): 17-8.

⁴³ “Mechanical Science.” *The Popular science review* 8.30 (1869): 195-7. For the introduction of a double piston in the air-pump, see “Method of Working an Air-Pump by Continued Motion, By Mr. Ritchie.” *The Kaleidoscope: or, Literary and scientific mirror* 7.342 (1827): 223. For the development of air-pump without valves, see Ritchie, “Scientific Records.” *The Kaleidoscope: or, Literary and scientific mirror* 7.320 (1826): 45. For general improvements with regard to the steam engine, see “Mr. Matthew Murray’s (Leeds), Patent for a Method of Constructing the Air-

Pump, and Sundry Other Parts Belonging to a Steam-Engine, by which there will be a Saving of Fuel, and an Increased Power Obtained.” *Monthly magazine* 13.86 (1802): 383-4.

⁴⁴ For the implementation of the air-pump in sugar-refining, paper making, and fabric dyeing, see “Application of the Air-Pump.” *The Wesleyan-Methodist magazine* 1 (1822): 188. For the ventilation of ships, see “Overcrowding.” *Critic* 5.120 (1847): 314-5. For the pneumatic railway, see “The Atmospheric Railway.” *Architect, engineer and surveyor* 4.37 (1843): 45-8.

⁴⁵ J. G. G. “Light and Heat.” *The London reader: of literature, science, art and general information* 16.406 (1871): 355.

⁴⁶ W. A. M., “Heat as a Mode of Motion.” *The Reader* 5.124 (1865): 537-8.

⁴⁷ “Professor Tyndall on Radiant Heat.” *The Reader* 2.29 (1863): 65-6.

⁴⁸ In *Stories of Inventors and Discoverers in Science and the Useful Arts* (1860), the history of the air-pump is presented as a litany of deaths and near suffocations: “In the exhausted receiver...most animals die in a minute or two: however, vipers and frogs, although they swell much, live an hour or two, and, after being seemingly quite dead, revive in the open air. Snails survive about ten hours; efts, two or three days; leeches, five or six. Oysters live for twenty-four hours. The heart of an eel, taken out of the body, continues to beat for great part of an hour, and that more briskly than in the air” (56-57). See John Timbs, *Stories of Inventors and Discoverers in Science and the Useful Arts*. London: Kent and Co., 1860.

⁴⁹ George Wilson, *Religio Chemici*. London: Macmillian, 1862. As the title indicates, Wilson modeled his essays on chemistry on Sir Thomas Browne’s *Religio Medici* in an effort to show chemistry’s alliance with natural theology. According to Shapin and Shaffer, Wilson’s texts remain “the best overall account” of Boyle’s experiments (footnote 6, 26). See also, Wilson, “On the Early History of the Air-Pump in England.” *Edinburgh New Philosophical Journal*. 46 (1848-1849), 330-354.

5. Pulp Fiction

The life is a germ, and a germ is life.
—Louis Pasteur¹

I saw that the letters, connected by their cursive scripts, were made from what would have looked to the layperson like rich green fernlike moss but in fact was probably a type of fungi or other eukaryotic organism. The curling filaments were all packed very close together and rising out from the wall. A loamy smell came from the words along with an underlying hint of rotting honey. This miniature forest swayed, almost imperceptibly, like sea grass in a gentle ocean current.

—Jeff VanderMeer²

The soil was alive. It was no longer the repository of inert dead matter, nor the privileged site of ‘vital’ chemical transformations. Suddenly, at the end the nineteenth century, the soil burst into riotous life with the discovery of the microbe’s biochemical role in the decomposition of matter. In his article, “The Living Earth,” published in *Longman’s Magazine* in 1897, the novelist and scientific popularizer, Grant Allen highlights this epistemic shift.³

But the particular point on which I wish to lay stress here is the modern discovery that the soil itself—the layer of soft mould which clothes the surface of the earth in all cultivatable districts and from which vegetation springs—is actually in great part a living layer, a confused mass of tiny plants and animals...a vast complex of living organisms...a vast subterranean forest of moulds and mildews. (559)⁴

The soil was alive, and it was alive with minute fungi. For the twenty-first century reader, the idea that the soil teems with microbial life is hardly newsworthy. However, with the endless evolution of scientific taxonomy, what the twenty-first century reader might not know is that the microbe was once classified as a fungus.⁵ Germs, bacteria, infusoria: microbes went by many names but, from roughly the mid-nineteenth until the mid-twentieth century, their place in the natural order was with the fungi. They were *Schizomycetes* (fission fungus), and these tiny fungi were at the center of debates not only about contagion and disease, but also about the evolutionary origins of life and the immortality of the protoplasmic cell.

Early in Arthur Machen’s bildungsroman, *The Hill of Dreams* (1907), the young protagonist, Lucian Taylor, makes the arduous ascent to the Roman ruins that sit atop the titular hill. Falling into a waking trance, he becomes aware of “hint of mysteries, secrets of life” (26).⁶ Just prior to falling into this strange trance, Lucian encounters an “abominable fungus” that leaves the earth “black and unctuous, and bubbling” and “pulp under the feet” (24). If Lucian’s

experience atop the Roman ruin brings him dangerously close to the “secret of life,” it is because, in the late nineteenth century, the mystery of life was the germ – and the germ was a formless fungus. Moreover, if the bildungsroman affixes its plot to the organic plasticity of the pliant hero, then *The Hill of Dreams* affixes Lucian’s plot to the organic plasticity of the abominable, amorphous fungus.

This chapter argues that *The Hill of Dreams* carries “the novel of formation” to its logical and terrible conclusion: only the fungal microbe can survive the process of endless self-formation. By joining Lucian’s plot of development to the growth of the abominable fungus, the novel reveals the fault line between form and formation that characterizes the ideological contradiction at the heart of the bildungsroman. *Bildung* implies self-modifying processes that are, by definition, ceaseless; the novel, meanwhile, must end. For the bildungsroman, closure is always a compromise, a “betrayal” of its own philosophic ideals.⁷ Since *The Hill of Dreams* ends with Lucian’s premature and tragic death from an apparent opium overdose, we might be tempted to think of his death as a strategic narrative device, viz. that a corpse transforms the endlessly self-modifying organism into a stable form. However, Lucian’s final act—his recollection that not only is a re-composition but also a projection of his self into the moldering home—turns the moment of bodily disintegration into yet another self-modifying process, as he merges with the microbial forces of decay.

Ultimately, then, this chapter reads this “failed” bildungsroman as the perverse consummation of the genre’s idealization of ceaseless self-formation. To draw out the particular resonance of this tension for Machen’s late-Victorian readers, I place the question of Lucian’s self-formation in the context of the nineteenth-century microbiology, which not only revealed the self’s vulnerability to pathological contagion, but also its enmeshment in unending biochemical, metabolic exchanges. While studies of the microbe tend to highlight its pathological virulence and, concomitantly, the self’s susceptibility to contagion, I discover in the history of the microbe an alternative conception of vulnerability – an inescapable and far-ranging metabolic interdependence. At the end of the century, mycologists and microbiologists discovered that both macro- and microscopic fungi lived in intimate, cooperative relationship with other organisms. Observing a range of mutualistic feeding relationships, the study of fungal associations lead to the development of the concept of “symbiosis.” These relationships went by many names, such as “mutualism,” “commensalism,” and “consortism” and were understood to range from destructive parasitism to cooperative symbiosis. Hence, the ethical implications of microbial metabolic sharing were far from clear, as deleterious parasitism complicated attempts to read all forms of mutualistic feeding as “altruistic.” Nevertheless, the ethical equivocality of microbial consortism elucidates the thrall and the thrill of the titular hills. The fungal soil nourishes and feeds Lucian’s imagination, even as its unseen agents ultimately come to devour him, dispersing his flesh into the never-ending process of germinal self-formation.

I. The Fragile Logic of the Bildungsroman

Let us begin with a basic question. Is *The Hill of Dreams* a bildungsroman? Following a very compressed account of Lucian’s time at grammar school, the text self-consciously gestures toward the bildungsroman’s less capacious kin, the novel of education: “it was a queer, funny life that of school, so very unlike anything in *Tom Brown*” (18). With this passing reference to Thomas Hughes’ *Tom Brown’s School Days* (1857), the text nods to the narrow conventions of didactic maturation, even as it reveals Lucian’s “queer” relationship to the plot of boyhood

socialization.⁸ Underscoring Lucian's peculiar connection to this 'manly' and sporting genre, the allusion to *Tom Brown* is quickly succeeded by another: coming home from school for the August holidays, Lucian buys a copy of Thomas de Quincey's *Confessions of an English Opium Eater* at the train station (19). This allusion to De Quincey's literary memoir serves, at least, three purposes: it foreshadows Lucian's opiate consumption; it tips off the reader to the novel's autobiographical elements; and, with this last, it fastens the text's tendency toward episodic, impressionistic, and nonlinear representations of time to the conventions and forms of experimental autobiography.⁹

In the scant scholarship on this understudied text, critics mostly concur that *The Hill of Dreams* is a "semi-autobiographical novel." With the exception of Kostas Boyiopoulos, who calls the novel an "underexplored experimental masterpiece," critics agree that *The Hill of Dreams* reflects, albeit through a glass darkly, Machen's personal experience as a struggling writer in London.¹⁰ In her reading of the novel's representation of social surveillance, Joanna Wargen draws out the connection between Machen's *Autobiography* and *The Hill of Dreams*, "which is loosely based on Machen's experiences in London" (12).¹¹ Shifting from a Foucauldian analysis of London to its Gothic spatiality, Amanda Mordavsky Caleb also sees the text as "an attempt at autobiography," where Machen tries to understand "his own journey from rural Wales to inner London" (42).¹² Seeking to reorient Machen scholarship toward that "complex filiation of Occultism, Celticism, and Symbolism," Sondeep Kandola also calls it a "semiautobiographical novel," in so far as it reveals Machen's personal interest in Celtic mysticism (503).¹³ Highlighting the connection between Machen's penurious start in a squalid quarter of London and Lucian's similarly putrid lodgings, Anthony Camara also calls it a "semiautobiographical novel" (11).¹⁴

While it is undeniable that the novel's plot cleaves to Machen's own life story, the designation of "semi" warrants further scrutiny as Machen's autobiography only carries us so far.¹⁵ Arthur Llewellyn Jones was born and raised in the Welsh town of Caerleon, Lucian, in the fictional Welsh town of Caermaen. Machen's father was a clergyman; Lucian's father is too. Poverty prevented Machen from attending university; Lucian's father cannot afford to send him to university. Machen moved to London and began his 'decadent' writing career, translating sixteenth-century French texts into English, including Marguerite of Navarre's *Heptamérone* and Beroalde de Verille's *Le Moyen de Parvenir* and writing his first piece of fiction, *The Chronical of Clemendy*, a pastiche in the manner of *The Canterbury Tales*. Lucian also moves to London, performs elaborate literary experiments, seeking out the secret workings of atmosphere and style, and writes a decadent tale called *The Amber Statuette*. But, with Lucian's death, the similarities stop. Lucian's life story comes to rest as the product of his own fictional development, as the outcome of his own "process of becoming" to borrow Bakhtin's description of the bildungsroman (21).¹⁶ Moreover, in the gap between the real life and its fictional representation, viz. in the breach between Machen's "success" and Lucian's "failure," the emplotment of teleological development appears contingent, an arbitrary solution to the manifold possibilities of a single life's course. Lucian's formation reveals the "fragile" logic of the bildungsroman.¹⁷

But before turning to the fragile logic of formation, it is necessary to broach that thorny question: what is a bildungsroman? Usually translated as "the novel of formation," the bildungsroman plots the growth and maturation of a young protagonist; more prosaically, it is the coming-of-age novel.¹⁸ However, in the history of its critical usage, "bildungsroman" has been put through the ringer, and there is little critical consensus on the parameters of its application.¹⁹ At one extreme, some scholars insist that the term's historical emergence should delimit its usage

to Romantic, German literature of the late eighteenth and early nineteenth centuries.²⁰ At the other extreme, some scholars insist that the analytical usefulness of the term exceeds national or historical boundaries.²¹ As Tobias Boes explains: with “the rise of feminist, post-colonial, and minority studies in the 1980s and 90s,” the definition of the traditional bildungsroman has expanded to include texts that bear “only cursory resemblance to their nineteenth-century, European models” (231).²² Hence, Frederick Amrine has suggested that we drop the term altogether since we run the risk of being “oppressively restrictive on the one hand and irresponsibly promiscuous on the other” (233), while Marc Redfield has suggested, per the title of his book, that the genre is a “phantom formation,” an empty construct that reveals the self-reflexive operations of aesthetic ideology.²³

While Redfield’s argument might undermine the practical usefulness, both analytically and pedagogically, of the bildungsroman as a generic designation, his critique of the genre’s self-reflexivity helps to lay bare the fragile logic of the bildungsroman.²⁴ In his deconstruction of the genre, Redfield argues that, “the ‘content’ of the Bildungsroman instantly becomes a question of form, precisely because the content is the forming-of-content” (42). Redfield reads *Bildung*’s circular idealization of ‘content’ as “an aesthetic synthesis that threatens to disappear into sheer illusion,” a short-circuiting of particularity thanks to the ideological operations of aesthetic education (43). While Redfield insists upon aesthetic ideology’s dematerialization of the narrative ‘contents’ of the self, I want to consider how the equation of “content” with the “forming-of-content” produces a decompositional dynamic, wherein the human form dissolves and reappears, again and again, in the perpetual instantiation of becoming. The self’s material adaptation to its own form is temporary, because it is wholly temporal: “time is introduced into man, enters into his very image, changing in a fundamental way the significance of all aspects of his destiny and life” (Bakhtin, 21). The introduction of time into man, of course, traces back to Schiller’s *Letters on the Aesthetic Education of Man*, the text usually credited with laying the groundwork for the concept of self-formation.

In *Aesthetic Education*, Schiller describes the development of human form – in time. Human form emerges as a temporal process, where every individual “carries within him, potentially *and* proscriptively, an ideal man, the archetype of a human being, and it is his life’s task to be, through all his changing manifestations, in harmony with the unchanging unity of this idea” (93).²⁵ Inscribed, then, in the logic of *Bildung* is the task of maintaining a harmony between a static structure (the archetypal human) and a dynamic process (changing manifestations). But this task is at once a “proscription” and a “potentiality.” That is, the “unchanging unity of the idea” must be continually called into being, as the self’s developmental latency adapts to its own “changing manifestations.” Indeed, the organismic metaphor underpinning Schiller’s conception of aesthetic education was influenced by Blumenbach’s idea of *Bildungstrieb* (formative drive), which postulated the existence of a developmental force latent in the embryo’s material structure.²⁶ Contra the doctrine of preformation, the organism does not “merely unfold” according to a predetermined design implanted in the “germ” (50).²⁷ The organism, reacting and responding to its environment, impels its own development. The harmonization of the ideal structure and the dynamic process can only ever be a flicker, a momentary realignment, before the process inevitably starts again. We are never done with *Bildung*. Or rather, *Bildung* is never done with us.

Here then is the fragile logic of the bildungsroman: the demands of constant emergence mean that the arrest of formation, in the closure of a static form, undermines the ideal of *Bildung*. Critics have long noted that the bildungsroman exists as a compromised form – a symbolic

enclosure of an otherwise never-ending story. In the critical history of the genre, one finds an array of containment strategies. For Lukács, the reconciliation of the self and the world inheres in the “earthly home” that substitutes for the “transcendental home”: homecoming arrests the quest of the spiritually homeless individual (132).²⁸ For Bakhtin, the hero and the world emerge *together* in the arrival of a new historical epoch: historical time affixes the emergence of the individual (23-4).²⁹ Arguing that youth expresses the symbolic form of modernity, Moretti proposes that the “formlessness” of protean youth must be “betrayed” for modernity to be represented (5-6).³⁰ For Moretti, the genre’s central ideologies are “pliant and precarious, ‘weak’ and ‘impure’ (10). Drawing similar conclusions about the weak ideology of development, Esty proposes that the traditional bildungsroman operates through a reciprocal soul-nation allegory, but “since stable national frames and endlessly transforming societies do not always consort in harmony, this core imaginative device—the plot of national closure—was a fragile one (40). The idea that the form of the bildungsroman belies its own principle of formation is not new.

What is new is the way that Machen fulfills *Bildung’s* organismic metaphor: *The Hill of Dreams* refuses to betray the process of self-formation and Lucian passes from the pliancy of youth into the pulpiness of fungal life. In *The Way of the World*, Moretti hints at precisely the self-destructive impulse latent in the process of self-formation:

Youth is chosen as the new epoch’s ‘specific material sign’...because of its ability to *accentuate* modernity’s dynamism and instability...It was impossible to cope with the times without acknowledging their revolutionary impetus: a symbolic form incapable of doing so would have been perfectly *useless*. But if it had been able to do only this, on the other hand, it would have run the risk of *destroying itself as form*. (5)

Moretti quickly resolves the implosive, self-destructive logic of formation: youth, he says, “does not last forever” (6). However, I explore the possibility that *life* might last forever in the “germ” of fungal microbial exchange. However, before turning to the germ’s fungoid morphology and physiology, I first want to consider the generic and formal stakes of the “abominable fungus” for the bildungsroman and its frail logic of formation. Comparing the abominable fungus to the trope of organismic dissolution in Machen’s horror fiction, I argue that we must consider the generic stakes of the pulpy thing, as it travels from horror fiction to novel of formation. Specially, I argue that the fungus represents the abjection inherent in the process of self-formation, even as it symbolizes the germinal formlessness of life itself.

II. Pulpy Thing

Early in *The Hill of Dreams*, Lucian makes the arduous climb to the Roman ruins that sit atop the titular hill, where, overcome with unbidden erotic desires, he experiences the Machen-equivalent of a primal scene, the disturbing intrusion of the unknown into the familiar world. The scene derives its illicit charge not just from its provocative descriptions of nebulous sexual fantasies, but also from its Romantic representation of an animistic natural world surging with dangerous vital forces. Unquestionably, Lucian’s ascent is sexual: he “desperately mounts” the fort, with its “swelling battlements,” and finally “thrusts the last bough apart” (23, 24). But his penetration of the ruin precipitates another breach: “quick flames now quivered in the substance of his nerves, hint of mysteries, secrets of life” (26). Breaching the boundaries of life, Lucian crosses into the unstable biological realm of the “matted thicket”: “not a branch was straight, not

one was free, all were interlaced and grew about another; and just above ground, where the cankered stem joined the protuberate roots, there were forms that imitated the human shape” (25). Here is Darwin’s “entangled bank” run riot.³¹ Luxuriously overgrown, life bursts its own bounds and fecundity ripens into rankness.³² With this profligacy of life, the line between the botanical and the zoological dissolves. Trees swell into human form, and Lucians envisions himself as a “strayed faun,” the trans-species symbol of lustful life (26).

At the thicket’s edge, the “abominable fungus” signals Lucian’s dangerous crossing-over into unstable biological terrain, marked by the fluent passage between efflorescence and deliquescence:

The earth was black and unctuous, and bubbling under the feet, left no track behind. From it, in the darkest places where the shadow was thickest, swelled the growth of an abominable fungus, making the still air sick with its corrupt odour, and he shuddered as he felt the horrible thing pulped beneath his feet. (24)

“Black,” “unctuous,” and “bubbling”: the fungus’s excessive “growth” ruptures the rhythms of development, such that maturation becomes a rapid ripening that ruptures into a formless, inky pool. Anthony Camara argues that the fungus is represented in the moment of “autophagic deliquescence,” where it destroys itself to eat itself (*auto-* ‘self’ + *phago-* ‘eating’) (12).³³ The fungus, thus, suggests the foul epicenter of life’s ceaseless formations: what persists across generations, and conceivably across all time, is an unctuous bubble.

While the abominable fungus condensates a number of scientific debates about morphological structure and taxonomic classification (more on this below), its foul disintegration echoes, linguistically and conceptually, a recurrent trope in Machen’s horror fiction – the spectacle of trans-species disintegration and the descent into “unctuous” jelly:

The skin, and the flesh, and the muscles, and the bones, and the firm structure of the human body that I had thought to be unchangeable, and permanent as adamant, began to melt and dissolve...Then I saw the body descend to the beasts whence it ascended, and that which was on the heights go down to the depths, even to the abyss of all being. The principle of life, which makes organism, always remained, while the outward form changed... I watched, and at last I saw nothing but a substance as jelly. (*The Great God Pan*, 143-44)³⁴

There upon the floor was a dark and putrid mass, seething with corruption and hideous rottenness, neither liquid nor solid, but melting and changing before our eyes, and *bubbling with unctuous oily bubbles like boiling pitch*. And out of the midst of it shone two burning points like eyes, and I saw a writhing and stirring as of limbs, and something moved and lifted up what might have been an arm. (*The Novel of the White Powder*, 78)³⁵

I saw his body *swell* and become distended as a bladder, while the face *blackened* before my eyes...something pushed out from the body there on the floor, and stretched forth, a slimy wavering tentacle. (*The Novel of the Black Seal*, 64)³⁶

Echoing the language of the fungus’s deliquescence, these metamorphic bodies “blacken,” “swell,” and “bubble with unctuous oily bubbles.” Reading, for the moment, across the genres of

horror fiction and bildungsroman, we see that Lucian's encounter with the abominable fungus partakes in the same spectacle: the horror of protoplasmic life.

Critics have seized upon Machen's perverse fascination with bodily decomposition. Susan Navarette proposes that Machen styles his horror fiction through a "protoplasmic metaphor," which bespeaks the language's living ability to evolve and devolve (182).³⁷ Navarette argues that Machen's fascination with the deliquescent body capitalizes upon "body-as-text/text-as-body analogy that had become central to the arguments of biologists and philologists" (188). In this way, Helen Vaughn's recapitulation of evolutionary descent in *The Great God Pan* emblemizes the entropic propensity of the body-text "to retrogress from a complex and specified state to one 'undifferentiated' [and] primitive" (195). Kelley Hurley also seizes upon Helen Vaughn's descent into jelly. But, for Hurley, Helen's loss of sexual and species specificity produces an even more fundamental loss: the collapse of "the specificity that distinguishes form from matter" (13).³⁸ Helen's devolution into "jelly" illustrates the "thing-ness of matter" (31). According to Hurley, Huxley's protoplasmic basis of life opened all forms to formless indifferenciation: "within a materialist reality there are nothing but Things: matter subjected, provisionally, to the contingency of forms" (31). In her view, Victorian materialist science inverted the hierarchy of form and matter, such that "form is no longer the dominate term within in the binarism" (31). In her view, matter's vitality, its strange animatedness, threatens to contaminate and even nullify form.

But protoplasm's thingness does not nullify form. Its amorphous viscosity constitutes matter's potentiality – its inward yearning – for self-organization. After all, what persists through all of Helen's grotesque metamorphoses is "the principle of life, which makes organism" (144). What persists in the jelly's thingness is the drive toward organization. That is, when viewed dialectically, matter's capacity for entropic disintegration (its thingness) becomes the basis for organism (form). At this juncture, I want to consider how "thing theory" might enrich our idea of "things"; allow us to reconsider the spectacle of protoplasmic dissolution; and reframe its narrative function.

Theorizing the connection between things and stories, Bill Brown argues that things produce stories when objects break:

We begin to confront the thingness of objects when they stop working for us...when their flow within the circuits of production and distribution, consumption and exhibition, has been arrested, however momentarily. The story of objects asserting themselves as things, then, is the story of a changed relationship to the human subject and thus the story of how the thing really names less an object than a particular subject-object relation (4).³⁹

The object's thingness arrests the flow of events—it produces friction—which, in turn, constitutes its narrative ability to become problematic, to generate a "story." Of course, in Machen's representation of protoplasmic dissolution, we are not arrested by the resistant bulk of drills or cars. We are arrested by amorphous jelly. But jelly is not frictionless: it is sticky, slimy, and viscous. And what is viscosity but a measure of the substance's "internal friction?"⁴⁰ So, if friction begets fiction, in our protoplasmic realm, internal friction begets the fiction of self-formation. Along the frontier of its viscous membrane pulse the potentiality of sticky exchanges and close encounters: those moments of friction that tell "the story" of a "particular subject-object relation."

So, what story emerges in Lucian's encounter with the pulpy thing? Following Stefanie Markovits' call to heed the generic status of textual "things," I want to consider how genre—differently encoding "subject-object relations"—determines what *kind* of story gets produced by the protoplasmic thing.⁴¹ When life coheres equally in all things, subject-object positionality tends to flatten, becoming, instead, a horizontal spectrum. Along this spectrum, we might imagine two extremes. At one extreme, the protoplasmic subject confronts itself as an object indistinguishable from the lowest of the low. At the other, the subject encounters the protoplasmic object, and, identifying its material commonality, views it as a fellow subject. The former is the abject terrain of horror: as illustrated by the revolting deliquescence of Helen Vaughn, the protoplasmic object threatens to drag the spectator down to "the abyss of all being."⁴² Meanwhile, the latter conforms to, but stretches, the bounds of realistic sympathetic identification found in the bildungsroman. However, in *Middlemarch*, George Eliot warns against the dangers of sympathetic identification with protoplasm: "if we had a keen vision and feeling of all ordinary human life, it would be like hearing the grass grow and the squirrel's heart beat, and we should die of that roar which lies on the other side of silence" (124).⁴³ So what *kind* of relationality does the pulpy thing express? Does Lucian encounter the abject object of horror fiction? Does he encounter the sympathetic subject that stretches the bounds of the bildungsroman? The short answer: both.

Bildungsroman and horror fiction: surely, on the spectrum of genres, these lies at the antipodes.⁴⁴ But the environment's ability to shape the "pliant" hero has long been acknowledged as a key feature of the novel of formation. Granted, pliability calls to mind soft lumps of clay (the divine matter of molding), while pulp conjures the mushy mass of a rotten log. Nevertheless, the formative potential of shapeless youth impels the plot of development. So, while the abominable fungus bears all the telltale signs of horrific abjection, its rank efflorescence reveals the fragile logic of maturation, where "growth" implies both the moldable and the moldering. That is, the pulpy thing crosses over from the genre of horror fiction into the novel of formation. It represents the abjection *inherent* in the process of formation – all the selves we molt and shed and excrete in the endless process of becoming – even as it represents the sympathetic unity *internal* to the germinal formlessness of life itself. But, as Eliot wisely suggests, sympathetic identification with life, in all its riotous excess, threatens to destroy the fragile self. In the section below, I argue that Lucian's encounter with the pulpy thing joins him to the fungal earth and shapes the unfolding of his brief life. In order to understand the extraordinary influence of this fungal encounter on Lucian's development, I survey the history of macroscopic and microscopic fungi, showing how these morphologically and taxonomically anomalous creatures raised questions about the primordial origin of life even as they solved, or rather endlessly resolved, the problem of life's continued existence, viz. the microbe's biochemical circulation of the earth's finite matter.

III. The Germ of Life

In the above section, I argued that the "abominable fungus" represents the abjection of self-formation's ceaseless exuviations *and* the sympathetic unity of life's germinal formlessness. But how does the "abominable fungus" actually shape Lucian's *Bildung*? What mechanism explains Lucian's vulnerability to the fungus's protoplasmic mysteries? The answer, I believe, lies in the soil, because it is not until he strips off his clothes and lies down in the grass that he becomes enflamed by exquisite, mysterious fantasies: "at last [he] lay down at full length on the

soft grass, and more at his ease felt the waves of heat pass over his body. And then he began to dream, to let his fancies stray over half-imagined, delicious things, indulging a virgin mind in its wanderings” (25). Indeed, his erotic reverie reaches its climax when, with a final shudder, “the turf beneath him heaved and sank as with the deep swell of the sea” (26). Lucian’s adolescent initiation into adulthood: he copulates with the living, fungal earth.

When I say Lucian copulates with the earth, I do not mean a mystical communion with a Romanticized mother earth, although that is implied. Rather, I mean a material intercourse, a series of biochemical exchanges, such that Lucian’s “waves of heat” energetically reverberate in the earth, which reciprocates with its rolling undulations. Recalling Grant Allen’s description of the “living earth,” these biochemical interactions enmesh Lucian in a complex web of microbial life—“a vast subterranean forest of *moulds* and *mildews*”—as signified by their exchange of heat and energy (559). As I will discuss below, mushrooms and microbes were classed together because they displayed both plant and animal characteristics. They both lurked on the inchoate boundary between the botanical and the zoological. In this way, we might say that Lucian’s intercourse with the earth is fungoid on, at least, two levels. First, the coupling of Lucian with the “living earth” fuses together the zoological and the botanical in a way that mirror the fungus’s hybrid form. Second, Lucian’s copulation with the earth exposes him to fungoid microbes – agents of pathological contagion – but also agents of metabolic renewal. If Lucian’s encounter with the “abominable fungus” brings him dangerously close to the “mysteries of life,” Lucian’s intercourse with the earth infect him with the germinal—that is, the fungal—formlessness of life itself.

Let’s start with the first instance of zoophytic conjugacy: the fact that the taxonomically anomalous fungus was known to share characteristics with both plants *and* animals.⁴⁵ No other organism better represented the nebulous boundary between botany and the zoology in the Victorian imagination than the fungus.⁴⁶ For the first half of the nineteenth century, it was not clear whether fungi should be classed as plants, animals, or an undefined “third” kingdom. Unlike plants, fungi do not contain chlorophyll, and therefore, do not produce their own nutrition. Like animals, fungi feed on living and dead organic matter. Animal-like ingestion, animal-like excretion: fungi “absorb oxygen when exposed to light, and give out carbonic acid” (24).⁴⁷ However, by the end of the century, the taxonomic confusion was resolved by creating a separate class for fungi: “it is now certain that fungi are not a separate class of plants, but that they are members of very distinct classes and families” (557).⁴⁸ But, even with this new third kingdom, fungi were still figured as “quasi-animals,” consuming, rather than storing, the sun’s energy (557).⁴⁹ Hunger for flesh—as well as a resemblance to flesh, as indeed, the consistency of the pileus was often called “fleshy”—continued to *animate* fungus in the Victorian imagination.⁵⁰ Neither plant, nor animal, the fungus embodied the porous boundary between plant and animal life that so interested the late Victorians.⁵¹ In this way, the humble mushroom provided not only a macroscopic precedent for the study of the zoophytic microbes, but also a metabolic protocol for the physiological investigation of morphological obscure species.

With the rise of cell theory and advances in microscopy, more and more of these zoophytic creatures (microbes) came into view, prompting scientists to develop an array of “third kingdoms” to account for the zoophyte’s atypical place in nature. In 1860, Richard Owen proposed the *Protozoa* (proto- ‘first’ + zoion ‘animal’). In 1860, John Hogg, rejecting the zoological emphasis of Owen’s *Protozoa*, proposed a new class that would include primitive plants and animals, the *Primigenum*. In 1863, John Cassin proposed the *Primalia*, a kingdom delimited to organisms that only had the capacity for nutrition and reproduction. In 1866, Ernst

Haeckle proposed a third kingdom defined by even simpler organization, the *Protista*, a kingdom defined by the organism's structural simplicity – the single-cell – as opposed to any privileging of zoological or botanical affinity.⁵² With so many competing systems and theories, it is not surprising that there were “endless” debates about the classification of individual species.⁵³ Indeed, in “The Border Territory” (1876), T. H. Huxley concludes that “the difference between animal and plant is one of degree rather than of kind; and that the problem whether, in a given case, an organism is an animal or a plant, may be essentially insoluble” (384).⁵⁴

Meanwhile, Pasteur, the definitive leader in the field of microbial science, employed a notoriously loose vocabulary. His many names for the microbe included “végétaux cryptogames microscopiques,” “animalcules,”⁵⁵ “infusoires,” “bactéries,” “vibrioniens,” “monads,” “mucor,” and “champignons” (187).⁵⁶ These names run the gamut from a species of mold (mucor) and a single-celled organism (monad), to microscopic flowerless plants (cryptograms) and tiny animals (animalcules). That is, Pasteur's imprecise terminology reflects the contentious and undecided place of the zoophyte in the natural order. But, as it turned out, “champignons” helped solve the problem of the microbe's classification. As discussed above, nineteenth-century mycologists had long understood that fungi must feed on organic matter. Bacteriologists soon realized that microbes, lacking chlorophyll, also fed on organic matter. In this way, comparative studies of the morphology and physiology of mycology and microbiology helped clarify the microbe's zoophytic classification.⁵⁷ Accordingly, in 1857, the German botanist Nageli proposed that microbes should be regarded as their own class within the vegetable kingdom (151).⁵⁸ He proposed the name *Schizomycetes* (fission fungus), and, despite the taxonomic problem posed by the blue-green algae, Nageli's classification persisted for the next one hundred years.⁵⁹ Hence, in *Bacteria* (1899), a popular science textbook, George Newman declares: “we know that bacteria are fungi (having no chlorophyll), in which no sexual reproduction occurs, and that their mode of multiplication is by division” (7).⁶⁰

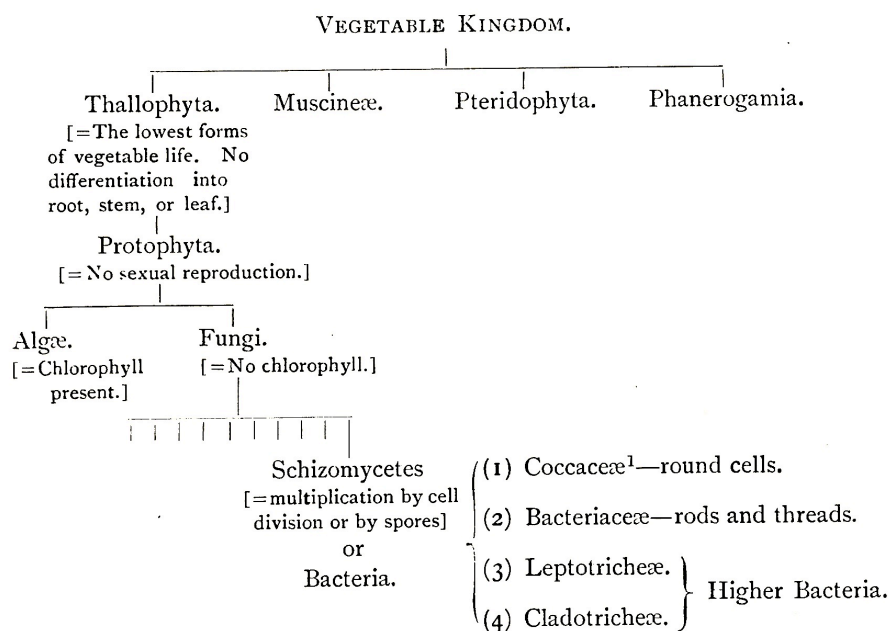


Fig. 9 Classification of Bacteria: *Schizomycetes* (fission fungi)
Newman, George. *Bacteria*. London: John Murray, 1899, p. 7.

The classification of *Schizomycetes* persisted well into the twentieth century.⁶¹ However, data gathered from microbial cultures, viz. their nutritive requirements, continued to push physiological and metabolic questions into the foreground. While “the older systematists had been concerned only to reduce the multiplicity of life forms to some order,” the new bacteriology sought to understand the microbe in its biochemical, pathological, and ecological context (152).⁶² As attention shifted to their physiological characteristics, microbes were increasingly perceived as indispensable environmental agents, secretly performing invaluable metabolic conversions. So, even if the pathological menace of the “germ” tends to dominate both Victorian and Victorianist approaches to microbial life, it is important to bear in mind that running alongside this dominant discourse was a secondary discourse, one that highlighted the beneficent functions performed by these little fungoid germs.

Even Pasteur, renowned for his work in the fields of microbial pathology and immunology, was convinced that the microbe played a crucial role in the *cycle de vie*. Pasteur’s vision of life was premised upon the belief that “it is a law of the universe that all that has lived disappears” (20).⁶³ For Pasteur, the cycle of life was an “absolutely necessary” exchange of “mineral and gaseous substances” (20).⁶⁴ Trained as a chemist, Pasteur’s *cycle de vie* remained a relatively straightforward exchange of elementary matter: “putrefaction restores to the atmosphere the water, the carbon dioxide, hydrogen, and ammonia without which life cannot exist” (110).⁶⁵ His chemical cycle was confined entirely to the atmosphere, such that chemical substances were simply “*voyageurs*” borne on aerial drifts (20).⁶⁶ To be sure, microbes played a crucial role in Pasteur’s conception of the *cycle de vie*, as they were responsible for the breakdown of organic matter, but, ultimately, “he viewed bacteria as chemical agents” (22).⁶⁷ He did not view microbes as organisms in their own right.

Reconceiving Pasteur’s *cycle de vie* as a “life cycle of organisms,” Ferdinand Cohn connected the circulation of chemical compounds to the biological processes of bacteria (22).⁶⁸ Unlike Pasteur, Cohn was trained as a botanist, and, hence, he realized that the release of chemical elements into the *atmosphere* could not account for the presence of elementary materials in the *soil*: there had to be “some mechanism by which the complex molecules synthesized by green plants from elementary materials were returned to the soil” (83).⁶⁹ In *Bacteria: The Smallest of Living Organisms* (1872), Cohn proposed that bacteria performed this necessary function:

The whole of arrangement of nature is based on this, that the body in which life has been extinguished succumbs to dissolution in order that that its material may become again serviceable to new life. If the amount of material which can be moulded into living beings is limited on the earth, the same particles of material must ever be converted from dead into living bodies in an eternal circle; if the wandering of the soul by a myth, the wandering of matter is a scientific fact. If there were no bacteria, the material embodied in animals and plants of one generation would after their decrease remain bound, as are the chemical combinations in the rocks; new life could not develop, because there would be a lack of body material. Since bacteria cause the dead body to come to the earth in rapid putrefaction, they alone cause the springing forth of new life, and therefore make the continuance of living creatures possible. (25)⁷⁰

The first half of this passage should sound familiar: it chimes with the “circulation of matter” that this project has traced from Hutton’s geological theory of the “composition, dissolution, and restoration” of the earth and Lyell’s theory of climatic reversions, to Ruskin’s vision of the crystal’s reformation of mineralogical decay and Pater’s conception of the electromagnetic “weaving and unweaving” of the subject. But, with the insertion of bacteria into the “arrangement of nature,” everything changes. Bodies no longer decompose of their own accord. In a striking reversal of Ruskin’s disintegrating rocks, Cohn argues that, if bacteria did not exist, animal and plant bodies would “remain bound” like the “chemical combinations in the rocks.” Ruskin’s chemical realm, animated by vital girl-crystals, becomes a lifeless, petrified waste without Cohn’s new source of life – bacteria. Bacteria *alone* are responsible for the ongoing existence of all living things, because bacteria alone can restore “the material which can be moulded” to the earth. Microbes are not just the veritable font of life; microbes are the living link between the mouldering and the mouldable.

From this brief survey of a far-reaching topic, we can draw a few conclusions about Lucian’s intercourse with the “living earth.” First, the taxonomically liminal fungus, instantiating the porosity of the botanical-zoological divide, suggests that the coupling of Lucian and the earth may not “abominate” the natural order but rather affirm its inextricable intimacies. Despite our quotidian habit of drawing a firm line between the immobile, will-less plant and the motile, emotive animal, for the late Victorians it was less a clearly demarcated line than an inscrutable frontier, as per Huxley’s “Border Territory.” In that piece, Huxley insists that “innumerable plants and free plant cells are known to pass the whole or part of their lives in an actively locomotive condition, in no wise distinguishable from that of one of the simpler animals; and while in this condition, their movements are, to all appearances, as spontaneous—as much the product of volition—as those of such animals” (374). Huxley’s opinion is not merely a curio from the annals of scientific history. In *The Hill of Dreams*—and indeed throughout Machen’s oeuvre—the vegetable earth might as well be a human character. Its power to shape and influence Lucian is unparalleled. No human’s influence – not even that of Lucian’s father – can rival the earth’s sway. Which leads to my second point: although Lucian’s intercourse with the earth might represent the intimate entanglement of plant and animal life in the late Victorian imagination, such intimacy is not necessarily friendly or benign. In the section below, I will consider Lucian’s deeply ambivalent relationship to the earth in relationship to fungal “consortism” – associations that ran the gamut from beneficial cooperation to insidious parasitism. Which raises the question: what happens to the process of self-formation when the self *consorts* with the germinal formlessness of life itself?

IV. The Fungal Matrix

In the section above, I gestured toward the metabolic interactions between Lucian and the earth, on the one hand, and those between dead matter and microbial life. In this section, I bring these metabolic registers together by placing Lucian’s relationship with the “living earth” in the context of fungal and bacterial symbiosis: “the living together for mutual benefit of very dissimilar types of life” (581).⁷¹ For the late Victorians, fungal symbiosis revealed the surprising intimacy between unlikely messmates, revealing, per the title of an 1887 article, “Queer Relationships.”⁷² Moreover, they placed the fungoid microbe in an entirely new light. Microbes performed “precious work” that allowed for the continuance of life on earth, and they did so by laboring together in cooperative systems and assisting other organisms in their nutritional needs

(264).⁷³ In what follows, I explore how fungal symbionts—the lichens, the nitrogen-fixing bacteria, and the mycorrhizae—merged unlike individuals together in nutritive relationships that ranged from the exploitative to the cooperative, and, thus help us understand the complex, ambivalent bond between Lucian and the “matted thicket.”

Haunted by the memory of his visit to the Roman ruins, Lucian relives it—and the narrative repeats—again and again. Always referred to as the incident in the “matted thicket,” its thick density exercises a gravitational force, pulling him, and the reader, back to the fungal earth. Moreover, the memory resurfaces at crucial moments in his life: after he learns that his manuscript has been plagiarized, after he learns that his beloved Annie has married another man, and most pointedly, as he slowly approaches death. While the following flashback is not tied to a major life event, it reveals the inseparable bond between Lucian and the “matted thicket”:

Sometimes when he was deep in his books and papers, sometimes on a lonely walk, sometimes amidst the tiresome chatter of Caermaen ‘society,’ he would thrill with a sudden sense of awful hidden things, and there ran that quivering flame through his nerves that brought back the recollection of the matted thicket...The exultant and insurgent flesh seemed to have its temple and castle within those olden walls, and he longed with all his heart to escape, to set himself free in the wilderness of London. (44)

“*The flesh*”: the text depersonalizes the affective circuit that runs memory-flame-flesh, inserting an impersonal gap between flame and flesh. Located within “those olden walls,” the flesh dislocates the origin of desire, springing not from Lucian or his proximate surrounds, but rather from the moldering ruin. The fungal earth reaches out with unseen fingers, and Lucian relives the memory of the earth’s touch as a “possession” (27). As the novel progresses, Lucian becomes persuaded that he has been dispossessed of his own humanity. At first, he worries that he has only become “in a measure inhuman” (145). As he gradually declines, he becomes convinced that “he could not be human” and speculates that there must be something “in his body that made him foreign and a stranger in the world” (167). Microbes weave themselves into Lucian’s body: they displace his own flesh and bind him to the thick, fungal forest.

In the nineteenth century, it was well known that several fungal species, especially the microscopic fungi, were parasites.⁷⁴ These nonchlorophyllous plants were, of necessity, heterotrophs (“other eaters”). It was thought that fungi could only feed either as *saprophytes* (nutriment from dead matter) or *parasites* (nutriment from a living host). The discovery that fungi entered into symbiotic relationships with algae, thus, forming an entirely separate class of plants, lichens, ushered in a new age in the history of biology.⁷⁵ When the Swiss botanist Simon Schwendener proposed this “dual hypothesis” in 1867, his representation of the fungus-alga relationship was, however, far from cooperative: he envisioned it as a master-slave relationship, wherein the dominant fungus captures, imprisons, and lives off the work of the servile alga (402).⁷⁶ Schwendener’s master-slave analogy gradually gave way to visions of mutually beneficial reciprocity. “Queer Relationships” refers to the fungi-algae alliance as a case of “reciprocal parasites” (622).⁷⁷ In this capitalist revision of Schwendener’s master-slave relationship, the “investing” fungus provides the alga with water, although noticeably this capital expenditure is represented as a minimum payment to prevent “desiccation” (622). However, by the end of the century, the fungi-algae liaison comes to exemplify the “intimate relations” of cooperative living (273).⁷⁸

Like the lichen, the discovery of the nitrogen-fixing bacteria in 1877 contributed to a growing appreciation of nature's complex, cooperative relationships. Nitrogen is an essential plant food. It exists abundantly in the air, but the plant leaf cannot synthesize it atmospherically. It exists in the soil, but only a tiny portion is in a form that can be taken in by the plant root. "All is thus against the plants" (262).⁷⁹ But the microbe comes to the plant's aid. Or rather microbes: nitrogen fixation requires two microbes. One microbial species decomposes ammonia into nitrous acid; another transforms nitrous acid into nitric acid. Hence, nitrogen-fixing bacteria were understood as forms of "association." In *Bacteria*, Newman declares that *association* is "of the first importance in bacteriology": it explains why microbial species isolated in pure cultures behave irregularly (33). While it is logical to presume that "such sensitive units of protoplasm as bacteria" will be influenced by media culture, they modify in artificial cultures because "the species has been isolated from amongst its colleagues and doomed to a separate existence" (34). Sensitive and social, the microbe performs better when in the company of his fellows. Hence, Aikman praises nitrogen fixation as "a highly interesting system of cooperation on the part of these minute soil workers" (977). No longer the insidious, unseen enemy, germs are laborers: "they are both economic and industrious in the best biological sense of the terms" (x).⁸⁰ What is more, they labor for our benefit: "To their activities we are indebted...and until lately man has been chiefly living upon the treasures accumulated by the invisible workers" (261-2).⁸¹ In a striking reversal, humanity is the parasite that feeds upon the nutritive wealth of the microbial nation.

While the discovery of nitrogen-fixing bacteria illustrated the principles of "association," the 1886 discovery of the nitrogen-fixing *Bacteria radicola* demonstrated the intimate relations of bacterial symbiosis. Agglomerating into "fleshy excrescences," the *Bacteria radicola* form nodules on the roots of leguminous plants, where they borrow hydrocarbon from the plant and, in turn, they supply the plant with nitrogen.⁸² As with the lichens, the association inspired strikingly different interpretations. For the anarchist communist, bacteria perform "precious work" on behalf of the plant (Kropotkin, 264). For the agricultural chemist, the bacteria "infect" the plant (Aikman, 212). For the doctor and professor of bacteriology, the nodules are "little tumors caused by a localized bacterial infection" (Collard, 84). Although Collard refers to the plant's microbial "infection," he underscores the microbe's vital assistance to the plant (84). Despite the semantic opposition of "infection" and "assistance," in this case, the infection *is* the cure: "seeds that were reared under sterile conditions failed to develop nodules and such plants were unable to grow" (84). In the case of bacterial symbiosis, fungal parasitism is the fodder – the nutritive lifeline – for the plant.

Now imagine a web of innumerable, reticulated lifelines passing nutrients to trees. In 1885, the German botanist and mycologist Albert Bernhard Frank uncovered just such a world with his surprising discovery of the symbiotic relationship between fungal mycelium and the roots of living trees – what he termed *mycorrhiza* (myco- 'of fungi' + rhiza 'root').⁸³ I say surprising, because the "spawn" of fungi was long considered destructive, even deadly, to tree roots.⁸⁴ Spawn, or, mycelium is the vegetative portion of the fungus, consisting in a network of fine white filaments. While we tend to picture the fungus as a capped pileus sitting atop a fibrous stem, these terrestrial forms are, in fact, just the "fruiting bodies" of the vegetative mycelium, which may lay latent beneath the surface "for centuries without ever throwing up the true fructifying threads" (53).⁸⁵ Frank discovered that certain species of trees did not "nourish themselves" but were feed by a "wet nurse" – a "mantle" of fungal mycelium that completely enveloped the root, even its growing tip.⁸⁶ Root and mycelium merged into "an organically

united” tissue, which was neither tree root nor fungus, “but resembles the lichen, a union of two different organisms into a single, morphological organ.”⁸⁷

Modern biologists now know that mycorrhizal networks provide important “non-nutritional benefits” to their hosts, including “improved resistance against drought and salinity.”⁸⁸ More astonishingly, recent experiments have proved that plants use these subterranean fungal grids to transmit electrical signals. Using the mycelium’s reticulated filaments as electrical circuits, multiple fungal and plant species “interact and ‘communicate’ via these CMNs,” common mycorrhizal networks.⁸⁹ The CMNs allow the fungus to connect with “multiple trading partners” to ensure a continuous supply of carbon. A recent study highlights how, in the process of forming this ‘many-to-many’ mesh, the fungus “discriminates between host plants” in order to improve “its bargaining power” with its plant hosts. Not only do the CMNs allow fungi to identify and select plant partners, but also, in return, they allows plants to transmit defense signals, warning other plants in the network about pathogenic and herbivore attacks.⁹⁰ A recent study found that plants within the network showed increased disease resistance and advance activation of defense enzymes – the plant equivalent of an intruder surveillance system.⁹¹ As it turns out, Huxley was right – the difference between plants and animals is one of degree rather than kind. Reaching out along delicate threads to probe associates and forge alliances, fungi are indeed “actively locomotive.” Selecting the best partners and protecting their communities from dangers, fungi possess the “volition” necessary to care for themselves and for their extended plant communities. However, Huxley did not anticipate the fungi’s power to forge complex living webs that were *also* webs of communication.⁹²

I contend that Machen did. He anticipates a living, talking forest communicating through its thick, densely interwoven vegetal-fungal web. After learning his manuscript has been plagiarized, Lucian takes a “shortcut” through the woods on his way home. Reflecting—or rather sensing—his anger and frustration, the heretofore erotic and lush woods turn ugly and violent:

At first the path led him by the verge of a wood; there was a noise of rustling and murmuring from the trees as if they were taking evil counsel together... The bramble bushes shot out long prickly vines, amongst which he was entangled, and lower he was held back by wet bubbling earth. He had descended into a dark and shady valley, beset and tapestried with gloomy thickets; the weird wood noises were the only sounds, strange, unutterable mutterings, dismal, inarticulate... He passed into the chill breath of the brook, and almost fancied he heard two voices speaking in its murmur; there seemed a ceaseless utterance of words, an endless argument. With a mood of horror pressing on him, he listened to the noise of waters, and the wild fancy seized him that he was not deceived, that two unknown beings stood together there in the darkness and tried the balances of his life, and spoke his doom. The hour in the matted thicket rushed over the great bridge of years to his thought; he had sinned against the earth, and the earth trembled and shook for vengeance. (60-61)

This passage amplifies, so to speak, the vegetative volume of the “matted thicket.” While the matted thicket represents the erotic intimacy of an overgrown biological entanglement, here, in the “gloomy thicket,” the erotic embrace becomes a vicious clutch. Prehensile vines send out swift “shoots” that ensnare Lucian, while the “bubbling” earth, echoing the language of the “abominable fungus,” slurps at his “lower” half. Not only is the vegetal-fungal earth motile and willful—malevolently so—but also it is alive with strange sounds. “Murmuring,” the wood emits

the low continuous sound of a crowd *and* the persistent throb of a beating heart. At first, these aortic whispers are “unutterable” and “inarticulate.” But then these inaudible “mutterings” speak up. They vocalize the dissent of the forest, which they articulate in “a ceaseless utterance of words, an endless argument.” The wood does not simply speak; it reasons, analyzes, and, with juridical authority, pronounces Lucian’s “doom” for his coupling with the earth.

Machen’s thicket is not *just* a Darwinian entanglement, which presumes that all organisms are connected. Machen’s fungal thicket presumes that all organisms are connected *and* this connection is a communication. His thicket is motile, purposive, and articulate. It has the power to embrace and ensnare, to caress and fetter. It has the power to express dissent, to articulate “sentences,” and to pass judgment on humanity. It may be hard for us to accept the idea of fungal communication; fungi are surely too passive, too mute to possess the power of communication. However, as demonstrated by the mycorrhizal network, fungi move and speak—on “the other side of silence”—even if we do not know how to listen. What is more, in human communication, we readily accept the power of nonverbal communication; we analyze the codes of bodily gestures; we study the affective significance of involuntary blushes. And, in light of the medical discourses surrounding autisms, we accept that verbal language is not the only way—and not even the best way—to communicate with some humans. So, why, do we instill upon using written language at the benchmark for communication and culture? Machen, I think, knew better. In *The Hill of Dreams*, the fungal world is endowed with the power to communicate – to send electric signals that are erotic and cruel – and, for such a “sensitive unit of protoplasm” as Lucian Taylor, he lives and grows and develops in the living mesh of their terrifying and alluring transmissions. In the following section, I explore how Lucian’s development as a writer is woven into the communicative mesh of the fungal earth.

V. Grafts, Implants, and Spines

This section takes up Lucian’s spongy penetrability as it distends his attempts to become a writer. Lucian’s literary nemesis: his writing exists forever in the throes of composition – what Mr. Taylor calls his son’s penchant for “the questionable process of composition” (94). Toiling endlessly over the cadences of phrases, the selection of individual words, and, worse yet, starting story after story and laying them aside unfinished, Lucian’s writing is continually beginning. Indexing his self-formation, Lucian’s writing process—its decompositional dynamic—manifest his link to the living, fungal earth, a thrall to the matted thicket that continually returns him to his origin story, to the beginning he can never fully cast aside.

Lucian concocts a number of elaborate literary experiments designed to analyze the secret workings of texts. In one case, he writes a few pages and then immediately re-writes them, “using the same incident” but altering “that indefinite something which is scarcely so much style as manner, or atmosphere” (148). In another, he mimics Hawthorne, changing a word here or there, “noting how sometimes the alternations of a trifling word would plunge the whole scene in darkness” (160). However, these exercises are pure decomposition; they do not dynamically interact with the synthesis of composition. Accordingly, in order to view the decompositional dynamic of Lucian’s writing, it is necessary to examine Lucian’s “finished” literary artifacts: his (plagiarized) manuscript, his book of devotion to Annie, and a decadent tale called *The Amber Statuette*. These ‘finished’ forms reveal the troubled logic of the bildungsroman.

Lucian’s manuscript is a laborious homage to the mysterious earth. Reflecting his symbiotic link to the land, his writing attempts “to translate into English prose the form and

mystery of the domed hills” (48-9). But, during the manuscript’s long composition, Lucian struggles to give form to his inchoate longings: “he had labored hard to do his very best, writing and rewriting, weighing his cadences, beginning over and over again” (49). He struggles to arrest an endlessly recursive writing process. Hence, the ‘finished’ manuscript bears the trace of its decompositional dynamic, as it fragments into its disjointed, plagiarized form. I say disjointed because, the thieving author, Mr. Ritson, only partially purloins Lucian’s manuscript. The plagiarized book, *The Chorus in Green*, splinters Lucian’s manuscript: his writing goes forth into the world as a hybrid-decomposed form. What is more Lucian finds that he (grudgingly) approves of the plagiarizer’s decision to only use part of his manuscript:

He soon found that he had wronged Mr. Ritson—that old literary hand had by no means stolen his book wholesale, as he had expected. There were about two hundred pages in the pretty little volume, and of these about ninety were Lucian’s, dovetailed into a rather different scheme with skill that was nothing short of exquisite. And Mr. Ritson’s own work was often very good; spoilt here and there for some tastes by the ‘cataloguing’ method, a somewhat materialistic way of taking an inventory of the holy country things; but, for that very reason, contrasting to a great advantage with Lucian’s hints and dreams and note of haunting. And here and there Mr. Ritson had made little alterations in the style of the passages he had conveyed, and most of these alterations were amendments, as Lucian was obliged to confess, though he would have liked to argue one or two points with his collaborator and corrector. (53)

The crafty Mr. Ritson carves Lucian’s manuscript into pieces, splicing bits of Lucian’s enigmatic, ethereal prose onto his sturdier, “materialistic” stuff. But Lucian finds the interlocking of Mr. Ritson’s style with his own “exquisite” – the mortises of Mr. Ritson line up perfectly with the tenons of Mr. Taylor, and, like a wood with a two-toned grain, their two styles contrast “to great advantage.” The dovetailed work, conjoining the styles and labors of two very different individuals, turns a straightforward case of literary parasitism into one of literary symbiosis: Mr. Ritson is Lucian’s “collaborator and corrector.”

Poor pulpy Lucian! He is strangely unconcerned about the vulnerability of his self or his labors. Talking the issue over with his irate father who wants him to “expose the rascals,” Lucian mildly rejoins: “Oh no, I think not. It really doesn’t matter much does it? After all there are some very weak things in the book; doesn’t it strike you as ‘young’?” (68). Without pause or hesitation, Lucian immediately begins to talk about his idea for his next book, while Mr. Taylor silently wonders at his son’s “excitement over a book that was not even begun, the mere ghost of a book flitting elusive in the world of unborn masterpieces and failures” (68). Through the critical gaze of Mr. Taylor, we see frail logic of *Bildung* played out as the “phantom formation” of the not-yet-formed book, where the epigenetic body (the “unborn” book) and the constantly self-forming idea (the book’s “ghost”) do not give rise to form, but, instead flit in the land of bibliophilic non-being. The manuscript, thus, demonstrates what I referred to earlier as the breach between Machen’s life (autobiography) and Lucian’s life (bildungsroman), as it reveals the contingent line separating Machen’s “masterpiece” from Lucian’s “failure,” and, thus, underscores the frail logic of teleological development.⁹³

The second literary artifact turns this delicate provisionality into a ritual of veneration. When working on his book of devotion for Annie, the inbuilt delay of the decompositional dynamic becomes a method for ritualistic elongation: “again and again he copied and recopied

this madness of a lover; dallying all day over the choice of a phrase, searching for more exquisite phrases” (87). Erotically lingering over his prose, Lucian’s repetition and revision of his composition becomes a means to draw out the pleasures of worshipful ‘dalliance.’ But endless de-composition does eventually beget a book: Lucian copies and recopies his prose “nine” times—the epigenetic text gestates for “nine” intervals—before he writes it out in a little book that he makes himself of “a skin of creamy vellum” (90).

Although Lucian succeeds in giving birth to his little book, the book is a never-ending repetition of Lucian’s hopeless connection to the fungal earth, channeled through Annie, his surrogate ‘earthly’ lover. Lucian prolongs the dalliance of composition by illuminating its pages with curious sylvan shapes, “the strange forms of trees, and the poisons growth of great water plants, and the parasitic twining of honeysuckle and briony” (93). As suggested by those parasitic twinings, his textual pleasure is inseparable from his symbiotic relationship with the fungal earth. Indeed, he takes particular pleasure in distilling his own inks from the earth, finding “in the *unctuous* juice of a certain fern” an ingredient that makes “his *black* ink still more glossy” (94). Lucian embeds the “unctuous” earth in his book of erotic devotion: the cast-off pulpy fiction of youth returns in the form of deliquescent inscription. Further revealing his inability to cast-off the abjection inherent to the process of self-formation, the prayer book becomes the liturgy for a secret ritual that literally draws the fungal earth into his home – into his bedroom: “from a steep and wild hillside, not far from the house, he had cut from time to time five large boughs of spiked and prickly gorse. He had brought them into the house, one by one, and had hidden them in the big box that stood beside his bed.” (94). Recalling the “prickly vines” from the “gloomy thicket,” these scourging boughs symbolize the snares that bind Lucian to the earth. It is an ensnarement that he acts out again and again with his “peculiar ceremony” of devotion:

When he had lit the candle, he would draw out the gorse-boughs, and place them on the floor, and taking off his nightgown, gently lay himself down on the bed of thorns and spines. Lying on his face, with the candle and the book before him, he would softly and tenderly repeat the praises of his dear, dear Annie, and as he turned over page after page, and saw the raised gold of the majuscules glow and flame in the candle-light, he pressed the thorns into his flesh. At such moments he tasted in all its acute savor the joy of physical pain; and after two or three experiences of such delights he altered his book, making a curious sign in vermilion on the margin of the passages where he was to inflict on himself this sweet torture. (94)

While Lucian’s prior zoophytic intercourse joined him biochemically to the fungal earth, in this scene, botany and zoology literally interpenetrate, as the gorse’s ridges implant themselves in his flesh: “here and there a spine would be left deep in the flesh, and he would pull these out roughly, tearing through the skin” (95). On particularly fervent nights, his thighs “stream with blood” and the wounds that heal during the day are “torn open afresh at night” (95). In turn, his porous wounds are reflected back into the text, which he revises again, inserting “curious sign in vermilion.” The prayer book becomes a never-ending register of Lucian’s brutal self-inscription. If the body develops through a dynamic process of anabolic and catabolic metabolism, that is, through a ceaseless disintegration and renewal of the cellular body, Lucian’s self-mutilations grotesquely parades the rhythms of growth and development. As the ritual increasingly consumes him, the destructive process of catabolism takes over: “the pale olive skin was red with the angry marks of blood, and the graceful form of the young man appeared like the body of a

tortured martyr. He grew thinner and thinner each day, for ate but little; the skin was stretched on the bones of his face, and the black eyes burnt in dark purple hollows” (96). Consumed by his devotion to Annie, Lucian presses his pliant body against a bed of thorns and pulps himself.

The final “finished” form, *The Amber Statuette*, presents a different case entirely. The decadent tale describes how a lovely girl with bronze hair prays to the Amber Venus, asking for love and “the grace of Venus.” Her wish is granted, and she turns into the titular amber statuette. Unlike all of his other protracted, decompositional efforts, the story comes to Lucian in one glowing vision and he transcribes it with ease. The tale is published; it becomes “a moderate success”; and Lucian is even pleased when “an influential daily paper [runs] an article pleasantly headed: ‘Where are the disinfectants?’” (234). A resounding compositional success, yes? I am afraid the case is far from clear. The history of *The Amber Statuette* falls at the end of the long and torturous chapter in which Lucian, recollecting the events of his life, slowly passes away. Moreover, this ‘recollection’ of Lucian’s literary success is followed by the following admission: “dimly he remembered Dr. Burrows coming to see him in London, but had he not imagined all the rest?” (236). Is *The Amber Statuette* a figment of his imagination? What portion of Lucian’s life story is real? What portion imagined? And why did Dr. Burrow, the Caermaen country doctor, come to see him in London? To answer these questions, we need to examine the novel’s last chapter – Lucian’s amorphous drift toward death and fungal dissolution.

VI. In the Mold

The last chapter of the novel is a retrospective recollection of Lucian’s life, what he refers to as “reckoning up the account of his past” (222). Lucian’s “reckoning” is a paratactic counting of the pages of his life, if one can imagine a system of counting without a numerical sequence. Touching the pages of his scattered manuscript, Lucian recalls—in no particular order—each scene of writing, such that recollection becomes a recomposition of his life from the heaped litter on his bureau. But the heap *mostly* remains a heap. That is, on the one hand, the last chapter is an inchoate stream of disconnected memories – memories that might be delusions, memories that might provide chronological information – but there is no way to distinguish between the two. We are left, per the critique of one dissatisfied Victorian reader, with “utter formlessness.”⁹⁴ On the other hand, the last chapter of the novel transforms this amorphous overlay of memories and visions into a melancholic song – a threnodic refrain of repeated patterns, sounds, and images. So, while the final chapter skims along Lucian’s shapeless stream of memories, the cadence of repeated phrases and images raises a frail, keening lament that gives form, if not meaning, to our hero’s death.

Of particular importance to the relationship between Lucian’s “failed” development and the representation of life’s fungal formlessness is the repeated refrain of the moldering home. A prime example of the “utter formlessness” of the text, the moldering home could be a drug-induced hallucination, a real tumbledown residence, or a representation of Lucian’s *own* London quarters. The moldering home first appears in Lucian’s recollections as a seemingly real house. Lucian likes to take long, desultory walks, seeking “for the old and worn and significant as an antiquarian looks for the fragments of the Roman temple amidst the modern shops” (218). Thanks to an accidental turning, Lucian stumbles upon “a small house” that “charms” his attention (219). With a discolored gate, a fallen iron railing, a pair of untrimmed, ragged box trees, and a rank, overgrown garden, the decaying house is slowly being reclaimed by the fungal earth: “the slate roof was all stained and livid, blotched with the drippings of a great elm...and

marks of damp and decay were thick on the uneven walls” (220). The more that Lucian dwells on the “black streaks that crept upon the walls, and the green drift upon the roof,” the more fixated he becomes on the possibility that some luckless soul has the misfortune of living in the derelict abode.

But the more that Lucian obsesses over the unhappy person who might reside in the crumbling home, the more untethered the home becomes from the urban geography of London. It exists in Lucian’s mind, and, thus, in the amorphous stream of the narrative as a series of repeated images: the green drift, the stained uneven walls, the box trees, the tossing boughs, the unhappy person, the wet earth, and the odor of moldy decay. Of these motifs, the odor of the dank earth becomes the living conduit that connects the vision, the memory, and the environmental experience of disintegration. At first, Lucian objectively imagines how, “no doubt, the damp was rising, and the odor of the earth filled the house” (221). But, as he images entering the home’s crumbling rooms, Lucian viscerally experiences the smell of moldy rot: “and there was that odour of decay, of the rank soil steaming, of rotting wood, a vapour that choked the breath and made the heart full of fear and heaviness” (228). And the stronger the imagined odor, the more he believes that the odor is real: “he drew a long breath, almost imagining that the air in his room was heavy and noisome, that it entered his nostrils with some taint of the crypt” (229). As the memory of the old moldering home surfaces again and again, the impression that he is inhaling the house’s moldy and mildewed air continues to grow stronger, and eventually, the leitmotif of the “odour of decay” crosses over from the realms of recollection and delusion, as he physically “gasps for breath [and] seemed to inhale a heavy air that reeked of clay and rotteness, and the odour of the clay was in his nostrils” (235). In the last moments of his life, Lucian looks up from his heap of papers and sees “the mould and decay gaining on the walls of a dismal room,” and “a vapor of the grave entered his nostrils” (238).

So, was Lucian’s life ever more than a fungal dream? And what about *The Amber Statuette*? And the doctor’s visit? Soon after Lucian dies, the landlady comes into his squalid rooms and makes the following speech to an unknown “Joe”:

‘It’s just as I thought it would be: ‘Death by misadventure’;’ and she held up a little empty bottle of dark blue glass that was standing on the desk. ‘He would take it, and I always knew he would take a drop too much one of these day’ (239).

The revelation that Lucian has been taking a “poisonous anodyne” compels the reader to reevaluate the narrative, returning to the previously unexplained reveries with the understanding that Lucian *could* have been under the influence of an unspecified drug, presumably opium (187). However, since Machen purposefully obscures Lucian’s opiate consumption throughout the novel, no amount of critical sleuthing can pinpoint the beginning of Lucian’s drug addiction: it is impossible to convert the narrative’s disordered sequencing into a chronological order of events. That is, the little blue bottle only superficially fulfills the narrative function of reversal and revelation. The discovery of Lucian’s addiction fails to turn *sujet* into *fabula*.⁹⁵ Or, rather, it underscores the impossibility of differentiating *sujet* from *fabula*. Since the novel affixes its plot of development to the organic plasticity of the fungal germ of life, *sujet* takes on *fabula*’s ability to represent time’s continuous unfolding.

Indeed, the shift in narrative focalization provided by the landlady’s arrival produces a number of nebulous “revelations” that fail to provide narrative closure or order. It is possible that the landlady was the inspiration for *The Amber Statuette*, since she comes into the room “half-

dressed” in a stream of “bronze hair” (239). But it is also possible that *The Amber Statuette* was a hallucination, since Lucian’s manuscript is “covered with illegible hopeless scribbling” which, according to Joe, “nobody could read, if they wanted to” (240). It also appears that Lucian was, in fact, obsessed with an old derelict home, since we learn that “they had to drag him away from a house in Halden Road” (240). That is, the shift in narrative focalization only confirms what we have known all along, viz. that Lucian had a ‘queer relationship’ with fungal life:

She advanced into the shabby room, the lamp she carried cast quaking shadows on the moldering paper, patched with marks of rising damp, and hanging in strips from the wet, dripping wall. The blind had not been drawn, but no light or glimmer of light filtered through the window, for a great straggling box tree that beat the rain upon the panes shut out even the night. (239)

The moldering paper, the rising damp, the bedraggled box tree: the one certainty gleaned from the shift in narrative perspective is that Lucian did not imagine the insidious force of his mouldering home. The moldering home may flicker on the edge of reality, an image continually decomposing and recomposing itself in Lucian’s sick mind. But, as it dances along the frontier of desire, memory, and environmental milieu, the moldy and mildewed house takes possession of Lucian’s dispossessed body. With the inhalation of the mildew and mold into Lucian’s nostrils and lungs, the agents of fungal decay drag him into the grave. Rising up from the “rank soil steaming,” the fungal earth reclaims its symbiotic partner.

Hence, the device of narrative closure, i.e. the shift in narrative focalization, fails to bring finality. It simply returns us to the terrain of the matted brake and the abominable fungus – the efflorescent of life into formless fungal germs. Indeed, the novel announces its own circularity: the last line of the novel repeats its first line. The first line reads: “there was a glow in the sky as if great furnace doors were opened” (11). When Joe brings the lamp to the desk where Lucian’s body slumps, the novel’s last line reads: “the flaring light shone through the dead eyes into the dying brain, and there was a glow within as if a great furnace doors were opened” (240). The novel explicitly circles back on itself, returning the reader to the opening image of the novel – the opening of the great furnace doors. Certainly, the opening of fiery doors at the end of life would seem to imply a form of divine punishment, and, perhaps, the circular form is only meant to signify humanity’s perpetual fall from grace. Nevertheless, I want to suggest that the folding of the energy of the burning sun into Lucian’s dead body reflects a popular late nineteenth-century conception of the metabolic relationship between plants, animals, and the sun. Plants stored the sun’s energy. Animals burned the sun’s energy. But animals were not the only agents of combustion: fungal microbes performed crucial biochemical combustive reactions. Speaking of the energetic expenditure of the animal as well as the “quasi-animal plants like the fungi,” Grant Allen claims that the animal is, “if we may be metaphorical, a sort of natural steam-engine, slowly burning up vegetable products within its *living furnace*” (549).⁹⁶ In passing from the pliancy of youth to the pulpiness of fungal germs, Lucian continues to burn in the vast metabolic fire of the universe.

NOTES

¹ Vallery-Radot, René. *The Life of Pasteur*. Trans. R. L. Devonshire. New York: Doubleday, Page & Co., 1919, p. 10

² VanderMeer, Jeff. *Annihilation*. New York: Farrar, Straus and Giroux, 2014. The mysterious wall of fungal writing in VanderMeer's *Annihilation* is one of this chapter's principle inspirations. I am intrigued by the possibility that a web of living organisms could compose a "continuous never-ending sentence" (47), using their "symbiotic fruiting bodies" as a "cursive script" (26). Even more than the materiality of their script, I am intriguing by what the fruiting bodies have to say about their ecological and spiritual role as nature's decomposers. Here is a portion of the fungal wall:

"...but whether it decays under the earth or above on green fields, or out to sea or in the very air, all shall come to revelation, and to revel, in the knowledge of the strangling fruit and the hand of the sinner shall rejoice, for there is no sin in shadow or in the light that the seed of the dead cannot forgive..." (134).

All is washed clean by "the strangling fruit," by the process of fungal disintegration. As I explore later in the chapter, fungus do, in fact, form vast social networks via their mycelium. These "mycorrhizal networks," used to transmit electrical signals, form a web of communication.

³ While Charles Darwin had drawn attention to the ecology of the soil in *The Formation of Vegetable Mould* (1881), his depiction of the earthworm, vitally churning and plowing the earth, left the soil intact as an inert substrate. Whereas, in Darwin's view, the soil was composed of the digested inorganic remains (the "castings") of the earthworms, this chapter tracks the "microbial turn," which envisioned the soil itself as a "living layer" composed of innumerable tiny creatures. See Darwin, Charles. *The Formation of Vegetable Mould Through the Actions of Worms, with Observations on their Habits*. London: John Murray, 1881.

⁴ Allen, Grant. "The Living Earth." *Longman's Magazine* (1897): 554-66.

⁵ For the fungal classification of microbes, see Collard, Patrick. *The Development of Microbiology*. Cambridge: Cambridge UP, 1976, p. 151; Bulloch, William. *The History of Bacteriology*. London: Oxford University Press, 1938, p. 177; and Sapp, Jan. *The New Foundations of Evolution: On the Tree of Life*. Oxford: Oxford UP, 2009, p. 46-7.

⁶ Machen, Arthur. *The Hill of Dreams*. Intro by Lord Dunsany. London: The Richards Press, 1954. All subsequent citations are from this edition. While the novel was published in 1907, it was composed during the late 1890s (1895-97) and bares the stamp of fin de siècle decadence and aestheticism.

⁷ Betrayal is Moretti's term: "Only by curbing its intrinsically boundless dynamism, only by agreeing to betray to a certain extent its very essay, only thus, it seem, can modernity be represented" (6). See Moretti, Franco. *The Way of the World: The Bildungsroman in European Culture*. London: Verso, 1987.

⁸ It is certainly open to debate whether Lucian's "queer" schooldays carry a sexual connotation. During the 1890s, Machen was befriended by Oscar Wilde, and, as documented by queer scholars, the first recorded instance of "queer," in a pejorative, sexual sense, appeared in a letter by the Marquess of Queensberry, Wilde's accuser, dated November 1, 1894. See Ellmann, Richard. *Oscar Wilde*. New York: Vintage, 1987, p. 426. Moreover, as suggested by recent queer scholarship, *Tom Brown's* representation of male-male friendship already reveals the nebulous boundaries between homosocial and homosexual desire. See Martin, Maureen M. "'Boys Who Will Be Men': Desire in *Tom Brown's Schooldays*." *Victorian Literature and Culture* 30.2 (2002): 483-502; and Harvey, Andy. "*Tom Brown's Schooldays*: 'Sportsex' in Victorian Britain." *Critical Survey* 24.1 (2012): 17-29.

⁹ The bildungsroman's generic proximity to the autobiography can be traced to Bakhtin: "the third type of novel of emergence is the biographical (and autobiographical type)" (22). See Bakhtin, M. M. *Speech Genres and Other Late Essays*. Ed. Michael Holquist and Caryl Emerson. Trans. Vern McGee. Austin: U of Texas, 1986. Recent work in modernist studies has tried to create a more capacious definition of the bildungsroman – one that privileges the connections between autobiography, biography, and bildungsroman. While *The Hills of Dreams* could be said to represent a modernist hybridization of autobiography and bildungsroman, I retain the designation of bildungsroman since Lucian's death self-consciously distances the novel from Machen's own life. See Riquelme, John Paul. "Modernist Transformations of Life Narrative: From Wilde and Woolf to Bechdel and Rushie." *Modern Fiction Studies* 59.3 (2013): 461-479.

¹⁰ Boyiopoulos, Kostas. "'The Serried Maze': Terrain, Consciousness and Textuality in Machen's *The Hill of Dreams*." *Victoriographies: A Journal of Nineteenth-Century Writing* 3.1 (2013): 46-63.

¹¹ Wargen, Joanna. "All Eyes are on the City: Arthur Machen's Ethnographic Vision of London." *Literary London: Interdisciplinary Studies in the Representation of London* 8.1 (2010).

¹² Caleb, Amanda Mordavsky. "'A City of Nightmares': Suburban Anxiety in Arthur Machen's London Gothic." Eds. Lawrence Phillips and Anne Witchard. *London Gothic: Place, Space, and the Gothic Imagination*. London: Continuum, 2010. pp. 41-49.

¹³ Kandola, Sondeep. "Celtic Occultism and the Symbolist Mode in the Fin-De-Siècle Writings of Arthur Machen and W. B. Yeats." *English Literature in Transition, 1880-1920* 56.4 (2013): 497-518.

¹⁴ Camara, Anthony. "Abominable Transformations: Becoming-Fungus in Arthur Machen's *The Hill of Dreams*." *Gothic Studies* 16.1 (2014): 9-23.

¹⁵ Machen wrote three autobiographies: *Far Off Things* (1922), *Things Near and Far* (1923), and *The London Adventure* (1924). The first two were subsequently reprinted in one volume as *The Autobiography* (1951).

¹⁶ Bakhtin, M. M. *Speech Genres and Other Late Essays*. Ed. Michael Holquist and Caryl Emerson. Trans. Vern McGee. Austin: U of Texas, 1986.

¹⁷ I borrow this formulation from Jed Esty, who refers to "the contingent, even fragile logic of the old bildungsroman" (17) and the "now-fragile ideology of developmental historicism" (37) in the context of modern trans-national globalism. See Esty, Jed. *Unseasonable Youth: Modernism, Colonialism, and the Fiction of Development*. Oxford: Oxford UP, 2011.

¹⁸ In *Formative Fictions*, Tobias Boes points out that *Bildung* is difficult to translate: "like the English word *education*, it can refer both to a dynamic process and to the static outcome of that process. Unlike *education*, however, which derives from the Latin verb *educare* (to bring up), a word that in turn is related to *educere* (to lead forth), *Bildung* does not imply any outside guidance or sculpting influence...*Bildung* instead refers to a formative development governed by an inner law" (46). See Boes, Tobias. *Formative Fictions: Nationalism, Cosmopolitanism, and the Bildungsroman*. Ithaca, NY: Cornell UP, 2012.

¹⁹ For a concise overview of the term's troubled history, see Tobias Boes, "Modernist Studies and the Bildungsroman: A Historical Survey of Critical Trends." *Literature Compass* 3/2 (2006): 230-43.

²⁰ For the classic example of this position, see Jeffery Sammons, "The Mystery of the Missing Bildungsroman, or: What Happened to Wilhelm Meister's Legacy?" *Genre* 14 (1981): 229-46.

²¹ More expansive definitions of the bildungsroman can be found in feminist and post-colonial revisions of the genre. For studies of the female bildungsroman, see Abel, E., M. Hirsch, and E. Langland, eds. *The Voyage In: Fictions of Female Development*. Hanover and London: University Press of New England, 1983; Felski, Rita. *The Gender of Modernity*. Cambridge, MA: Harvard UP, 1995; Fraiman, Susan. *Unbecoming Women: British Women Writers and the Novel of Development*. New York: Columbia UP, 1993. For studies of the genre in colonial and postcolonial contexts, see Esty, Jed. *Unseasonable Youth*; Castle, Gregory. “Coming of Age in the Age of Empire: Joyce’s Modernist Bildungsroman.” *James Joyce Quarterly* 40.4 (2003): 665–690; and Stein, Mark. *Black British Literature: Novels of Transformation*. Columbus: Ohio State UP, 2004.

²² Boes, “Modernist Studies and the Bildungsroman.”

²³ Quoted in Boes, “Modernist Studies and the Bildungsroman.” See Amrine, F. “Rethinking the Bildungsroman.” *Michigan Germanic Studies* 13 (1987): 119–39. See Redfield, Marc. *Phantom Formations: Aesthetic Ideology and the Bildungsroman*. Ithaca: Cornell University Press, 1996.

²⁴ In response to Redfield, Esty points out that: “the concept of *Bildung* has shaped literary criticism and practice for generations—a fact not altered by its nonfulfillment in any text” (18).

²⁵ Frederick Schiller, *Letters on the Aesthetic Education of Man*, trans. Elizabeth M. Wilkinson and L. A. Willoughby, in *Essays*, ed. Walter Hinderer and Daniel O. Dahlstrom. New York: Continuum, 1993.

²⁶ For the relationship between Blumenbach’s *Bildungstrieb* and the historical development of the concept of *Bildung* in late eighteenth-century Germany, see Boes, *Formative Fiction*, 46-53. For the relationship between *Bildung*’s organismic ontology and the form of the nation, see Esty, *Unseasonable Youth*, 41-53. For the self-reflexivity of “organic plasticity” in relation to the “literary absolute,” see Redfield, 42-62.

²⁷ Boes, *Formative Fiction*.

²⁸ Lukács, Georg. *The Theory of the Novel*. Trans. Anna Bostock. Cambridge: MIT Press, 1971.

²⁹ Bakhtin, M. M. *Speech Genres and Other Late Essays*.

³⁰ Moretti, Franco. *The Way of the World*.

³¹ Darwin, Charles. *On the Origin of Species*. Ed. Gillian Beer. New York: Oxford UP, 2008, p. 360.

³² While this chapter only engages tangentially with the novel’s decadence, it is worth noting that Charles Bernheimer considers nature’s excessive fecundity a touchstone of decadent aesthetics – the chapter, “Decadent Naturalism/Naturalist Decadence” opens with a luxuriant description of a “great surge of vegetation” that is particularly relevant to the biological excess of Machen’s “matted thicket” (56). See Bernheimer, Charles. *Decadent Subjects: The Idea of Decadence in Art, Literature, Philosophy, and Culture of the Fin de Siècle in Europe*. Baltimore: Johns Hopkins University Press, 2003.

³³ Camara explains that it is “a reproductive strategy that disperses spores and returns water and nutrients to the environment for future generations” (12). See Camara, Anthony. “Abominable Transformations: Becoming-Fungus in Arthur Machen’s *The Hill of Dreams*.”

³⁴ Machen, Arthur. *The Great God Pan and The Inmost Light*. London: John Lane, 1894.

³⁵ Machen, Arthur. *The White People and Other Weird Stories*. Ed. S. T. Joshi with foreword by Guillermo del Toro. New York: Penguin, 2011.

³⁶ *Ibid.*

³⁷ Navarette, Susan. *The Shape of Fear: Horror and the Fin de Siècle Culture of Decadence*. Lexington: University of Kentucky Press, 1982. See chapter 4, “The World Made Flesh: Protoplasmic Predications in Arthur Machen’s *The Great God Pan*,” 178-201.

³⁸ Hurley, Kelly. *The Gothic Body: Sexuality, Materialism, and Degeneration at the Fin de Siècle*. Cambridge: Cambridge University Press, 1996.

³⁹ Brown, Bill. “Thing Theory.” *Critical Inquiry* 28.1 (2001): 1–22.

⁴⁰ In the domain of fluid mechanics, viscosity is measured by calculating “the magnitude of internal friction, as measured by the force per unit area resisting a flow in which parallel layers unit distance apart have unit speed relative to one another.” Abate, Frank R., and Elizabeth Jewell. “Viscosity.” *The New Oxford American Dictionary*. New York: Oxford UP, 2001.

⁴¹ Markovits, Stefanie. “Form Things: Looking at Genre through Victorian Diamonds.” *Victorian Studies* 52.4 (2010): 591-619.

⁴² This is precisely the Gothic terrain explored by Navarette and Hurley.

⁴³ Critics have long noted the protoplasmic connection between this passage in Eliot and the following passage from T. H. Huxley’s “On the Physical Basis of Life”: “The wonderful noonday silence of a tropical forest is, after all, due only to the dulness of our hearing; and could our ears catch the murmur of these tiny Maelstroms, as they whirl in the innumerable myriads of living cells which constitute each tree, we should be stunned, as with the roar of a great city.” See Adam, Ian. “A Huxley Echo in *Middlemarch*.” *Notes and Queries* 209 (1964): 227; and Eliot, George. *Middlemarch*. Ed. Bert G. Hornback. New York: Norton, 1977.

⁴⁴ In both the feminist and post-colonial expansion of the boundaries of the bildungsroman, critics have bridged the gap between the novel of formation and other “low-brow” genres. In *Unbecoming Women*, Fraiman argues that the plot of female development reveal “counternarratives” that “imply that the disreputable gothic novel may account more plausibly for the passage of bourgeois womanhood than the classic *Bildungsroman*” (10). Meanwhile, in *Unseasonable Youth*, Esty argues that, since modernist novels of formation and imperial romances both suspend their protagonists in an eternal adolescences, their shared antidevelopmental temporality “casts colonial fiction as integral to the emergence of modernist art novel rather than as a middlebrow detour” (3).

⁴⁵ I borrow “zoophyte” from Carl Linnaeus’s *Zoophyta* (zoo- ‘animal’ + *phyte* ‘plant’) for the sole purpose of its expressive simplicity, not out of any particular attachment to what would have been considered an outmoded system of classification at the turn of the century. See Sapp, *The New Foundations of Evolution*, 7-9.

⁴⁶ For a rigorous scientific study of mycological taxonomy—and its difficulties—at mid-century, see Berkeley, M. J. *Outlines of British Fungology: containing characters of above a thousand species of fungi and a complete list of all that have been described as natives of the British Isles*. London: L. Reeve, 1860. For popular accounts, see J. H. F. “The Mushroom Tribe,” *The Mirror of Literature, Amusement, and Instruction* (1839): 54-5, and “Facts about the Fungi,” *Sharpe’s London Magazine* (1848): 185-9. In “The Mushroom Tribe,” the author reflects on the taxonomic confusion surrounding the fungus: “there has been much discussion as to which of three great departments of Nature these extraordinary productions actually belong. They have been referred to the animal, the vegetal, and even to the mineral kingdom; but Necker affirms that they belong to neither of those three, and contends that they form a distinct, yet intermediate kingdom” (54). Similarly, in “Facts about the Fungi,” the author also highlights the fact that, “it has even been a serious question whether the fungi were rightly considered to be vegetable

productions at all; and it has been proposed to constitute them as an independent kingdom, equally distinct from animals and vegetables” (186).

⁴⁷ Berkeley, M. J. *Outlines of British Fungology*.

⁴⁸ Allen, Grant. “Genesis.” *The Gentleman’s Magazine*. June 1885: 546-559.

⁴⁹ Ibid.

⁵⁰ Open to almost any page of Berkeley’s *Outlines of British Fungology* and you will find a description of “fleshy” pileus (see pp. 9, 25, 54, and passim. 92-245). The same can be said of Hussey’s *Illustrations of British Mycology*. Hussey, T. J. *Illustrations of British Mycology, containing figures and descriptions of the funguses of interest and novelty indigenous to Britain*. London: Lovell Reeve, 1847.

⁵¹ As Sapp notes, “creatures possessing both plant and animal characteristic had been spoken about since antiquity” (7-8). See Sapp, Jan. *The New Foundations of Evolution*.

⁵² For an overview of Owen’s, Hogg’s, and Cassin’s kingdoms, see Sapp, *The New Foundations of Evolution*, “Microbes First,” 17-27. For an overview of Haeckle’s phylogenetic conception of the *Protista*, see Sapp, *The New Foundations of Evolution*, “The Germ of Phylogeny,” 28-44.

⁵³ Sapp, *The New Foundations of Evolution*, 39.

⁵⁴ Huxley, T. H. “On the Border Territory Between the Animal and the Vegetable Kingdoms.” *Macmillan’s Magazine* Feb. 1876: 373-84.

⁵⁵ Following the lead of Antony van Leeuwenhoek, who called them “animalcules,” microbes were considered animals due to their power of motion and were classed zoologically until the middle of the nineteenth century. For an entertaining account of Leeuwenhoek’s life and discoveries, see Kruif, Paul de. *Microbe Hunters*. New York: Harcourt, Brace, 1926.

⁵⁶ Bulloch, *The History of Bacteriology*.

⁵⁷ Crucial to the connection between the fields of mycology and microbiology was the work of the German mycologist and microbiologist Anton de Bary. His book, *Comparative Morphology and Biology of the Fungi, Mycetozoa and Bacteria* (1887), represented an important synthesis of the fields of mycology and microbiology. One reviewer of *Comparative Morphology* noted that the study of microscopic fungi had attracted little popular interest until it was seen that “such diverse and important phenomena as alcoholic fermentation, the vine blight, potato disease, and silkworm rot were proved to be due to the invasion of different fungi,” at which point, “the vast significance of the despised science became manifest.” Underscoring the importance of the once despised fungus, he states: “each succeeding year seems to show yet more and more the extent to which organic chemistry, biology, and pathology, are concerned in mycology” (527). See “Books on Biology.” *The Saturday Review* 15 Oct 1887: 527-8. See De Bary, Anton. *Comparative Morphology and Biology of the Fungi, Mycetozoa and Bacteria*. Trans. Henry E. F. Garnsey. Oxford: Clarendon Press, 1887.

⁵⁸ Collard, *The Development of Microbiology*.

⁵⁹ Bacteria were classed as fungi because they lacked chlorophyll, but, as their chromatic name suggests, the blue-green algae possessed chlorophyll and appeared to reproduce by fission. Accordingly, in 1875, Ferdinand Cohn proposed a new classification that would merge together the fungoid bacteria and the chlorophyllous blue-green algae: the *Schizophytae* (fission plants). However, as Sapp notes: “few botanists followed his lead; bacteria were generally regarded as fungi, and the *Schizomycetes* and the blue-green algae as organisms apart.” Sapp, *The New Foundations of Evolution*, 50.

⁶⁰ Newman, George. *Bacteria: Especially as They Are Related to the Economy of Nature to Industrial Progress and to the Public Health*. London: John Murray, 1899.

⁶¹ Throughout the first half of the twentieth century, *Schizomycetes* underwent subdivision and revision, but the classification persisted despite the problem of the blue-green algae. However, a revolution in bacterial classification occurred in 1957 when Ellsworth Dougherty proposed the division of “eukaryotic” and “prokaryotic” based on the presence and absence, respectively, of membrane-bound nuclei (Sapp, 102). However, this major breakthrough in phylogenetics was not immediately accepted. Hence, in Collard’s *The Development of Microbiology*, published in 1976, he notes that although Dougherty’s division “is of great evolutionary significance,” this new knowledge “has not of course led to any internal rearrangement within the class *Schizomycetes*” (155-56).

⁶² Collard, Patrick. *The Development of Microbiology*.

⁶³ Pasteur, Oeuvres, vol. III, 84-85. Quoted in Ackert, Lloyd. *Sergei Vinogradskii and the Cycle of Life: From the Thermodynamics of Life to Ecological Microbiology, 1850-1950*. Dordrecht: Springer, 2013.

⁶⁴ Ibid.

⁶⁵ Debré, Patrice. *Louis Pasteur*. Baltimore: Johns Hopkins UP, 1998.

⁶⁶ Ackert, Lloyd. *Sergei Vinogradskii and the Cycle of Life*.

⁶⁷ Ibid.

⁶⁸ Ibid.

⁶⁹ Collard, Patrick. *The Development of Microbiology*. Collard traces the history of soil bacteriology as it emerged out of Pasteur’s work on fermentation, see Collard, “Microbial Metabolism,” 77-96. For a discussion of Cohn’s bacteria in relation to the concepts of microbial evolution and microbial ecology, see Sapp, *The New Foundations of Evolution* “Creatures Void of Form,” especially the subsection, “Little Plants,” 46-51. For an account of soil bacteriology at turn of the century, see Newman, *Bacteria*, “Bacteria in the Soil,” pp. 139-79.

⁷⁰ Cohn, Ferdinand. *Bacteria: The Smallest of Living Organisms*. Baltimore: Johns Hopkins, 1939.

⁷¹ “Symbiosis.” *Chambers’s Journal of Popular Literature, Science and Arts* (1888): 581-4.

⁷² “Queer Relationships.” *Saturday Review* (1887): 622-3.

⁷³ Kropotkin, Peter. “Recent Science.” *The Nineteenth Century* Aug. 1893: 248-66. Kropotkin cuts an interesting figure in the history of evolutionary science and communist philosophy. A Russian prince committed to the abolition of serfdom, Kropotkin lived in exile in London from 1886-1941. During this time, he wrote his most popular book, *Mutual Aid* (1902). Written in opposition to the idea of “survival of the fittest,” *Mutual Aid* makes the case for the biological, evolutionary basis of cooperation. The text was based on a series of articles written in the 1890s for *The Nineteenth Century*. In these articles, Kropotkin endlessly culls examples of cooperative living in nature and human society. For an overview of Kropotkin’s life and his critique of the Social Darwinists, see Sapp, Jan. *Evolution by Association: A History of Symbiosis*. Oxford: Oxford University Press, 1994, 20-25.

⁷⁴ For an excellent mid-century overview of the parasitic microscopic fungi, see Cooke, M. C. *Rust, Smut, Mildew, and Mould: An Introduction to the Study of Microscopic Fungi*. London: Robert Hardwick, 1865. For the pathogenic properties of the parasitic fungi, see Berkeley, “Diseases Caused by Fungi,” *Outlines of British Fungology*; and “Diseases of Plants Induced by Cryptogamic Parasites: Introduction to the Study of Pathogenic Fungi, Slime Fungi, Bacteria, and Algae.” *The Athenaeum* (1897): 197-8.

⁷⁵ For the evolutionary implications of lichen's "dual" nature, as well as its important role in the development of "microbial evolution," see Sapp, *Evolution by Association*: "Symbiosis: Evolution in Action," pp. 3-14.

⁷⁶ "Notes on Current Science, Invention, and Discovery." *The Leisure hour* (1894): 401-3.

⁷⁷ "Queer Relationships." *Saturday Review* (1887): 622-3.

⁷⁸ In "Notes on Current Science, Invention, and Discovery," the reviewer enthusiastically declares: "as a case of co-operations or 'symbiosis' in plants, the lichens unquestionably afford the most fully developed instance yet known in nature" (402). Vine's botany textbook likewise describe how fungi live "in *intimate relation* (symbiosis) with plants which possess chlorophyll, and obtain from them the necessary carbonaceous food, but without destroying, or apparently injuring them." See Vine, Sydney Howard. *A Student's Text-Book of Botany*. London: S. Sonnenschein & Co, 1894, p. 273.

⁷⁹ Kropotkin, Peter. "Recent Science."

⁸⁰ Newman, *Bacteria*.

⁸¹ Kropotkin, Peter. "Recent Science."

⁸² Aikman, Charles Morton. "Nitragin: An Important Advance in the Science of Agriculture." *The Contemporary Review* Aug 1896: 210-4.

⁸³ It appears that Frank's work was not translated into English in the nineteenth century. However, his discovery was mentioned in the periodical press in articles on symbiosis and in botany textbooks. See "Symbiosis." *Chambers's Journal* (1888): p. 584; Kropotkin, Peter. "Recent Science." pp. 256-66; and Vine, Sydney Howard. *A Student's Text-Book of Botany*. pp. 273 and 710. Like Kropotkin, H. G. Wells describes the cooperative association of plants and fungi to bolster his vision of a socialist "synthesis" as the natural evolution of human society. Wells takes the strong position that it is "very probable" that "the great majority of forest-trees obtain food, not by their roots directly, but through the intermediation of fungus filaments that interweave among their roots" (420). The symbiotic tree, ultimately, becomes the image for the "extensive modification" of humanity into "such strange forms as we have hinted at, human trees with individuals as their branches and so forth" (422). See Wells, H. G. "Ancient Experiments in Co-Operation." *The Gentleman's Magazine* Oct. 1892: 418-22.

⁸⁴ Berkeley describes how fungal spawn "is often fatal to trees and herbaceous plants, by running over the roots and inducing decay." Berkeley, M. J. *Outlines of British Fungology*, 71.

⁸⁵ Berkeley, M. J. *Outlines of British Fungology*.

⁸⁶ Frank, B. *Mycorrhiza* (2005) 15: 267. doi:10.1007/s00572-004-0329-y

⁸⁷ Ibid.

⁸⁸ See Bücking, Heike, Jerry A. Mensah, Carl R. Fellbaum. "Common mycorrhizal networks and their effect on the bargaining power of the fungal partner in the arbuscular mycorrhizal symbiosis." *Communicative & Integrative Biology* 9. 1: 2016.

⁸⁹ Ibid.

⁹⁰ Babikova, Zdenka, Lucy Gilbert, Toby J. A. Bruce, Michael Birkett, John C. Caulfield, Christine Woodcock, John A. Pickett, David Johnson. "Underground Signals Carried through Common Mycelial Networks Warn Neighbouring Plants of Aphid Attack." *Ecology Letters*. 9 May 2013.

⁹¹ Song YY, Zeng RS, Xu JF, Li J, Shen X, et al. "Interplant Communication of Tomato Plants through Underground Common Mycorrhizal Networks." *PLoS ONE* 13 Oct. 2010: 5(10): e13324. doi:10.1371/journal.pone.0013324

⁹² For a compelling account of nonhuman culture and the corollary human privileging of language as the basis for culture, see Feder, Helena. *Ecocriticism and the Idea of Culture: Biology and the Bildungsroman*. Farnham, GB: Routledge, 2014. Feder argues that “our notion of culture is culturally (and, more narrowly, disciplinarily) constructed; the emphasis on a narrow notion of symbol, along with symbolic learning and syntactic communication, is only one of the anthropological biases underlying some definitions of culture” (11).

⁹³ *The Hill of Dreams* has been hailed as a “masterpiece” by a small but fervent group of admirers among Machen’s Victorian and contemporary readers. One late Victorian reviewer called it “a masterpiece of prose.” See “The Hill of Dreams.” *The Academy* March 17, 1907: 273-4. As I noted above, Kostas Boyiopoulos calls the novel an “underexplored experimental masterpiece.” See Boyiopoulos, Kostas. “‘The Serried Maze’: Terrain, Consciousness and Textuality in Machen’s *The Hill of Dreams*.”

⁹⁴ “The Hill of Dreams.” *The Athenaeum* March 16, 1907: 317.

⁹⁵ In *The Way of the World*, Franco Moretti argues that the English *Bildungsroman*, unlike its continental counterpart, concludes with a “discovery”—an uncovering of a suppressed truth that reveals the maligned, exiled protagonist’s rightful return to his place in the world—that results in a retelling of the tale: “all these twice-told tales – why, they are so many *fabulae*... In other novelistic traditions, the *fabula* remains ‘hidden’ in the story; in the English novel, its ‘discovery’ is instead a narrative episode, and the conclusive, definitive one at that” (210-11).

⁹⁶ Allen, Grant. “Genesis.” *The Gentleman’s Magazine*. June 1885: 546-59.

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