SCIENCE AS AESTHETIC DEVICE
IN NINETEENTH-CENTURY AMERICAN LITERATURE

by

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This dissertation considers how key works of American writing took inspiration from scientific concepts to rethink the type of work literature could do. Telescopes, microscopes, and other optical instruments fascinated the American public in the nineteenth century. These instruments extended the range of human vision; in so doing, they enabled scientists to gain new knowledge about the exterior world. Nineteenth-century writers responded in different ways as they grappled with science’s growing prestige. An influential strain of literature—exemplified by some of the Romantics—saw the intellectual world in terms of a division of labor in which science explored the physical world and literature explored the inner world of emotion and beauty. This division sometimes took the form of a literary hostility to science, as demonstrated by Keats’s complaint about Newton “unweaving the rainbow.” Other writers responded to science’s growing prestige by simply reproducing scientific accounts of the natural world. In a third kind of response, writers from Poe to Chopin acknowledged that literature’s primary province was the representation of emotion and experience; but instead of critiquing science, they used science as a model, analogy, and resource in extending knowledge of subjective states beyond what was possible for traditional literary methods. Just as science depicted physical entities beyond the range of vision, Poe, Dickinson, Melville, and Chopin showed how literature might illuminate previously
inaccessible interior states. They intimated sensations, thoughts, and feelings outside the range of natural human experience. When no social or literary terms described these sensations, the writers used scientific and technical language and images to represent them.
Introduction

Science and Literature in Nineteenth-Century America

Scientific instruments fascinated the American public in the nineteenth century. Periodical articles heralded new discoveries made with devices such as telescopes and microscopes that extended the range of human vision. Nineteenth-century writers responded in different ways as they grappled with science’s growing prestige. An influential strain of nineteenth-century literature—exemplified by some of the Romantics—saw the intellectual world in terms of a division of labor in which science explored the physical world while literature and art explored the inner world of emotion and beauty. This division sometimes took the form of a literary hostility to science. For example, John Keats complained about Isaac Newton “unweaving the rainbow,”¹ and Nathaniel Hawthorne portrayed scientists as villains. Other writers responded to science’s rising cultural status by simply reproducing scientific accounts of the natural world.

Some writers took a different path. In a third kind of response, Edgar Allan Poe, Emily Dickinson, Herman Melville, and Kate Chopin acknowledged that literature’s primary province was the representation of emotion and experience; but instead of critiquing science, they used science to represent the inner world in new ways. In some cases, they depicted new interior states that existed outside of ordinary experience or that had no name. These writers took science as a model for this type of work: just as science and scientific instruments revealed physical entities beyond the range of vision, these writers showed how literature might illuminate previously inaccessible interior states.

¹ For a background on Keats’s comments, see Robert Dawkins’s *Unweaving the Rainbow* and Denise Gigante’s “The Monster of the Rainbow.”
They intimated sensations, thoughts, and feelings outside the range of lived experience. They often used science as a resource for doing so. They turned to language and concepts circulating in scientific discourses. This context provided them with a means for rethinking approaches for representing interiority.

Dickinson’s “It was not Death, for I stood up” (Fr 355) considers an unnamed state outside the range of ordinary experience. While this state resembles death, the poem’s speaker knows that it is not death. No conventional social or literary terms are adequate to this feeling; the speaker represents it in terms of temperature.

It was not Frost, for on my Flesh
I felt Siroccos – crawl –
Nor Fire – for just my marble feet
Could keep a Chancel, cool –

Dickinson exploited the correlation of temperature with feeling contained in familiar tropes where, for example, love is warm and fear makes one chilly. She reworked this correlation to intimate an extreme and paradoxical subjective state by describing extreme temperatures. Her study of chemistry revealed techniques for measuring extreme temperatures beyond the range of human sensation. Her chemistry textbook at Mount Holyoke Female Seminary, Benjamin Silliman’s *First Principles of Chemistry*, explained how chemists were able to measure and record extreme temperatures by using new technical devices. Dickinson turned to these devices as models. As chemists were able to measure extreme physical states, she used temperature to expand literature’s subject matter by attending to feelings beyond the range of society’s vocabulary for describing emotion.
Dickinson used heat and cold as a basis for representing an extreme emotional experience. Several other key nineteenth-century writers also used science to pursue an aesthetic aim of representing interior states in new ways. They used science as a model, resource, and analogy for examining sensations and feelings outside the scope of everyday language and traditional literary methods.

**Literature and Science: Historical and Critical Background**

Science gained increasing visibility and recognition as a field as it professionalized in nineteenth-century America. The middle of the century saw the formation of the American Association for the Advancement of Science, which “marked the emergence of a national scientific community in the United States” as it organized scientists with similar interests and goals (“Origins”). Historian George H. Daniels argues that “the emergence of a community of such professionals was the most significant development in nineteenth-century American science” and contributed to its growing cultural influence (34). Charlotte Sleigh notes that efforts to standardize science caused science to gain greater cultural standing in the United States in the decades before the Civil War (95). These efforts helped disseminate scientific information to the educated American public.

According to Laura Dassow Walls, by the middle of the century

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2 Maurice S. Lee discusses changes in attitude toward science in nineteenth-century America (13).

3 Historian George H. Daniels explains that “American scientists evolved from a disorganized group of amateurs without common goals or direction into the professional body that they had become by mid-century” (7).
Educated readers turned with ease to primary works of scientists, and responded directly to the arguments advanced therein; scientific and technological advances were seen as signs of the times, part of the buzz of the influx of the newspapers, parlors, and periodicals—right alongside—often the subject of—poems and stories and gossipy fillers.⁴ (Seeing New Worlds 5-6)

This cultural and literary interest stemmed in large part from the science’s professionalization in the 1820s, 1830s, and 1840s, a development that transformed how science was perceived within larger American culture. Science became a prominent subject in newspapers and other periodicals.⁵ Many magazines featured sections on science alongside features on literature and art. The Eclectic Museum of Foreign Literature, Science and Art appeared in 1843. The introduction to the first issue of the popular Harper’s New Monthly Magazine (1850) noted how the magazine contained information about scientific discoveries alongside literary works, featuring “all the events in Science, Literature, and Art in which the people at large have any interest” (“A Word at the Start” 2). The popular Putnam’s Magazine had the subtitle “A Magazine of Literature, Science, and Art.” The first issue (1853) invited the reader into a magazine where “he will find poets, wits, philosophers, critics, artists, travellers, men of erudition and science” (“Introductory” 2).

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⁴ Renée Bergland describes this relationship in “Urania’s Inversion.”

⁵ Daniels explains that “the number of periodicals publishing scientific material more than doubled” between 1815 and 1825” (15).
These periodicals showed the overlap between science, literature, and art in intellectual circles where writers, professional scientists, and interested amateurs shared ideas. Renée Bergland explains that, during the nineteenth century, the fields of science and literature were not as separate as they are now: “American poets frequently wrote about science or scientists and spent much of their time fiddling with microscopes and telescopes, while the foremost scientists of the age read, recited, and even wrote poetry” (76). This time period was vital for the assimilation of scientific discourses in culture and literature because writers encountered science in a range of contexts. Bergland notes that science became more specialized and less accessible to the general public toward the end of the century (81).

Bergland and many other critics investigating nineteenth-century literature and science use terms that carried a different meaning during the time period. While critics use these terms, which include “technology” and “science,” it is important to examine what terms Poe, Melville, Dickinson, and Chopin were familiar with and how they understood science. In her overview of natural science in the Romantic era, Jennifer J. Baker notes that “anyone approaching this topic will face the challenge of terminology. To begin with, ‘science’ is far from a self-evident term. The first half of the nineteenth century witnessed dramatic changes in the way the natural world was studied and understood” (“Natural Science” 388). Walls explains that

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6 Recent examples include Paul Gilmore’s Aesthetic Materialism and Maurice S. Lee’s Uncertain Chances; but Carl Mitcham and Eric Schatzberg explain that “there were few if any significant poems, short stories, plays, or novels in which ‘technology’ appeared in title or text. One can find closely related terms such as ‘machine,’ ‘industrialization,’ ‘invention,’ and ‘applied science,’ along with particular technologies (such as trains and bridges) in titles and many texts” (45).

7 Baker continues, “Natural history came to be characterized as polymathic (encompassing studies of weather, plants, animals, rocks, and fossils, as well as ethnological studies), open to the amateur, strongly inclined to description, and attuned to the aesthetic appreciation of the natural world. By contrast, natural
Though the word “scientist” had been coined by William Whewell in 1833…it was not yet in general use and would not be for some decades…Meanwhile, “natural philosophy,” “natural history,” and “science” were virtually interchangeable, and a person practicing in any of them was usually called a “man of science” or a “philosopher.”8 (Seeing New Worlds 6)

Natural philosophy covered a broad base of knowledge. This larger field had recognized sub-fields such as “physical sciences, acoustics, optics, astronomy, geology, crystallography, mineralogy, chemistry” as well as “biology, physiology, zoology, botany.” By the 1860s, the term “natural philosophy’ was becoming obsolete” as Louis Agassiz and organizations like the American Association for the Advancement of Science associated that term with “merely amateur status” (Seeing New Worlds 6-7).

Following Walls’s lead, I use the term “science” when referring to critical discussions with this language, but I use historically-appropriate terms whenever possible, especially when I discuss primary readings that use specific terms. At times, I use “science” when I discuss the field broadly, which reflects Laura Otis’s usage of “science” as referring to a “systematic, theoretically informed body of knowledge” that “began to take on its modern meaning” in the 1830s (xvii).

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science, a broad rubric for the disciplines we now know as astronomy, chemistry, geology, physics, and biology, came to be understood as vocational, analytical, and sub-divided into fields of specialization. Taking natural philosophy as its model, it aimed at using inferential procedures to detect the unseen aspects of nature and to establish laws that could explain, or even predict, natural occurrences. This distinction began to solidify around the middle of the nineteenth century, prior to and during which time the terms ‘natural history,’ ‘natural science,’ and ‘natural philosophy’ were used interchangeably” (“Natural Science” 388-9).

8 Charlotte Sleigh makes a similar observation in pointing out that the term “scientist” was coined in 1833 to distinguish practitioners of a specialized work (13).
According to historian Leo Marx, mid-century scientists and inventors applied scientific ideas and thinking “to the improvement of the mechanic arts,” which led to a rapid development and advancement of machines and scientific instruments (“Technology” 568). In her history of scientific instruments, Deborah Jean Warner notes that the term “scientific instruments” became more popular and common by the mid-nineteenth century (“What Is a Scientific Instrument” 85). The term “technology” first appeared in America in 1829 in Jacob Bigelow’s *Elements of Technology*, but it did not gain widespread usage until later in the early twentieth century (Mitcham and Schatzberg 36). “Technology” was used infrequently in America in the nineteenth century, and it referred mostly to “to the practical arts and modern industry” (Mitcham and Schatzberg 35). Marx points out, though, that there was a “semantic void that the concept of technology eventually would fill” (“Technology” 567).

While nineteenth-century Americans rarely used the term “technology,” they were familiar with the machines, instruments, devices, and tools that became important to everyday life. In his landmark study of American culture, *The Machine in the Garden*,

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9 Warner also gives an overview on the understanding of science as a field: “Science, as it came to be understood in the nineteenth century had various meanings, many of which were broader than natural philosophy, and narrower than traditional scientia meaning all of knowledge. Many scientists viewed science—or natural science, to distinguish it from political science and moral science—as encompassing the biological and physical sciences, now expanded to include such subjects as chemistry, geology, and physiology” (86).

10 In “‘Technology’: The Emergence of a Hazardous Concept,” Leo Marx notes that “the word technology, which joined the Greek root, techne (an art or craft) with the suffix ology (a branch of learning), first entered the English language in the seventeenth century” (562). Bigelow’s work “resurrected” the term, which was viewed as “arcane” at the time (569).

11 Historian Eric Schatzberg notes that the term was not used widely until the 1930s: “issues that historians now discuss in terms of technology were framed in such terms as useful arts, manufacturing, industry, invention, applied science, and the machine” (486). For a history of the use of the term “technology” in nineteenth-century America, see Schazberg’s “Technik Comes to America” 488-492.
Marx observes that many important American writers took a special interest in the machines of the industrial revolution. Hawthorne and Henry David Thoreau wrote about steamboats and railroads. Their literary representations of machines reflected a larger American attitude toward machines. Several authors wrote about the “tension” between the simple, pastoral American life and opportunities afforded by industrialization (26). This tension reached its zenith between 1840 and 1860, but writers throughout the nineteenth century took an interest in machines. They employed the machine as a “symbol for progress,” as evident in works such as Washington Irving’s “Sleepy Hollow” and Mark Twain’s *Huckleberry Finn* (192). The machine captured the American literary imagination as it immersed itself deeper into Americans’ lives. Literary critic Hubert Zapf describes how the natural sciences represented an important source of inspiration to American Renaissance writers like Poe, Melville, Dickinson, and the Transcendentalists. The pendulum swung even more in this direction in the era of realism and naturalism, in which the reliance on science became a central criterion for the truthfulness of literary narratives. (2)

Jennifer Carol Cook makes a similar observation: “the unbounded forces of science and technology” influenced American literature through the end of the century (3).

Some writers understood a division of labor between science and literature, especially as organizations like the American Advancement for the Association of Science defined the field’s objectives, methods, and values. Robert J. Scholnick describes science and literature in terms of a “growing separation of the two modes of knowing” in the United States beginning in the first half of the nineteenth century. Science developed
a particular vocabulary, methodology, and way of knowing. In response “literature [asserted] its autonomy as a way of knowing” separate from science (11). Baker provides an overview of criticism that describes how the “romantic era witnessed the beginnings of a disciplinary specialization that would eventually set science and literature at odds with each other” in Britain and America (“Natural Science” 393). According to Stephanie P. Browner, writers “negotiated a deepening divide between empirical and imaginative ways of knowing” in the wake of science’s and medicine’s growing status at mid-century (225).

Literary critics describe how some nineteenth-century writers responded to science with hostility. Andrew Cunningham and Nicholas Jardine observe that the Romantics were certainly hostile to the mechanical natural philosophy and descriptive natural history that they inherited from the Enlightenment. This antipathy is symbolized by Goethe’s attack on Newton’s colour theory, by the famous toast “Newton’s health, and confusion to mathematics”, proposed by Charles Lamb, by Keats’s lines in Lamia. (3)

John Cartwright makes a similar claim:

In the 19th century the legacy of the Romantic critique of enlightenment rationalism, and the fact that by about 1870 professional scientists were demanding greater voice in cultural affairs, led to such exchanges as those between Mathew Arnold and Thomas Huxley, where each asserted the superiority and distinctiveness of literature or science, respectively, as a foundation for a humane education.12 (117)

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Some American writers espoused hostility to science as well. David Van Leer argues that Hawthorne was among American Renaissance writers skeptical of or “hostile” to science. Hawthorne depicted dangerous scientists as “villains” in “Rappaccini’s Daughter” and “The Birth-Mark” (Van Leer 307). According to H. Bruce Franklin, Mark Twain warned of the dangers that new technology posed in *A Connecticut Yankee in King Arthur’s Court*. Marx maintains that Thoreau held a hostile view of the machine in *Walden*. Thoreau was part of a group of writers who thought that “the worshipful view of material progress was symptomatic of moral negligence and political regression” (“Technology” 566).

But not all writers were hostile to science. Others responded to science’s growing prestige by reproducing scientific descriptions of the natural world in their poems and stories. Walls explains that Emerson “abolished the distinction” between science and poetry throughout his oeuvre (*Emerson’s Life* 12). In a similar way, Thoreau merged science and poetry on the same pages. Critics also examine representations of science in literature in order to better understand authors’ attitudes toward science. Critics who examine science in Dickinson’s poems, for example, frequently debate whether she had confidence in the field or critiqued its methods. This conundrum is evident in studies considering the line about microscopes in “Faith is a fine invention” (Fr 202). Some critics consider Poe’s

13 Van Leer argues that Ralph Waldo Emerson “rejected science,” Hawthorne “portrayed the scientist as a villain” and Edgar Allan Poe “characterized science as a ‘vulture’” (307). Peter Obuchowski makes a similar point in arguing that Melville and Emerson warned about science’s potential dangers (xvii).

14 See Walls’s *Seeing New Worlds* and Robert M. Thorson’s *Walden’s Shore*.

15 For example, see Fred D. White’s “Sweet Skepticism of the Heart.” White argues that Dickinson’s poem suggests that “it is better to see with microscopes than to be sightless with faith; for microscopes, those
depiction of science as a “vulture” in “Sonnet to Science” as representative of his resistance to scientific inquiry at the beginning of his career.  

Critics, biographers, and editors of anthologies detail writers’ scientific backgrounds, adding to a growing body of criticism that shows how closely literature and science were related in nineteenth-century America. For example, Fred D. White tracks the hundreds of scientific references in Dickinson’s poetry: “more than 200 poems touch upon scientific themes” from fields such as biology, astronomy, and physics (121). Harold Aspiz lists Whitman’s references to scientific concepts, and Kevin J. Hayes’s *Edgar Allan Poe in Context* includes several essays on Poe’s “scientific and pseudoscientific contexts.” Maurice S. Lee examines how Dickinson, Poe, Melville, Thoreau, and Frederick Douglass referred to new scientific ideas on probability and chance. These studies tend to emphasize that examining science in literature can show how a larger culture responded to science, with literature reflecting these attitudes.

In their introduction to *American Literature*’s 2002 special issue on science and literature, Wai Chee Dimock and Priscilla Wald underscore how science can influence preeminent icons of positivist science, ironically will reveal new wonders” (126). Marianne Erickson also discusses Dickinson’s attitude toward science within the context of this poem and “The Lilac is an ancient shrub.”

16 Van Leer sees Poe’s “Sonnet to Science” as a critique of science, although many critics view it as a representative of Poe’s complex attitude toward science. Lynda Walsh understands this poem as Poe’s “fascination with science” (307, 54). Paul Hurh explains that the poem examines science’s attention to the “objective perspective” (136).

17 See White, “Sweet Skepticism of the Heart” for a complete list.

18 See “Science and Pseudoscience” in Harold Aspiz’s *A Companion to Walt Whitman*.

what how writers think about literature. They argue that “science can quite literally
generate new art forms that at once register and promote new conceptual exchanges
across and within traditional disciplines” (706). Literary critics must therefore study
representations of science in literature—it is their “birthright” and “obligation” (708).
This concept is vital to current science and literature criticism as well as my study; but
while Dimock and Wald raise important questions about how “new forms of knowledge”
influence literature, their special issue reproduces a dominant mode of criticism in
emphasizing that literature replicates scientific knowledge. Dimock and Wald note that
“the first four essays in this issue”—including an article on nineteenth-century American
literature—“focus primarily on the way fiction registers scientific thought” so that
literature “reflects” science while also influencing how scientists think (709).

This mimetic model follows in the tradition that sees literary and scientific texts
as part of the “one culture” that George Levine describes in his foundational study of
science and literature, One Culture: “Literature becomes part of the history of science.
Science is reflected in literature” (7).20 Working with this framework, critics often use
literature to uncover new information about science or its history in the United States.
Literature can register scientific knowledge and disseminate it.21 For example, Browner,
Bergland, and Nina Baym argue that some writers used literary texts to discuss attitudes
about women’s roles in science and medicine.

20 Cartwright explains that many theorists take this approach, including many new historicist scholars even
though there is no “universally accepted approach or paradigm” in science and literature scholarship (115-6).

21 For a background on how nineteenth-century American literature disseminates scientific knowledge, see
Baym’s chapter “Print and Women’s Scientific Affiliations.”
Critics also examine how accurately literary texts represent science. Robert M. Thorson traces science in Thoreau’s literary works, emphasizing how they reflected scientific knowledge and practices. Thorson makes note of Thoreau’s “astonishingly accurate vision for the ice-sheet glaciation of Concord” in *Walden* (xv). Sam Halliday discusses how Melville, Twain, and Poe reproduced specific details from important experiments on electricity (7).

Some scholars emphasize the similarities between literature and science in a slightly different way by considering how literary texts anticipated later scientific developments. Jonah Lehrer argues that Walt Whitman’s poetry foretold contemporary neuroscience’s theory that emotions originate in body rather than in the brain (1-2). In another example, Lee describes how “Poe deploys probability theory in a number of registers as he comes to anticipate a range of developments in literature and science alike” in “The Purloined Letter” and other stories featuring Dupin. In anticipating later theories, Poe drew from and built upon the science available at the time (18).

Studies in these traditions have done important work describing the close relationship between literature and science in nineteenth-century America. Scholars prove that many authors knew about science and incorporated it into their imaginative writings; but critics often minimize the distinctions between literature’s and science’s aims.22 Cartwright describes this tendency in the tradition that follows Levine’s “one culture” model: “in its extreme form this approach has led to a kind of cultural relativism where science is treated as an epistemologically unprivileged discourse or narrative” (116).

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22 Cartwright identifies this impulse in many new historicist studies that view literature and science as part of one culture (116).
Even Levine underscores how science and literature have different “languages” and “modes” (4), a caveat that scholars do not always keep in mind when noticing their similarities. Sabine Sielke emphasizes literature’s and science’s different goals with her discussion of “what literature can do that science can’t (and vice versa)” (“Science Studies” 12). She argues that literature should not be considered as having the same goals as scientific texts.

Jerome McGann warns about the problems of treating a work of literature as a scientific text, with critics often determining the accuracy of the science in literary works. Specifically, he criticizes scholars who interpret Poe’s prose poem *Eureka* based on the accuracy or inaccuracy of its science. This tradition considers *Eureka* as a scientific text, even though, as McGann argues, Poe is “not interested in making a scientific claim or building a fact-based model” (101). Rather, McGann maintains that the poem “should be understood in poetical rather than philosophical or scientific terms” (102). McGann’s study shows how authors did not necessarily reproduce scientific principles and were not necessarily interested in commenting on science or making scientific claims. They used science as a means for theorizing about or creating poetry. Drawing from this viewpoint, I argue that some writers used science as an aesthetic device, especially in relation to extending literature’s capacity to represent interiority, which many authors presented as a key goal for literature.

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23 Stella Pratt Smith describes “the risk…of perceiving literary practices solely as vehicles for the dissemination of science.” She takes a different approach than McGann in emphasizing how literature influences scientific thought and language (51).
Literature’s Interior States

Critics use historical studies to explain how nineteenth-century American writers tended to be concerned with providing insight into interior states. In *Interior States*, Christopher Castiglia describes the “discourses of interiority” that appeared in a range of antebellum literary works, including Melville’s writings (11). Rachel Greenwald Smith argues that writers before the twentieth century tended to represent “emotional interiority with great intensity” (39). Studying Hawthorne, Emerson, and Harriet Beecher Stowe, Theo Davis emphasizes the “primacy” of experience in nineteenth-century America as cultural and economic forces “fostered a literature devoted to the privacy and interiority of the subject” (8, 3). Michelle Kohler takes Hawthorne as an example of a tradition of nineteenth-century writers who described characters’ thoughts and feelings. She calls these interior states “interiority,” “interior truths,” “human” and “psychological” interiors, “interior reality,” “interior life,” and “truth of the human heart.”24 Sharon Cameron makes a similar observation about interiority in Hawthorne’s works. She notes that Hawthorne wrote a great deal about interior states. He made the interior self more accessible than the exterior world in *The House of the Seven Gables* (*The Corporeal Self* 119).25 Criticism on sentimental literature also describes literature’s close ties to the interior world, including emotions, in a tradition extending from the end of the eighteenth century through the second half of the nineteenth century.

Jane Thrailkill emphasizes nineteenth-century American literature’s insights into emotion in terms of an historic context that took deep interest in interior states. Literary

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24 Kohler, *Miles of Stare* 87, 84, 102, 84, 91, 84.

25 Davis makes a similar observation (78).
works, especially realist texts, “traffic in emotion” by describing characters’ feelings and promoting sympathy for them (22). Thrailkill attributes this interest in emotions to historic circumstances. Nineteenth-century scientists and philosophers increased attention to emotions, and writers were familiar with these ideas. She concludes that some nineteenth-century literary texts reflected how we naturally feel, process, and interpret emotions. Thrailkill also draws from recent studies in cognitive science and neuroscience to show how literature promotes natural emotional responses.

Literary critics also turn to contemporary cognitive science to understand how literature works and how the brain responds to literature.26 Lisa Zunshine, Suzanne Keen, and Blakey Vermeule emphasize how literature provides access to characters’ interior states. In this way, literature makes use of a natural curiosity to understand others’ thoughts, feelings, desires, and motivations, as well as a natural capacity to draw conclusions about them. People are good at reading clues to approximate how they are feeling or what they are thinking; and they draw from this background when reading literature.27

Borrowing from cognitive psychology’s Theory of Mind, Zunshine explains how fiction facilitates “mind-reading,” or our “ability to explain people’s behavior in terms of their thoughts, feelings, beliefs, and desires” (Why We Read 6).28 Vermeule argues that this aspect is why readers take interest in literary characters: readers want to learn about

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26 Michael W. Clune summarizes this recent trend: “In their different ways, critics like Mark Turner, Lisa Zunshine, Gabrielle Starr, and Blakey Vermeule apply scientific models of everyday cognition and perception to describe literature and literary experience. Science tells us what the brain can do, and the critics show how literature does it” (19).

27 Zunshine points out that individuals’ ability to read clues varies.

28 Paula Leverage et al. summarize Zunshine’s position: “reading engages and improves mind reading abilities” (2).
what others think and feel,\textsuperscript{29} and literature provides a way to access these states. Readers can assemble authors’ clues in order to understand these states. Literature therefore works with our natural interest in and capacity to learn about others’ “intentions” as well as their thoughts, feelings, sensations, and motives by reading external clues (14). Literature, more than “any other medium,” taps into this natural capacity as writers use “tools” that “run along the grain of our minds” (xiv, xiii).

Discussing literature’s relationship with emotional responses, Keen explains how literature facilitates empathy, or “sharing” in others’ feelings, which works with readers’ natural interest in learning about others’ emotions (4). Readers identify with others’ emotions by comparing them to past experiences. Some nineteenth-century writers, especially those influenced by the Romantic tradition, emphasized “the powers of sympathy” and “attempted to bring their readers into contact with others…in order to guarantee the conversion of feeling into benevolent action” (48). Poetry and art became the realm of feeling and interiority, which expanded during the Victorian period as writers used sympathy to garner support for social causes.\textsuperscript{30} This was also true of American literature in the nineteenth century, as Thrailkill, Kohler and scholars of sentimental novels demonstrate.

Literature typically works within a set of feelings that readers already know. Zunshine argues that “works of fiction provide grist mills of our mind-reading adaptations that have evolved to deal with real people” (\textit{Why We Read} 16-17). She argues that there are two main reasons why people read fiction. One reason is that “we may see

\textsuperscript{29} Vermeule argues that humans evolved to have this capacity: “mind reading is an evolved capacity” (34).

\textsuperscript{30} See Keen’s discussion on page xxii and page 10.
pleasure afforded by fictional narratives as grounded in our awareness of the successful
testing of our mind-reading adaptations” (20). Another possibility is that fictional works
provide an opportunity for “‘trying on’ mental states potentially available to us but at a
given moment differing from our own” (Why We Read 17, emphasis original). Zunshine
explains that literature provides access to interior states that readers already know. Other
critics seem to agree. Keen argues that readers recognize familiar emotions when reading.
She describes a reader’s experience with a novel: “the novel succeeds because it presents
recognizable, verisimilar characters in situations that not only resonate with [the reader’s]
experience, but also reach out to a wider audience through feelings that any reader would
know” (113-4). Literature makes available familiar feelings and states of mind.

But what about feelings that are not ordinarily accessible to readers or available
through traditional literary methods? What about those feelings we have never known or
can never know such as those experienced after death? What about feelings that have no
name? Poe, Dickinson, Melville, and Chopin used their poems and stories to offer insight
into interior states, and they were not only concerned with examining states that readers
can naturally encounter. They intimated sensations, thoughts, and feelings outside the
range of natural human experience. And when no social or literary terms described these
sensations, they used scientific and technical language and images to represent them.
Writers used science as a model and resource to pursue an aesthetic aim of representing
interior states in new ways and, in some cases, representing new interior states.
Science as Aesthetic Device: Four Studies

In the chapters that follow, I describe how Poe, Dickinson, Melville, and Chopin used science to push against natural limits in understanding others’ thoughts, feelings, and sensations. Their works extended literature’s potential to represent interiority. I draw from literary theory, the history of science, and the rhetoric of science to describe how writers used and adapted evolving scientific concepts and language in order to describe new emotions and experiences. They used scientific lexicon and logic as tools for this purpose even though they drew from a range of different discourses.

I discuss canonical authors already linked to science as a way to trace how they used it for their literary and aesthetic goals. They turned to science to pursue literary aims of extending literature’s capacity to illuminate interiority. I do not argue that all nineteenth-century authors used science this way or that these authors only used science for this reason, but these examples from the 1830s through the 1890s show how some authors in some instances turned to science as a model and resource for representing interior states.

In my first chapter, I argue that Poe used daguerreotypy to invent strategies for producing novel aesthetic effects. I study his depictions of light. Contrary to critical studies that see Poe’s light as a symbol, I argue that he used light as a tool to create new kinds of images. Poe’s writing on the daguerreotype focused on light’s role as a creator of images rather than as a passive source of illumination. He presented light as a creative agent in poems and stories published after the daguerreotype’s introduction. He arranged “The City in the Sea” to track light’s action as it strikes surfaces, much like how light strikes a daguerreotype plate.
“The City in the Sea” shows light reversing its direction. Light travels upward from a source below rather than from the sun above:

No rays from the holy heaven come down
On the long night-time of that town;
But light from out the lurid sea
Streams up the turrets silently — (“The City” 12-15)

This unusual light progressively generates the textures of the surfaces it illuminates. Light has a similar agency in “The Fall of the House of Usher,” “Ulalume—A Ballad,” and “Landor’s Cottage.” Poe created novel aesthetic effects with light and in the process of doing so, he explored the experience of vision.

Chapter 2 considers how Dickinson used models from contemporaneous chemistry textbooks to represent states outside of lived experience such as those felt after death. These textbooks described the most recent methods for measuring temperatures. While criticism considers Dickinson’s familiarity with chemistry and other sciences, it focuses on whether she approved of scientific inquiry or rejected it. I move beyond biographical readings to examine how she used science as a formal poetic device to represent alien feelings. For example, in “After great pain, a formal feeling comes,” she used extreme cold to represent emotions and physical sensations that had no name.

The next chapter, “Technologies of Vision in Melville’s Fiction,” examines how Melville used optical instruments as models for characters’ capacity to see imperceptible states. In Mardi; and a Voyage Tither, one character asks Oh-Oh, the owner of a powerful microscope, “what other discoveries have you made? Hast yet put a usurer under your lens, to find his conscience? or a libertine to find his heart?” (381) This
moment carries a double meaning. On the one hand Melville poked fun at Oh-Oh’s fervent belief in the instrument’s power, but on the other hand, as the context of the novel makes clear, the author signaled his own interest in the imaginative extension of the instrument’s vision-enhancing qualities. Melville depicted optical instruments in works throughout his career. He took them as a means of rendering an augmented vision that reveals ordinarily imperceptible interior states. Having worked with spy-glasses and telescopes as a sailor, and having read about them in scientific articles, he was familiar with the mechanics of optical instruments. This chapter explores how scientific descriptions of optical instruments provided Melville with the means to imagine a new kind of augmented psychological vision. He endowed characters in Mardi and Moby-Dick with an enhanced vision. This vision enables them to see others’ mental distress. This capacity exceeds natural empathy as characters inhabit others’ mental states as smoothly as a chemist gazing into a microscope sees a hidden physical world.

“Actual Awakenings and the Science of Sleep in Kate Chopin’s Fiction” explores Chopin’s idiosyncratic rendering of inaccessible states. Chopin developed a popular contemporary theory describing how the body and mind change during sleep. The science of the time described these changes as invisible. Chopin’s innovation was to make them visible. The Awakening’s Edna looks at her body with a new perspective as soon as she wakes from a deep sleep. In one example, Edna is “observing closely, as if it were something she saw for the first time, the fine, firm quality and texture of her flesh” (84). Several scenes later, her husband and doctor remark that she transformed. The doctor notices a “change” that makes her appear like “sleek animal waking up in the sun” (123). The narrator ties Edna’s transformations to her sleep throughout the novel. I show how
Chopin used the contemporary science of sleep as a strategy for revealing character. This reading argues against a critical tradition that views Edna’s sleep as metaphorical.

In these chapters, I situate authors’ engagement with science within a nineteenth-century reading culture. I analyze the language and ideas from the books, textbooks, and periodical articles that these authors read or may have read. My study attends to both historical context and questions of literary aesthetics. Cindy Weinstein and Christopher Looby describe a similar approach in recent criticism of American literature. In the introduction to their 2012 collection *American Literature’s Aesthetic Dimensions*, Weinstein and Looby argue that it is necessary that “aesthetic questions return to the critical conversation, perhaps in fruitful conversation with the historicist and political questions that have earned their central position in our inquiries” (1). Samuel Otter and Geoffrey Sanborn emphasize this approach in their recent edited collection on Melville. They observe how literary critics identify intersections between the political, social, historical, and aesthetic (2). Otter and Sanborn ask questions such as “How might one draw connections between aesthetic and cultural and historical analysis?” (3) These concerns guide my work as I examine historical context and primary scientific documents while also considering authors’ conceptions of art and literature.

Writers from Poe to Chopin used science to examine novel effects and extend literature’s capacity to reveal insight on subjective or interior states. Studying this aspect has implications for studies of science and literature more generally as well as studies of

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31 Weinstein and Looby identify other studies that have this focus: “Several signal moments, large and small, might be cited as evincing the halting return to aesthetic questions in American literary studies, among them the special issue of *American Literature* coedited (with Russ Castronovo) by one of our contributors, Christopher Castiglia, in 2004, under the title ‘Aesthetics and the End(s) of Cultural Studies’” (7).
the texts themselves. Examining *The Awakening* in this way exposes a pattern of actual sleeping and waking across the novel, which shifts critical attention away from the metaphorical awakening enacted in the final scene. Investigating Poe’s unnatural light moves discussion away from light’s symbolic role that dominates scholarship. Studying Melville’s optical knowledge shows how his attention to telescopes and spy-glasses has more significance than only as a gauge of his views on science.

A tradition of literature and science criticism demonstrates that authors throughout the century referred to science and engaged with its ideas. My central project is to illuminate a technique that criticism has not yet examined. It presents an additional way to understand how nineteenth-century writers used scientific knowledge. That is not to say that writers did not use scientific knowledge in some instances as a symbol or as way to speak about what was happening in science. But those were not the only ways that they engaged with the field. I therefore expand current scholarship on literature and science that identifies scientific references in authors’ works, details authors’ knowledge of science, and points out science’s place within nineteenth-century culture.

Articles and textbooks informed writers about then-current scientific discoveries. But Poe, Dickinson, Melville, and Chopin did not simply reproduce these discourses, and they did not have the goal of disseminating scientific ideas. Instead they used science, often by transforming or adapting its language and concepts, to pursue aesthetic aims of representing interior states in new ways and creating novel aesthetic effects. They turned to science to rethink how literature depicted thoughts, emotions, and sensations.
How can simple illumination count as art? Edgar Allan Poe alluded to such a possibility in his description of light’s action in his January 1840 “The Daguerreotype.” Marveling at the mechanics of daguerreotypy, he explained how it exposed a new feature of light: its remarkable ability to create an image. He described how the daguerreotypist prepared the instrument’s “surface for the action of light.” Then light took a primary role in the process: “the action of the light does the rest” (“The Daguerreotype”). Poe explained how light became an active agent rather than a passive illuminator in the daguerreotype process. A larger discourse on the new instrument also emphasized light’s active role in creating an image.

Poe explained how brighter, more intense light shortened and improved the process. He even used the name—“photogeny (from Greek words signifying sun-painting)”—that foregrounded light’s work in creating an image (“The Daguerreotype”). Poe adapted this quality in a series of poems and tales. Light exerts agency as it moves in some works. Examining this literary light illuminates an analogy between his art and daguerreotype technology. He used art to create space for light’s agential capacity to become manifest. Poe altered light and endowed it with new

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32 By 1832, the term “photography” referred to a similar process, and this name also emphasized light’s role in the process in referring to “light writing” or “light drawing.” French artist and cartography Hércules Romuald Florence “began using the term photographie for his process, deriving it from the Greek words for light and writing” (8). See Mary Warner Marien’s history of photography.
properties, an aspect that encapsulated his philosophy about art’s novelty. He showed how simple illumination became art when it took on a new or altered form.

Although Poe wrote about light in works across his career, he depicted it more frequently and with more intensity in poems and tales published in the decade after the daguerreotype’s introduction in 1839. I argue that this instrument and photography more generally provided him with a means to develop and deepen his aesthetic experimentation with light.

Poe referred to nineteenth-century photography and optics in “MS. Found in a Bottle” (1833), “Mesmeric Revelations” (1844), “The Thousand-and-Second Tale of Scheherazade” (1844), and *Eureka* (1848). These works provide evidence for his knowledge of the science of light and light-altering technologies.33 Poe mentioned natural philosophers, scientists, and inventors associated with the study of light as well as light-related phenomenon like its undulatory movement, luminiferous ether, refraction, and polarization.34

This altered light appears in “The City in the Sea” (1842), “Ulalume—A Ballad” (1847), “The Fall of the House of Usher” (1839), “The Man of the Crowd” (1840), and “Landor’s Cottage” (1849) where light exerts agency as it moves. While some of Poe’s depictions of light may not necessitate re-readings of entire poems or stories, they reveal a sustained pattern where altered light creates dramatic effects for his characters and

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33 Susan Elizabeth Sweeney describes Poe’s “extensive familiarity with nineteenth-century technologies of visual perception, entertainment, surveillance, reproduction, and enlargement” (4).

34 For example, “MS. Found in a Bottle” refers to polarization (138); “Mesmeric Revelation” explains how “a luminous body imparts vibration to the luminiferous ether” as it moves (1038); “The Thousand-and-Second Tale of Scheherazade” refers to “The daguerreotype,” Herschel’s telescope, Newton’s experiments, and the speed of light (1168; 1169; 1167; 1168).
readers. The “unnatural,” “unusual,” and “preternatural” light produces a range of strange
effects.35

Light yields striking effects across Poe’s corpus; but this feature has not received
the critical attention that such a sustained pattern necessitates. Instead critics tend to focus
on how he uses light as a symbol for other concepts. Two critics who attend most
extensively to Poe’s depictions of light explore illumination’s symbolic value. John
Tresch argues that sight and light are symbols of “madness” and unreliability in Poe’s
works (126). William J. Scheick focuses on vision and eyes in Poe’s stories, arguing that
the “luminous” eyes in the characters of Augustus Bedloe in “A Tale of the Ragged
Mountain” and Roderick Usher in “The Fall of the House of Usher” are symbols for the
“interior light of the imagination” (95). These studies establish Poe’s deep interest in
illumination, but I argue that viewing his light only as a symbol is inadequate because
Poe imbued light with a dramatic sense of activity in his literary works. He also
articulated an interest in light’s activity in “The Daguerreotype” and other essays. For
example, he included several paragraphs on light’s effects in the 1840 essay “The
Philosophy of Furniture.” He showed interest in the effects that light can produce, and
studies that privilege its symbolic function overlook the real effects that this altered,
agential light produces.

Published several months after the daguerreotype’s introduction, “The Fall of the
House of Usher” focuses Poe’s interest in experimenting with light’s effects. From the
“unnatural light” that envelopes the house to the “luminous windows” that appear in “The
Haunted Mansion” poem (412; 407), the story details light’s appearance and characters’

reactions to it. The unnamed narrator frames his story with an experiment that tests light’s effects on perception and emotion. Upon arriving at the House of Usher, he immediately describes the house, including light’s play on it. The scene affects him physically and emotionally, as he feels

an utter depression of the soul which I can compare to no earthly sensation more properly than to the after-dream of the reveler upon opium…There was an iciness, a sinking, a sickening of the heart – an unredeemed dreariness of thought which no goading of the imagination could torture into aught of the sublime. (397)

He examines different perspectives and angles in order to understand what aspect of the scene triggers this effect. He hypothesizes that

there are combinations of very simple natural objects which have the power of thus affecting us…It was possible, I reflected, that a mere different arrangement of the particulars of the scene, of the details of the picture, would be sufficient to modify or perhaps to annihilate its capacity for sorrowful impression. (398)

Although he makes note of the house and trees, he focuses on light’s activity, shape, and intensity. He alters his perspective to test light’s role in producing this effect. He inverts the image by examining its reflection in a “black and lurid tarn that lay in unruffled lustre” (398). The house’s reflection in the illuminated tarn produces an intensified effect on his emotions that results in “a shudder even more thrilling than before” (398). The house’s appearance affects him, and light’s play on the house amplifies this effect. Light
emerges as a powerful tool that changes the scene for the narrator; it produces a real effect that extends light’s function beyond symbolism.

The narrator makes note of similar light effects elsewhere in the story. He finds one of Roderick’s paintings—a painting that depicts light’s glow—to be especially striking, producing in him “an intensity of intolerable awe” (405). The painting shows how light “rolled” in “a flood of intense rays,” appearing without a discernible source and “bath[ing]” the scene in a “ghastly and inappropriate splendor” (406). Even within the static painting, the narrator perceives light’s movement. The narrator describes how he witnesses light’s movement in person in the story’s culminating scene when light glows from the house. The light produces a disorienting and unnerving effect upon him. Even though he runs from the falling house in terror, he briefly stops because of the light that moves toward him. He describes how this active light has a strange nature: “Suddenly there shot along the path a wild light, and I turned to see whence a gleam so unusual could have issued — for the vast house and its shadows were alone behind me” (417). This light proceeds from an unusual source and seems to direct its movement along the path. In another scene, he describes illumination as a process by which “feeble gleams of encrimsoned light made their way through the trellised panes” (401). This description suggests that light does more than passively illuminate the space but rather moves in it to create a pattern of shadows on the wall.

Poe referred to theories about light’s movement, speed, and related phenomena in “The Thousand-and-Second Tale of Scheherazade.” The narrator emphasizes light’s activity and agency several times. He also connects light’s agency with the daguerreotype. He explains how light creates an image in the story of a necromancer
“who can command the sun to paint his portrait;” the story includes an accompanying footnote that identifies the process as “the daguerreotype” (1168). This description of daguerreotypy emphasizes how light becomes a creative actor and agent in creating an image. Satwick Dasgupta notes that the story “emphasizes the agency of the sun in creating daguerreotypes” (315).36 The storyteller hints that light could not ordinarily do this work without magic; but light could act this way in daguerreotypy.

**Poe and Daguerreotypy: A Background**

Poe referred to the daguerreotype process in “The Thousand-and-Second Tale of Scheherazade,” and many writers presented similar information in dozens of articles on the invention that appeared after the daguerreotype’s introduction in the United States. Poe contributed to this discourse with “The Daguerreotype” (January 1840 in *Alexander’s Weekly Messenger*). He also wrote “The Daguerreotype” (April 1840 in *Alexander’s Weekly Messenger*) and “A Chapter in Science and Art: Improvements in the Daguerreotype” (May 1840 in *Burton’s Gentleman’s Magazine*).

Poe took great interest in the daguerreotype almost as soon as it was introduced in the United States. He witnessed the process firsthand when he had his portrait taken at least twice before 1847.37 According to Benjamin J. McFarland and Thomas Peter

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36 Dasgupta provides a brief encyclopedic overview of Poe’s interest in photography. Although Dasgupta mentions light’s agency in daguerreotypy, he focuses on Poe’s attention to the nature of the daguerreotype image.

37 Scholars confirmed that the famous “McKee” daguerreotype was most likely taken in Philadelphia in 1842 or 1843, and the “Daly” daguerreotype was taken in New York between 1844 and 1847. See Michael J. Deas, *The Portraits and Daguerreotypes of Edgar Allan Poe*. Poe may be featured in the “earliest extant interior non-portrait daguerreotype taken in America” taken in the winter of 1842 to 1843 at the Academy of Natural Sciences of Philadelphia (McFarland and Bennett 4).
Bennett, Poe also read the growing literature on the instrument. “Daguerreomania” took hold in New York and Philadelphia when written reports of the invention reached the United States in 1839. Scientists and the public clamored to learn about the new invention and see how it worked (17). The new instrument especially captivated Philadelphia, a city that “was the intellectual and creative center for many scientific and artistic developments, the most lasting of these being photography” (1). Living in Philadelphia between 1839 and 1843, Poe was in the hub of this exchange, especially given his ties to the city’s scientific community and involvement in its publishing scene, which produced countless articles on the daguerreotype and earlier photographic instruments such as the camera obscura and camera lucida.38 In “The Daguerreotype,” Poe referred to the “camera obscure,” which focused light onto glass surfaces in order to assist artists in copying images, as a predecessor to daguerreotypy. This reference showed his familiarity with “the history” of the daguerreotype and photography more generally (“The Daguerreotype”).

Examining Poe’s language in articles on daguerreotypy, McFarland and Bennett argue that “Poe likely drew his information from Daguerre’s own published account of his experiments or Poe’s scientific colleagues” (17). Kevin J. Hayes makes a similar observation in arguing that Poe was very knowledgeable about the process and knew technical information about new techniques. For example, he “expressed his belief that the reproduction of photographs on paper was imminent,” an idea that he must have taken from William Henry Fox Talbot, a leader in developing and improving photographic

38 Kevin J. Hayes explains that “living in Philadelphia during the early 1840s, Edgar Allan Poe had an opportunity to observe the city’s growing enthusiasm for daguerreotype portraiture, and to participate in its lively publishing scene” (“Poe, the Daguerreotype” 477).
instruments and processes (“Poe, the Daguerreotype” 480). Articles on Talbot abounded. Many writers described the process as manifesting light’s agency in creating an image. These articles explained that the daguerreotype enabled light to impress the image in a permanent way. Light emerged as a painter or artist, with many articles using language that ascribed agency to light.

The author of the one of the earliest American articles on the instrument, the February 23, 1839 article “Remarkable Invention” in the *Boston Daily Advertiser*, presented light as having “agency” in creating a daguerreotype image: “the invention is a method of fixing the image permanently on the paper, or making a permanent drawing, by the agency of light alone” (“Remarkable Invention”). An article that appeared in the *Boston Mercantile Journal* three days later explained that a better image emerged when the plate was exposed to brighter light:

> The impression of the image takes place with greater or less rapidity, according to the intensity of the light; it is produced quicker at noon than in the morning or evening, in a summer than in a winter…It may be presumed that the sun of Africa would give him instantaneous images of natural objects in full life and action. (“Extraordinary Chemical”)

This invention provided a new way of understanding light’s action and agency, two aspects that become increasingly associated with daguerreotypy in newspaper and magazine articles and, as I will show, became central features of Poe’s accounts of light in essays, poems, and tales.

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39 Hayes points out that Poe used the terms “photogeny” and “photogenic drawings,” which “suggests his familiarity” with Talbot’s research (“Poe, the Daguerreotype” 480). Dasgupta notes that a character in Poe’s “The Spectacles” bears the name of Talbot (314).
Language on “light’s action” became part of the cultural context surrounding the daguerreotype, a context with which Poe was familiar and to which he contributed with his articles on daguerreotypy. In her study of the print culture of daguerreotypy, Marcy J. Dinius notes that Poe’s description of the device in “The Daguerreotype” “echo[ed] familiar assertions of the artistic agency of chemistry and light” (24). Other articles used similar terms, with attention to light’s agency and action enduring in descriptions of daguerreotypy through the 1850s. One Philadelphia-based periodical foregrounded the “Self-Operating” nature of daguerreotypy in describing how an artist was not needed because light did most of the work: “It amount[ed] to nothing less than making light produce permanent pictures, and engrave them at the same time in the course of a few minutes.” The “action of the light on the different parts of the plate” produced an image (“From the Spectator: Self-Operating” 341). A letter published in the Philadelphia-based *Journal of the Franklin Institute* focused on “the chemical action of light on paper prepared with a solution of chloride silver” (Bird 202). The writer, Golding Bird, called the process “Heliographic” drawing, which emphasized the sun’s active role in the process. The sun could draw and write (202). A writer for the *Journal of the American Institute* described how “the ways of light that are thus reflected have the power of acting in the way above alluded to on chlorate silver, or certain preparations of it” (“Chemical and Optical” 276). J. S. Memes used the word “agency” to describe light’s work (417). Meme’s article appeared in British and American periodicals, including *The Observer*, *American Repertory of Arts, Sciences, and Manufactures*, and *The Family Magazine*, and
The Useful Arts. Memes summarized the process, with one section describing the “action of light” (415). He also used the word “agency”:

It is easy to conceive that this operation, being accomplished only through the agency of light, will be the more rapid in proportion as the objects, whose photographic images are to be delineated, stand exposed to a strong illumination, or in their own nature present bright lines and surfaces. (417, emphasis added)

Memes explained how the instrument focused the light, but he also ascribed agency to light itself several times. Attention to light’s primary role in the daguerreotype process endured through the 1850s and 1860s. In 1864, M. A. Root explained that photographers, or “heliographers,” should know about how light behaved because the sunlight was the primary actor in the process (49). Examining how the daguerreotype manifested light’s action and agency provides a context in which to understand Poe’s depictions of light’s action in tales and poems.

Poe’s Light Effects: Critical Commentary

The narrator of “The Oval Portrait” (1850) describes how light strikes surfaces. He also discusses the effect that this “action” produces. He first moves the candelabrum so that light “throw[s] its rays more fully on the book” he is reading, an “action” which “produced an effect altogether unanticipated” as the light “fell” into another part of the

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40 See Beaumont Newhall’s *The Daguerreotype in America* for more information on Daguerre’s report.

41 Root included a chapter on “The sun the heliographer’s instrument” that discussed “Newton’s theory of light—Young’s theory—Field’s theory—Light, heat, actinism—Light as a compound of seven colors, according to Newton” (49). A heliographer needed to know about light’s physical properties and behaviors because light plays such a significant role in the process.
room (663). He then describes how light strikes the canvas, using language recalls the work of light striking a daguerreotype plate to reveal an image: “the light dripped upon the pale canvas only from overhead” (665). A painter created the portrait in the darkened space, but this description of light recalls daguerreotypy. This reference suggests that Poe was interested in experimenting with light and in its capabilities revealed through the process. The narrator describes light’s action on the canvas several other times in the short story, tracking the interplay of light on the architecture and painting. In one scene, light produces a startling effect upon him as he looks at the painting: “the first flashing of candles upon that canvas had seemed to dissipate the dreamy stupor which was stealing over my senses, and to startle me at once into waking life” (664).

Examining these stories demonstrates how Poe employed light to produce effects on his characters as well as his readers by imbuing them with an ambiance of the strange. He altered light, intensifying its agential capacity to such a level that it becomes unnatural. Critics who examine Poe’s relationship to daguerreotypy and photography primarily focus on what he thought about the daguerreotype image.42 In her study of American authors and daguerreotypy, for example, Susan S. Williams argues that the portrait in “The Oval Portrait” (1845) acts as Poe’s commentary on the accuracy of daguerreotype images that fits with “popular conceptions of the daguerreotype as an uncannily accurate double” (71). Ronald R. Thomas examines how the photograph provides a useful way to examine Poe’s crime fiction stories. These stories focus on

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42 Dasgupta points out that “the daguerreotype’s influence on Poe’s work remains largely undocumented because he seldom mentioned it or evoked its working principles in his imaginative writings” (314).
strategies for revealing the “truth” in an accurate way (91).43 Poe discussed the final image’s accuracy, but he also described the process in his essays on daguerreotypy. The process fascinated him, and he adapted some parts of the daguerreotype process into his literary works. McFarland and Bennett describe how Poe replicated the daguerreotype process in the “The Black Cat” (1843) where the “ammonia fumes from its [the cat’s] decomposing body” create an image of the cat on a wall, a process that is similar to the “chemical processes of photography” (17). Dasgupta argues that “The Oblong Box” (1844) refers to one key part of the daguerreotype process—the salt solution used to set the image. While the narrator believes the box to contain a painting, it actually contains a body and salt. Dasgupta argues that these items refer to the daguerreotype process where salt was used “as a means of fixing the photographic impression” on a plate (319).

Although these studies establish Poe’s interest in the daguerreotype process, they neglect to take into consideration how the light especially captivated Poe. In “The Black Cat,” for example, the fire’s light and heat help to set the image as it reacts with the lime and ammonia in the plaster. Such studies also risk overlooking the connection between Poe’s aesthetic philosophy and his interest in daguerreotypy. Dasgupta offers a useful way to begin considering this relationship in pointing out that Poe did not believe mimetic reproduction to have aesthetic value: “mimetic veracity, needless to say, was not part of Poe’s visual aesthetic” (317). While Poe “did not totally rule out” the daguerreotype’s artistic potential in “The Daguerreotype,” he emphasized its value for

43 This focus is apparent in several studies of other mid-century writers’ depictions of daguerreotype images. Dinius examines whether Hawthorne and Herman Melville believed that a photographic image reflected an entirely objective reality or whether photographers exerted influence over the final image, which would make the image a piece of art (57). Some scholars examine Hawthorne’s The House of the Seven Gables. Michael C. Frank reads the novel as questioning photography’s (and the novel’s) ability to convey the truth. Alan Trachtenberg focuses on similar questions in “Seeing and Believing.”
science in reproducing accurate images such as for recording the moon’s phases (317). Dasgupta argues that this aspect inspired Poe as he conceived of detective fiction: a daguerreotype image reveals subtle clues about a person just as police investigations and detective fiction uncover accurate details of a crime. Dasgupta raises important questions about photographic mimesis and aesthetics, but I offer a new way to consider how Poe took inspiration from the process. The daguerreotype’s interaction with light inspired aesthetic effects in works across his career.

The daguerreotype provided Poe with a way to conceptualize an aesthetic practice based on altering light—photography revealed the possibility of light’s agency that he puts to aesthetic use. When he discussed the instrument’s potential for “the drawing of a correct lunar cycle” in “The Daguerreotype,” he again focused on light’s role in the process: “the rays of this luminary are found to be appreciated by the plate” (“The Daguerreotype”). He altered light and endowed it with strange properties in a series of poems, creating novel forms with slight, simple alterations to light. As Dasgupta points out, Poe valued novelty in terms of visual art. Poe also believed that poetry, like visual art, should not be mimetic. I argue that we can track this feature in examining his depictions of light. For this reason, it is necessary to consider how the daguerreotype process—and not the daguerreotype image—was analogical to the type of work that he believed art should do.

Critics document Poe’s emphasis on novelty in poetry, especially as he articulated it in reviews of others’ poetry. Kent Ljungquist points to Poe’s review of Henry Wadsworth Longfellow’s *Ballads and Other Poems* as representative of Poe’s insistence
upon art’s novelty in explaining that “novelty and ideality” became “hallmarks of poetic genius” (13). Poe wrote that

[Poesy’s] first element is the thirst for supernal BEAUTY—a beauty which is not afforded the soul by any existing collocation of earth’s form—a beauty which, perhaps, *no possible* combination of these forms would fully produce. Its second element is the attempt to satisfy this thirst by novel combinations among those forms of beauty which already exist—or by novel combinations *of those combinations which our predecessors, toiling in the case of the same phantom have already set in order*. We thus clearly deduce the *novelty*, the *originality*, the *invention*, the *imagination*, or lastly the *creation* of BEAUTY (for the terms as here employed are synonymous), as the essence of all Poesy. (687)

Citing this passage and “The Poetic Principle” and “The Philosophy of Composition,” critics like Ljungquist point to Poe’s emphasis on novelty as central to his understanding of poetry and art.44 Such an idea is especially significant in considering his treatment of light. Light produces such striking effects on characters because it behaves in new ways. As light becomes a signifier of the strange and unnatural, it also has the potential to produce such an effect on readers. Poe transformed light to create a novel form of illumination that can produce such effects.

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44 See Rachel Polonsky and Chris Beyers.
Poe’s Active Light

While Poe mentioned the instrument in some works like “The Thousand-and-Second Tale of Scheherazade” and alluded to it in “The Oval Portrait” and “The Black Cat,” his attention to light in a series of other works encapsulates his aesthetic experimentation that the process inspires. Poe experimented with active, agential light in poems and tales across his *oeuvre*, and especially those from the late 1830s and 1840s. He anthropomorphized light in some works, describing how light and luminous bodies exercise agency in their movement. For example, he made the red sun much more of an actor in choosing to “lazily lay” in his revision of “The Valley of Nis” (1831) into “The Valley of the Unrest” (1845) (8). Light also acts in “A Descent into the Maelstrom” (1841). An unnaturally brilliant light “blazed forth the full moon with a lustre that I never before knew her to wear. She lit up every thing about us with the greatest distinctness — but, oh God, what a scene it was to light up!” and then “the rays of the moon seemed to search the very bottom of the profound gulf” (587, 591). The verbs “wearing” and “searching” anthropomorphize light and suggest a degree of agency that light would not ordinarily have.

Many of these descriptions of light appeared in works published after 1839, but several earlier works also feature light in a similar way. Poe took an interest in active light and the striking effects that it could produce as early as 1829. He depicted active light in “Al Aaraaf” (1829), which anticipated his later experiments with light’s movement and agency. While “Al Aaraaf” features a number of references to mythology,
the Koran, Eastern culture, and cosmology,\(^{45}\) it focuses on light. It tracks light’s natural illumination as a star.

In his detailed analysis of cosmology in the poem, Stephen Rachman notes that “the words light, ray, and their variants occur more than twenty-five times in its 422 lines” (8). The poem describes active light and tracks the path of a luminous body and its light effects as it moves across the sky as a “wandering star” (I. 15). Some of these descriptions rely on synesthesia, as when “twilights murmur” and “light breathes” (Rachman 8), that connect with Poe’s anthropomorphization of light into the figure of Nescace. The star moves in its anthropomorphized form. It first moves “’mid seas of rays that roll” (I. 20). Other stars “fell” and “refracted” so that their “keen light” light creates effects across the sky (II. 160, II. 159). Yellow light springs, and then light moves “with a downward, tremulous motion” (I. 155, II. 239). As these examples demonstrate, the poem presents a clear focus on light’s movement. The speaker then connects moving light with the strange: “the moon danc’d with a stranger light” as the star travelled into “the sunlit ether” (II. 10, II. 8).

In “Metzengerstein” (1832), one of Poe’s early tales, light becomes strange as it moves. The narrator tells of a feud that culminates in a fire at one family’s castle. The story draws from Gothic and psychological modes,\(^ {46}\) and it features light’s instrumental role in the action. Frederick Metzengerstein finds himself captivated by a tapestry depicting the murder of a Berlifitzing family member until a flash of light breaks the “spell”: “he diverted his attention to the glare of the ruddy light” from the fiery stables

\(^{45}\) See Rachman for a discussion of these references.

\(^{46}\) See Travis Montgomery’s “Poe’s Oriental Gothic.”
outside (22). As the scene progresses, light takes on an increasingly prominent and active role in affecting Frederick. It takes on an active quality instead of being passively thrown around the room. Another “flash of red light” appears, “streaming far into the chamber” and then “flung his shadow” upon the tapestry (23). The narrator no longer casts the light as a passive illuminator but rather uses active verbs to describe light’s movement and force—it flings shadows rather than being thrown into the room. This light effect unnerves Frederick when it strikes the surface of the tapestry to reveal a new image upon the surface. This light causes him to see his shadow “assuming the exact position, and precisely filling up the contour, of the relentless and triumphant murderer of the Saracen Berlifitzing” (23). As light moves into the room, it projects Frederick’s image. This light has such an unnerving effect that he must leave the room, as he believes that this light arranges itself in this way in order to expose him as the murderer. This light effect causes Frederick to obsess over the feud, which precipitates his death in the fire. At the end of the story, the fire releases a strange light, “a white flame…that shot forth a glare of preternatural light” as it moves upward into the sky (29).

In “The Man of the Crowd,” which appeared one year after the daguerreotype’s introduction, Poe explored light effects in more detail in examining how light’s movement and interplay on surfaces, including on glassy surfaces, produce real effects upon the narrator. Throughout the story, the narrator tracks light from the gas light’s “strong glare” to the “dim light of an accidental lamp” (514) that allows him to perceive details about the people in the city. Susan Elizabeth Sweeney argues that the story subtly refers to daguerreotypy in a scene where the narrator looks out a window into the crowd. He notices his reflection at the same time: the “alternation between transparency and
reflection makes the window re semble an early daguerreotype portrait: that is, a polished silver plate, imprinted with the sitter’s reversed image, which presents either that image or the viewer’s own reflection, depending on the angle at which one holds it” (7-8).

Sweeney points out that the narrator looks through windows and glass as he observes people in the crowd. And the narrator’s emphasizes light’s role in creating this image. He notices this effect only when the figure “comes within the strong glare of the lamp” (“The Man” 514). These effects necessitate examination of light’s role in producing such an image rather than the nature of the image itself.

Sitting inside a coffee house, the narrator looks out through a “bow window” to observe the people who pass by in the streets (507). As soon as the “lamps were well lighted,” he notices minute details of workers’ clothing and mannerisms that allow him to identify large groups of people with different classes. The light renders these details more perceptible. He continues to describe light’s effects on him and his perception of the city. The light and its effects become increasingly strange as the night progresses.

As the night becomes darker, he notices the way illumination changes the city’s appearance and how he perceives the crowds. He gains “more interest of the scene” as the lamps illuminate the city: “the rays of the gas-lamps, feeble at first in their struggle with the dying day, had now at length gained ascendancy, and threw over every thing a fitful and garish lustre” (510-1). He marvels at light itself, which moves upward as it illuminates the city. He considers the way light affects him and the scene: “The wild effects of the light enchained me to an examination of individual faces” (511). As the “world of light flitted before the window,” he no longer thinks about the people as part of
a large group or as representative of their class, but he marvels at how he can understand each person’s “history” (511).

One passage from the “The City in the Sea” (1845) tracks light’s movement as it moves along “a wilderness of glass,” a reference that recalls photographic instruments and focalizes light effects as it strikes a glass surface. Beginning in the first stanza, the speaker describes how light strikes surfaces to reveal shadows and details hidden in the dark.

In all of its versions (“The Doomed City” [1831], “The City of Sin” [1836], and “The City in the Sea” [1845]), the poem describes light’s illumination of a dark city. Poe increased the attention to light’s movement with each revision. Criticism on the poem, though, tends to overlook light’s dramatic movement and activity, focusing instead on the location of the city and the city’s symbolic significance as representing a range of mythic cities. The critical tradition focuses largely on Poe’s inspiration for the city and the city’s symbolism. Louise Pound cites earlier critics like Thomas Ollive Mabbott, who argued that the city may have represented “a symbolic association with Babylon and Gomorrah,” but she maintains that the submerged city has its roots in ancient and medieval legends on “sunken cities” (27, 25). Scott Peeples believes the city to be representative of a city near the Dead Sea (25). In one of the few recent studies of the poem, Robert Oscar Lopez continues to emphasize the importance of locating the city in order to determine its symbolic significance. Lopez rules out a number of real and fictional cities, ultimately arguing that this city could be an Orientalization of John Winthrop’s idea of the city on a hill (93).
Oliver Evans examines light’s prominent role in the poem. He notices that light in the poem is different from ordinary light in that radiates “upward” instead of “downward” (295); this light behaves unnaturally. Although Evans reads the light as symbolic of sin, “doom,” and “destruction” (295), he establishes that unnatural light is a central feature of the poem, especially in the third version. Poe increased attention to light’s action and away from light’s symbolic role over the course of the three publications of the poem. T. Frederick Keefer notes that Poe changed the title to shift focus from sin and death represented in the titles “The Doomed City” and “The City of Sin” (437). Poe also removed several lines, which distanced the poem from moralistic overtones associated with sin and death. For example, in the revision from “The Doomed City” to “The City of Sin,” he removed an entire stanza on God’s condemnation of the city’s inhabitants. In his revision from “The City of Sin” to “The City in the Sea,” he removed the two final lines from the poem that directly discuss how “Death” leaves the city to destroy other cities (56-8). Poe’s removal of the lines “Oh no! – O no! – ours never loom/ To heaven with that ungodly gloom” also distanced the poem from its association with sin and doom (8-9). He shifted focus away from the city’s inhabitants, their behavior, and destruction to the light that illuminates the city.

Poe added a line about light’s motion in the 1845 version: light “gleams up the pinnacles far and free —” (16). The speaker describes light’s movement upward in the first stanza:

No rays from the holy heaven come down
On the long night-time of that town;
But light from out the lurid sea
Streams up the turrets silently —
Gleams up the pinnacles far and free —
Up domes — up spires — up kingly halls —
Up fanes — up Babylon-like walls —
Up shadowy long-forgotten bowers
Of sculptured ivy and stone flowers —
Up many and many a marvellous shrine (“The City” 12-19)

Light’s illumination reveals architectural details hidden in the darkness. The poem emphasizes how light moves in describing this illumination. Light moves upward, an action that repeats at least seven times.

This passage suggests that this movement is strange: it streams and gleams in a surprising direction and from a surprising source. While this light takes the form of familiar, natural light in illuminating the city, the speaker makes it clear that this movement “up” is unusual. The speaker sets up the expectation that light should move downward from heaven, but it then traces how light breaks from this expectation. This simple and stark reversal in light’s movement alters light’s action. The speaker emphasizes this reversal through repetition. Similar references to light’s activity appear in the stanzas that follow as the speaker tracks light’s action when it moves through the city, ascending from another light in a “lurid sea” (9). The speaker establishes that it is impossible for this city to be illuminated because no light source exists with the city submerged “far down” out of the sun’s reach (3). The city’s geographical location in the “dim West” also prohibits other sources of light (3). Peeples observes that “even the sky

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47 Poe removed the qualifying adjectives “deep” from the line “Light from the lurid, deep sea” to “But light from out the lurid sea” (9).
is mysteriously starless,” so the sea would not reflect any light from the sky (25). Given these circumstances, the “lurid sea” must be light’s only source, with light generating itself.

Perhaps the most significant revision that Poe made to the “The City in the Sea” was his addition of the adjective “luminous” to the lines “There open fanes and gaping graves/ Yawn level with the luminous waves (30-1). The pairing of luminous with “waves” again emphasizes light’s movement, and it recalls a popular nineteenth-century theory of light’s movement that cast light’s moving as a wave through ether.

In ascending upward and then moving as a wave, this light is uniquely active in the poem. Light’s movement contrasts with the darkness and stillness that characterizes the city before light enters:

For no ripples curl, alas!
Along that wilderness of glass —
No swellings tell that wind may be
Upon some far-off happier sea —
No heavings hint that the winds have been
On seas less hideously serene. (36-41)

The speaker then heralds a change when the wave enters the city: “But lo, a stir is in the air!/ The wave — there is a movement there!” (42-3). With the speaker describing these waves as “luminous waves,” this line suggests that light’s entrance causes the movement in the city. Light and motion merge. And the glassy surface acts as a surface for light’s action. Light strikes this surface much like the glass surfaces of the daguerreotype and other photographic instruments.
In the next stanza, the water is no longer a still glass surface because waves begin to swell. They become illuminated with “a redder glow” (48). Light and waves merge, and in doing so, light colors itself. The red glow enshrouds the entire city and changes the city’s appearance.

The narrator of “Landor’s Cottage” (1849) describes how light moves and takes on a striking color. This light gives the appearance that it directs itself, and it gains the ability to alter the appearance of an entire scene. The narrator describes how he comes across a cottage while on his walking tour along a path that “undulated” through the New York countryside (1328). He calls attention to the light that illuminates this scene. He first describes light’s intense vibrancy and purple color, which differ from the dull light in the first paragraph. He then presents this light as an actor that exercises agency in its movement: “glaring with a purplish lustre,” the sun dances as it “made its way down behind the gentle hills” in “slight *chassez*” (1330, 1331). This activity alters the scene. The narrator now notices that “suddenly, therefore — and as if by the hand of magic — this whole valley and every thing in it became brilliantly visible” (1331). The narrator also explains how much this illumination has an effect on him, as the sun’s sliding into this position impressed me very much as I have been impressed when a boy, by the concluding scene of some well-arranged theatrical spectacle or melodrama. Not even the monstrosity of color was wanting; for the sunlight came out through the chasm, tinted all orange and purple; while the vivid green of the grass in the valley was reflected more or less upon all objects from the curtain of vapor that still hung
overhead, as if loth to take its total departure from a scene so enchantingly beautiful. (1331)

Light’s movement creates a real effect that alters how the narrator perceives the scene. The sun’s “sliding” makes it seem like light creates a “well-arranged theatrical spectacle.” The attention to the arrangement suggests that this light moves into its place with a specific plan. Even if the sun may not actually arrange the scene, its movement across the landscape gives this impression.

The speaker of “Ulalume—A Ballad” (1847) tracks light’s action as it illuminates another landscape. This active light exercises a similar sense of agency, which leads the speaker to conclude that this light must not be natural. The ballad follows an unnamed speaker travelling through a darkened landscape a year after the death of his lover, whom he seems to have forgotten.48 He follows the luminous celestial bodies in the sky. Most critics focus attention on the fourth stanza, which describes the light that guides the narrator to Ulalume’s tomb. But critics overlook the way light behaves even though the stanza features light prominently. They also tend to view the light as a symbol even though the speaker details its physical properties and appearance.49

The speaker and Psyche discuss the light in terms that suggest that it exercises agency in its activity; as anthropomorphized light, it shapes its own movement in guiding the travelers. The first lines establish the scene as taking place at “night” in a landscape

48 See Richard Kopley and Kevin J. Hayes, Joseph P. Kenyon, and Eric W. Carlson for reviews of criticism on the poem.

49 Kopley and Hayes observe that criticism on the poem focuses on two elements: the symbolism and the references’ sounds (197-8). Carlson reads the poem as a “psychodrama” rooted in symbols of love and sexuality (26). Kenyon considers the poem as representative of Poe’s psychological turmoil caused by his wife’s death (66).
overrun with darkness: the skies “were ashen and sober” and reflect on the glassy surfaces of the “dim lake” and “dark tarn” (6, 8). Several stanzas later, the speaker directs attention to the sky when stars appear. This light initiates and guides this journey. Rising upward from the landscape, the traveler sees “a liquescent/ And nebulous lustre” rising from the path, and he follows it (33-4).

As light begins to appear, the speaker tracks light’s action, tracing its movement upward. It also changes its physical properties from a misty luster to a solid state, a “bediamonded crescent” as it moves (37). Specifically, the speaker calls attention to this star’s movement, which creates dramatic light effects in the sky. As in “Al Aaraaf,” this light travels by “rolling.” It rolls “through an ether of sighs” (40). This reference to ether once again gestures back to light’s natural movement in luminiferous ether as described by then current optics. Now the speaker tracks Astarte’s movement in the sky. Astarte, a star,50 “has come past the stars of the Lion, / To point us the path to the skies –” and “Come up, in despite of the Lion, / To shine on us with her bright eyes –” (44-5).

Through this movement, Astarte directs the traveler through the landscape. The traveler makes note of the light’s movement in the next stanza, disregarding Psyche’s concerns about the star’s appearance and calling for them to follow the light:

“Let us on, by this tremulous light!
Let us bathe in crystalline light!
Its Sibyllic splendor is beaming
With Hope and in Beauty to-night –
See! – it flickers up the sky through the night!

50 Thomas Ollive Mabbott notes that “Astarte” is usually identified with stars and could refer to the planet of Venus, “‘the most brilliant of the gods’” (422).
Ah, we safely may trust to its gleaming
And be sure it will lead us aright –
We surely may trust to a gleaming
That cannot but guide us aright
Since it flickers up to Heaven through the night.” (62-71)

Focusing on the star’s movement and brightness, the traveler observes how this light looks. Taking the form of prism-like “crystalline light,” the star appears even brighter as it trembles. The wanderer notices how light’s activity—its shaking, trembling, flickering—produces the effect of unnatural brightness exemplified in its “Sibyllic splendor” (64), with the adjective signifying “excessive” (“Sibylline”). As light moves across the sky, the narrator emphasizes its upward movement: it “flickers up the sky” and “flickers up to Heaven” (66, 71). Because of this direction, the traveler “trusts” this light to “lead us alright” until he realizes that the light moves upward from Ulalume’s tomb, a feature that he finds to be strange. It is noteworthy that even Ulalume’s name refers to light, containing a reference to light’s Latin root *lumen*.51

Upon unexpectedly arriving at his dead lover’s tomb a year after her death, the traveler figures that this light must be unnatural and conjured by “ghouls” in the woods (96). The light is extremely bright, with the phrase “sinfully scintillant” suggesting both its otherworldly nature and brightness (103). Light and the strange again intertwine because the light takes on new forms.

51 Mabbott explains that Poe most likely invented the name “Ulalume” by joining “*lumen*,” meaning light, with the prefix “ula,” which most likely pertains to the Latin verb “*ululare*” meaning “to wail.” This prefix could also represent the onomatopoeia of wailing sounds (419)
Illumination in “Ulalume” encapsulates Poe’s experimentation with light. The light captivates the traveler as it moves across the sky. Light dances, tumbles, and rises, capturing the motion, action, and agency that fascinated Poe in early photography. This light is strange, unnatural, preternatural, and unusual because of how it acts. It colors itself, creates images, directs its movement, and alters the appearance of entire scenes. The light produces real, noticeable effects in its new form; from the ruddy light that produces an effect “ghastly in the extreme” in “The Masque of the Red Death” to the unnatural “lustre” in “A Descent into the Maelstrom” (672, 587), this light disorients and arrests his characters. Poe made otherwise familiar, unremarkable illumination into light that produces dramatic, unnatural effects. He transformed light so that it actively shapes experiences. This light takes on a new form, so that Poe’s poems and tales work like daguerreotypy in manifest new properties. And Poe intensified these properties to such a level that they produce striking, unusual, and sometimes novel effects that are integral to his philosophy of art.
Chapter 2

A Formal—Thermal—Feeling Comes: Temperature in Dickinson’s Poetry

In a letter to friend James D. Clark, Emily Dickinson wrote of her mother’s death in terms of temperature: “Her dying feels to me like many kinds of Cold” (L 788). This metaphor links feeling with temperature. Literature and everyday language often relate how love is warm and how fear makes one feel chilly. Emotions and temperature also have a physiological connection, with some emotions making one feel warmer or cooler. Dickinson featured this correlation in the poem “When I hoped, I recollect” (Fr 493), which casts hope and despair in relation to temperature. Hope keeps the speaker “warm,” and despair brings “Icicles” that “Prickled Blue and Cool —.” In other poems Dickinson used temperature to account for feelings that are outside the range of human experience and beyond the reach of traditional metaphors.

Dickinson described this kind of state in “It was not Death, for I stood up.” Dickinson’s speaker represents it in terms of temperature when no existing social or literary terms are adequate:

It was not Frost, for on my Flesh

I felt Siroccos – crawl –

Nor Fire – for just my marble feet

Could keep a Chancel, cool –

By describing extreme temperatures in this poem, Dickinson repurposed the correlation of temperature with common emotions in order to intimate an extreme and paradoxical subjective state. Her study of science showed her the cutting-edge techniques whereby
scientists measured and recorded extreme temperatures with thermometers and other
devices. Just as chemists were able to measure extreme physical states, Dickinson used
temperature to expand literature’s subject matter by attending to feelings beyond the
range of society’s vocabulary.

Studying Dickinson’s correlation of alien feelings with extreme temperatures
reveals a significant but unexplored pattern in her poems. It also illuminates a new way to
consider her engagement with scientific concepts and language, one that departs from a
dominant critical tradition concerned with uncovering information about her biography
and attitude toward science. Criticism is moving toward a more complex investigation of
how contemporaneous scientific and mathematical knowledge shaped Dickinson’s
poetry,52 and her treatment of temperature demonstrates that she used scientific
knowledge for aesthetic purposes. She altered and extended temperature’s logic and
lexicon in order to describe the alien feelings important to her aesthetic aim of
representing unfamiliar feelings.

Dickinson’s Knowledge of Science: A Critical and Historical Background

My study, like others on Dickinson’s science,53 follows in the direction of
Cristanne Miller’s Reading in Time, Richard E. Brantley’s Emily Dickinson’s Rich
Conversation, Domhnall Mitchell’s Monarch of Perception, and Jed Deppman’s Trying
to Think with Emily Dickinson. These maintain that Dickinson read books and periodicals

52 Paul Giles critiques scholarship that works to pinpoint “any specific intellectual position that Dickinson
may have held” (7).

53 See Robin Peel’s Dickinson and the Hill of Science.
and took an interest in ideas from politics, literature, science, and technology. Jerusha
Hull McCormack underscores how Dickinson took great interest in the cultural milieu
around her: “little if anything within the range of contemporary events escaped
Dickinson’s imagination” (572). Deppman looks at Dickinson’s education for evidence
that she knew about scientific thinking: “Dickinson’s self-awareness about thinking”
emerges “as a logical outgrowth and application of the lessons she learned from a
pedagogical culture that prized experiments and observation in all things” (Trying to
Think 53). This critical framework provides a way to understand how Dickinson engaged
with scientific ideas that circulated in Amherst at mid-century. During this time,
chemistry was one of the fields most intricately concerned with temperature. Dickinson
studied this subject while at Mount Holyoke from 1847 to 1848 under the leadership of
trained chemist Mary Lyon.

Critics describe Dickinson as an amateur scientist familiar with chemistry, botany,
astronomy, biology, medicine, physics, and geology.54 They examine poems with
chemical terms, such as “atom,” to consider what they reveal about her attitude toward
chemistry and what they show about her religious beliefs: how did Dickinson’s science
education affect her belief in God? This critical approach makes sense considering how
Edward Hitchcock’s chemistry-inflected natural theology circulated in Amherst at the
time. The two major studies of Dickinson and chemistry, Eric Wilson’s “Dickinson’s
Chemistry of Death” and Hiroko Uno’s “‘Chemical Conviction,’” attend to the ways that
“The Chemical Conviction” and other poems refer to debates in natural theology.

54 Kohler lists studies of Dickinson’s science (“The Apparatus” 58-9). Giles writes that “Dickinson was of
course well versed academically in science, having taken at Amherst Academy various scientific courses,
including geology, botany, algebra, Euclidian geometry, chemistry, and astronomy” (5).
Dickinson wrote about how she studied science, including chemistry. In a December 1847 letter to her brother, she wrote about her courses in “Chemistry, Physiology, & quarter course in Algebra,” and, in a January 1848 letter to friend Abiah Root, she noted, “I am now studying ‘Silliman’s Chemistry’ & Cutler’s Physiology, in both of which I am most interested” (L 19, L 20). 55

A significant component of “Silliman’s Chemistry” focused on temperature and thermometers as tools for studying matter and the physical world. Silliman’s *First Principles of Chemistry for the Use of Colleges and Schools* (1846) and Dickinson’s other chemistry textbook, Alonzo Gray’s *Elements of Chemistry* (1841),56 featured some of the vocabulary and concepts that she used in poems. Silliman began a lengthy section on temperature by describing how the body sensed relative heat while thermometers accurately measured it (56-7). Gray introduced his first chapter in a similar way. He defined heat as “the sensation we experience” as “when we touch a hot body” and identified the thermometer as an important tool for chemists because it provided an accurate measurement (17). Thermometers augmented humans’ natural ability to discern temperature, and, in doing so, they assisted scientists in better understanding matter’s properties.

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55 See Richard B. Sewall, White, Marianne Erickson, and Cynthia Griffin Wolff for a discussion of these letters.

56 Carlton Lowenberg identifies two possible chemistry textbooks for the 1847-1848 school year at Mount Holyoke Female Seminary: Benjamin Silliman’s (senior) *Elements of Chemistry in the Order of the Lectures Given in Yale College* (originally published in 1830-1) and Benjamin Silliman Jr.’s *First Principles of Chemistry* (originally published in 1846) (91). While both textbooks provided similar information, Jed Deppman argues that Dickinson most likely used Silliman Jr.’s book (*Trying to Think* 53). Lowenberg identifies Gray’s *Elements of Chemistry: Containing the Principles of Science, Both Experimental and Theoretical* as Amherst Academy’s chemistry textbook during the time when Dickinson studied there (54).
Dickinson likely used thermometers while doing experiments in laboratories at school,\textsuperscript{57} and she regularly used them while gardening. Judith Farr observes that “much of [Dickinson’s] mature correspondence describes the difficulties of keeping flowers healthy in the heat and cold” (124). Dickinson referred to thermometers in many letters: writing to Austin Dickinson, “the weather has been wonderful, the thermometer every noon between 60 and 70\textdegree above zero,” and to Frances Norcross, “We have had fatal weather—thermometer two below zero all day, without a word of apology” (L 157, L 254). In these and other letters, she wrote about how she spent a great deal of time tracking weather and using thermometers.

Silliman and Gray also explained thermometers’ limits. Technical improvements increased thermometers’ accuracy and extended the range of temperatures that could be measured, but thermometers could still only account for a small range of temperatures. Gray noted that “thermometers and other instruments measure only a few degrees, in the middle of a scale, whose extremities are indefinitely extended” (39-40). While thermometers could not record extreme temperatures, they work within a model that made it possible to imagine where those would fall on the scale as it extended higher or lower “indefinitely.” The thermometers presented a way to begin to understand, approach, and measure extreme temperatures.

Most common temperature-related metaphors and similes refer to temperatures within thermometers’ limited range. Linguist Alice Deignan argues that “most generic conceptual metaphors are grounded in physical experience,” which may give rise to

\textsuperscript{57} Miriam S. Levin observes that “when Emily Dickinson studied at Mount Holyoke [Female Seminary], the school’s founder and trained chemist Mary Lyon, designed lessons based on experimentation in laboratories” (25). Silliman’s textbook included many experiments for students.
temperature-related metaphors (59). Michele Emanatian points out that anger produces “physiological effects” like “increased skin temperature and heart rate,” which may underlie metaphors of anger as heat (165). Zoltán Kövecses notes how some expressions for emotion are rooted in physical changes that alter, or are perceived to alter, the body’s temperature. There is “an assumed drop in body temperature” with fear, which may give rise to the phrase “to have cold feet” (5).

Dickinson reproduced many common expressions in poems and letters. “A narrow Fellow in the Grass” (Fr 1096) describes fear in terms of temperature. The speaker relates how it is not possible to see a snake in the grass “Without a tighter Breathing/ And Zero at the Bone.” Fear initiates a physical reaction that includes a feeling of intense cold in the body.58

In one letter, Dickinson related her affection for Susan Gilbert as “so hot and feverish” (L 96). She referred to the familiar connection between warmth and affection dozens of times, including when she called herself a “warm friend” (L 14), mentioned “warm affection” (L 50), and expressed “warmest love” and “warmest congratulations” (L 190, L 902). In a letter to Dr. and Mrs. J. G. Holland, she wrote that “it is cold tonight, but the thought of you so warm, that I sit by it as a fireside, and am never cold anymore” (L 133). She connected “sorrow and frost” to convey her loneliness in a “Master letter” (L 233).

In some letters, Dickinson departed from these common expressions in using temperatures to describe other feelings. She reflected on how writing poetry made her feel in a letter to friend J. K. Chickering: “my own Words so chill and burn me, that the

58 L. Edwin Folsom makes a similar observation (367).
temperature of other Minds is too new an Awe –” (L798). She hoped that temperature could help Chickering understand her excuse for not meeting with him. The “chill” in this passage recalled Dickinson’s famous description of poetry in a letter to Thomas Wentworth Higginson: “If I read a book [and] it makes my whole body so cold no fire ever can warm me I know that is poetry” (L 342a).\textsuperscript{59} This line reinforces Dickinson’s interest in the correlation between feeling and temperature while underscoring her belief in poetry’s ties to feelings. Dickinson examined interior experiences throughout her poetry, with Sharon Cameron arguing that she took interest in making “interior experience” visible and accessible (Lyric Time 26).

Dickinson described these emotions and conditions with extreme temperatures in a series of poems. The speaker of “The fascinating chill that music leaves” (Fr 1511) relates an affective response to music in terms of the cold. This “chill,” though, is not an ordinary cold but rather refers to an extreme state. The chill is “fascinating.” Helen Vendler explains that “fascinating” here connotes “a hitherto-unknown climate, a climate chillier than the human one” (Dickinson 482). Vendler’s discussion of this temperature helps in understanding how Dickinson used extreme temperatures to describe experience and feeling.

In several other poems, Dickinson also used extreme temperature primarily to discuss unfamiliar feelings. She reworked the correlation between temperature and emotion to do so. She associated feelings with numbers on the thermometer’s scales; and, because this imagined scale extended indefinitely, she pushed higher or lower on the scale to intimate unfamiliar feelings. I include both emotion and physical sensations

\textsuperscript{59} Farr observes the similarities between Dickinson’s letter to Chickering and her letter to Higginson (102).
when using the term “feeling” consistent with the definition for “feeling” in her family’s Noah Webster’s 1844 *American Dictionary of English Language*. Deppman notes that “scholars have long considered Webster’s 1844 dictionary to be an important resource for reading Emily Dickinson’s life and work” (“I Could Not Have Defined” 49).

Cameron explains that Dickinson often examined “relationships that have been lost, forgotten, or hitherto unperceived” (*Lyric Time* 28). Dickinson opened up such experiences by naming them, “[leaving] us with names for what otherwise might be unspeakable” (55). She took an interest in describing perception after death, a truly alien state. The speakers in several poems, including “Because I could not stop for death” (Fr 479), speak from beyond the grave, which shows the “straying of a poem across impossible limits,” including the limits of consciousness (92). Cameron’s observation suggests that Dickinson used poetry to extend knowledge of interior and subjective states, pushing beyond the type of knowledge that poetry usually makes available.

Cameron and other critics examine several ways that Dickinson approached post-death and other unnamable or alien experiences. One additional unexamined technique is her use of temperature, often extreme temperature, to represent them. Dickinson featured this kind of state in “After great pain, a formal feeling comes” (Fr 372). The poems’ speaker describes an affective experience without a name. Joan Burbick points out that the poem examines the “effect” of some traumatic incident, whether it be

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60 *Emily Dickinson Lexicon* uses Webster’s 1844 dictionary. The *Emily Dickinson Lexicon* is Cynthia Hallen’s digital project that lists the definitions with which Dickinson was familiar. See “Feeling” in Hallen’s edition of the dictionary: “A. Sensation” and “B. Emotion.”

61 Deppman also examines a number of poems that belong to “the large group devoted to the theme of lingering ‘consciousness after death,’ which includes ‘I Died for Beauty but was scarce,’ ‘Safe in their Alabaster Chambers,’ and ‘Doom is the House without the Door –’ (“I Could Not Have Defined” 66, 76n.26).
psychological pain, illness, or accident. The poem focuses on the feeling that comes after it (100). Like the “it” in “It was not Death,” this feeling does not have a name. While no existing term can adequately account for it, the poem’s speaker is able to describe it in terms of temperature:

This is the Hour of Lead –  
Remembered, if outlived,  
As Freezing persons, recollect the Snow –  
First – Chill – then Stupor – then the letting go –

The speaker uses the freezing process to relate how the body feels in this state—it feels like intense cold followed by a gradual numbing. The body feels cold, it feels the cold intensify, and then begins to lose the ability to feel. The sensation after the “great pain” is not a series of an intense pangs of pain, but it is also not an absence of feeling. “Outliving” and “remembering” the experience, the speaker describes her emotion in this state as a “Quartz contentment,” a reference with ties to chemistry. Silliman’s and Gray’s textbooks described how water molecules arrange in a crystal-like or quartz-like pattern during the freezing process.62

The speaker gives assurance that this experience, even if it lacks a name, can be remembered, related, and felt through poetry. As critics observe, the poem’s opening line joins emotion and a notion of poetic form in “a formal feeling.” A. R. C. Finch points out that the second stanza’s “feet” also carries an association with poetry’s composition

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62 Silliman and Gray described quartz’s properties; see Silliman 223-5 and Gray 200.
Poetry can provide access to interior and subjective states like unfamiliar feelings.

As with the “Snow” in “After great pain,” Dickinson correlated the cold with grief, trauma, and death in some other poems. This association may stem from the body’s physical changes upon death, including its loss of heat with rigor mortis. The speaker in “’Twas warm — at first — like Us —” (Fr 614) describes how a dead body becomes “Chill—like frost upon a Glass—,” and the speaker in “Victory comes late” (Fr 195) discusses a deceased body with “freezing lips/ Too rapt with frost” to drink.

In this context, readers often view temperature as a metaphor for death or symbol of death in Dickinson’s poetry. L. Edwin Folsom observes that “winter and death become concomitant conditions,” with winter, cold, and snow acting as metaphors for death (365, 363). Ernest Sandeen makes a similar point in arguing that winter stands for death throughout Dickinson’s poetry because the cold literally kills life in the Massachusetts winter (485). Some of Dickinson’s references work this way. Dickinson also extended the relationship between temperature and death. Living people sense that dead bodies become cold, but Dickinson presented a different perspective. Her poems grapple with the question of what it feels like to be dead. They also feature vocabulary used in her chemistry textbooks and scientific discourses more generally. While several poems mention the cold and warmth, they most often feature temperature-related terms such as

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63 Finch argues that the poem refers to poetry’s form, including elements like meter (173).

64 Helen Vendler notices that “some parts of the body have already undergone rigor mortis” in “After great pain, a formal feeling comes” (“Emily Dickinson Thinking” 42).

65 Sandeen writes about winter’s obvious connection to death in Dickinson’s poetry: “Literally and figuratively, winter is the realm of antibeing, opposed to summer in every way, bringing death instead of life, stasis and paralysis instead of movement, monochromatic dullness instead of color, depression of spirit instead of ‘ecstasy’” (485).
“degrees,” “zeroes,” “siroccos,” and “anthracite” when dealing with unfamiliar emotions and sensations.

“I heard a fly buzz when I died” (Fr 591) describes feelings experienced after death. Narrating after death and after mourners have stopped crying, the speaker is especially interested in perception after death, as when she hears a “Blue—uncertain—stumbling buzz.” She also describes how her body feels during this state. During death, her body senses the cold: “The Dews drew quivering and chill—” because her “gossamer” gown and “tulle” tippet offer her little protection from the cold. Although we cannot know what death feels like, the speaker attends to this problem in terms of temperature. Most significantly, it shows how cold acts not only as a symbol for death or the cause of death in Dickinson’s poetry. Cold describes the sensation that dead bodies feel.

Roland Hagenbüchle examines perception after death in “‘Tis so appalling—it exhilarates” (Fr 431). The poem’s speaker, like several of Dickinson’s speakers, is “dying in full consciousness” (6). According to Cameron, the speaker has “the capacity to remember death rather than anticipate it” (Lyric Time 106). The speaker mentions what she can see after death and relates what it feels like to be dead or on the precipice of death. She fears death’s “frost,” then finds it “so appalling” that “it exhilarates” and “half Captivates.” She then describes how death feels “Bald, and Cold—.”

Dickinson’s poems usually feature death in terms of cold, but at least one poem works with a model of heat. “There is a Languor of the Life” (Fr 552) uses the image of water’s heating into vapor in order to describe feeling after death. The speaker establishes that the body is dead. It rests on the surgeon’s table with “no Vitality,” and the surgeon
declares that he cannot save “the Creature” because God has taken its life. Although the creature is dead, the speaker describes the feelings that it experiences. It feels a “Languor” that is “Pain’s Successor—When the Soul/ Has suffered all it can.” The speaker compares this experience to water’s vapor:

A Drowsiness—diffuses—
A Dimness like a Fog
Envelops Consciousness—
As Mists—obliterate a Crag.

References to “Fog” and “Mists” that “diffus[e]” recall the process by which water heats and expands. Silliman and Gray detailed this transformation, often using water as the primary example to describe such physical changes. Silliman wrote that “water presents a familiar instance of a substance known to us all in three states; as a solid in ice, a liquid at common temperatures, and an invisible vapor at higher temperatures. The sole cause, so far as we know, of this change of state in water, is variation in temperature” (55). With fog and mist a manifestation of heat, the poem connects temperature with sensation felt in death.

The speaker in “More Life – went out – when He went” (Fr 415) pairs heat and cold to describe death. Jay Ladin explains that the poem supposes that “‘Life’ can be weighed and measured” because the speaker describes the amount of vitality that a body holds (26).66 She also assigns this quality a temperature. “Life” corresponds with heat and death with cold. The speaker describes the interplay of these temperatures:

66 Surprisingly, Ladin does not mention temperature in his study of the poem.
More Life – went out – when He went
Than Ordinary Breath –
Lit with a finer Phosphor –
Requiring in the Quench –

A Power of Renowned Cold,
The Climate of the Grave
A Temperature just adequate
So Anthracite, to live –

For some – an Ampler Zero –
A Frost more needle keen
Is necessary, to reduce
The Ethiop within.

“Life” is an intense heat registered in the term “Phosphor.” While not a measure of temperature, “Phosphor” refers to extreme heat because of its unique capacity to burn at extremely low temperatures.\(^{67}\) It requires an intense cold, a “Renowned” cold, to extinguish or counteract it: “Requiring in the Quench—/A Power of Renowned Cold.”

The speaker underscores the cold’s intensity by using chemistry’s lexicon in the line “So Anthracite, to live –.” Death takes the form of a cold that is sufficient for anthracite, a coal, to “live.”\(^{68}\) But how can coal live? Dickinson’s chemistry textbooks

\(^{67}\) Silliman and Gray included sections on phosphorus and its extreme inflammability. The element is unusual in that it emits heat and fire at extremely low temperatures. (Silliman 209-13; Gray 200-6)

\(^{68}\) See Silliman 216 and Gray 173 for discussions of anthracite.
hold the answer. Silliman explained that anthracite must be kept extremely cold for it to remain in this form. It is different from other coals because it has not been exposed to high heat. The anthracite has been “driven off by heat and pressure” in a chemical change in bituminous coal (216). For anthracite to “live,” it must remain very cold. Dickinson’s *American Dictionary* also underscored anthracite’s ties to low temperatures: “like a mineral that with heat, pressure, and time can become a diamond…cold now but having the potential to create light and warmth” (Hallen). The speaker emphasizes a cold feeling by referring to a colder cold in the next part.

The poem’s speaker relates how some lives take even colder temperatures to extinguish, requiring “an Ampler Zero—A Frost more needle keen” that “is necessary to reduce/ The Ethiop within.” The “Ampler Zero” is so intense that it requires a measure that extends below the thermometer’s zero, often the lowest number on the scale. Death therefore takes the form of cold, and it also relates how it feels to die or be dead. The cold produces a strong piercing sensation, which is captured in the phrase “needle keen.” The speaker accounts for how this process feels by using language closely associated with physical sensation. Dickinson’s *American Dictionary* listed this definition for needle as an adjective associated with feeling: “Sharply; crisply; nipping; prickling; tingling; stinging,” while keen can refer to “Acute; intense; bitter; painful; excruciating” (Hallen). Dying feels like an intensely cold shock that tingles through the body.

This extreme cold is needed to counter an extreme heat. Folsom argues that this line describes a movement from “cold winters” to “warmth” (366). Hallen’s lexicon lists the first definition in Dickinson’s *American Dictionary* for “Ethiop” as “heat” and a “tropical zone.” The definition for “Ethiopian” is “Hot; sunshiny” (Hallen). With this
connotation, the line suggests that only an extreme cold can counteract the tropical warmth represented in the figure of the “Ethiop.” This attention to thermal language offers a way to conceive of death as requiring energy and also to begin to imagine what death feels like—an intense cold that stings an exceptionally hot body.

The reference to “Ethiop” also carries the association with Africa and its inhabitants. The second definition for “Ethiop” in Dickinson’s American Dictionary is “Africa; wealthy nation” (Hallen), and scholars argue that this reference could relate to Dickinson’s views on race. Daneen Wardrop notes that “the word ‘Ethiop’ was widely used as a literary prerogative by nineteenth-century writers to metonymize and thereby designate all African Americans” (80). Sandra Runzo argues that Dickinson’s two references to “Ethiop,” one in this poem and another in “Civilization – spurns – the Leopard” (Fr 276), work with contemporaneous stereotypes about Africans (285, 290-1). Runzo notes that references to Ethiopians and Africans became a “shorthand for referring to the alien, the unclassifiable, the not-wholly-human,” especially in the context of sciences and pseudo-sciences related to race (284). The “Ethiop within” could therefore suggest a powerful figure who lives in a warm climate. As Folsom notes, the line can refer to heat, which works within the context of Africa’s climate. Folsom writes that the poem tells of how the cold must “overcome a hearty people” represented in the phrase “Ethiop” (366).

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69 Wardrop reads Dickinson’s references to “Ethiop” as her “depiction of a minority” that could be her response to her friend Helen Hunt Jackson, who presented herself as an advocate for “minority’s rights”: “Of course Dickinson, never overtly political, argued less for rights than she described a sort of vexed personal ontology represented by a phrase such as the ‘Ethiop within’ (Fr415). Implicit and coy, Dickinson goaded a little the sometimes blustery Jackson” (78). This discussion of “Ethiop” fits within a larger tradition of criticism on Dickinson’s representation of race. Vivian Pollak summarizes criticism on Dickinson’s attitude on race (94).
Dickinson’s poems repeatedly show how temperature can open access to feelings and sensations that are ordinarily difficult or impossible to know. Several poems present the relationship between temperature and feeling in a slightly different way.

“Conjecturing a Climate” (Fr 551) and “The Zeroes — taught us — Phosphorous —” (Fr 284) use a similar vocabulary to show how temperature can influence thought and feeling. “Conjecturing a Climate” tells of a “Shivering Fancy” who thinks about the heat from several “unsuspended Suns” in order to ease his physical suffering in the cold or “To palliate a Cold.” This thought experiment does not warm the thinker, as it neither moves him to another place nor raises the temperature by any measurable “Degree.” Although it does not warm him, it produces a physical effect—it amplifies the cold. Thinking about the heat “adds poignancy to winter” and actually makes him feel colder. This aspect demonstrates the power of thinking with temperature: it can produce physical effects even if they are not the ones anticipated by the experiment.

The speaker of “The Zeroes — taught us — Phosphorous —” relates how interacting with opposite extremes can yield access to new knowledge. It shows how to think with temperature by pairing opposite extreme temperatures:

The Zeroes – taught us – Phosphorus –

We learned to like the Fire

By playing Glaciers – when a Boy –

And Tinder – guessed – by power

Of Opposite – to balance Odd –

The opening line describes how sensing the cold “Zeroes” yields knowledge of heat represented in the term “Phosphorus.” The speaker explains how being cold enables him
to learn about the existence of a heat source, “Tinder,” “by power/ Of Opposite.”

Temperature offers a means to encounter knowledge about a state that he has not yet experienced. Extreme cold also affects how we experience this heat—we learn to like the warmth by being cold: “We learned to like the Fire/ By playing Glaciers.” In other words, thinking about temperature can influence how we feel and interpret physical sensations.

The speaker uses the extreme temperatures of hot fires and cold glaciers to understand temperature’s close ties to feeling and thought. But while this stanza shows that temperature can influence thought and feeling, the speaker returns to the problem of depicting feeling in the second stanza. In this way, “The Zeroes – taught us – Phosphorus –” fits with the tradition of the other temperature poems that open access to feelings, sensations, thoughts, and other interior states. Vendler argues that the poem presents “formulations of emotional states” like “desire and deprivation” (Dickinson 102, 101).

She tracks Dickinson’s revisions of the poem between 1862 and 1863 to argue that the revisions aim to present “emotional states” that are “precise, recognizable, and striking”: “the images of white and red are canceled in favor of eclipse and paralysis” (102).

If White – a Red – must be!
Unto Vitality! (1862)

Eclipses – Suns – imply –
Paralysis – our Primer dumb
Unto Vitality – (1863)

Vendler concludes that these revisions use more specific language in order to reflect the “dramatic” feelings that more accurately align with this emotion (102). While “white”
could refer to snow and ice and “red” to fire and heat, Vendler points out that these colors could represent many different ideas (102). “Eclipse” is much more specific. “Eclipse” also emphasizes temperature in suggesting extreme cold because there is no sunlight to warm the earth. The eclipse contrasts with the heat from the “Suns.” The speaker uses temperature to represent feelings.

Temperature is a powerful tool for describing feeling, and these poems show that Dickinson took interest in this relationship. She presented the correlation of temperature and feeling in a striking form. She dramatically pushed beyond the boundaries of thermometers and common expressions by using models and vocabulary from science to describe unfamiliar states. She used zeros, siroccos and renowned colds in order to provide access to alien emotions. Dickinson’s words “chill” and “burn.” They account for states that do not have names or which remain inaccessible. This aspect illuminates a new perspective on one of Dickinson’s most famous remarks about temperature. Writing to Thomas Niles, she enclosed two poems and a note: “I bring you a chill Gift—My Cricket and the Snow” (L 813). The “chill Gift” refers to her poetry. As many critics point out, the adjective “chill” acts as a pun on the attached poem about snow; but the reference may relate to poetry’s aesthetic value. Poetry’s chill gift is its ability to open access to the unknown and render formal feelings that would be otherwise unknown, unnamed, and unfelt.
Chapter 3

Technologies of Vision in Melville’s Fiction

In the inscription of his 1888 collection of poetry, *John Marr and Other Sailors with Some Sea-Pieces*, Herman Melville described his “acute” friend Hilary, who was known for his insight and “penetrative perspicacity.” Melville posited that Hilary’s work as an optician may be one reason why he had such insight: these qualities were “perhaps (who knows?) developed by his business; for he is an optician, daily having to do with the microscope and telescope, and other inventions for sharpening and extending our natural sight” (3). Melville emphasized the instruments’ capacity to enhance natural vision. The instruments revealed aspects about the natural world that were otherwise invisible and inaccessible. Melville hypothesized that being in close proximity the instruments enhanced Hilary’s perception in reading situations and people. Hilary believed that he can access the invisible qualities that expatriates have; he observed their “natural make-up” and “an intangible something” (2). With this figure, Melville connected optical instruments with an ability to access others’ subjective states.

Melville depicted optical instruments, including telescopes, spy-glasses, and microscopes, in works from the 1840s through the 1880s. In some works, he took these instruments as a means of rendering an augmented vision that reveals ordinarily imperceptible interior states. Having worked with these instruments as a sailor,70 and having read about them in scientific articles, he was familiar with the mechanics of

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70 For an overview of Melville’s sailing experience, see Wilson Heflin’s *Herman Melville’s Whaling Years*. 
optical instruments. This background in optics provided him with the means to imagine a range of representational strategies centered on vision and interior subjective states.

Some characters have an augmented psychological vision modeled on these instruments. They see well beyond the range of natural vision and observe extremely subtle clues. The enhanced vision allows them to see how others are feeling and what they are thinking. Other characters have a transformed vision where they see states that have no physical presence. No scientific instrument augments vision enough to render these states, but Melville’s characters see them. Their vision breaks from the science of sight described in the articles and books that Melville read.

In these and other strategies, Melville shows characters gaining an extreme ability to read others’ thoughts and feelings because they can see interior states that are ordinarily imperceptible. Melville often focused on parts of the eye or optical instrument such as the lens. He altered lenses so that they have unnatural qualities that change how characters see. He took inspiration from the anatomization of vision described in scientific articles. These articles often described the parts of the eye or parts of optical instruments, and Melville recombined and altered components to create new ways to represent vision.

**Melville’s Science Background**

Critics document Melville’s familiarity with science generally. They tend to focus on his attitude toward science or his use of scientific concepts as symbols.71 As with

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71 Jennifer J. Baker summarizes a critical tradition on the “symbolism of cetology” in *Moby-Dick*: “There is a substantial critical tradition, dating back to Vincent (1949), which has focused on the symbolism of cetology” (“Dead Bones” 101).
scholarship on Dickinson’s poetry, critics work to understand whether the author approved of scientific endeavors. I expand upon these critical readings in tracing how Melville transformed this knowledge and used it as a model for representing interior states in new ways.

Critics who consider Melville’s science have proved that he read a great deal about it and that he took interest in some of the newest scientific theories and instruments that captivated the public imagination, especially during his most prolific years in the 1840s and 1850s. Critics use this background to make several main claims about his depiction of science. Most studies prove that he knew about science. Others decipher his attitude about science and scientific authority. One thread of criticism considers how accurately Melville reproduced the scientific material in his literary works. Some critics read Melville’s references to science as symbols or allegories.72

Some of the earliest studies of Melville’s science are biographical studies that track Melville’s reading. Tyrus Hillway and Merton M. Sealts Jr. list numerous scientific sources that Melville read during his early education, during his voyages at sea, and in libraries at the height of his writing career. Hillway argues that Melville read a great deal about science even though his formal education in it was limited.73 Melville read “books

72 Most attention to science-as-symbol in Melville’s works focuses on his engagement with Darwin. For example, Eric Wilson sees Moby-Dick as “an allegory signifying the rise of Darwin and the consequent dethroning of man, the victory of evolution of essentialism” (“Melville, Darwin” 131).

73 Hillway writes that “references and comments in Melville’s works to several other branches of science or to scientific facts and theories reveal a fairly broad interest and an extensive though not intensive knowledge (sometimes inaccurate) of a number of different fields, including archaeology, astronomy, botany, some chemistry, ethnography (as distinguished from ethnology), and physics. He also knew something about phrenology and physiognomy, then still regarded by many people as sciences” (415). Paul McCarthy notes that Melville “received at least some instruction in chemistry, astronomy, “natural science” or biology, mathematics, and perhaps laboratory work” and then enrolled in the Lansingburgh Academy where he “received four months of mathematics, possibly chemistry, and basic engineering and surveying.” This background most likely inspired Melville’s interest in the sciences that he developed as a sailor (11).
and periodicals produced primarily for laymen rather than for a specialized audience” and selected topics that interested him and those that he could use as source material in his novels (Hillway 411). Melville took interest in popular scientific topics such as Newton’s writings on refraction (415).74 He read many scientific articles and books during his 1843-1844 term on the United States, a ship that had a library with “more modern scientific works.” These works included the Harper’s Family Library series, “which contained a substantial number of scientific and semi-scientific works” (424).75

These studies on Melville’s scientific education and reading remain important in Melville scholarship, with many critics referring to them in order to track how Melville reproduced scientific information and expressed his attitude about science, especially in the context of religion in nineteenth-century America. Richard Dean Smith argues that Melville’s novels “reveal the conditions and events of the mid-nineteenth century, reflecting the enormous changes wrought by science, especially man’s perception of himself, and the influence that discoveries in science would have on religious faith” (xiii). Works from Typee to The Piazza Tales show technology as a “threat” with little use for art and other humanistic endeavors (5, 41). Like most critics of Melville’s science, Smith focuses on Melville’s familiarity with cetology, which he reproduced in parts of Moby-Dick.

Hillway argues that Melville critiqued contemporary scientists on several occasions by “ridiculing” them for their complicated lexicon (415). In his article on

74 Richard Dean Smith also points out that Melville did not always use science accurately. Brett Zimmerman argues that Melville’s reproduction of astronomy is quite accurate.

75 See Richard Dean Smith 8 and Paul McCarthy 12.
science in “The Lightning-Rod Man,” Allan Moore Emery makes a similar observation about Melville’s criticism of science: “if Melville was bothered by the fallibility of science, he was more disturbed, it seems, by its intellectual impact” (561).76 Brett Zimmerman claims that Melville was hostile to many sciences except for astronomy, for which he had a “fondness” and reproduced accurately in many of his novels and stories (71).77 Eric Wilson presents Melville as a “scientific thinker” who developed original scientific conclusions on evolution (“Melville, Darwin” 132).

Samuel Otter tracks Melville’s references to cetology, noting that he reproduced—both accurately and inaccurately—much of the information he read about in Thomas Beale’s The Natural History of the Sperm Whale (1839) (132). Eric Wilson argues that Melville anticipated some of Darwin’s ideas in evolutionary science in Moby-Dick (“Melville, Darwin” 132).

Breaking from a tradition focused on how Melville’s literature sheds light on nineteenth-century science, Jennifer J. Baker looks at Melville’s knowledge of science in terms of questions about aesthetics: how does science fit with Melville’s understanding of art? Baker argues that the natural sciences are integral to Ishmael’s vision of beauty in the novel. Ishmael’s “measurement and analysis of the whale’s skeleton” is important to his “aesthetic experience of the whale” because they allow him to perceive “forms, patterns, symmetry, scale” central to eighteenth-century standards of beauty (“Dead Bones” 85-6).

76 Hillway notes that “‘The Lightning-Rod Man’ and ‘The Bell-Tower,’ may even be interpreted as attacks upon science for gross pretense and inhumanity” (423).

77 Baker identifies a number of “discussions of Melville’s hostility toward science” (“Dead Bones” 101). She observes that “with only a handful of exceptions, Tyrus Hillway’s claims that Melville denounced the ‘coldness and inhumanity of the scientific mind’ and its ‘destruction of beauty’ have lain largely untouched since he first made them in the 1940s” (“Dead Bones” 85).
Baker’s study signals a need to examine Melville’s science in relation to his literary concerns.

I expand upon Baker’s attention to science and aesthetics in Melville’s work by examining the science of vision in relation to his representation of interior states. How did scientific discourses affect his project of examining psychological states in works such as *Moby-Dick* and *Mardi*?

Melville’s attended to psychology, the mind, and feelings in many works. Christopher Castiglia argues that *Moby-Dick* shows Melville’s interest in studying interior states. For instance, Melville described whales’ social natures and personalities as well as their physical “interiors” in the “Cetology” chapter (14).78 In addition to the “Cetology” chapter, the novel’s “Extracts” opening section also describes whales. The narrator introduces the whale as a “Leviathan” and reproduces Biblical, political, and literary references to the Leviathan in order to “give a bird’s eye view” of the term (8). He refers to the “Book of Job,” *Pilgrim’s Progress*, and Thomas Hobbes’s *Leviathan*. One contemporary Leviathan also captured Melville’s attention: the story of the “Leviathan of Parsonstown.” Countless periodicals, including some that Melville read, described the “Leviathan of Parsonstown,” which was the nickname for Lord William Rosse’s 57-foot-long telescope completed just six years before the publication of *Moby-Dick*.

Lord Rosse’s telescope captivated the imagination of many Americans, with newspaper and magazine articles highlighting its’ vision-enhancing qualities afforded by

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78 Castiglia continues, “interior states for Melville are intrinsically *queer* places, in the nineteenth-century sense of unpredictable, unusual, and unconventional” (14).
its large size. They also linked it to another famous telescope, William Herschel’s telescope. Melville knew about both instruments, as he mentioned Herschel’s telescope in *Moby-Dick* and Rosse’s “Leviathan of Parsonstown” in the short story “I and My Chimney” (1855) where the narrator compares his large chimney to “Lord Rosse’s monster telescope” (349).

In his history of the telescope, astronomer Fred Watson notes that “Leviathan” was a popular term for the large telescopes built in the mid-nineteenth century. Even though telescopes, microscopes, and spy-glasses were not new, they gained attention because of their size and the increasing number and significance of discoveries afforded by new designs. Watson explains that “by the turn of the nineteenth century, on the eve of its 200th birthday the telescope seemed assured of a bright future” because many persistent problems had been solved and advances were made in the design of lenses and other parts (180).

Herschel’s and Rosse’s telescopes stayed in the public imagination and popular press into the second half of the nineteenth century, and Melville took great interest in them. Renée Bergland describes Melville’s familiarity with the telescope and other optical instruments by situating him within a tradition of American poets who “frequently wrote about science or scientists and spent much of their time fiddling with microscopes and telescopes” (76). She also details Melville’s acquaintance with Maria Mitchell, the astronomer who inspired his poem “After the Pleasure Party” (76).

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79 Bergland also includes Dickinson in this category.

80 Bergland reads the poem as a discussion of sexual desire as well as “an astronomy poem” rooted in Melville’s interest in astronomy (91).
Melville’s references to Herschel and Rosse suggest that he took interest in the mechanics of telescopes. Much of the language he used corresponded with periodical articles; but he did not just reproduce these passages and ideas, which Brett Zimmerman argues in his study of Melville’s depiction of astronomy. Instead Melville referred to and altered these ideas in depicting characters’ enhanced vision in several stories.

These modes of vision are dramatically transformative of ordinary vision. Melville reworked—rather than reproduced—the science of optics made available to him by articles and books. It is in this aspect that Melville’s relationship to science strikes accord with science fiction texts, a relationship that critics have not yet fully examined. Melville’s representation of vision is grounded in the science that he knew about and read about. He extended, transformed, and reworked these concepts.

This treatment of science has some similarities with the way that Istvan Csicsery-Ronay Jr. describes science in science fiction texts. He identifies “imaginary science” as one of the seven categories within the science fiction genre (5). Imaginary science results in “playful deviations from known scientific thought” necessary for many of the technologies in science fiction texts (7). This aspect allows writers “the freedom to violate, stretch, ironize, and problematize” science, often in a way to work around problems that established scientific concepts cannot overcome (111).

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81 Zimmerman identifies sources of Melville’s knowledge of astronomical instruments and considers the accuracy of his representation of astronomy.

82 Only a handful of critical works examine science in Melville’s literary texts, and even fewer consider Melville’s works in relation to science fiction. One article, Salvatore Proietti’s “In the Shadow of No Whales,” discusses Samuel Delaney’s reimagining of Moby-Dick into a science fiction text. Carter Kaplan’s “Jules Verne, Herman Melville, and the ‘Question of Monster’” compares similarities between Melville and science fiction writer Jules Verne. David Ketterer’s 1974 New Worlds for Old briefly touches upon Melville’s relationship to science fiction.
Csicsery-Ronay argues that the science in science fiction is usually not accurate and often only resembles “an image of science” (111). Stories include traces of established science, but the actual science need not be exact. Science provides “raw material” that writers “play with” in their fictional texts (115). The science is fictionalized, but writers begin with scientific concepts and language from the scientific community. Their texts only conjure up language and images associated with science, especially since most readers do not know the details of the science (114).

Melville transformed science—often in the playful ways that Csicsery-Ronay describes. Melville violated natural laws, exaggerated features, and pushed science to the extremes, all of which are markers for the “imaginary science” of science fiction texts. He did so with the aim of experimenting with the type of states that literature can represent. His attention to the science of sight innovated new ways of seeing.

**Optical Instruments and the Science of Sight**

Hillway and Sealts list Melville’s textbooks and the articles that he read, some of which contain articles on the science of sight. Melville visited lectures on astronomy and also read David Brewster’s *Life of Newton*, which featured extended discussions of telescopes and microscopes (Hillway 413). Melville read the *Penny Cyclopaedia*, the *Literary World*, the *Living Age*, and the *Dollar Magazine* as well as *Putnam’s Magazine* and *Harper’s Monthly Magazine*. From the 1830s through the 1850s these periodicals

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83 Hillway lists some of the astronomy lectures that Melville attended or may have attended (420).
84 See the appendix in Sealts’s *Melville’s Reading*. 
published hundreds of articles on telescopes, microscopes, spy-glasses, optics, vision, and other topics related to the science of sight.

While these instruments were not new, they received a great deal of attention in part because of advances in their power and the number of discoveries they made available such as Urbain Le Verrier’s official discovery of Neptune in 1846. Authors of these articles most often focused on the instruments’ capacity to augment vision in dramatic ways. Articles on Rosse’s and Herschel’s telescopes, for example, emphasized their lenses’ large size, which afforded higher resolutions. These features enabled viewers to see more distant objects. Herschel explained how “he needed telescopes of ever-bigger aperture to gather more light” (Watson 173). Herschel’s “aperture fever” continued into the nineteenth century with the creation of the gigantic “leviathan” telescopes at mid-century (173).

The *Penny Cyclopaedia*, one of Melville’s sources, summarized Herschel’s “researches on what he calls ‘the space-penetrating power of telescopes’” (“Telescope” 163). This language was consistent with a tradition that marveled at optical instruments’ “power” to see areas that the eye cannot naturally see. An 1847 article in the *Literary World* presented the telescope as having enormous power that should be celebrated: “You will rejoice with me that the great nebula of Orion has yielded to the power of our incomparable Telescope” (“Scientific Proceedings: American Association” 227). Watson calls this power “Seeing the Unseeable” (5), a useful term for considering Melville’s own interest in the instrument’s capacity.

85 See “Loomis’s Astronomy” 407.
Paul McCarthy notes that the *Penny Cyclopaedia* was “a favorite source” for Melville. The source presented “reliable” scientific information on topics including physiology, surgery, and insanity (14). The *Penny Cyclopaedia* included detailed technical descriptions of optical instruments. The entry for “telescope” identified it as an “optical instrument” for extending vision, with the name’s etymology meaning “far-seeing” (157). The entry included ten pages of detailed technical information on how light reflected and refracted on lenses. The concluding sections explained how the instrument augmented the eye’s natural vision in both “magnifying” objects and enhancing sight at night, a feature essential for “naval men, who have occasion during the obscurity of the night to keep in view a ship of which they may be in chase” (163).

Many articles on the microscope and telescope emphasized the power of these devices, underscoring how their discoveries made available new information unavailable to the eye. These articles frequently compared the vision enhanced by these instruments to the deficiencies of the eye. The instruments afforded a viewer extraordinary vision than the naked eye; they revealed details and even objects that were ordinarily invisible. The *Penny Cyclopaedia* presented this point in the opening lines of the entry for microscope in emphasizing how the “instrument” transformed vision by enabling the viewer to see new images. The eye now saw objects smaller “than would otherwise be visible” (177).

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86 Paul McCarthy (14) and Sanford E. Marovitz (106) detail Melville’s familiarity with the work and identify it as a source for science and other material in several works, including *Moby-Dick*, *White-Jacket*, and *Israel Potter*. 
These articles also anatomized vision in identifying the parts of the eye and optical instruments. The *Penny Cyclopaedia* described the telescope as being comprised of convex and concave lenses, an eyepiece, and a tube. It then focused on each part’s history. Another article included an image of the eye and described its anatomy, which include “the orbits, or sockets, of the eye; the optic nerve; the eyeball, or globe, with its contents” as well as lenses (“Eye” 134). The article suggested that it was necessary to know about individual parts before understanding how instruments altered vision.

The article on the telescope presented several pages describing the interplay of light on a series of convex and concave lenses. In a refracting telescope “the rays in the pencils of light which come from every part of the object viewed are, by the first lens on which they are incident, made to converge so as to form an image at the focus of the lens.” In a reflecting telescope the “rays of light coming from the object” are reflected “upon the concave surface of the speculum” (“Telescope” 157). The article on the microscope provided a similar background, especially in emphasizing that an object must be illuminated in the magnification process. The “pencils of light” from the object interacted with two lenses in the instrument (“Microscope” 179). The image was created when the rays of light from the visible object interact in some way with the lenses. Both articles provided many descriptions of how light hit the lenses and how the eye interpreted the resulting images.

Articles in *Littell’s Living Age* and *The Literary World* presented discussions of vision in a similar way, often by highlighting how light and lenses worked in the process. One 1856 article described the lenses used for magnifying vision (“Microscopics” 808).
This background provided Melville with a vocabulary for discussing vision, but it also showed him the limits of vision and the instruments.

An article on Lord Rosse’s telescope described its “optical power” that opened up access to entirely new areas of sight (“Miscellany: Lord Rosse’s” 368). Another author described the experience of looking through a telescope as pushing beyond “the limits of the galaxy” (“The Quarterly Review” 58). The telescope pushed access beyond limits because of its powerful lenses. An article on a prominent astronomer’s lecture referred to its “space-penetrating power” and role as an “artificial eye” seeing “remote” spaces otherwise inaccessible (“Prof. Mitchell’s” 179). The author then compared this perspective to the limits of the “unaided eye.” Another author explained how limited the “naked eye” in comparison to the telescope, which can “bring new glories into view” (“Popular Works” 207).

Many volumes of Harper's Family Library included entries about some type of optical instrument. The 1841 volume included a history of the telescope. This discussion focused on the difference between vision with the “naked eye” and vision with a telescope, where the telescope radically enhanced vision (Brewster, “Life of” 43). This same volume included an entry on Johannes Kepler, who studied optics and improved upon the telescope: “He also explained the cause of long-sighted and short-sighted vision” and described how different lens shapes could improve vision. The article explained how the eye can “elongate” to see farther (Brewster, “Life of” 204-205). The 1845 volume reproduced Newton’s description of telescopes and other optical instruments that enhanced sight. The introduction discussed his work in relation to more recent advancements such as Herschel’s telescope: “it as an instrument of discovery, to
exhibit to the eye of man new worlds and new systems, and to bring within the grasp of
his reason those remote regions of space to which his imagination even had scarcely
ventured to extend its power” (Brewster, *Harper’s Family* 45).

This language on optical instruments circulated in the magazines Melville read
and in the intellectual circles in which he belonged. He also used a range of optical
instruments, including eyeglasses to correct his vision. Melville also had a working
knowledge of spy-glasses and telescopes in addition to a number of navigational
technologies that appear in *Moby-Dick* and other stories about sea voyages.

Discourses on optical instruments were so prevalent in periodicals that even a
review of Melville’s writings used language associated with optical instruments. An
anonymous review in London’s *Morning Chronicle* (1851) compared *White Jacket* to
*Mardi* by using the language of optical instruments. Readers of *Mardi* looked “through a
hazy telescope with many colored glasses” (qtd. in Higgins and Parker 403). In other
words, the book focused on few details. In comparison, *Mardi* allowed the reader to look
“through a carefully cleaned microscope, which shows you every infinitesimal blister on
the tar of the ship’s seams—every fibre in a topsail haul-yard, and every hair in a
topman’s whisker” (qtd. in Higgins and Parker 403). This review shows how much
Melville encountered discourse about enhanced vision, which provided a model for his
experiments with vision.

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87 Hershel Parker includes a description of Melville’s facial features provided by one of Melville’s friends. The
description noted “pleasant eyes, well browed, but always hidden behind the glasses made necessary by short-sight” (471). Tyrus Hillway explains that Melville wore eyeglasses (413).

88 Steven J. Dick explains that ships during the 1830s and 1840s “would receive one or two chronometers, along with appropriate charts, sextants or quadrants, artificial horizons, compasses, and spyglasses” (477). For more information on supplies on whaling ships, see Margaret S. Creighton’s *Rites & Passages*. 
In one strategy for representing vision, Melville zeroed in on optical instruments’ parts. *Mardi* features one passage where the narrator describes eyes, which he finds “truly miraculous things” (99). The narrator compares the eye to eyeglasses in that “these divine organs should be mere lenses inserted into the socket, as glasses in spectacle rims” (99). This comparison contrasts one islander’s eyes, which look like opals, with others’ eyes. While most eyes are just organs, this islander’s eyes reveal his inner soul.

Melville’s fictional captains often look through spy-glasses. *Typee*’s narrator describes a captain reaching for his “spy-glass” to see in the distance (28). *White-Jacket*, *Israel Potter*, and “The Encantadas” feature sailors with spy-glasses. *Omoo*’s opening chapter features “a spy-glass” (5). The narrator also describes how an instrument transforms his vision as he looks through a capital spy-glass and sees new details. The narrator of “Authentic Anecdotes of Old Zack” describes a military major who “at a good distance leveled his spy glass” and “spectacles” to see a shell in the distance (219). He repeatedly relates the experience of seeing out into the distance, focusing on how vision changes with this instrument.

*Moby-Dick*’s Ishmael describes the “lens of Herschel’s great telescope” (263). Ishmael shows interest in techniques to enhance vision while attributing this work to the lens. Ishmael anatomizes the whale’s head in order to relate how it sees. In this way, he invites readers to adopt the perspective of a whale, to see through the whale’s eyes. He invites readers into a thought experiment in urging them to imagine having only a “command some thirty degrees of vision in advance of the straight side-line of sight; and about thirty more behind it” (263). Readers would see two distinct views out of each eye and would lose the ability to see straight ahead.
Ishmael also discusses the whale’s vision in order to present a glimpse into the way a whale thinks and interprets the world, as this mode of seeing requires a brain that is “so much more comprehensive, combining, and subtle than man’s” because this vision requires the brain to process two sight areas (263). The whale’s vision offers a way to access its perspective and thought process.

Ishmael also explains the difference between whales’ vision and humans’ vision. Compared to humans’ vision, which is typically enhanced by larger lenses, whales’ vision is not improved with larger lenses. Their vision is still limited by the location of their eyes. Their eyes are on the side of their heads, which limits their vision, especially in comparison to humans who can “take in an undiscriminating sweep of things at one glance” (263). While whales’ vision will not be enhanced by larger eyes or larger lenses, they still have one advantage over humans in that they can focus on an object in a way that humans cannot. Humans require optical instruments to focus on one small area.

The narrator addresses vision in other parts of the novel. Otter briefly describes the many eyes that appear throughout the novel:

Inside the whale are not only other heads and arms and jaws, but also eyes. Above Tashtego, embedded in the flesh, a lidless pupil and iris stare at Queequeg’s limbs. Other eyes gaze out at the viewer: a small, pale eye above the harpooner’s raised hands, the bloodshot eye of the shark, the eyelike wheels in the torn line of tackle, and especially Queequeg’s glistening orb. (*Melville’s Anatomies* 1)

This attention to the eye signals Melville’s interest in vision. But more than just describing how vision works, Melville took aspects of vision, such as parts of the eye or
optical instruments, and transformed them in order to dramatically enhance or alter vision. Characters have an augmented vision that allows them to see states that are ordinarily invisible. Melville experimented with tubes and lenses such as the “lens of Herschel’s telescope,” by making them extremely large or clear. Melville transformed how characters see. In some cases, he used optical instruments as models for this work and, in other cases, he altered how the instruments work.

In looking for the great white whale, *Moby-Dick*’s Ahab clasps his spy-glass as he scans the ocean for even the smallest sign. He directs the crew to “skin your eyes for him, men; look sharp for white water; if ye see a bubble, sing out” (138). Sharon Cameron identifies a number of references to eyes in the novel. She connects these eyes to Melville’s interest in rendering one’s interior state, as the novel is interested in “the relation between inside and outside,” what can and cannot be seen (“Ahab and Pip” 574). While many authors represented the interior state in metaphorical terms, Melville “literalize[d]” it (“Ahab and Pip” 575). The body’s interior states take on physical forms. For example, Ahab’s “unconscious mind” takes the form of the character Pip: “Pip is that part of Ahab which is driven out of the latter’s mind” (“Ahab and Pip” 584). Cameron cites another passage that shows how the novel allows the reader to “see Ahab’s thoughts not simply because Melville makes us privy to them, privileging an inside to which we would otherwise have no access, but also because they are written on Ahab’s brow by ‘some invisible pencil…tracing lines and courses upon the deeply marked chart of his forehead’” (575). Cameron argues that these lines are physical manifestations of his thoughts.
Ahab discusses vision in an interaction with Starbuck: “stand close to me, Starbuck’ let me look into a human eye; it is better to haze into sea or sky; better than to gaze upon God. By the green land; by the bright hearth-stone! this is the magic glass, man; I see my wife and my child in thine eye” (406). As Cameron points out, Ahab sees “grief” in this eye (“Ahab and Pip” 584). This passage links vision with interior states. Specifically, she says that Ahab sees himself reflected in the eye. Ahab sees his body reflected, and the body shows signs of grief.

Cameron’s examples establish Melville’s connection between vision and interiority. They also establish how Melville used the novel to explore interior, subjective states. This interpretation frames my discussion. Not all instances where characters know others’ thoughts and feelings take on the physical dimension that Cameron describes. Cameron argues that Ishmael—and readers—see them because of the physical and visible lines on his face act as a representation of them. But these lines have no clear or direct connection to Ahab’s thoughts. The lines are no physical manifestation of these thoughts. Ishmael, though, imagines how “you could almost see that thought turn in him” as he moved about (137). Ishmael’s remark suggests that it could be possible to see another person’s thoughts even if they have no visible manifestation. He sees Ahab’s invisible mental unrest. He accurately reads these clues that have little, if any, connection to the states they represent.

In another scene, Ishmael tells how much knowledge he gathers about an albatross by looking into its eyes: “Through its inexpressible, strange eyes, methought I peeped to secrets which took hold of God…I cannot tell, can only hint, the things that
darted through me then” (160). Ishmael feels a state that has no name, a state he had never before experienced, just by looking into the bird’s eyes.

Throughout the novel, Ishmael perceives other characters’ thoughts and feelings. Observing a conflict between two of the crewmembers, Radney and Steelkilt, Ishmael understands how Steelkilt feels a “nameless, phantom feeling” (204). In the “Ahab’s Leg” chapter, he explains Ahab’s deep mental distress and woe, including phrases like “Ahab thought” to explain what is happening is his “monomaniac mind” (355).

Ishmael tells the story mostly from his first-person perspective, which focuses on how he sees and feels; but at some points during the novel, he assumes an omniscient narrative role in knowing what other characters, especially Ahab, feel. Critics offer a number of different interpretations of this unusual narrative position, and I suggest that his augmented vision may be one reason that he can see into Ahab’s interior states, especially in the context of Ishmael’s extensive attention to eyes and vision throughout his narrative. Throughout the novel, Ishmael lingers on Ahab’s emotions, often making observations about what Ahab feels and thinks even when there are few—if any—clues to his conclusions.

Ishmael explains how he looks at Starbuck and sees his emotions when Starbuck feels distress over Ahab’s apparent madness. Although he has not talked to Starbuck or heard his conversation with others, Ishmael explains that “to my poor eye Starbuck then looked as I the other evening felt…for when I clapped my eye upon his skull I saw it” (145). In another scene, Ishmael describes Ahab’s “nameless, interior volition,” which he transfers to Stubb, Starbuck, and Flask while “glancing intently” at them (141). As he glances at them, “he would fain have shocked them into them the same fiery emotion
accumulated within the Leyden jar of his own life” (141). Just by looking at these men, Ahab transfers his emotion, and Ishmael notices this exchange by observing the scene as an outsider.

Derek John Woods connects Melville’s attention to vision with a larger scientific context. He argues that sight became a tool for the natural philosophers of the seventeenth and eighteenth centuries. Within this context, the natural philosopher (and later the scientist) was “a scientific observer” who looked at the world with a special type of vision (31). Woods explains that “Visual knowledge leads to the head by way of the eye,” and *Moby-Dick* encapsulates this idea since it features vision so prominently. Ahab keeps watch over the oceans because he must see the whale in order to kill it (32). Woods quotes Ishmael’s line “Your whales must be seen before they can be killed” and points out that “Ahab’s gaze strikes ‘like a javelin’ on the doubloon that is ‘the white whale’s talisman’” (32). Woods uses this background to examine Melville’s relationship to the United States’ imperial and colonial project of visiting, describing, and mapping foreign lands, so that science becomes a tool for Americans in their efforts to exert power over other countries and gain economic power. He observes that “in *Moby-Dick*, seeing and visual knowledge are frequently associated with violence and appropriation” (32). His study underscores Melville’s attention to vision and the connection that Melville drew between vision and science in the novel while, at the same time, emphasizing that Melville employed science for reasons other than for using it in order to comment on its value. In reading Ishmael’s discussion of vision, Woods points out that it reminds readers that “behind our field of vision is an unseen interior that is a constant reminder of the incompleteness of our perspectives on bodies and places” (31). This observation raises
questions about how Ishmael sees. In what ways is vision incomplete? How can he access unseen interiors? After all, as a narrator, Ishmael makes many observations about characters’ (and whales’) interiors, which he gathers just by looking at them.

Let’s expand upon Woods’s and Cameron’s reading in examining Melville’s depiction of vision and eyes in other works; some of Melville’s characters can see states that have no physical presence. These characters have an augmented vision that enables them to see interior states that remain invisible because they have no physical form. Their vision and interpretation of invisible or extremely subtle clues extends well beyond natural empathy or natural ability to interpret others’ emotions. This capacity radically exceeds natural empathy as they inhabit others’ mental states as smoothly as a chemist gazing into a microscope illuminates a hidden physical world.

Visible Mental States

Critics who examine literature’s relationship to Theory of Mind (ToM) describe how people naturally pick up on visible clues that allow them to interpret how others feel and, in some cases, feel empathy for them. Bettina Kümmerling-Meibauer explains how “mind-reading,” or “a special cognitive ability that enables us to understand other people’s mental states, i.e., their feelings, thoughts, and imaginings,” takes years to develop, as children must learn how to read external clues and signs (64). They must learn how to first observe, then “decode” these signs, which include “facial expressions, gestures, body language, and intonation” (67). Kümmerling-Meibauer emphasizes how we see into others’ mind by observing visible signs that, within a specific context, have a clear meaning. It is a natural process that other critics also explain is part of empathy.
Lisa Zunshine makes a similar point in explaining the role of external clues in understanding others’ thoughts and feeling. She explains how an author “assumes” that “because of our past collective history as readers” (Why We Read 4), we can understand how a character’s behavior—especially “a character’s body language”—“is indicative of his thoughts and feelings” (3). She continues, “We all learn…that the default interpretation of behavior reflects a character’s state of mind” (4). Visible clues, such as body language and facial expressions, provide access to others’ interior states, their “thoughts, feelings, beliefs, and desires” (6). Suzanne Keen provides a similar discussion in explaining how we can observe “physical signs” (xx). Empathy “aris[es] from our physical and social awareness of one another” (5). We learn to read signs in “‘facial expressions, vocalizations, postures, and movements’” (5).

These critics show that it is possible to understand others’ feelings, beliefs, thoughts, and motivations, or to see into and read others’ minds, but it is based on external features when there are no clear markers. Melville was interested in examining interior states in works across his career, and he sometimes presented his characters as working to decipher a range of these external clues. But not all of Melville’s characters use clear external clues to access others’ states; some characters have the ability to know what others’ are thinking without clues or signs. They decode subtle or invisible clues. These characters have an augmented ability to see into others’ interior states, and I argue that Melville’s referred to optical instruments that augment vision present a model for this type of activity. These characters sometimes hold spy-glasses or other vision-enhancing instruments.

89 Zunshine makes a similar point in another work where she emphasizes “observable behavior” and “body language” that provide access to another’s mental state (“Theory of Mind” 70).
The passage on microscopes in *Mardi* provides a context for understanding this relationship. Melville published the novella just a few years after his last voyage as a sailor. The narrator spy-glasses and other optical instruments. *Mardi*’s opening chapter explains how the narrator Taji looks through a “glass” at distant islands and the “summit beyond” (2). He looks through a spy-glass again several chapters later around the island of Jarl.

As Taji, Media, and Babbalanja arrive at the island of Padulla, Taji explains that the island is famous for its telescope. The group meets Oh-Oh, the elderly famous owner of the telescope whom Taji describes as “a venerable antiquarian; a collector of Mardian vertu; a cognoscenti; and dilettante in things old and marvelous” (378). Taji focuses on Oh-Oh’s intense interest in these instruments. Oh-Oh enthusiastically tells stories about many of his “relics” and “rarities,” but it is his telescope and microscope that he discusses with the most fervor (379). The telescope is his most famous possession. After a brief tour of other “wonders,” Oh-Oh shows the group this “famous telescope, by help of which, he said he had discovered an ant-hill in the moon.” This telescope “was a prodigiously long and hollow trunk of a Palm; a scale from the seakraken its lens” (381). This description shows Melville’s familiarity with the design and mechanics of a telescope.

Zimmerman takes this description as a reference to Herschel’s powerful telescope, arguing that Melville “thought up a magnifying tube more powerful than even Herschel’s,” even though Melville knew that “no telescope in America or elsewhere had such immense resolving power” (19). With his depiction of a telescope with such resolving power—a level that exceeds current technology—Melville emphasized the
device’s capacity and purpose: the telescope augments vision to unnatural levels.

Melville depicted this capacity with Oh-Oh’s description of what he sees through the telescope: he can see “an ant-hill in the moon.” The reference to the moon suggests the telescope’s capacity to see distant objects. The telescope provides extraordinary detail to see some of the smallest geographical features one could possibly see, the ant-hill. This reference emphasizes the telescope’s extreme vision-enhancing qualities, and Melville made them even more extreme by extending then-current technology.

Richard Dean Smith, like several other critics who discuss this scene, sees it as representing Melville’s critique of scientists who place too much emphasis on science’s and technology’s power. Smith argues that this scene shows that “Melville was a critic of science and scientists” because the telescope offers little use in practical matters—it is “useless”—and it “debases beauty with its absurd quantifying and counting.” Oh-Oh’s “folly” is his enthusiasm for the instrument and science more generally (40). Thomas Edward Lucas reads this in terms of a tradition of criticism of “Melville’s quarrel with science” and the critique of “the limitations of science” (652). Lucas argues that the scene pokes fun at some aspects of scientific endeavors. But the scene also shows a figure who holds fervent belief in the instruments’ capacity. This aspect signals Melville’s own interest in what type of knowledge these instruments actually made available.

As Oh-Oh shows them the next optical instrument, a bamboo microscope, he again emphasizes its power. He explains that the microscope shows such detail of such small objects that he counted “precisely twelve thousand five hundred and forty-one triangular lens” in the eye of a dragon-fly as well as seeing detail on a smaller insect, the flea. Oh-Oh adopts a serious tone throughout his lecture as he emphasizes how these
instruments are invaluable to his scientific studies and “entomological pursuits.” For example, he uses his measurements of flea muscles “for scientific purposes” in calculating how high a flea may jump (381). Oh-Oh is an expert on the instruments and proselytizer for their value.

Babbalanja commends Oh-Oh, praising his work and the instruments’ power by calling the discoveries “grand,” before adopting a more mocking tone. But throughout the conversation, Oh-Oh resists any attempt from Babbalanja to mock him; as Babbalanja questions the value of the research by imagining a “bandit” having a similar anatomy as the flea’s. Oh-Oh answers Babbalanja’s jabs with a serious response that underscores his work’s value and the “wisdom” that the instruments afford. His work is important, he says, because it offers new knowledge about the insects while confirming a “Divine Providence” (381). The microscope shows how a divine design makes it so that bandits cannot have this capacity. Oh-Oh’s seriousness reaffirms the value of the instruments’ vision-enhancing qualities. And even when Babbalanja continues to mock the elderly antiquarian for his fervent belief in the power of the technology, Oh-Oh responds with a serious testament to the instruments’ power.

Babbalanja jokingly asks whether he has used the microscope to see “a down peach or a rosy cheek,” and, in the same breath he asks, “what other discoveries have you made? Hast yet put a usurer under your lens, to find his conscience? or a libertine to find his heart?” (381) This comment has a double meaning. Babbalanja uses the bawdy joke to poke fun at Oh-Oh’s obsession with the technology’s power; but the scene calls attention to the microscope’s vision-enhancing qualities. With Oh-Oh’s seriousness,
Melville signals his own interest in the imaginative extension of the instrument’s vision-enhancing qualities.

In mentioning the character traits, Babbalanja is again taking a jab at Oh-Oh’s research and tools. He offers an extreme example to humiliate Oh-Oh in challenging him to see something invisible. A person’s interior, subjective qualities have no physical presence. Even more, he selects character traits that are dissociated from specific types of personality. He implies that a usurer would not have a conscience, which would make Oh-Oh’s discovery even more impossible. Again Oh-Oh replies with seriousness that reinforces his confidence in the instrument’s power and value. He replies, “I have,” maintaining his firm belief in these instruments’ value (381).

While Babbalanja jokes about the idea that the microscope can see character traits, Oh-Oh’s seriousness signals his own interest in the imaginative extension of the instrument’s vision-enhancing qualities, including his interest in seeing or rendering ordinarily imperceptible thoughts or feelings. Babbalanja suggests that they are invisible—or even impossible to find—but Oh-Oh’s response signals that the microscope can see them. While the microscope cannot actually make them visible, within the context of the story, Melville augments the microscope’s power to dramatic, unnatural resolution. He uses its powers as a model for an augmented psychological vision. In several works, he connects optical devices with this type of psychological vision in pushing beyond the limit of what we can naturally see about the interior world.

As in Moby-Dick, the narrator focuses on how the “lenses” transform vision. And with such power, the lenses have qualities that ordinary lenses—as part of the eye or optical instruments—do not have. This lens in this scene becomes endowed with some
enhanced property, which, in turn, transforms Oh-Oh’s vision. Melville took this component of vision and pushes it to the extreme as a way to reconsider how vision works. Here vision works in an unusual way by seeing objects that have no material presence. Oh-Oh’s enhanced vision is not modeled on the telescope and microscope; it works in an alternative, transformed way in detecting states that have no physical presence.

This scene introduces a connection that Melville carries out in later works. Early in *Mardi*, the narrator experiments with his vision in testing how far his eyes can see, including with a “glass” (4). The narrator finds himself standing on the mast, which affords him an opportunity to look out at the expanse ahead of him on the horizon and over the glassy water. With this new perspective, he finds himself fascinated by new images. Experimenting with his perspective, he casts his “eyes downward” and then back at the expanse. Upon looking up he is delighted to see a further distance, exclaiming “in the distance what visions were spread!” (7) He sees so far that he imagines these “vistas leading to worlds beyond” (8). He explains how the experience at sea affects how he feels, and he frames it by discussing his vision: “he closes his eyes, to test the reality of the glassy expanse” (9). He later describes what it looks like when a sailor is at sea level, he writes that “your sphere of vision is little larger than it would be at the bottom of the well” (37).

Melville showed a deep interest in vision and depicted characters that can see details that are ordinarily invisible. Some characters have this ability because they have an augmented vision modeled after optical instruments. Other characters have a transformed vision that allows them to see states that have no physical presence. While
these states would not ordinarily be able to seen, even with the most advanced optical instruments, Melville rendered this experience possible in the space of his stories. He transformed vision by transforming the lenses—the parts of the eye and optical instruments central to sight. While Melville’s friend optician and instrument maker Hilary had an acute sense of perception, Melville fictional characters have augmented and transformed perception that allows them to have the unnatural ability to read others’ minds and emotions without many external clues. These stories become a space where Melville tested the limits of what we can know about others just by looking at them.
Chapter 4

Actual Awakenings: The Science of Sleep in Kate Chopin’s Fiction

The words “sleep, sleep, sleep” echo in Kate Chopin’s short story “The Night Came Slowly” (1895) as drowsiness overtakes the narrator. When she begins to sleep, a remarkable effect occurs: her “whole being was abandoned to the soothing and penetrating charm of the night,” with sleep initiating a transformation within her body (366). She feels change beginning.

Chopin attended to sleep again in her most famous work, The Awakening (1899). Given the title, this focus seems apparent, but critics tend to overlook Edna’s actual, physiological sleep across the novel. In many of these readings, sleeping and waking have metaphorical significance with Edna awakening figuratively—and typically at the end of the novel—by escaping from the social oppressions that bind her. While Chopin imbued Edna’s sleeping and waking with metaphorical significance, she also depicted actual physiological sleep and its real effects, as she did in “The Night Came Slowly.”

Edna sleeps and wakes at least a dozen times throughout The Awakening, and aspects of her body and mental outlook change. Sleep transforms Edna into a “new-born creature” that she and others recognize as different (175).

A new theory of sleep’s transformative powers took hold in the nineteenth-century science. Scientists described how sleep initiated a series of imperceptible transformations that renewed the body and mind each night. These changes were gradual and ordinarily invisible. Chopin, who was knowledgeable about science and the science of sleep, rendered these changes in Edna in The Awakening. The narrator traces a series
of actual sleeps and awakenings that initiate visible changes within Edna. The narrator also describes Edna’s thoughts, emotions, sensations, and perceptions as she experiences such changes.

Attending to this pattern illuminates a new and more pluralistic view of Edna’s transformations, shifting the focus away from the significance of novel’s final scenes. It also necessitates a reexamination of Chopin’s engagement with contemporary science. Most scholarship considers whether she agreed or disagreed with contemporaneous theories, with critics often discussing her attitude toward Darwin. But in referring to sleep, Chopin also used science as a tool to illuminate Edna’s character. The novel provides insight into the ordinarily invisible transformations to the body and mind prompted by sleep, and it represents how it feels to undergo such dramatic transformations.

**Chopin and Science: A Background**

Critics demonstrate that Chopin took great interest in science by documenting references in her literary works. Bert Bender, the critic who deals most extensively with Chopin’s engagement with science, details her knowledge of Darwin’s ideas. Bender argues that the 1890s stories “The Night Came Slowly” and “Juanita” reveal her opinions on these ideas. He writes that Chopin expressed “anger” at “scientific descriptions of womanhood” in these stories (198). He locates additional evidence for her knowledge of Darwin’s theories in the 1890 novel *At Fault* as well as in a note from Chopin’s close friend William Schuyler. Schuyler wrote that
In the midst of all her labors [Chopin] still found time to keep up her reading, which she had never abandoned, but the subjects which now attracted her were almost entirely scientific, the departments of Biology and Anthropology having a special interest for her. The works of Darwin, Huxley, and Spencer were her daily companions; for the study of the human species, both general and particular, has always been her constant delight. (qtd. in Toth and Seyersted, *A Kate Chopin Miscellany* 117)

Taking this background into account, Donald Pizer, Erik Margraf, and Jennifer B. Gray examine Chopin’s attitude toward Darwin in considering whether she accepted Darwin’s theories. Pizer argues that Edna “rejects” some tenets and finds herself trapped with certain biological roles (6). He identifies a number of sources that Chopin responded to in her representation of Darwin’s ideas in her novel: “Like her near-contemporary Edith Wharton, Chopin was deeply responsive during the period just prior to her undertaking a literary career to the major new ideas and fiction of her time, reading fully in Charles Darwin, Herbert Spencer, and the French naturalists” (5). According to Pizer, Chopin engaged with science primarily by responding to these ideas.

As Pizer, Bender, and others make clear, Chopin’s reading and participation in intellectual circles in New Orleans and St. Louis exposed her to science from the 1860s through the 1890s. Biographer Per Seyersted explains that the New Orleans newspapers she read “made an effort to keep their readers up to date on science and modern literature” (42). Chopin also “followed very closely the newest developments in science and in fiction” and “kept up with a wide range of periodicals” (86).
Historian Michael J. Thorpy argues that the nineteenth century was an “‘age of sleep theories’ as some of the greatest physicians and psychologists turned their attention to explanations of the cause of sleep” and published “several comprehensive books…entirely on the physiological and clinical aspects of sleep” (xxviii). Psychologists and physiologists from Britain and America wrote about sleep’s causes, the nature of dreams, sleep medications, sleep-walking and sleep-talking, and sleep’s purpose. In an 1876 article, American journalist Junius Henri Browne discussed a boom in research and writings, observing that “knowledge on sleep is growing” (667). Specialized scientific journals and popular magazines disseminated this information to a range of readers.

Chopin made note of several magazines that she read. Around spring of 1869, she wrote that she “devoured in Appleton’s Journal (a new paper, by the way) ‘The Man Who Laughs’ by V. Hugo, devoured it to the very last word of the last number and must wait till next Saturday to satisfy in a small degree my ravenous appetite” (qtd. in Seyersted 25).90 Hugo’s story was serialized in Appleton’s Journal of Popular Science, Literature and Art from April 1869 through September 1869. The journal featured a section on new developments in science in most issues. It often included longer articles that explored scientific topics in depth.91 Given how closely Chopin followed Hugo’s story, she most likely read other articles in the magazine, which included at least two articles on sleep between April and September: Dr. Hammond’s “Why We Sleep” appeared several pages

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90 This remark appeared in a May 8, 1869 entry in Chopin’s commonplace book (Seyersted and Toth 84).

91 For an overview of the magazine and its ties to science, see Frank Luther Mott, A History of American Magazines.
after the first installment of “The Man who Laughs,” and H. Charleton Bastion’s “The Theory on Sleep” appeared in a May issue.

Both articles discussed sleep in a similar way, describing how it initiated invisible changes to the mind and body. Hammond, a leading expert on sleep, opened his article with a striking example that emphasized sleep’s nature. He related how Chinese prisons used sleep deprivation as a form of torture and punishment. The prisoner’s body changed: “by the third day, he began to feel very uncomfortable. His eyes were red, his mouth was parched, his skin dry and hot, and his head ached.” Then his mental state degraded, causing him to become “delirious” and “entirely insane” within the next few days (14). Sleep typically counteracted these effects because it initiated a series of transformations that restored the body. For example, the brain “deposit[ed] new brain material” each night (15).92 While the effects of sleep deprivation became visible, sleep’s transformations to the brain and other body parts were interior and invisible.

Bastion presented sleep in a similar way. He explained that sleep counteracted the damage that occurred in the brain and body during waking: “every action taking place in a living being is possible only by the death and molecular resolution of those portions of tissue-elements which occasion the vital manifestation” (279). Sleep restored the molecules and other parts of the body. All of these changes brought about “nutritive repair” even if they remained invisible (280).

Numerous other articles presented a similar theory in emphasizing sleep’s transformative capacity. One writer maintained that these changes guarded against mental

92 Hammond made similar conclusions in his influential full-length treatise on sleep from the same year, *Sleep and Its Derangements*. He explained that sleep changed the brain by “repair[ing]” it (12). For an overview of Hammond, his influence on sleep theories, and his *Sleep and Its Derangements*, see Wolf-Meyer 59-61.
and physical “debility, disease, and disintegration” (“The Necessity” 91). Sleep allowed the body to “recuperat[e]” its “energy” (91). Benjamin W. Richardson’s attention to the “intercourse” between the mind and body during sleep anticipated other theories on sleep’s real effects on the body and mind (350). E. M. Chesley argued that the mind entered a new state of interior restoration during sleep (75). The new state differed from waking in that it involved a reduced amount of attention to the outside world, which allowed for energy to be directed inward toward the body’s growth and transformation. This hypothesis was common among many late-nineteenth-century theorists. Writing a decade after Chesley, N. S. Shaler identified “sleep as the compliment of the activity of the body and mind,” both of which transformed during the process (237).

In his frequently-cited treatise on sleep, George Henry Lewes explained how the body changed during sleep. The body actually reinvigorated on a biological level by way of the cells in the brain and rest of the body. Cells and the molecules changed so that the body was “repaired” “molecule by molecule” through chemical modifications prompted by sleep (302). These small transformations resulted in the body, cells, molecules, and muscles becoming renewed; sleep rebuilt the body and mental faculties. Like Lewes and other theorists, Hammond wrote about this regrowth in describing how hair, muscles, and other body parts are different from their states prior to sleep because “old material” was “removed” while “new has been deposited” (Sleep and Its Derangements 13). These changes were so subtle and gradual that they were imperceptible.

The numerous associations of sleep as bringing restorative and reparative changes point to a widespread understanding of the benefits of sleep in the second half of the nineteenth century. Writing amidst this cultural interest in sleep, Chopin employed a
similar idea in “Beyond the Bayou” (1891) and *At Fault* (1890), which include references that cast sleep as important to health. In “Beyond the Bayou,” La Folle is at the precipice of death after falling unconscious, with a doctor verifying that she may die. But “death had passed her by” when she regains strength through sleep: “she did sleep; so soundly; so healthfully” (179). Upon waking, La Folle “arose, calmly, as if no tempest had shaken and threatened her existence but yesterday” (179). This reference to La Folle’s sleeping “healthfully” suggests sleep’s vital role in promoting health. In the “Painful Disclosures” chapter of *At Fault*, the narrator implies that an unrestful sleep can bring about negative effects. Thérèse gives the appearance of a “mental disturbance” like the kind “that might have succeeded a night of unrefreshing sleep” (764). The absence of restful, refreshing sleep can negatively affect the mind. This representation of sleep has some of language and concepts that appeared in articles on sleep circulating in the final decades of the nineteenth century.

These articles described the invisible transformations that sleep initiated. While a lack of sleep revealed itself in exterior signs such as those in *At Fault* and “Beyond the Bayou,” the interior changes that occurred during sleep were gradual and imperceptible. But Chopin made them perceptible in *The Awakening*. Edna and other characters notice that she changes after she sleeps. The narrator relates what Edna thinks, feels, and senses as these dramatic changes occur. She offers access to this experience, which is typically inaccessible. In this way, Chopin used her knowledge of sleep as a resource to represent the interior changes that Edna experiences.

Edna sleeps in four distinct cycles that move her toward becoming an entirely “new-born creature” (175). Some of Edna’s “awakenings” provide her with a new mental
freedom while others provide her with a more physical and sensual awareness. During each sleep cycle, Edna discusses new aspects about herself and her surroundings. The narrator describes these scenes with language referring to newness, strangeness, and unfamiliarity. She also describes what it feels like to experience such dramatic changes.

Edna’s first cycle of sleep and waking inside her summer cottage causes her to become aware of her “oppression” and “anguish” (49). As Edna rests outside and on Chênière Caminada in a second cycle, sleep offers her an entirely new perspective on sensing her body. The third cycle, which takes place in the pigeon house, centers on Edna’s taking action in carrying out the changes that she desires, and the fourth cycle, extending through the novel’s final scene, causes her to become fully cognizant of the scope of these changes. In each case, Edna’s sleep precipitates the transformations that occur within her body and mind, and they become visible to Edna and those around her. The transformations precipitate unfamiliar feelings and states that Edna has never before experienced.

This attention to Edna’s actual sleep necessitates a shift in reading the novel’s awakenings as primarily metaphorical, a dominant thread in criticism. Cynthia G. Wolff reads sleep in the novel as a metaphor in terms of the “myth of the sleeping beauty,” and Maria Anastasopoulou identifies Edna’s sleep as symbolic rites of passage (Wolff, “Thanatos” 461; Anastasopoulou 19). Anca Parvulescu cites a large body of criticism that casts Edna’s sleep and waking as representative of a “sexual awakening” (480). With such critical interest in the symbolic significance of sleep in the novel—Robert S. Levine even calls it “‘the sleepiest’ novel in the American literary canon” (71)—it is paradoxical that critics have given little serious attention to the physical process of sleep. Levine
presents the one major study of sleep in his “Circadian Rhythms and Rebellion in Kate Chopin’s The Awakening,” which connects Edna’s sleep with her rebellions against social norms.93 While Levine calls attention to Edna’s actual sleep, he discusses its symbolic function. In attending more fully to sleep’s physiological and mental effects, I argue sleep initiates real, perceptible changes upon Edna. She notices that sleep changes her.

**Edna Pontellier’s Sleep**

Shortly after the narrator introduces Edna, she describes how Edna is “fast asleep” and “overcome with sleep” (47). Edna then “sprang out of bed” and “lean[ed] on her pillow” (47, 48). The narrator emphasizes how strange Edna feels upon awaking—she feels so different that her physical and emotional reactions surprise her. Something about Edna has changed, and she tries to make sense of it.

Upon becoming “thoroughly awake,” her body has an unusual reaction: she cries after her husband “reproached” her, a response she ordinarily does not have. Edna becomes even more surprised when her crying continues. His censures “seemed never before to have weight much” upon her, so “she could not have told why she was crying” (49). She experiences new emotional reactions to her husband. She becomes aware of her unhappiness, which she identifies as a new sensation. It is an “indescribable oppression, which seemed to generate in some unfamiliar part of her consciousness” that “filled her whole being with a vague anguish” (48, 49). She has no words for the new feeling because it is so alien to her. The narrator again refers to this experience chapters later.

93 Levine briefly summarizes criticism of sleep in the novel, see 79n.4.
Edna once again cries “just as she had wept one midnight at Grand Isle when strange, new voices awoke in her” (116).

Edna’s second cycle of rest on Chênière Caminada prompts her to experience her body and its sensations in a new way. After defying her husband and maintaining her position on the hammock, Edna becomes aware of her independence and ability to operate outside of her husband’s direction. She senses it in her body; Edna “perceives that her will had blazed up, stubborn and resistant,” which occurs alongside her body’s “writhing motion” (78). She now takes action against her husband in commanding him to return inside. In reversing their roles, Edna acknowledges her ability to break outside of the “realities pressing on her soul,” or the oppression that initiated her crying several nights before (78). This feeling is unfamiliar to her, which is why she has such an unusual reaction to it.

Sleep offers Edna a new perspective on her desires, and she feels it again when she sleeps again. This next occasion of sleep prompts another change within Edna. After waking, Edna chooses to do something that she had never done before—she sends for Robert to accompany her to visit Chênière Caminada (79). Edna’s eagerness to undertake this new activity marks a difference in her mental outlook; she has a renewed sense of energy as well as an ability to recognize and follow through on the activities that she desires to do.

The narrator foregrounds Edna’s mental and physical transformation by calling attention to Edna’s more acute senses, especially her sense of sight and attention to her body, after her “long and sound” sleep on the “low drowsy island” of Chênière Caminada (83). Edna pays especially close attention to her body in preparing for sleep later that day.
She perceives it and senses it in a new way during this activity. This sensual description continues with Edna lying “stretched” on the bed while noticing how “luxurious it felt” and how “sweet” it smelled (84). She touches her hair with her fingers, “looked at her round arm,” “rubbed them together,” and “observe[ed] closely, as if it were something she saw for the first time, the fine, firm quality and texture of her flesh” (84). She sees her body in a new way. Anastasopoulou identifies this moment as part of a transformative ritual of a “passage from the stage of a woman married to a man who considers her as ‘a valuable piece of personal property,’ to that of an independent and aware person functioning to her full capacity towards growth and fulfillment” (19). Anastasopoulou’s claim that Edna moves toward personal awareness corresponds with Edna’s attention to her body as she undertakes a pre-sleep ritual by caring for her face, neck, and arms.94

Rosemary F. Franklin states that Edna’s preparation for sleep indicates an “admiration of her body” because Edna “indulges herself narcissistically” as she never before had done (518). Wolff makes a similar claim in noting that Edna develops a new awareness of hunger as she directs her attention toward her needs (461). She undergoes a process of “body-discovering” and, more importantly, finds “joy” in it (461). Sleep transforms how she sees and feels. At the end of this sleep cycle, Edna gains a new sense of perception, a new sight, that parallels her physical changes: “her eyes were bright and wide awake and her face glowed” (85). The narrator punctuates Edna’s waking with more language related to change. Edna remarks about this change when she awakes fully. She teasingly asks,

‘How many years have I slept? …The whole island seems changed. A new

94 Anastasopoulou claims that Edna never fully completes this passage (19).
race of beings must have sprung up, leaving only you and me as past relics. How many ages ago did Madame Antoine and Tonie die? and when did our people from Grand Isle disappear from the earth?’ (85)

These questions, especially with the language of newness, emphasize unfamiliarity and change. Something about her and her perspective has changed.

Edna’s physical change on Chênière Caminada enables her to think about herself in new ways. This becomes visible to others. Her husband recognizes that her mind and feelings have changed:

it sometimes entered Mr. Pontellier’s mind to wonder if his wife were not growing a little unbalanced mentally. He could plainly see that she was not herself. That is, he could not see that she was becoming herself and daily casting aside that fictitious self which we assume like a garment with which to appear before the world. (108)

He “sees” that Edna has changed and is continuing to change. The narrator also emphasizes how much Edna has changed in such a short time. Edna senses the world in an entirely new way. Her senses are heightened as she now “hears” the water, “feels” the wind, and “see[s]” the moon as she had never before experienced. She also feels a “subtle current of desire passed through her body,” and then she “wander[s] alone into strange and unfamiliar places” where “she discovered many a sunny, sleepy corner fashioned to dream in” (109). This passage emphasizes Edna’s perception of new experiences and feelings. Unfamiliarity and sleep intermingle and cause a perceptible change that Edna can feel just as her husband can “plainly see.”
Several scenes later, Mr. Pontellier reports to Dr. Mandelet that Edna’s “whole attitude—toward me and everybody and everything—has changed” (117). Mr. Pontellier interprets Edna’s new state of being as a problem, or some sort of illness, in describing her to Dr. Mandelet. Mr. Pontellier explains that “she doesn’t act well. She’s odd” (117). Dr. Mandelet suggests that he allow Edna do as she pleases, including allowing her to sleep when she pleases. When visiting Edna a few days later, Dr. Mandelet notices for himself how Edna has changed when he looks at her:

He observed his hostess attentively from his shaggy brows, and noted a subtle change which had transformed her from the listless woman he had known into a being who, for the moment, seemed palpitant with the forces of life. Her speech was warm and energetic. There was no repression in her glance of gesture. She reminded him of some beautiful, sleek animal waking up in the sun. (123)

This scene reveals how others can see Edna’s real transformation. She appears to be a new being, an idea echoed in Dr. Mandelet’s comparison of her to a waking animal, which anticipates the narrator’s description of her as a “new-born creature” at the end of the novel (175). This reference to the animal waking from sleep again situates this change within the context of sleep.

Edna once again prepares for sleep several scenes later. She looks for a place to rest after her father, husband, and children leave. When “she was last alone, she breathed a big, genuine sigh of relief. A feeling that was very unfamiliar but very delicious came over her” (126). While Edna looks at the various “chairs and lounges” to rest upon, the narrator again imbues the scene with a sense of newness and unfamiliarity. She looks at
her house in a new way “as if inspecting it for the first time” (126). She notices everything about the house in an entirely new way than she ever had before. She notices the smells, colors, and textures of the house. She now sees the kitchen’s “character” in way “she had never before perceived” (126). As on Grand Isle, she feels that she is a new place even though it has not changed. Instead Edna and her outlook have changed.

Edna finally finds a place to lounge; she then “grew sleepy” (127). This sleep allows her to renew her senses and attend to her own needs. Immediately upon growing sleepy, Edna “realized that she had neglected her reading, and determined to start anew upon a course of improving studies” (127). Edna now prioritizes her own needs and desires, which marks a change in her attitude and behavior. She no longer muses about her former long intimate dinners with her husband in which she talked about her children, and she no longer “wondered what they were doing” (126). This shift marks Edna’s distinctly new perspective. The narrator once again emphasizes how new it is for Edna: “after a refreshing bath, Edna went to bed. And as she snuggled comfortably beneath the eiderdown a sense of restfulness invaded her, such as she had not known before” (127). This remark draws upon the idea of refreshment and rejuvenation associated with theories of sleep. It also foregrounds the “new” experience she has because of it.

In the fourth cycle of sleep, Edna realizes and acknowledges that she has changed. She chooses where she sleeps, and she selects a place that “pleased her,” the pigeon house (151). Edna anticipates and welcomes a total renewal through the sleep in this house in welcoming Arobin’s suggestion to “rest” as a remedy for her current “chilled and miserable” state (149). Her sleep in the pigeon house follows the pattern of sleep predicated upon a series of rejuvenations to her body and mind. Sleep changes her
emotions. She had a “jealous pang” but now feels “hope” and “the promise of excessive joy.” When she is “awake,” her eyes have a new sense of brightness and allow her to see this promise (161). The focus on Edna’s eyes signals the strengthening of Edna’s senses that allow her to think and see in new ways. Upon waking, she regrets her actions: “she felt she had been childish and unwise the night before in giving herself over to despondency” (161-2). Sleep allows her to gain clarity, and her regrets signal her resolve to act differently. And Edna has changed. She writes to her husband with a new sense of “friendly evasiveness” that she had never before experienced (162). This change can be attributed in part to Edna’s affairs with Robert and Arobin, but the narrator also connects these changes with Edna’s sleep.

Sleep emerges again as a catalyst for Edna’s mental and physical change in this fourth cycle of sleep, which extends through the novel’s final sentences. Shortly before the ending, Edna visits Mrs. Ratignolle, who is in the process of childbirth, and reflects upon her own experience giving birth. Edna recalls how her body changed when she received the artificial sleep aid chloroform. She recalls the “deadened senses” caused by the chloroform and her waking from the “stupor” after giving birth. Jennifer B. Gray argues that Edna’s linking of childbirth and motherhood with torture demonstrates her “opposition” to the “‘mother-woman’ role” exemplified in Mrs. Ratignolle (71). Edna’s rejecting this role signals a metaphorical distancing from the larger society. I argue that the sleep imagery and language also correspond with a more tangible change in Edna. Edna leaves Mrs. Ratignolle’s apartment feeling “dazed” (171). This sensation corresponds with chloroform’s effects, which many sleep articles mentioned as a method for inducing sleep. Edna mentions sleep when she speaks to Dr. Mandelet. She remarks
that “the years that are gone seem like dreams—if one might go on sleeping and
dreaming—but to wake up and find—oh! well! perhaps it is better to wake up after all,
even to suffer, rather than to remain a dupe to illusions all one's life” (171). She
acknowledges how waking brings about new clarity and new experiences that can be
painful.

In the passages that follow, the narrator explains that Edna has changed:

all the tearing of emotion of the last few hours seemed to fall away from
her like a somber, uncomfortable garment, which she had but to loosen to
be rid of. She went back to that hour before Adèle had sent for her; and
her senses kindled afresh in thinking of Robert’s words, the pressure of his
arms, and the feeling of his lips upon her own. (172)

The narrator ties Edna’s shift in how she thinks about herself to sleep; sleep emerges as
one of the key catalysts. The narrator returns to Edna’s sleep, explaining how she “did
not sleep” (172). Even though she does not sleep, the scene marks a distinct change in
Edna’s habits that anticipate the narrator’s observation that Edna has changed in the
novel’s final scenes, when Edna undertakes her final swim into the sea.

Edna casts aside the unpleasant feeling of her “pricking garments” in preparing
for her swim. As she does so, she recognizes the “delicious” sense of being naked under
the sky, and “felt like some new-born creature, opening its eyes in familiar world that it
had never known” (175). The attention to opening eyes recalls the process of waking
from sleep that reinforces the sense of newness that corresponds with a “new-born
creature.” Edna’s “exhaustion” and movement into a dream of her childhood suggest that
she will once again fall asleep (176). She again sees herself differently, casting herself as
an artist, an identity that she never before fully embraced. Edna is falling asleep as she walks into the water. Just as each sleep process brings about a rebirth, so too will this occasion; it has similar valences to the other occasions throughout the novel.

The ending’s ambiguity had garnered much critical attention, with most critics focusing extensively on the implications of it in terms of a metaphorical awakening for Edna’s character:

Most discussions of Kate Chopin’s *The Awakening* turn on attempts to judge Edna Pontellier’s decision to commit suicide at the end of the story—and, in this respect, the present discussion is not in the last bit novel. Furthermore, as students of Chopin know full well, taking on the task of judging means confronting a persistent and roughly polarized disagreement over how to evaluate Edna’s final decision. Should she be praised or blamed? Does she command sympathy or disapproval? Does it mark a victory or a defeat? (Bartley 719)

In these readings, the ending is the most significant scene in the novel and the most important to understanding the novel and Edna’s character, especially if it represents the titular awakening, as critics like Levine, Wolff, and Ivy Schweitzer suggest.95 Many

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95 Peter Ramos summarizes this tradition by reading the two main theories of Edna’s suicide—as Edna’s “triumph” or her “defeat” (145). He then explores a third reading of the ending, “a third, though far less popular, reading of Edna’s final actions insist they are inconsistent with her character and, as such, flaw the novella as a whole” (146). Ramos argues that this response is exemplified in Emily Toth’s suggestion “that Chopin had Edna commit suicide in order to accommodate the moral demands publishers and readers would place on a woman who committed such transgressions” (146). All of these readings place an emphasis on the ending and explain that Edna needed to die. Robert Treu provides a comprehensive overview on critical discussion of Edna’s death as suicide (29).
critics view Edna’s suicide-drowning as a representative of her death and defeat. Parvulescu, for example, identifies it as an “awakening-unto-death” (477).96

But this ending is consistent with Edna’s pattern of sleep across the novel. Rather than occurring at one major moment of awakening, Edna’s pattern of physiological sleep shows that she experiences many smaller awakenings across the text that correspond with her repeated cycles of sleep and waking. Each awakening brings about observable changes to her body and mental state. These changes refer to and amplify scientific theories on sleep’s invisible changes.

This sustained pattern of sleep also necessitates an alternative view of Chopin’s engagement with scientific knowledge, which critics often take into account in interpreting the ending. Some critics focus on how the novel reproduces naturalist philosophies on determinism in this final scene.97 Pizer summarizes a tradition that traces how “Edna’s fate” is “largely determined by the biological and social context in which she lives” (11). Although Pizer explains that it is problematic to read *The Awakening* strictly as “naturalist fiction,” he maintains that it refers to naturalistic ideas and the larger cultural context in which they were circulating. In his reading of the novel as “a remarkable achievement of naturalism as feminism,” Erik Margraf argues that social and biological forces necessitate that Edna die in order to find fulfillment denied by such forces: “Edna Pontellier is left disenchanted to the brutal facts of life, which eventually sweep her out of this world” (94). The only way for Edna to escape from the biological

96 Parvulescu argues that “the awakening only happens at the end, better yet, after the end of the novel” (485). Susan J. Rosowski points to Edna’s affair with Arobin as the moment of Edna’s awakening (47).

97 For an overview of criticism on naturalism in the novel, see Pizer 5. Erik Margraf also discusses criticism that identifies the novel as naturalistic fiction.
and social forces that inhibit her fulfillment is to commit suicide. Such an idea “is entirely in line with the evolutionary theories of natural history developed in the nineteenth century” (99).

Darwin-driven readings often point to Edna’s interaction with Dr. Mandelet, who, according to Margraf, “speaks with the voice of science” (100). After Edna sees Madame Ratignolle’s childbirth, Edna tells Dr. Mandelet that she is “not going to be forced into things” (171). He responds in a way that critics have interpreted as a naturalistic philosophy, explaining that “‘Nature takes no account of moral consequences, of arbitrary conditions we create, and which we feel obligated to maintain at any cost’” (171). Edna’s remark that it is better to remain sleeping ties sleep into this conversation. She points to awakenings as foundational moments that cause her to see and experience change.

Examining this and other occasions of sleep across the text necessitates a more pluralistic reading of Edna’s patterns of sleeping and waking in order to understand the many ways in which Edna’s character changes to become more self-aware across the novel and not only in the metaphorical awakening in the final scene. The critical over-emphasis on the novel’s ambiguous ending and moment of Edna’s awakening has had the effect of undervaluing the process of Edna’s self-discovery and change during her many instances of sleep across the novel. Sleep actually changes Edna in dramatic ways throughout the novel. Chopin experimented with sleep theories and used them to describe new and unfamiliar interior states. She amplified the transformations that sleep theorists

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98 John Glendening makes a similar point (67). Levine argues that “the word ‘awakening’” in the final scene “takes on a grim biological shading” (77).
described. In doing so, she described what it feels like to see the world and one’s self in a new way.
Conclusion

The previous chapters enabled us to identify a new form of the relationship between science and nineteenth-century American literature. The writers in this study adapted scientific and technological terms and ideas toward aesthetic ends. These chapters showed the range of what these writers counted as aesthetic. A brief overview of the ways that previous criticism characterized the relation between science and literature will help us to discern the nature of the relation that Poe, Dickinson, Melville, and Chopin developed.

Scholarship focusing on nineteenth-century American literature and science generally fits within two main traditions. A dominant thread focuses on writers’ attitudes toward science. Critics search for clues in writers’ literary works and biographies. They ask whether Poe had confidence in science or whether Dickinson disapproved of it. They study what Melville’s depictions of scientist-like figures suggest about his opinion of science. Some scholars question whether Chopin remained skeptical of Darwin’s ideas throughout her career. Critics take this approach in studying a number of other canonical figures throughout the century.

Another thread of criticism traces how writers reproduced scientific concepts. Within this cultural studies approach, critics examine literature for more information about scientific ideas circulating at the time. Others ask how authors registered cultural attitudes about scientists or physicians.

These studies make it clear that writers read about then-current scientific discoveries and referred to them in literature in several ways. I study one unexamined technique. I argue that Poe, Dickinson, Melville, and Chopin did not simply comment on
discoveries or reproduce scientific discourses. Instead they used science—often by adapting its language and concepts—to pursue a range of aesthetic aims related to perception and interior states. The range of examples is striking. Although these writers had different aesthetic ends, they all used science for pursuing them.

Poe showed art’s capacity to reconfigure perception. He drew from discourses on light and daguerreotypy that discussed perception in featuring instances where light affects characters. The narrator in “The Fall of the House of Usher” relates how light distorts his perception as it creates an unusual effect on the titular house. The narrator in “The Man of the Crowd” explains how light makes a range of hidden details perceptible. Both narrators explain how light appears increasingly unusual and unnatural throughout the stories. This literary light becomes unnatural in that it breaks from the laws that govern light. Poe explored these effects in a number of poems and stories across his career and especially in the decade after the introduction of the daguerreotype, which resulted in a surge in articles on the mechanics of light and photography. Rather than reproducing these discourses, he altered them. This technique underpinned some of his efforts to produce novel effects for readers and to reconfigure how characters see.

The chapters on Dickinson and Chopin focus on one significant aesthetic effect that draws a comparison between the two writers. Dickinson and Chopin understood the aesthetic in terms of literature’s capacity to illuminate interior states. Dickinson wrote about perception after death and the feelings that accompany it. She described emotions and sensations without names. Chopin described what it feels like to see one’s body and mind transform. She drew from accounts that described transformations generated by sleep and then made these ordinarily imperceptible transformations perceptible in The
Awakening. These transformations affect Edna, who expresses what it is like to become a “new-born creature” after several sleep cycles enacted across the novel (175).

These two examples suggest that there may be a relationship between writers’ aesthetic aims and their gender. Dickinson and Chopin undertook sustained inquiries into the interior world by drawing from scientific discourses. Nina Baym, Stephanie Browner, and other critics prove that some women writers knew a great deal about science from their education in science courses at women’s schools. This was the case with Dickinson at Mount Holyoke. Perhaps, as my study of Dickinson and Chopin suggests, some women saw science as a device to look inward and explore a range of thoughts and emotions, including new experiences. Incorporating science into their literary texts provided them with a means to study the interior world. They read about science and then experimented with ideas in the space of poems and stories. These writers looked inward while scientists, who were most often male,99 often looked outward at the physical world toward newly-discovered planets and stars. Other examples to consider may be Elizabeth Stuart Phelps and Catharine Maria Sedgwick, two authors that critics have associated with science.100 How did they represent scientific ideas and language? Did they also use science to explore the inner world?

The “Technologies of Vision in Melville’s Fiction” chapter demonstrates how Melville can be thought of as an intermediate figure between Chopin’s and Dickinson’s focus on interiority and Poe’s experimentation with perception. Melville used science to imagine forms of perception of interior states. In one example, he connected his friend’s

99 See Bergland’s discussion of women’s place within professional science.

100 Baym discusses Phelps in Styles of Affiliations. Shelly R. Block and Etta M. Madden discuss Sedgwick’s references to science in “Science in Catharine Maria Sedgwick’s Hope Leslie.”
heightened perception with optical instruments used “for sharpening and extending our natural sight” (John Marr 3). He explored this relationship in Mardi, Moby-Dick, and other works where he experimented with forms of perception. One striking example is his description of a whale’s eye in order to render its perspective.

Poe, Dickinson, Melville, and Chopin turned to science to rethink how literature depicted perception, thoughts, emotions, and sensations. They generated these effects by transforming scientific discourses. Poems and stories appeared alongside articles on science in periodicals, but these literary texts represented scientific ideas in a different way. While the authors of scientific articles disseminated ideas, these writers used scientific ideas to engender a range of aesthetic effects.

The writers in this study altered scientific logic and lexicon in order to produce unnatural features that would shock characters and readers. Studying this approach underscores literature’s transformative capacity. Nineteenth-century American literature did not always reflect the world. It also provided a space for authors to innovate. Writers could create new forms and effects unencumbered by laws that govern the physical world.
Works Cited

The following abbreviations are used to refer to the writings of Emily Dickinson:


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