From fields of labor to fields of science: the working class poet in the nineteenth century

by

Angela Walther

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Dr. Dometa Brothers, Major Professor
Dr. Linda Shenk
Dr. Gloria Betcher

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TABLE OF CONTENTS

CHAPTER 1. INTRODUCTION

In 1804 the working-class poet Robert Bloomfied published his poem "Good Tidings" in his volume of pastoral poetry *Good Tidings; or, News From the Farm*. Set amidst the fields of the laborer, Bloomfield's poem praises the effects of the recently developed smallpox vaccination and is a direct result of his collaboration with his patron and supporter Edward Jenner, a country doctor and "experimental anatomist".[1] When the public reacted toward Jenner's new medicinal discovery with disgust and skepticism, he enlisted the pastoral bard Bloomfield to compose a poem in praise of the vaccination process. The stigmas surrounding the new medicinal practice prevented this science from developing, and Jenner needed a writer who could promote his discoveries to the lower and middle classes, the groups of people most infected with the disease.

As a field laborer, Bloomfield's connection to nature and predilection for Georgic idealism created a perfect ethos that Jenner needed, an ethos that proved vaccinations were natural and not nasty. The cowpox and smallpox vaccinations required a sample of the infection to be harvested from a cow's infected udder and then injected into the body, and this process was seen as a demoralizing, dirty, and bestial practice, and for good reason. The vaccinations *sometimes* worked, and spreading rather than stemming the disease was a very real risk, but Bloomfield's own family members had suffered and died from smallpox, which impassioned him to join Jenner's cause. Bloomfield's course of action was then to romanticize a practice that was clearly unromantic.

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[1] Debbie Lee and Tim Fulford, "The Vaccine Rose: Patronage, Pastoralism, and Public Health," *Robert Bloomfield*, Eds. Simon White, John Goodridge, Bridget Keegan (Lewisberg: Bucknell University Press, 2006).

To make the practice of vaccinations palatable to the public, Bloomfield had to jeopardize his own relationship with the working-class poetic tradition and with his supporting patron, Jenner. In Debbie Lee and Tim Fulford's article "The Rose Vaccine: Patronage, Pastoralism, and Public Health," they conclude that Jenner's ambition threatened Bloomfield's poetic value; using smallpox and vaccinations as subjects for his poem threatened the idyllic tradition of pastoral poetry by exposing the harsh realities of the rural lifestyle. Bloomfield was challenged with keeping his readership intact by balancing the deformities of the smallpox with the stigmas of scientific practice while *also* maintaining the bucolic scenery of life on the farm. Bloomfield appeals to the pathos of his readers in an effort to maintain the peacefulness of the pastoral amidst disease, and he positions Jenner and his vaccinations as the key to the restoration of rural purity:

Forth sped the truth immediate from his hand,
And confirmations sprung in ev'ry land;
In ev'ry land, on beauty's lily arm,
On infant softness, like a magic charm,
Appear'd the gift that conquers as it goes;
The dairy's boast, the simple, saving Rose! (ll 121-26).

The vaccinations issued from Jenner's hand are not dirty or disgusting but the "gift" (125) that restores the innocence of the rural lifestyle, and the saving "Rose" (126) of the vaccinations serve as the solution to sustaining the rustic, pure character of the pastoral poet by connecting the site of the vaccination with an organic and natural object. The image of the rose reflects the sore spot left on the body after the administration of the vaccination, but Bloomfield compares this scarring of the body to an environmental yet delicate process of a blossoming rose.

Not only does Bloomfield employ metaphors of nature to explain the nonthreatening vaccination process, but he also transports this science across the borders of the working class environment. The repetition of "ev'ry land" (26) moves the vaccination process from the fields of the laborer to the larger body politic; this new medicinal science becomes an international necessity. Lee and Fulford's essay note Bloomfield's participation and his role in the larger national literary stage, stating how his relationship with Jenner encouraged him to explore a more complex realm of working-class life that the pastoral genre did not normally allow.[2] They emphasize the relationship between Bloomfield and Jenner, claiming that in the end it is scientific practice and the scientist that reinforces pastoral lore.[3] More interesting, though, and more overlooked, perhaps, is Bloomfield's actual connection to the sources of this scientific information surrounding vaccinations.

It is unknown how much of Jenner's research Bloomfield had access to or how much agency Bloomfield had in crafting his poem, but what Bloomfield did know was the grotesque vaccination process. Prodding a cow's oozing wound for bacteria and then injecting it into the body as a "cure" for laboring-class diseases creates an unpleasant and imbalanced relationship between the working-class poet and scientific information. Just as Jenner controlled and pressured Bloomfield's poetic Muse, the vaccination process depicts the working class's lack of agency in how science was practiced, appropriated, or generated. The working-class was merely *acted* upon by science, receivers rather than initiators.

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[2] Lee and Fulford, 146.
[3] Lee and Fulford, 153.

But, Bloomfield admits that Jenner's science is a pervasive "Truth" (26) that traverses beyond prescriptive boundaries, benefiting *all* classes in every environment. This recognition signals a desire for working class participation in promoting and practicing this "truth" of science; obtaining scientific truth generates social mobility, progress, and a more healthy society, and it is Bloomfield's admission of science's benefits to the working classes that motivates this project. Conceiving the nineteenth-century working class as mere bystanders to scientific progress only reinforces working-class poetry as inferior; it assumes the working-class poet was incapable of observing the complex cultural influences surrounding them inside and outside their own working-class environments.

Bloomfield writes on the threshold of a surge in scientific development. From the middle of the eighteenth century, huge paradigmatic shifts in physics and the natural sciences completely revolutionized the Renaissance and Enlightenment conceptions of the universe. The biblical timeline was confounded by studies in geology and deep space. In 1803, one year before Bloomfield's publication, the iron-framed printing press entered the market, transmitting the specifics of these new developments, new theories, and the results of new experiments in quick succession.

Not only could information be produced cheaply and quickly, but also products and goods could be shipped in a like manner, meeting the demands of a growing consumer culture. By the 1840s science was very much in vogue among the middle classes, and scientific information was constantly generated for this new consumer-driven public. The middle class dedicated much of their leisure time to the growing scientific institutions, visiting the Kew botanical gardens, spending time at the zoo, or attending the renowned World's Fair in London in 1851. The middle class's interest in science influenced the production and genres of popular literature, and the literary market sought to fill the growing demand for cheap, accessible scientific information.

Although science was a public curiosity long before the 19th century, it required the middle class's investments to spur the market of popular science; only then did this information become beneficial to the lower classes. The middle class appetite for instantaneous information along with rising literacy rates of the 19th century made newspapers and pamphlets cheap, available, and the information accessible and digestible to all classes of society. These cheap magazines, such as the *Penny Magazine*, included pictures of exotic animals with detailed explanations of anatomical structures; it featured illustrations of dinosaur bones; it included pictures and diagrams of imported flora and fauna; it showcased new inventions such as the spectroscope. Just like the thread used by the Lancashire weaver, science was stitched into the very cultural fabric of the 19th century, confounding religious, political, social, and philosophical norms, and establishing an unrivaled scientific ethos. However, just like Bloomfield's experience, this ethos does not and cannot fully explain the relationship between the working-class poet and scientific discovery because the pervasive popular science also arguably supports the inferiority of working-class poetry.

Popular science, like working-class poetry, has maintained its own set of stigmas. Bernard Lightman in his book *Victorian Science in Context* defines popular science as the process of adapting privatized and complex scientific information for a broader audience, but it is also considered by some contemporary historiographers to be an uncontrolled, diluted dissemination of scientific knowledge that carries connotations of "crudity, ignorance, and tyranny."[4] With rising literacy rates in the 19th century as well as a vigorous publishing community, science was spilling into the public, compromising the quality and accuracy of information. However, I have found evidence that the working class had access to not only popular, but also elite scientific texts. My research into the places and private environments of the working-class culture reveals the working class's deeper connection to science, a connection that proves to be more elite than "popular."

Recent scholars such as Lightman, Anne Secord, and George Ganter support this more targeted investigation of science's influence on particular groups and places, advocating a more focused study into the nooks and crannies of practical science. Lightman admits that scholars tend to focus too much on *who* is producing the popular science and not enough attention is given to "*how* this message [is] read and appropriated in different ways in different local settings by different social groups."[5] Secord and Ganter respond to Lightman by proving science was practiced, developed, and advanced in particular places by the working classes.[6] Secord's article "Science in the Pub: Artisan Botanists in Early Nineteenth-Century Lancashire" uses a theory of place and habitus to prove that the working-class's botanical clubs placed in the pub allowed artisans to study science free from middle-class interference.[7] Ganter follows the similar theme of place and space to explore the variety of marketplaces that existed for scientific thought. These marketplaces, which included elite scientific texts, comodified science, and the control over this property created tensions within and between social classes.

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[4] Bernard Lightman, *Victorian Science in Context,* (Chicago: Chicago University Press, 1997), 11.
[5] Lightman, 17.
[6] G. Ganter, *Science In the Nineteenth-Century Periodical: Reading the Magazine of Nature* (Cambridge: Cambridge University Press, 2004).
[7] Anne Secord, "Science in the Pub: Artisan Botanists in Early Nineteenth-Century Lancashire," *History Of Science*, 32 (1994): 284.

The movement in the theoretical approaches to studying Victorian science has shifted to include the working-class populace, and this shift constructs a "revised map that incorporate[s] the presence of new groups."[8] If the historical studies of science recognize the importance of the working-class perspective, then the question becomes why has this approach been neglected in the studies of literature? Why has working-class verse never been considered as a viable, valuable vessel of scientific information? Why has this scientific lens never been applied to the "unlettered muse"? The most practical and palpable answer is found in the critical tradition surrounding working-class poetry. Working-class criticism has historically and culturally been maintained as a sociopolitical phenomenon. I do not disagree with this tradition; however, the applications we use to arrive at these culturally informed conclusions need not remain static, and yet there has been little initiative among scholars to apply broader cross-disciplinary investigations to the 19th-century working-class poet.

The theoretical history on working-class literature begins with its recovery. The first published anthology of working-class verse was Brian Maidment's foundational 1987 book *The Poorhouse Fugitives*, and it revived an interest in the self-educated. The trend occurring in the 1970s and 1980s to extend the edges of the canon inspired scholars to reconsider the contributions of the underprivileged, self-educated poet. Scholars such as Martha Vicinus spearheaded this research, and her article "The Study of Nineteenth Century British Working Class Poetry" published in 1971 illuminated the cause for the relegation of working-class verse among scholars while also arguing for its importance despite its diurnal and sentimental themes. Explaining how working-class verse changed over the 19th century from a class-conscious activity to a privatized middle-class

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[8] Lightman, 7.

hegemonic artistic aspiration, Vicinus provided the platform on which new cultural and political meaning could be derived from the stigmas of its inferiority.

More recently, Florence Boos and John Goodridge take up the working-class poetic cause in an effort to encourage more theoretical approaches. Goodridge, like Vicinus, attempts to explain *why* working-class poetry is so sentimental in his article "Some Rhetorical Strategies in Later Ninteenth-Century Labouring-Class Poetry." Goodridge offers another perspective for viewing this stigmatized, seemingly sentimental literature by illustrating the performance of working-class poetry; their verse would have been *performed* rather than *read,* an explanation that qualifies the melodramatic qualities of working-class verse. Goodridge looks beyond the sentimental and melodramatic qualities in order to emphasize the poetic potential, a poet contemplating "metaphysics, political progress, and social change."[9] Boos agrees with Goodridge and Vicinus that the movement for establishing working-class verse as a viable artistic form has been steady but slow and predictable. In her anthology of working-class Scottish female poets, she positions working-class verse as an entity of literature that is deserving of a complexity that many are hesitant to recognize because "sheer remoteness" of space and time separating reader and critic, a space that causes inaccuracy in judging the degrees of "access, education, and privilege" associated with the working-class.[10]

It is this inaccuracy produced by space and time that this thesis attempts to correct. The approach of historical scientists such as Secord and Lightman is one step towards closing this gap between modern critic and nineteenth-century poet. A close,

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[9] John Goodridge, "Some Rhetorical Strategies in Later Nineteenth-Century Laboring-Class Poetry," *Criticism,* 47.4 (2005), 542.
[10] Florence Boos, *Working-Class Women Poets in Victorian Britain* (Toronto: BroadviewPress, 2008) 17.

intimate exploration of the individual and the individual's habitat will prove the literary contributions of the working classes should be considered as more than merely hegemonic reproductions of middle class priorities. What Boos terms as the "apparent simplicities of working-class verse"[11] only draw attention to our own prejudices towards the unlettered muse, and these "simplicities" are a result of our own modern shortsightedness rather than the reality of the poet's talent. Applying the scientific lens to working-class poetry reveals a complexity within their poetry that has not yet been recognized by literary scholars.

This project will expand the themes of working-class literary criticism by exploring the scientific aspects of working-class poetry and, at the same time, tightly focus on the habitats of the working classes such as the pubs and the fields of the laborer to establish a non-hegemonic relationship between the working-class poet and practical science. Unlike Bloomfield's relationship with Jenner, this place-based study of science shows the working-class poet encountered science free from middle class imposition. Through this process, the working-class poet understands and becomes a witness to how these scientific philosophies influence and affects his own place and space within the larger society.

The first chapter concentrates on the working-class botanical societies formed during the early nineteenth century. These scientific working-class communities originated in the pub and used the Swedish botanist Carl Linnaeus's plant classification system. Linnaeus's system was internationally adopted by the middle of the eighteenth century, and it allowed anyone who collected plants to identify new species, name them, and then classify them according to his system. This classification underscores the

[11] Boos, 20.

diplomacy of practical science of the early Romantic period, a diplomacy that changes by the Victorian period. This shift from amateur practical science to specialized science is evident in the working-class poet Samuel Bamford's elegy to the botanist John Horsfield, "Lines, On the Death of John Horsfield, Botanist, of Prestwich" (1864). Horsefield participated in botanical pub clubs in Lancashire and Manchester, and this intimate space of practical science created a unique fusion of working-class oral culture with the linguistic qualities and organization of Linnaean taxonomical nomenclature.

The second chapter moves from the pub to the fields of the laborer, and the focus on amateur science and specialized science moves to examine the paradigmatic shifts taking place in the field of physics. During the early Romantic period a major change occurred between the mechanical natural philosophy of the Renaissance and the emerging dynamical natural philosophy introduced by Immanuel Kant and William Herschel. A little known working-class poet and thrasher, William Vincent Moorhouse, provides an interesting investigation into how the working-class poet situated himself within these evolving views of the material world. The ordered mechanical natural philosophy of Isaac Newton complicates Moorhouse's relationship with his working-class space of the field and his place within the industrial system. As scientists such as Herschel proposed a dynamic universe based on evolution and change, a different perspective on the organization of economic and social systems in this new Herschelian perspective quickly followed.

Moving from the universal changes in matter to the minute relationships between atoms, the third chapter explores how the discovery of the electromagnetic field influenced even the tiniest spaces between matter. The electromagnetic field proposed that matter traveled throughout this field composed of mediating ether. The poetry of the working-class Chartist, Gerald Massey, explores this relationship between the ether and light, electricity, and magnetism to explore the boundaries between the physical world and the spiritual world. Massey was a devout spiritualist, and physics becomes a crucial component to defending his beliefs that communication with the dead is possible.

Bamford, Moorhouse, and Massey prove that it is our own theoretical nostalgia for working-class poetry that stymies the value of their verse, and it is the scientific lens that alleviates this prejudice. It is by broadening working-class critical discourse while tightening the theoretical lens of popular science that will evolve the vision of the working-class poet from simple to complex, from ignorant to informed, from insignificant to valuable. To study how science is represented in art, especially working-class poetry, is to reveal how science was processed, understood, and appropriated not only within an individual but also within an individual's community. It gives insight into the way particular individuals viewed themselves as an agent and a receiver of scientific and technological advances, and how this scientific thought influenced their relationship with the natural world and the universe.

CHAPTER 2. THE DEATH OF DIPLOMATIC SCIENTIFIC PRACTICE: LINNAEAN CLASSIFICATION IN SAMUEL BAMFORD'S ELEGY TO JOHN HORSEFIELD

The frontispiece for the 1794 publication of the *Illustratio Systematis Sexualis Linnaei* translated by Iohannem Miller[12] features a detailed black and white print portraying the international and ambassadorial stage of botanical science. This illustration depicts various peoples carrying their native plants to a raised altar situated in the middle of a courtyard.[13] A tree grows on top of the altar, which is surrounded by a sultan from India, a native American with an intricate headdress, an African woman with a basket of fruit propped on her head, and an aged man from the orient. Each person carries his or her native plants to the altar, piling flora, fauna, and fruit under the altar's Latin inscription from chapter one of Genesis: "And the earth brought forth grass, and herb yielding seed after his kind, and the tree yielding fruit, whose seed was in itself, after his kind: and God saw that it was good."[14] Standing under the tree on top of the altar, the focal point of the piece, are Adam and Eve, dressed in simple, plain shepherd's clothing. Decorating the arch over the courtyard are portraits of Carl Linnaeus, the Swedish botanist, and the French botanist, Johannes Miller. These two scientists watch as a global society gathers at the feet of the humble Adam and Eve, who are, according to Christian legend, the original cultivators of the land.

With his head wrapped in a wreath, Adam's long robe and sandals present him as a shepherd strolling through the fields. He is holding a cornucopia filled with fruit, and

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[12] Full title translation: *An illustration of the Sexual System of Linnaeus*. Iohannem Miller, *Illustratio Systematis Sexualis Linnaei* (London: New Bond Street, 1794).
[13] See Appendix A.
[14] "Produxit Enim Terra Germen, Herbam Producentem Semen Juxta Speciem Suam, et Arborem Facientem Eructum, Cui in Erat Semen Suum Juxta Speciem Suam Viditque DEUS Quod Esset Bonum"

Eve, dressed in a similar fashion, one breast coyly exposed, rests her head on Adam's shoulder. The two stand under the tree, representing the idyllic pastoral romance and drama that occupied so much of 18^{th} century poetry. This scene at the altar portrays the intimate pastoral environment, a model of a quintessential English lifestyle; rising above the exoticism of its surrounding patrons, the altar becomes the point of contact between the newly discovered places of the world and the intimate, traditional, and humble spaces of the European. Surrounding this point of contact, however, is the elite courtyard adorned with marble archways and expensive stately busts. In its entirety, the illustration indicates the interaction between the intimate, humble fields and forests of the bucolic environment, the exotic spaces of the new world, and the privileged places of the elite.

This chapter will explore how these different spaces between humble and elite, exotic and domestic converge and diverge as practical science moves from an amateur, leisurely study to a more rigid, professionalized field during the nineteenth century, becoming more and more exclusive. The illustration demonstrates the diplomatic inclusivity of scientific practice, particularly botany, during the mid- to late- eighteenth century. The shepherds situated on top of the altar proclaim a privileged working-class connection to the natural world, as the international community places its plant specimens at the altar of the humble pastoral environment, honoring the modest nature of scientific practice. The elite scientists framed in the marble arch do not control this universal celebration of scientific exchange; rather, they stoically, passively, and proudly observe this diverse community of botanical enthusiasts gathering to share their knowledge and goods. Linnaeus profoundly supported the universal utility of science, and the flowers from China, the ferns from Africa, and the fruits from South America that decorate the pages of his book prove Linnaeus's classification of plant life was imbued with a democratic philosophy.

Linnaeus first published his classification in *Systemae Naturae* in 1735. He proposed a new system for organizing and classifying all living things on Earth, according to species and genera. Plants were categorized based on the plant's sexual characteristics. Some 24 (and then later 26) configurations of stamens and pistols accounted for all plants on the earth. The classification system allowed for anyone to place a plant within the established hierarchal system and to name it according to certain defining characteristics, even if the plant was new and unknown. The Linnaean classification embodied a strong resistance toward the professionalization of science. In the James Smith's preface to his translation of *Reflections on the Study of Nature* by Carl Linnaeus, he states "nothing affords a more humiliating view of human wisdom, than when we see men of real learning and skill in particular branches, treating the scientific pursuits of others with contempt."[15] During the eighteenth century, the segregation of science based on social status was contemptuous. According to Mary Louise Pratt, Linnaeus's system fostered a democratic approach to scientific classification; anyone who was able to learn the system could collect and classify any plant, which was becoming quite a profitable commodity towards the end of the eighteenth century.[16]

Linnaeus's system was so popular that it was quickly adopted worldwide. Foreign travel, including Captain James Cook's famous expedition through the South Seas in 1768 as well as travel texts from explorers such as Mungo Park, George Francis

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[15] Sir J.E. Smith's translation of Linnaeus's *Reflections on the Study of Nature* (London: 1798).

[16] Mary Louis Pratt, "Science, Planetary Consciousness, Interiors," *Imperial Eyes: Travel Writing and Transcultration* (NY: Rutledge, 2008), 17.

Lyon, and Joseph Ritchie, communicate the profound interest in exotic and domestic flora and fauna. Even slavery inspired a cultural obsession with plant classification and collection—the search for a cheap, easily produced fruit to feed the vast number of slaves on the sugar plantations powered a commercial plant industry.[17] According to one of Linnaues's students, the classification system inextricably linked practical botany to the economic system:

> The researches of the naturalist, in particular, are productive of no less advantage to others, than delight himself; especially those of the BOTANIST, whose discoveries and acquisitions are often of the utmost consequence to the trading and commercial interest of his country. Nay, the celebrated Linnaeus has even ventured to assert, that the knowledge of plants is the very foundation of the whole public economy; since it is that which feeds and clothes a nation.[18]

In the middle of the eighteenth century, botanical practice supports a burgeoning population and contributes to the very financial fabric of British culture more so than ever before. The economic pertinence of botanical information makes this knowledge extremely valuable for industrial agronomy, and Linnaeus's taxonomy makes it extremely accessible even to the working classes.

The humble working-class naturalist and his involvement in botany can be dated almost directly following Captain Cook's expedition in 1770, and these aspiring botanists continued to flourish through the first half of the nineteenth century. The author of

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[17] The search for Breadfruit as a sustainable source for slaves is one example of plants and botanical science as a source of economic importance. See Fulford, Lee, and Kitson's "Banks, Bligh and the breadfruit: slave plantations, tropical islands and the rhetoric of Romanticism," *Literature, Science and Exploration in the Romantic Era* (United Kingdom: Cambridge University Press, 2004).

[18] As quoted in Pratt, 32.

British Flora published in 1799 relied heavily on the specimens of the warehouse porters, James Crowther and William Evans of Tyldesley. Crowther is specifically credited with the discovery of Lady's slipper orchid (Cypripedium calceolus) and Mudwort (Limosella aquatica).[19] Even the impoverished Edward Hobson routinely corresponded with Sir William Hooker on rare species of moss, proving a democratic and scientific interaction allowed the laborer to contribute to the production of scientific knowledge. The first botanist out of Lancashire to publish was Edward Hobson with his *Musci Britannici* in 1818, but others quickly followed, such as Richard Buxton's botanical guide to the Manchester area.[20] George Crozier, Francis Looney, John Nowell, and John Whitehead, a collection of printers, weavers, and cotton operatives, respectively, all printed their collections featuring local flora and fauna in the early nineteenth century.

Linnaean's taxonomy was ultimately one of inclusivity, allowing the laborer to contribute to the corpus of botanical literature during the nineteenth century. The Linnaean system offered the working classes a foundation for scientific participation and facilitated economic competition, and botanical pub clubs and artisan botanical societies quickly formed in the industrial cities of Manchester and Lancashire to propagate the Linnaean system. One crucial figure in the instruction of Linnaean classification was Horsefield, who studied the Linnaean Latin taxonomy when he was sixteen years old from James Lee's 1760 *An Introduction to Botany*.[21] Horsefield also had the Daffodil *Narcissus horsefieldii* named after him, and he eventually experimented with plant

[19] John Percy, "Scientists in Humble Life: The Artisan Naturalists of South Lancashire" University of Manchester.
[20] Richard Buxton, *A Botanical Guide to the Flowering Plants, Ferns, Mosses and Algae found Indigenous within Sixteen Miles of Manchester* (Manchester: Abel Heywood, 1849).
[21] Leo H Grindon, *The Country Rambles and Manchester Walks and Wild Flowers* (Manchester: Palmer and Howe, 1882).

hybrids in his garden. Horsefield, a weaver and artisan botanist from Whitefield just north of Manchester, was obsessed with plants and became the President of the Botanical Society in Prestwich on September 11, 1820.[22] This private, informal scientific pub community fostered organic intellectuals with the goal of scientific practice.

Horsefield's fluency in Linnaean taxonomical nomenclature earned him the reputation of a skilled and reputable artisan botanist.[23] Each member of the club collected plants and then brought them to the pub. The meetings commenced with toasting a round of beers to the *Botanist's Song*[24] and then naming out loud each collected plant according to Linnaeus's system. Finding a new plant species or a rare plant often resulted in published recognition or financial reward. Given the working class's access and interest in agriculture and their exposure to the environment, aristocratic botanical enthusiasts often recruited artisans and laborers to collect plant samples and new species.[25] Like the humble figures of Adam and Eve amidst the international congregation of botanical science, the artisan botanist also held a key role in furthering the science of botany. However, the artisan's lack of Linnaean Taxonomical nomenclature sometimes resulted in misclassifications, making an educational system to support the laborer crucial to scientific study.

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[22] Grindon, 27.

[23] Anne Secord, "Science in the Pub: Artisan Botanists in Early Nineteenth-Century Lancashire," *History of Science,* 32 (1994): 269-314.

[24] The *Botanist's Song* is not published and the verses changed from meeting to meeting, and only one stanza appears in an 1823 issue of the *Manchester Guardian*. I believe this is a testament to the role of oral transmission in the study and practice of science, a theme that is not fully developed in this paper.

[25] John Martin of Tyldesley collaborated with William Wilson, a gentleman botanist, and Martin collected rare mosses for Wilson. Wilson credited Martin for the discoveries in his publications. Secord, 310.

The societies collected dues from members and formed a circulation library of scientific texts, and the pubs developed into a culture protected and independent from an imposing middle class ideology.[26] Although public, the pub's questionable morals discouraged the morally conscious middle class from pressuring reformation and tainting the information at the laborer's disposal, and this stigma of the pub and freedom from hegemonic control created "an unknown culture at its strongest points," a place where "working-class culture appeared at its most impenetrable."[27] Because the pub was free from most social regulation, this place promoted an egalitarian, working-class, educational system that supported the oral tradition of the working classes—it was a system that Samuel Bamford, known for his political radicalism, supported and admired. Bamford lauds the artisan botanists comprising these pub clubs as "the most intelligent of any in the island…They can show a greater number of botanists; a greater number of horticulturists; a greater number who are acquainted with the abstruse sciences…"[28] Interestingly, Bamford's use of "island" to describe Britain emphasizes its wilderness and wildness, and the laborer becomes the superior tamer of this seemingly unexplored "island." It is the laborer's connection with the natural world and his abilities as a botanist that earn him a working-class scientific identity.

Bamford and Horsefield met in 1816 during the frequent social reform meetings of the period.[29] The democratic practice of science during the Romantic period influenced both Horsefield and Bamford. Horsefield, practicing botany and teaching Linnaean taxonomical nomenclature, and Bamford, inspired by his cellmate (aptly named

[26] Secord, 282.
[27] Secord, 301.
[28] Samuel Bamford, *Walks in South Lancashire* (Blackley: Bamford, 1844).
[29] Grindon, 285.

"Plant") during his imprisonment after the Peterloo Massacre both supported the study of botany. While scholars such as Martin Hewitt and Robert Poole value Bamford's poetry for his early political radicalism and strong anti-Chartist influences, his scientific authority, botanical connections or interests do not play a role in these studies.[30] In Bamford's introduction to *The Dialect of South Lancashire or Tim Bobbin's Tummus and Meary*, he observes the importance of joining science and poetry: "Already there is a streak in the horizon of this dark north. Poetry, history, and the arts, are beginning to embellish science, whilst science is leading on from wonder to wonder."[31] For Bamford, poetry, history and art are intimately linked, each enhancing the other, and it seems necessary to observe his poetry not only from the lens of political radicalism but also scientific enlightenment. The unifying natural structure of Carl Linnaeus's classification system supported the classless practice of scientific exploration; however, by the time of Horsefield's death in 1854, the professionalization of science ultimately marginalized the working classes. It is the loss of the working-class botanist's *place* within scientific practice that Bamford mourns in his elegy to his good friend and scientist, John Horsefield.

The loss in scientific prestige of the laborer through the eradication of democratic practical science is most poignantly recognized in Bamford's biblical metaphor "All Flesh is Grass," appearing in the third stanza of Samuel Bamford's poem "Lines on the

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[30] The most extensive studies on Bamford are by Martin Hewitt and Robert Poole, who wrote the introduction to *The Diaries of Samuel Bamford,* by Samuel Bamford (New York: St. Martin's Press, 2000), x-xxxi. Also, see Hewitt's "Radicalism and the Victorian Working Class: The Case of Samuel Bamford," and Michael Sander's "Poetic Agency: Metonymy and Metaphor in Chartist Poetry 1838-1852."
[31] Samuel Bamford, introduction to *The Dialect of South Lancashire or Tim Bobbin's Tummus and Meary* (Manchester: Stationer's Hall, 1850), iv-x.

Death of the Late John Horsefield, Botanist, of Prestwich."[32] The words of Isaiah[33] from the Old Testament somberly mark the fragility of his friend's life and the inevitability of death. Bamford was a weaver and political activist living in London at the time of the elegy's publication in his *Homely Rhymes, Poems, and Reminisces* in 1864, and his "biblical intertext"[34] in this poem is a common trope in working-class verse, assumed by many scholars to be a conformist tool for appealing to middle-class values. However, this particular religious rhetoric serves as an equalizer, wherein "All flesh" incorporates a universal structure of humanity, a structure free from social segregation and privilege. More importantly it not only implies the unification of the classes through the inclusive "All flesh," but it also laterally connects the corporeal body with grass, combining a religious and poetic metaphor with the scientific allusion to a botanical structure. Bamford amalgamates the sacred with the scientific, human flesh with the plant, to create an egalitarian community, a democratic botanical community symbolized in Linnaeus's classification.

The pub clubs in Lancashire and Prestwich encouraged scientific study in a non-hegemonic, democratic community, an environment that changed dramatically by the time Horsefield died in 1854.[35] The pub clubs dissolved by the middle of the nineteenth century and were replaced by more formal educational institutions. The landscape of practical science moved from the working class environment of oral communication in the pubs to the more structured learning disciplines of the Mechanic's Institutes, which,

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[32] Samuel Bamford, *Homely Rhymes, Poems, and Reminisces* (London: Marshal and Co., 1864), 130-132.
[33] Isaiah 40:6
[34] A term first used by John Goodridge in "Some Rhetorical Strategies in Later Nineteenth-Century Laboring-Class Poetry," *Criticism,* 47 (2005): 531-547.
[35] As well as by the time Bamford's elegy was included in his 1864 edition of *Homely Rhymes Poems and Reminisces*.

by the time of Horsefield's death, were a highly criticized venture. In Leo H. Grindon's exposé on Horsefield in his 1882 book *The Country Rambles and Manchester Walks and Wild Flowers*, he confirms Horsefield's hesitancy to associate with the Mechanic's Institutes, claiming his preference was to express himself amongst his own botanical clubs:

> Horsefield was a member of the Banksian Society, but rarely came to the meetings of the Mechanics' Institution class, reserving himself for those country musters where his knowledge and good nature had the full wide scope which they at once merited and deserved."[36]

The pubs did not limit the voice of the laborer in scientific expression but provided a "wide scope" for scientific communication. The Mechanic's Institutes were stifling for the working classes, and Grindon's explanation of Horsefield explains the communal malaise the working classes had towards the Institutes.

Science and technology became increasingly beneficial to the progress of the industrial revolution, and by 1825 the Mechanic's Institutes existed in every major industrial center. The Mechanic's Institutes sought to educate the working classes in practical subjects, such as engineering and arithmetic; however, to our modern perspective they have been condemned as a controlling organization for moralizing and placating the working classes rather than educating them in science. In Sherry Shapin and Berry Barnes' article "Science, Nature, and Control: Interpreting Mechanics' Institutes" the Institutes merely distracted the laborers from their supposedly lewd

[36] Grindon, 193.

habits.[37] The Institutes ultimately failed as a result of the encroaching "petty-bourgeois" in the 1830s and 1840s, when shopkeepers and clerks replaced the actual mechanics and artisans.[38] In a Letter to the Editor published in the *Middleton Albion* in 1858, Bamford blames the fickle upper-class patronage and influence for failing the Institutes. The Mechanics' Institute in Middleton gained an impressive library due to the generous donation of Lord Suffield, and in an effort to promote the "taste of reading," these books were read aloud to the general public who congregated at the Institutes; however, the donor, realizing his money had been "misapplied" through mass exposure, put a stop to these recitations:

> A veto was given by [Lord Suffield]…that the weekly readings, which were well attended, were by his lordship's desire discontinued; that the ownership of the books was afterwards, at the instance of two original trustees, thrown open to anyone paying a penny a week…and thus disappeared the first mechanics' institution founded at Middleton.[39]

Lord Suffield, through his control of the Mechanic's Institute, creates a stasis in the working-class scientific progress by silencing the oral dissemination of scientific

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[37] Steven Shapin and Barry Barnes, "Science, Nature and Control: Interpreting Mechanics' Institutes," *Social Studies of Science,* 7 (1977): 31-74. "In general, scientific study was to be an intellectual pastime which could be an appropriate alternative to socially undesirable activities, such as drinking and extra-marital sex. More specifically, the study of the natural world would point out laws, relationships and the presence of design of which the worker would otherwise be unaware. And in being thus brought to perceive this rational organization of nature, he would perceive (metaphorically or directly) the rational organization of society also, in its harmonious relationship with the natural world."

[38] Shapin and Barnes, 71. For Shapin and Barnes the result of this failure is not a concern of their article, but only that the Institutes *did* fail, the institution dissolving by the 1850s.

[39] Samuel Bamford to the Editor of the *Middleton Albion*, 1858, in *The Diaries of Samuel Bamford,* ed. Martin Hewitt and Robert Poole (New York: St. Martin's Press, 2000), 25-6.

information. Bamford's correspondence underscores the change in scientific practice from the beginning to the middle of the century. The oral distribution of scientific information in the pub clubs thirty years prior to the Institutes reflects just how much the nature of scientific practice changed from the Romantic to the Victorian period. The Victorian period underscores an emerging duel between oral and written traditions of the two classes. The oral tradition maintains that the "knowledge of one is a knowledge for all," but when knowledge is commodified, especially botanical science, the voice is silenced to control the market.[40]

The Mechanic's Institutes are merely one instance of the professionalization and hegemony of science developing during the middle of the century. Sir Joseph Banks, the botanist and traveler who was president of the Royal Society from 1778 to 1820, was an "embodiment of the informal power" of scientific practice; he believed that "science should continue to flourish as a broad, amateur practice, of immediate practical benefit to agriculture."[41] However, Banks' philosophy died with him in 1820, and Humphrey Davy replaced him, marking a pivotal moment in the history of science. Davy was not an aristocrat but a scientist by profession, and the aristocratic amateurism that defined the genesis of eighteenth-century science was redefined by Davy's appointment. Science, as a profession, became fully established. In 1840 William Whewell coined the term "scientist" in his introduction to his *Philosophy of Inductive Science*, solidifying the boundaries between professional and amateur scientist.[42]

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[40] Secord, 280.
[41] Fulford, Lee, and Kistson, 254.
[42] William Whewell, *Philosophy of Inductive Sciences Founded Upon Their Histories* (London: Harrison and Co. Printers, 1840), cxiii. "We need very much a name to describe a cultivator of science in general. I should incline to call him a Scientist."

This shift from the democratic all-inclusive practice of science to a professional, restricted, and limited initiative does not mean the artisan botanist was barred from scientific practice; rather, it limited the validity of the artisan's impact in the sciences, and this change in scientific authority becomes a palpable loss in Bamford's elegy to Horsefield. Horsefield's death not only marks the end of his friend's life, but also the end of a society founded on democratic principles of scientific practice. It is in the second stanza of Bamford's elegy that nostalgically celebrates Linnaeus's classification, fusing the pastoral genre of traditional working-class verse with Linnaeus's structure:

No more he seeks the fern within the dell,
Nor humid moss that drips beside the well;
Nor pimpernel, that weather warns the poor;
Nor golden asphodel, that gems the moor;
Nor purple heath, that scents the breezy wild;
Nor hyacinth, of shady nooks the child;
Nor sun-dew, glittering on the moorland dun,
Nor primrose coyly nestling to the sun (ll 9-16).[43]

The anaphora of "nor" is an interesting choice in this poem—it negates the practice of plant collecting while also rhythmically directing the reader from plant to plant. "Seek" in line 9 also initiates a movement, mimicking a botanist's collection of plants. The fluid movement between the lines despite the idea that Horsefield cannot actually move (because he is dead) serves to highlight the agency Linnaeus's taxonomy facilitated. This motion is further perpetuated by Bamford's organization of the actual lines, which

[43] For the entire poem, please refer to Appendix C.

conform to Linnaeus's construction in his *Species Plantarum*.[44] Published in 1753 *Species Plantarum* was the first corpus cataloguing of all the plant life known to Linnaeus, and he divided all of the plants into Classes, Orders, Genus, and Species. In this first compendious text of plant life, the plant name is given in Latin followed by the plant's description, and a comma always separates the two clauses.[45] When this structure is placed alongside Bamford's poem, the mobility of the botanical poetic persona is reinforced by the scientific text (See Appendix B).[46] Bamford layers the pastoral landscape with the structure of the scientific text to transport his botanist through the scene.[47] The Linnaeus's structure supports not only the anaphora but also the steady, consistent steps of iambic pentameter, enhancing the botanist's steady progression through the pastoral setting. The authority of Horsefield's modest plant collecting from his youth is no more by the time of his death, and Bamford's positioning of Linnaeus's structure as a source of agency is a poignant juxtaposition between the freedom fostered by Linnaeus's taxonomy amongst the working class space of the pub and the strictly defined and exclusive spaces of elite science.

For Bamford the pastoral tradition reflects the working-class botanist's connection to nature, and he unites the two seemingly antithetical subjects of scientist and artisan into a scientific, poetic hybrid structure that fosters movement. This hybridity also reclaims working class space; as the landscape of scientific practice changed so did

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[44] Caroli Linné, *Species Plantarum: Exhibentes Plantas Rite Cognitas ad Generas Relatas,* (Holmiae: Impensis Laurentii Salvii, 1753)

[45] Caroli Linné, *Species Plantarum*

[46] Caroli Linné, *Species Plantarum;* Samuel Bamford, "Lines on the Death of the Late John Horsefield, Botanist, of Prestwich," *Homely Rhymes, Poems, Reminisces* (London: Marshal and Co., 1864), 130-32.

[47] Translated texts of Linnaeaus' *Species Plantarum* also feature this same construction. See James Lee, *Introduction to Botany* (London: J. and R. Tonson, 1765), 14.

the land itself. As Pratt notes, "the systematizing of nature came at a time when relations between urban centers and the countryside were changing rapidly."[48] The peaceful countryside of the midlands became littered with thrashing machines and factories. Combating this industrial imagery is Bamford's layering of Linnaeus's structure with pastoral imagery. The plants are placed within the working-class environment of "the well" (10), the "moorland dun" (12), and the "dell" (15), emphasizing the quotidian, Romantic ideal of the working-class environment. It is the nostalgic tone of the passage mourning the death of not only Horsefield and the changing landscape of practical science, but also the actual landscape of the laborer, altered by technology of industrialism.

The movement within the working-class countryside also hearkens to Linnaeus's disciples. After his 1735 publication of his classification, Linnaeus recruited young botanists to travel the world, gathering, classifying, and transporting any and all plant life. Essentially, the traveling botanists desired a tool for extracting foreign plants for domestic introduction, reducing the cost of expensive imports,[49] but the trips of Linnaeus and his disciples embodies the philosophy of scientific practice without borders, both geographical and institutional; the only requirement for a disciple was to have keen eyesight, "good stamina and, above all, be able to work independently as natural historians."[50] Horsefield's trek through the working-class countryside, by "the well" (10), the "moorland dun" (12), the "shady nooks" (14), and the "dell" (15), figures him as one of Linnaeus's disciples, navigating and owning the wilderness of his "island."

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[48] Pratt, 35.
[49] Sverker Sörlin, "Globalizing Linnaeus – Economic Botany and Travelling Disciples," *Tijdschriftvoor skandinavistiek*, 29 (2008) 125.
[50] Sörlin, 122.

Horsefield's life represents the ideals Linnaeus envisioned for his classification, an egalitarian rather than segregated practice that promoted botanical science everywhere and to *everyone*.

Horsefield imagined as a Linnaean disciple helps reclaim the working-class space, which becomes a large part of Bamford's poetic process. Through Linnaeus's structure, he demonstrates the agency of democratic practical science, and uses the hierarchical system of the taxonomy to reinforce this action. Bamford lists Cryptogamia first: ferns and moss. According to Linnaeus's *Species Naturae*, which organized plants according to their sexual stamens, there are 26 classes of plants, and the Cryptogamia is listed as the *last* class in this system.[51] Cyrptogamia, classified as the non-seed bearing plants such as fungi, algea, and moss, reproduce in shady, damp places. Beginning this stanza with the last "lowly" class and the most unfruitful plants, which prosper in dark, moist areas, alludes to an environment that is not unlike the artisan's pubs, but the botanist moves away from these plants as the poem continues. The humble botanist encounters more flowery, beautiful, and exotic plants, finally ending with the primrose "coyly nestling in the sun" (16). The last plant in this stanza is endowed with a sharp wit and a place in the sun to prosper. Primrose received its name from the Latin Primus, meaning prime or first, and this plant is the first to open in the spring.[52] Moving from Cryptogamia to the Primrose features the utility of science to aid in the movement from dark to light, echoing Bamford's views on science as a beacon of light "in the horizon of this dark North." Horsefield's participation in scientific discourse allows him to literally and figuratively

[51] Caroli Linné, *Systema Naturæ Per Regna Tria Naturæ,* (Holmiae: Impensis Laurentii Salvii, 1766).
[52] George Crabbe, *Universal Technological Dictionary: or, Familiar Explanation of the Terms Used in All Arts and Sciences* (London: Baldwin, Cradock, and Joy, Paternoster Row, 1823).

navigate the scientific hierarchy of plants, reflecting Linnaeus's underlying philosophy of egalitarian scientific practice as a tool for scaling the social stratification as well as the scientific. The system itself is a fixed hierarchy, but the utility of the system is not.

Complicating the utility of Linnaeus's taxonomy is his implementation of Latin. Linnaeus's Latin binomials are purposeful simply because *no one* spoke it.[53] The language reflects the equalizing force of Linnaeus's system, representing a non-nationalistic venture in the name of global scientific practice.[54] However, for the laborer, this proved to be a complex skill to master, which reflects Britain's education system rather than Linnaeus's shortsightedness. The Linnaean system and the Latin binomials complicated the oral tradition of the laborer, which made Horsefield's mediating presence even more crucial. As one member of the botanical clubs noted, "[I] once gathered a trailing plant for its peculiar beauty and sent it to the local society to have it named. Word came back that it was--- well, I don't know what, but a very rare plant."[55] The artisans' inability to pronounce Latin made Horsefield's job quite difficult: "some being unable to pronounce it, some garbling it, we have been constrained of late years to adopt another method."[56] The Latin of the system forced the laborer to learn the information through different means, but this made Horsefield's position as a teacher and President an even more fundamental component. As Secord explains:

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53 Pratt, 27.
54 For more on the global implications of Linnaeus's system please see Mary Louise Pratt's "Science, Planetary Consciousness, and Interiors" and Sverker Sörlin "Globalizing Linnaeus"
55 As quoted in Secord, 281.
56 As quoted in Secord, 282. The other method of communicating the Latin is unknown.

> The president's skill was judged according to an old, informal and internally governed structure of authority within the oral tradition…a complex mixture of the literary and the oral embodied in a particular individual.[57]

Horsefield's role in controlling and maintaining the oral tradition and authority within the context of scientific practice presents him as a hybrid of both scientific progress and traditional values. As an educated, working-class botanist, he successfully represents the two cultural dichotomies of the oral tradition, the hymn singing and balladry of the working class, and the Latin-learned, progressive, bourgeois community. Bamford represents this dichotomy through his use of colloquial plant names.

Just as Bamford combined the pastoral environment with a scientific structure to promote unity, he also creates a "complex mixture" between the oral tradition and Latin nomenclature. In Bamford's edition of *Homely Rhymes, Poems and Reminiscences* (1864), which first featured his elegy, a footnote is included describing "Pimpernels that weather warns the moor" as "often called the poor man's weather glass."[58] Bamford employs the colloquial term for the flower to not only contrast and therefore highlight the juxtaposition between the working class oral culture and Linnaeus's Latin, but it also emphasizes a working-class dignity. Bamford's use of "Pimpernels" underscores his allegiance to the working-class's unique connection to nature, a connection with its own language and own meanings that represent a special relationship to nature that differ from his upper-class counterparts. Furthermore, this elegy would have been read or recited aloud at Horsefield's funeral, and Bamford uses both the scientific structure with

[57] Secord, 278.
[58] Bamford, *Homely Rhymes, Poems, and Reminisces,* 130.

working-class language to represent the harmony between the two discourses, a harmony represented by the individual life of the artisan botanist.

The convergence of two discourses, those of the labor-class traditions and those of scientific practice, place the botanist directly at the intersection of the scientific community as well as his own working-class community. However, it is not the only two discourses Bamford unites in his elegy. The structure of Linnaeus's text allows Bamford to place the artisan botanist in the rural setting common to the working-class naturalist, but a shift occurs in his elegy in line 21, when the tour of the countryside supported by Linnaeus's scientific structure switches to religious rhetoric:

And thus it is,--we pass like dew away,
Or, like the summer flowers, that will not stay.
The germ of life, becomes a plant, and dies;
And in its place another plant doth rise.
"All flesh is grass,"—the myriads rise and grow,
And, quickly as they come, so quick they go (ll 21-6).

The cyclical movement of life and death in this stanza replaces the movement of the botanist in the second stanza, but the inclusive language is still in tact. "The germ of life" (23) classifies and connects *all* lifespans to that of the plant. The botanists, whether artisans, slaves, or members of the Royal Society, are all bonded as natural structures themselves; Bamford levels the human to that of the plant as a reminder that human life is just as fragile and replaceable as the botanical subjects they study and admire; Bamford relates through Horsefield's death the common circumstances of existence, and the universality of the human enterprise contrasts starkly with the evolving exclusivity of the scientific enterprise.

Bamford's combination of botanical with the corporeal *and* the spiritual presents a unique dynamism in his elegy. The use of religious rhetoric in working-class poetry is quite common in working-class verse. As Bridget Keegan remarks in her article "Mysticisms and Mystifications: The Demands of Laboring-Class Religious Poetry," that the working-class poet's scriptural verse harkens to the oral tradition of hymn singing and pastoral ballads, and it assisted the working-class poet to "claim the right to speak"[59] and to speak politely to their middle-class patrons. God became a mouthpiece, and "religious verse created the space for those people who were otherwise disenfranchised to experiment with a range of poetic styles and to express and explore their identities as writers" without alienating their middle-class readership.[60] Publishing poetry and owning a poetic voice was a form of social subversion for the working-class writer, and the religion allowed the working-class poet to initiate a unifying voice of radical poetry, playing a "vital role…in expressing radical ideas and binding radical identities."[61] For Bamford, the religious metaphors link Bamford to the oral traditions of his community and to his politically radical ideology.

However, many scholars note how the religiosity of working-class verse belies the established inherent prescriptive boundaries limiting the subjects and content of working-class poetry. It forced a political quietism, directing their appeals to God for social justice rather than the powers of the body politic. However, Bamford employs this religious rhetoric to participate non-threateningly in scientific discourse, and it

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[59] Bridget Keegan, "Mysticisms and Mystifications: The Demands of Laboring-Class Regligious Poetry," *Criticism* 47 (2007): 471-491.
[60] Keegan, 472.
[61] Martin Hewitt and Robert Poole, introduction to *The Diaries of Samuel Bamford*. Bridget Keegan's article also supports Hewitt's idea that the religious rhetoric coincided with radicalism, as well as John Goodridge's *Some Rhetorical Strategies in Later Nineteenth-Century Laboring-Class Poetry*, xxii.

demonstrates how the emerging scientific conversations complicated the working class's relationship with their religious discourse. As the modern historiographer Bernard Lightman explains:

> In the second half of the century, truths based on an appeal to sacred texts, to religious authorities, to an inner conscience…were no longer seen as possessing intellectual credibility. Therefore those who could claim to speak on behalf of science gained immense cultural authority and intellectual prestige.[62]

Just as Keegan remarks that religion allowed the working-class poet to "claim the right to speak," so too does Lightman use the same language to position science as usurping literary and oral authority during the middle of the century. I believe Bamford's elegy embodies this cultural shift in rhetorical authority. Bamford does not place religious appeals at the beginning of his poem but scientific ones, which are then followed by the traditional religious rhetoric of the working-class poet. Bamford redefines the traditional patterns of working-class poetry through the inclusion of practical science, which, ultimately, becomes a new form of social subversion in and of itself.

The combination of religious and scientific rhetoric has received little attention from scholars. For the modern critic, the archetypal diurnal themes of working-class poetry never connected with scientific philosophy. Hewitt claims when considered alone Bamford's career and writing "reveal no great new truths, demolish no long-established orthodoxies"[63]; however, it is when one positions Bamford within the production and practice of science that his radical use of information complements his aesthetic

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[62] Bernard Lightman, "Historians, Popularizers, and the Victorian Scene," in *Victorian Popularizers of Science* (Chicago: University of Chicago Press, 2007), 1-38.
[63] Martin Hewitt ,"Radicalism and the Victorian Working Class: The Case of Samuel Bamford," *The Historical Journal,* 34 (1991): 873-92.

capabilities as a poet. The pubs and the botanical societies they harbored prove that science was very much a staple in working-class spaces, a practice that influenced the perceptions of the natural and social worlds.

Underlying Bamford's commemoration to his deceased friend is the nostalgic mourning over the loss of a diplomatic human interaction between the classes in the name of scientific progress. The knowledge of one is no longer the knowledge of all by the middle of the nineteenth-century, and this loss is clearly expressed in the closing lines of Bamford's elegy:

So, husband, parent, neighbour, steadfast friend,
All ties dissolve when human life doth end;
Until in spirit-life, again we rise,
And meet thee in the fields of Paradise (ll 49-52).

The community of the working-class botanist is completely absent at the end of the poem, and the familial, friendly, and professional relationships Horsefield created during his life have "dissolved" (50). The democratic ideals of Linnaeus no longer exist at the time of Horsefield's death, and the passing of Linnaeus's philosophy is embodied in the passing of Horsefield as his personal and professional relationships also disappear. Linnaeus's classification established a community connected by scientific practice, but by the Victorian period, the boundaries restricting scientific dialogue across class lines limit the artisan's role within this newly structured system. The international community gathered together at the feet of the humble shepherds to share their knowledge of botany disperses, and these public connections are reestablished only in the afterlife. Bamford and Horsefield will meet again "in the fields of Paradise" (52), ending the poem in another enclosure of working-class space. Bamford's elegy moves from Linnaeus's open system to the working-class fields of Paradise, exemplifying the move of scientific practice from borderless and egalitarian to bordered and limiting, achieving the equality he so desperately desires only in death.

Bamford's "fields of Paradise" (51) transform by the middle of the nineteenth century. The artisan botanist's strolls through the fields to collect plants becomes a practice of antiquity; rising industrialism at the turn of the century not only changes the landscape of scientific practice but also limits the artisan's role in the field of science. Linnaeus's classification of all life forms situates science as an international cooperative effort, one that was ordered, accessible, and mutually valuable. However, within the borders of Bamford's British "island," the communal ownership of information disappears and is replaced by segregation and specialized, pluralized *fields* of science by the 1830s. The changing spaces of practical science by the publication of Bamford's elegy can be summarized by disciplinary demarcation. The fields of science were subdivided and the "subdivisions insulated,"[64] becoming more and more institutionalized. The Mechanic's Institutes, the newly minted physics, geology, and astronomy degrees from Oxford and Cambridge, as well as the new philosophies of the Royal Society, all contributed to the redefinition of what constituted a "field of science."

Nature is no longer understood through homogenous observation; the skills required for physics become different from the skills needed for chemistry and geology, and Linnaeus's ordered classification of all living things is challenged by the rising theories of transmutation and evolution. The fields of science were changing, shifting, and evolving. The dynamism of the fields of science coincides with the encroaching machine of industrialism, which physically alters the laborer's environment, the "field."

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[64] Whewell, 501.

It is this changing landscape of practical science and working-class spaces that will become the focus of the next chapter. Bamford's elegy marks the loss of a unified, diplomatic field of science, but the dynamism introduced near the turn of the century produces new spatial metaphors for understanding and decoding not only the laws of nature but also the laws of society.

CHAPTER 3. IN THE FIELD OF PHYSICS: NEWTON, HERSCHEL, AND THE POETRY OF WILLIAM VINCENT MOORHOUSE

Linnaeus's 1735 publication of his classification system transformed not only the natural world but also the social world; his hierarchical system of living things fostered a nonhierarchical utility. His system not only infiltrated the pub life of the laborer, but also traveled the world on Captain James Cook's expedition to the South Seas in 1768. Cook's team of scientists, although not referred to as scientists at the time, included aristocratic botanists, geologists, anthropologists, and astronomers from all around the world, as well as members of the Royal Navy. Despite the political storms brewing on the main lands between Britain and France, Cook's team of explorers and researchers freely navigated international waters, safe from piracy and seafaring skirmishes. The trip lasted three years, and its successful completion underscores the extreme international cooperation and devotion all in the name of scientific progress.

Cook led a team of scientists, including the botanist Joseph Banks, to Tahiti, New Zealand and Australia with the ultimate goal of mapping the transit of Venus. Cook charted countless new territories in Africa, the pacific islands, and Australia; he revolutionized cartography and remapped whole new sections of the world; his team of scientists collected countless new specimens of rocks, minerals, new species of animals, insects, eventually returning "to Britain with an unprecedented number of botanical specimens"[65] from the "fields of Paradise," as the South Sea was soon to represent. It was Cook's expedition in 1768 that reflects the profound diplomatic and all-encompassing interest in the scientific composition of the natural world.

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[65] Tim Fulford, Debbie Lee, and Peter Kitson's *Literature, Science and Exploration in the Romantic Era* (United Kingdom: Cambridge University Press, 2004).

Only three years after Cook returned from his first trip to the Tahitian fields of Paradise in 1774, the professional musician and amateur astronomer from Germany, William Herschel, used his homemade five-foot reflector telescope to observe the famous, constant, and reliable North Star, a mythic symbol of constancy, direction and the stability of space. Much to his surprise, he observed that the Pole Star was plural—it was actually two stars. Herschel completely changed the same star(s) Cook and his team used to navigate to the South Seas, literally, overnight. This seemingly simple revelation, which was not confirmed by the Royal Society until nearly ten years later in 1782, had profound effects on the construction of space. Double stars offered a valuable method of gauging the distance between the Earth and other stars in the Milky Way by a process that would be called Parallax by the middle of the nineteenth century[66] revolutionizing the sheer size of space.

During the Cook's Transit of Venus observations, his team of astronomers measured an approximate distance between the Earth and the Sun; however, the discrepancy in observations and the phenomenon called the "black out effect"[67] obscured any concrete measurements between the two planets. But, Herschel's double stars could offer a more precise measurement. Triangulating the movements of the two stars against each other over a period of six months achieved a more obvious and accurate dimension. These measurements, though not exact, challenged the eighteenth-century's

[66] Richard Holmes, *The Age of Wonder*, (London: Harper Press, 2008), 23. He gives a nicely condensed definition of parallax: "Parallax is basically a trigonometrically calculation applied to the heavens. Stellar parallax is a calculation, which is obtained by measuring the angle of the star from the Earth, and then measuring it again after six months. The earth's movement during the interval provides a long base line in space for triangulation. So the difference in the two angles of the same star (the parallax) after six months can be used in theory to calculate its distance."
[67] Ruth Netting, "James Cook and the Transit of Venus," *NASA Science Journal*, Web. 6 April 2011.

contemporary attitudes that the universe was relatively small. For the eighteenth-century star-gazer, the universe may be only a few million miles above the Earth, revolving in a cyclical, unchanging pattern around fixed stars, either shining brightly if they were large or small (not far or near), creating a safe, predictable and almost intimate universe. After Herschel's double stars in 1774, and then his discovery of Uranus in 1781, and his constant addition of nebulae,[68] Herschel literally redefined not only the boundaries of space but also conceptions of time.

Herschel's calculations of parallax and his observations of the countless nebulae provided further inquiry into the age of the universe. The distance between Earth and the stars proved that they were many light years away, so far away in fact that it would take more than 6,000 years for Earthlings to see them. This new *sidereal*[69] timeline contested the age of the Earth and the biblical creation of the world, which supposedly occurred on December 25th 4004 BC, a date determined by the Bishop Usher in 1611.[70] According to Herschel's calculations, the earth and the universe had to be much, much older. Furthermore, Herschel's nebulae, he observed, were subject to fluidity and movement—they were not fixed entities—as evidenced in the death and birth of new nebulae. Like Linnaeus's plants, Herschel proposed that the nebulae clusters were at certain stages of development, either in the beginning processes of "compressing nebulous gas into huge, bright galactic systems," or at the end, "drawing towards a period of change or

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[68] Holmes, 181. During Herschel's time, nebulae were merely defined as gaseous clouds in space, but Herschel proposed that they were clusters of stars—very, very distant clusters of stars. In little over a decade, from 1770-1785, Herschel and his sister, Caroline, added over a thousand known nebulae to the celestial map.
[69] "Sidereal" is the temporal measurement of the motion of the stars rather than the planets.
[70] Marilyn Gaull, "Under Romantic Skies: Astronomy and the Poets." *Wordsworth Circle.* 21 (1990), 34-41.

dissolution."[71] The idea that the nebulae could be classified in almost a Linnaean manner based on their life cycle created a complex timeline of celestial matter.[72] However, Herschel's cataloguing and classification had much more profound and disturbing philosophical implications than Linnaeus's. Herschel's classification attested to a universe that was no longer small, intimate, quantifiable, or predictable—it was changing, birthing and destroying whole galaxies, evolving and, essentially, decaying.

This new universal dynamism redefined the Newtonian cosmology of the Renaissance into an evolutionary process called cosmogony. Dometa Brothers explains in her article "Coleridge's Web of Time" that Herschel's theory on the aging of nebulous matter positioned the universe as not infinite and immovable but dynamic and liable to decay. The mortality of heaven had a profound influence on the Romantic psyche:

> The world went from having a cosmography to a cosmogony. The celestial world, in this view, was no longer unchanging and fixed; it therefore, could not be eternal. If the heavens were no longer eternal, then human existence was not in contrast to eternity—it was an *adumbration* of transience.[73]

Brother's evokes the ephemeral quality of human life alongside this introduction of a cosmogony. Just as Copernicus decentralized the Earth from the center of the Ptolemaic solar system, so too does cosmogony displace and usurp human's central position within

[71] William Herschel, *Catalogue of a Second Thousand Nebulae* (London: Royal Society of London, 1789), 329-37.
[72] Holmes, 192. He also remarks on the Linnaean aspect of Herschel's work and quotes an interesting description from Herschel's papers on the universe as a garden: "The heavens are now seen to resemble a luxuriant garden which contains the greatest variety of productions, in different flourishing beds…and we can extend the range of our experience [of them] to an immense duration." I believe it underscores the desire to categorize the extreme variety of space, to compress it into a digestible metaphor despite the underlying philosophical implications that threaten certain religious paradigms.
[73] Dometa Brothers, "Coleridge's 'Web of Time': The Herschels, the Darwins, and 'Psalm 19,'" *The Coleridge Bulletin*, 28 (2006): 91-100.

the *timeline* of the universe. Humans may not necessarily be the apexes of the universal timeline.

This Herschelian view of the dynamic universe was in direct opposition to the eighteenth-century Newtonian clockwork universe. Newton's three laws of matter outlined in his 1687 *Prinicipia Mathematica* produced a set of equations using calculus and vectors to determine the initial conditions (F=ma) defining the forces acting upon matter. Essentially, the trajectory of any object, whether terrestrial or celestial, could be understood and predicted using Newton's form of calculus called Fluxions.[74] To this end, Newton's universe was theoretically predictable, deterministic, and mechanical. The Laws of gravity were set in place, and the operation of the forces upon matter would operate consistently and predictably with little interruption. Thus, Newton's mechanical universe, regulated by the Pantocreator, ticked away continually and accurately for eternity, and it is this continuity in time that defined the Newtonian philosophy:

> Absolute, true, and mathematical time, of itself, and from its own nature, flows equably without relation to anything external, and by another name is called duration. . . . Absolute space, in its own nature, without relation to anything external, remains always similar and immovable. . . . As the order of the parts of time is immutable, so also is the order of the parts of space. . . . All things are placed in time as to order of succession; and in space as to order of situation.[75]

Newton's space is more closely related to Linnaeus's classification. Each object in space is consigned to a set of initial conditions just like each of Linneaus's species are assigned certain characteristics, and straying from either Linnaeus's hierarchy or Newton's

[74] Leon Lederman, *The God Particle* (London: Delta Trade Book Publishing, 1993), 88.
[75] Newton, 291.

mathematical laws is impossible. The philosophy of a set of standards that are constant, immutable and maintained by God defines the eighteenth century. The language directly contrasts with Herschel's description published in his 1814 papers, *Philosophical Transactions of the Royal Society*: "breaking up of parts of the milky way affords a proof that it cannot last for ever, it equally bears witness that its past duration cannot be admitted infinite."[76] For Herschel the Newton's "ordered parts" actually break; the stars are susceptible to the decay catalyzed by gravitational forces, and the order of succession of time is completely confounded.

Newton and Herschel embody two theories relating to nineteenth-century physics: the mechanical natural philosophy dating from the Renaissance and the nascent dynamical natural philosophy developing in the middle of the eighteenth century. The mechanical natural philosophy purported by Newton believed that matter was composed of tiny, indivisible atoms, or corpuscular bodies, and these small corpuscles bumping into each other explained all natural phenomena. The only value of matter was in its form and its degree of motion. It was not endowed with any active principles and did not have the power to originate change; rather, gravitational forces acted upon matter in empty space. All matter was corpuscular, or atomic, and therefore all subject to the unifying laws of nature. Dynamical natural philosophy, however, believed matter was more complex, endowed with inherent attracting and repulsive forces that made matter unpredictable. As Kant explains in his 1755 publication of the *Metaphysical Foundation of Natural Science*:

> The mode of explanation of the specific variety of matters by the construction and composition of their smallest parts as machines is *mechanical natural philosophy,*

[76] As quoted in Brothers, 92.

> but that which derives the specific variety of matter from matters not as machines, that is, mere tools of external moving forces, but from the moving forces of attraction and repulsion originally belonging to them, may be called *dynamical natural philosophy*.[77]

The difference lies in the idea that mechanical physics explained solid matter as influenced by forces in empty space, but in dynamical physics, matter was endowed with its own forces that operated through a space filled with mediating ether, making material operations and reactions much harder to predict. These concepts will be further explored in the next chapter, but it still explains the important paradigmatic shift between these two theories. To understand how these theories of atomic matter influenced celestial bodies, look to the stars. Unlike Herschel, Newton believed the stars were fixed and proportionally placed in space in such a way that their gravitational forces were canceled out.[78] Because they were not matter in motion, they had no forces to explain or even suspect a collapse or compression. Herschel, however, believed that matter operated under different, complex forces of gravity—the stars belonged to whole separate solar systems with indefinable characteristics, making their compression and dissolution wholly possible. Newton's calculus could not explain the interaction between three bodies of matter, let alone thousands of stars, making Herschel's dynamism plausible.

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[77] Immanuel Kant, *Prolegomena and Metaphysical Foundations of Natural Science*. Second Edition. Transl. by Ernest Belfort (Boston: Harvard College, 1891), 120. Kant introduced the dynamic philosophy of matter in 1755.

[78] Newton originally stated in the 1706 edition of the Optiks that it was God who kept "the fix'd stars from falling upon one another." However, he changed this explanation in the 1713 edition of his *Principia* stating, "the fixed stars, everywhere promiscuously disperse in the heavens, by their contrary attractions destroy their mutual actions." It is God's arrangement of the stars rather than his direct involvement that prevents the obvious gravitational consequences of stars collapsing in on each other.

These new material conditions of how the *space* of Space operated impacted the imagination of the Romantic poet. The turn of the century inculcated a new generation of poets and philosophers in these new theories of a dynamic cosmos, and the disturbing, inspiring, and awesome reactions to the Herschelian universe have all been noted in the works of Samuel Taylor Coleridge, Erasmus Darwin, and John Keats. But, what effect did this new ideology of the dynamic universe and the changing boundaries of space have on the Romantic working-class poet? The laborer's space was defined by the dogma of Newtonian mechanics at the turn of the century, and the encroaching industrialism shaped the spaces of the industrial laborer— the fields and factories were controlled according to the mechanical ideology that operated the celestial bodies outlined by Newton's natural, immutable laws.

The Newtonian clockwork universe directly correlated with the totalizing power of industrialism, and birthed the laissez faire economy.[79] Newton's physics presented the universe as a bounded, inertial system regulated by God, and, as the celestial often reflects the terrestrial, other systems, specifically the economic system, was viewed as a naturally self-regulated laissez faire entity.[80] But what happens to the fields of the laborer when the fields of physics change? How does the Herschelian view of space change the laborer's place in this new physical and economic landscape? For William Vincent Moorhouse, a nineteenth-century, laboring-class poet, the dynamism had a profound influence on his poetic metaphors, allowing him to explore the chaos of the celestial to reconstruct the social spaces of the terrestrial.

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[79] E. P. Thompson, ''Time, Work-Discipline, and Industrial Capitalism,'' *Past and Present* (1967): 56-97.
[80] Stuart Peterfreund, "Newton Demands Some Abstruser Musings: Three Recent Discussions of the Reception of 'Newton' in the Eighteenth and Nineteenth Centuries," *Papers on Language and Literature,* 27 (1990): 112-34.

The mechanical natural philosophy directly affected the experiences of the laborer in the social and economic worlds, which is why it is important to study how the laborer accepts or rejects these new dynamic philosophies. In the case of Moorhouse, it reveals how the new system of evolutionary cosmogony destroyed the poetic analogies and metaphors of Moorhouse's literary progenitors, requiring him to deconstruct the tropes and analogies of the pastoral, as well as of time and space, in order to resituate himself in an emerging poetic discourse that was *of* and *about* the physical conditions of time and space.

William Vincent Moorhouse was a poor Thrasher born in 1796 and published only the one volume in 1828, and it his lack of any publishing longevity that has kept his poetry out of the circle of critical curiosity. Moorhouse's timeline becomes obscured in the early nineteenth century. Moorhouse describes himself as a Thrasher outside of Repton in Derbyshire, signing the preface of his edition in Repton in 1828 but publishing it through Houlston and Sons from Wellington, which had just relocated to London. The parish registries in Wellington do not contain a birth certificate for Moorhouse, and his exact birthplace is still unknown. However, the number of subscribers from Derbyshire places him somewhere in the Western midlands—he dedicated his edition to the Duke of Devonshire (the 5th one who died in 1811), who had his Chatswick estate in Derbyshire. In 1816 Moorhouse lost his hand when his gun backfired while hunting fowls, and the poem "Lines," written during his confinement in bed, claims the accident occurred far from home; however, Moorhouse's full connection to Repton and Derbyshire is still unknown. Moorhouse also has no documented education. The schoolmaster for the Repton Grammar School subscribed to Moorhouse's edition, but he did not attend the school.

I cautiously posit that it is Moorhouse's connection to the medical community and the relationships forged during his recovery from the amputation of his hand in 1816 that exposed him to the major scientific advancements of the period— as evidenced of the 25 surgeons who subscribed to his edition. Furthermore, it places him within the literary community with the likes of Coleridge, who was not only a strong follower of Herschel but also had an expressed interest in and connections with various surgeons in medical practice, including the surgeon James Gillman. Moorhouse's negative experience with machines, whether it is a gun that backfired or the thrashing machine of the field, encourages him to naturally question the validity of the clockwork, mechanized universe.

Moorhouse's poetry was chosen to explore this spectrum of changes in the fields of physics partly due to Herschel's popularity as a self-made scientist. Herschel was born to a working-class family of musicians; his father played in the German military band while his mother managed a household of ten children. He was not classically educated in mathematics like Newton and Laplace, but relied on his observational skills and his own mathematical studies to reconstruct the heavens. It was when he moved to England in 1766 that Herschel began experimenting with optics, telescopes, and the boundaries of deep space. Herschel eventually earned the honored position as King George the III's resident astronomer. His life is a testament to the influence and success the autodidact, amateur scientist could achieve in the fields of eighteenth-century science, a field that was rapidly changing by Moorhouse's publication of his edition. Herschel's life and his discoveries developed into a cultural and public fascination. The *Penny Cyclopedia of the Society for the Diffusion of Useful Knowledge* and the coinciding *Penny Magazine* of the 1830's featured articles and pictures of Herschel's discoveries as well as his life.[81] Consequently, Herschel became a household name for a scientific enthusiast such as Moorhouse.

While there is no direct connection between Herschel and Moorhouse, Herschel's philosophies on the evolutionary cosmogony play a role in Moorhouse's poetry. The dynamic Herschelian heavens contrast starkly with Moorhouse's fields of the laborer in his poem, "The Thrasher." The three-part poem describes how the local, industrial setting of the laborer is trapped in the temporal cycles of the season. The stagnant, repetitive industrial spaces of field laborer causes Moorhouse to destroy the Pre-Romantic figure of the Shepherd:

Can [Thrashers], like shepherds, tell a merry tale,
Their voice is lost, drown'd by the louder flail.
But they think: alas! What pleasing thing,
E'er to the mind can the dull fancy bring;
Their eye behold no pleasing objects there,
No cheerful sound directs their listening ear,
The shepherd well may tune his voice to sing,
Inspir'd with all the beauties of the spring:
No fountain murmur there, no lambkins play,
No linnets warble, and no fields look gay;
'Tis all a gloomy, melancholy scene,
Fit only to provoke the muse's spleen (ln 38-50).

[81] *The Penny Cyclopaedia of the Society for the Diffusion of Useful Knowledge*. Ed. George Long. (London: Knight and Co. 90 Fleet Street, 1833). Herschel's article on the observation of the stars was published in the Penny Magazine in 1833.

Unlike the glorified shepherd-figures in the frontispiece of Linnaeus's system, the shepherd in Moorhouse's poem cannot exist in the spaces of industrialism and is figured as an antithetical subject to the laborer, juxtaposing two very distinct working-class experiences and culture. The Shepherd, belonging to the pastoral tradition of Moorhouse's literary predecessors, tells a tale not of woe but of pleasing "beauties of the spring" (46) while the "thump after thump resounds the thrasher's flails,"[82] drowns the Thrasher's voice. Moorhouse uses the abused thrasher to replace the Pre-Romantic figure of the shepherd. The beauty of the natural world inspires the Shepherd, but within these new industrial spaces, the natural world is corrupted and the Thrasher's spleen is provoked rather than his poetic muse.

Within this Newtonian industrial system, the material world is stationary and torpid amongst the methodical steady thumping of the Thrasher. The Thrasher is functioning in a melancholic scene where the Earth is frozen in time, frozen in a perpetual state of absence: "No fountain murmur there, no lambkins play, / No linnets warble, and no fields look gay" (ln. 46-43). The natural world is literally trapped in time, fixed and immovable. Moorhouse creates a stasis due to the Thrasher's inability to make a connection with the natural yet industrial world in the same way as the shepherd. The shepherd represents the working-class poetic tradition of Georgic, pastoral verse; however, it is the industrial system that destroys this symbol of pastoral peacefulness.

Moorhouse's displacement in his working-class poetic landscape results from a death of a poetic historical idealism. The laborer no longer has the relationship with the natural world he once had due to the corruption of the industrial experience, and a new analogy is needed to represent this experience. Continuing in part two of the poem,

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[82] William Cowper's *The Task* also describes the thrasher's flailing.

Moorhouse describes the Thrasher machine, a new invention that automatically stripped the grain from the stalk without having to manually beat it. Moorhouse describes the Thrasher's new working environment alongside this machine: "The sweat, the dust, the suffocating smoke, / Make them so much like Ethiopians look. / Week after week they this dull task pursue" (ll 53-56). In these lines, time is cyclical, methodical and unwavering, supported by the steady iambic pentameter of the lines and the anaphora of the descriptions: "The sweat, the dust, the suffocating smoke…week after week they this dull task pursue" (53-56). Time slowly ticks away the weeks just as Newton's universe "can tick away continually and accurately for years on end,"[83] and the industrial fields of the laborer directly reflect the Newtonian mechanical natural philosophy.

Time in the industrial landscape is unceasing, constant, and ultimately oppressive. The new invention of the thrasher machine in 1784 transformed the landscape of the laborer's working space and created a lifestyle based on Newtonian mechanics. Turned black from the machines, Moorhouse describes the Thrashers as a suffocating mass of Ethiopians, replacing the analogy of the Shepherd with that of the slave.[84] The largest problem with the self-regulating Newtonian economic philosophy was the issue of slavery, and Moorhouse explicitly labels the mechanical philosophy as exploitive by transforming the Thrasher into a slave. In 1830, just two years after Moorehouse's edition was published, the Swing Riots began east of Kent, induced by the working-class's distaste for the thrasher machine and catalyzed by the abuse of landlords. The

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[83] Gerald Whitrow, "The Role of Time in Cosmology" *Cosmology, History, and Theology.* Eds. Wolfgang Yourgrau and Allen D. Breck (London: Plenum Press, 1977).
[84] For more on the laboring-class's profiling of slaves see Kelly J. Mays, "Slaves in Heaven, Laborer's in Hell: Chartist Poets' Ambivalent Identification with the (Black) Slave," *Victorian Poetry,* 39 (2001): 137-63.

social system reflects the dynamism of Herschel's new universe; the riots in 1830 are the culminating effects of a steady rebellion against the deterministic philosophies of Newtonian mechanics, and Moorhouse's poem promotes a dynamic and powerful social system, a system founded on the principles of protest and change.[85]

The machine not only affected the temporal spaces of the laborer, but it also physically altered his body, causing him to be "othered" by his "Ethiopian look" (54). The physical connection to the actual *space* of the working environment changes from the pastoral shepherd to the abused slave. Moorhouse disassembles the shepherd as an analogous figure between man and nature, and it is this new search for an analogy that underscores Moorhouse's poetic agenda. As Marylyn Gaull observes, "analogies are static and depend on a static view of creation: the belief that everything that could be created was created, that nothing new could appear and nothing could be lost."[86] But, the field of physics was changing from mechanical to dynamical, and the way Moorhouse *perceives* his working space also alters as evidenced by the shifting analogies between the shepherd and the Ethiopian. Herschel no longer stressed the universe as static but dynamic, no longer still but a complex, shifting system, and new synecdochal metaphors allowed a familiar part to stand and represent this unfamiliar whole. Moorhouse's substitution of the Ethiopian for the shepherd serves to explain the industrial system, creating a relationship in which the slave represents an entire oppressive system of both time and economy.

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[85] Riots against machines were not uncommon in industrial Britain during the early nineteenth century. The Luddite revolts of 1811 and 1812 saw the smashing of machines by textile workers in Nottingham.

[86] Gaull, 35.

Moorhouse's "Thrasher" proves that Herschel's new dynamism redefined not only abstract space but also material space. In Alice Jensen's *Space and the 'March of Mind'* she claims that during the nineteenth century there was "no consensus on what space was. Material spaces were easy to describe and define, but abstract space, the idea of space was not."[87] However, for the working-class poet, material space is quite complex and difficult to define—marred by industrialism, the material space of the laborer requires new relationships, new metaphors, to communicate the experience. Moorhouse contests the Kantian notion that space is unified and understood through natural law because the industrial laborer experiences spatial and temporal spaces quite differently than the non-laborer. The divergent philosophies surrounding abstract space such as Newton's mechanics and Herschel's dynamism complicate abstract space, but it also complicates the *material* spaces of the working classes.

In the material space of the industrial worker, time is cyclical, predictable and eternal, but when Moorhouse leaves the terrestrial realm of the Thrasher's fields, he contrasts this material space with the broader abstract, dynamic space of the galaxy. The poem immediately following "The Thrasher," is "A Night Piece," a description of Moorhouse's fanciful observation of the night sky. It is in this poem that one not only finds Moorhouse's use of tropes and synecdoche, but also his position within the Newtonian/Herschelian concepts of the universe:

O be it thine to read the spangled skies,
Where every twinkling star proclaims a God!
Through ether's fields portentous comets glare,
The lucid meteors fly, the planets roll;

[87] Jensen, 153.

And to the conscious world His fame declare

Whose wisdom form'd and regulates the whole (ll 15-20).

Moorhouse first employs the common trope of the stars as God's text from the Renaissance, the *Liber Creatorum*. The book represents an intransient promise of God's existence and a covenant that cannot be broken or destroyed. However, the celestial "book of nature" to which Moorhouse refers is also vulnerable to the alteration of time. It was Newton who rewrote this book in mathematical terms, quantifying the script of nature with physics.[88] This quantification of the language of nature by way of Newton's mathematical calculus is expressed in Moorhouse's exclamation, "O be it thine to read the spangled skies" (15), articulating a desire to understand this new mathematical script. However, it also reflects Herschel's uncanny ability to read the stars like a piece of music. Herschel's expertise in mapping the night sky reflected his ability to sight-read music, becoming familiar very quickly with celestial patterns and the movement of celestial objects. Moorhouse's exclamation in line 15 reads as a celebration of Herschel's abilities. This Herschelian reading is supported by the following line "Where every twinkling star proclaims a God!" (16). Herschel's foray into deep space and his discovery of Uranus sparked the imagination of whole separate worlds, and Herschel was an outspoken proponent of extraterrestrial life. Each star does not represent a different God, but new worlds with new life that proved God's variety of creation.

Though slightly ambiguous, lines 15 and 16 and their emphasis on the stars seem to directly reference Herschel's reading and sweeping with his telescope the deep recesses of space as well as his nebulae containing mysterious new worlds. The poem continues to reflect this dynamism in his description of the celestial planets. The ether-

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[88] Stephen Berman, *The Genesis of Science,* (NY: Prometheus Books, 2010), 67.

filled fields of space reflect the mediating gravitational fields of dynamical natural philosophy, where "portentous comets glare" (17), "meteors fly" (18), and "planets roll" (18), a violent environment much like the machine-populated fields of the Thrasher. Poetically and figuratively, the heavens are traditionally referred to using images of gardens and Edenic references, however, like the Shepherd in "The Thrasher," this analogy does not connect with Moorhouse's industrial experience. Instead, the Edenic gardens found in such poems as Anna Letitia Barbauld's "A Summer Evening's Meditation" are replaced with "*fields* of ether," creating a synecdochical relationship—the stagnant, temporal spatial fields of the industrial thrasher are replaced by the dynamic, moving, and evolving universal fields of ether. The realms of outer space embody a dynamism that *should* apply to Moorhouse's industrial material spaces.

Although not completely possessing the proficiency of Erasmus Darwin, Moorhouse's description of the heavens does echo his poem, *The Botanical Gardens*, especially Darwin's description of Herschel's imploding nebulae:

So, late descry'd by HERSCHEL'S piercing sight,
Hang the bright squadrons of the twinkling Night;
Ten thousand marshall'd stars, a silver zone,
Effuse their blended lustres round her throne;
Suns call to suns, in lucid clouds conspire,
And light exterior skies with golden fire;
Resistless rolls the illimitable sphere,
And one great circle forms the unmeasured year.
—Roll on, YE STARS! exult in youthful prime,
Mark with bright curves the printless steps of Time;

Near and more near your beamy cars approach,

And lessening orbs on lessening orbs encroach;—

Flowers of the sky! ye too to age must yield,

Frail as your silken sisters of the field!

Star after star from Heaven's high arch shall rush,

Suns sink on suns, and systems systems crush,

Headlong, extinct, to one dark centre fall,

And Death and Night and Chaos mingle all! (ll 359-76)[89]

Though a long passage, the language in these lines echoes Moorhouse. The mass of "twinkling" (360) stars "rolling" (365) towards each other and finally collapsing as "suns sink on suns" (374), explicitly explains the decay and rebirth of distant nebulae. Moorhouse does not match the vivid, rich imagery of Darwin's "systems systems crush" (374), but I believe the mutual vocabulary and images of the multiple stars "rolling," and "twinkling," in a "field" and the rushing of comets and meteors all contribute the instability of the universe. Moorhouse may lack Darwin's descriptive prowess, but Herschel's dynamic philosophy is still embodied in the language of both the poets.

Celestial space, as opposed to his industrial terrestrial space, allows both Moorhouse and Darwin a freedom to experiment with the very nature of Chaos. As Jenkins notes, "Writers…who needed a place in which to situate arguments and anxieties about the various kinds of order and categorization that were being derived from—and imposed on—the physical and intellectual world" used the destructive forces of Chaos. [90] Moorhouse constructs a chaotic heaven with "portentous comets" (17) to destroy his

[89] Erasmus Darwin, *Botanical Gardens, A Poem in Two Parts,* Fourth edition (London: J. Johnston, 1799).
[90] Jenkins, 216.

social industrial space, but for Moorhouse, Chaos is also re-creation. Herschel's star clusters collapse in on themselves and implode, but as the phoenix rises from the ashes, so too do new universes, and at the end of Moorhouse's poem, night does evolve into "everlasting day" (36), and Chaos yields a new order. The Herschelian universe is chaotic compared to the dependable Newtonian mechanics, but for Moorhouse, it provides a hope for social change and the re-creation of his terrestrial space, as well as an eternity of peace in the afterlife. Moorhouse is able to fuse his religious ideology with the chaotic physics of Herschel's universe.

Like Darwin, Moorhouse's poem describes the awe of an unpredictable system reflected by the ominous operation of the celestial bodies, glaring, flying, and rolling. His use of "portentous comets" (17) is particularly important. It was Caroline Herschel, William's sister and astronomical assistant, who discovered several new comets, causing a great popular stir. These new comets and their rare appearances separated them from the "constant, regular, and uniform objects in the Heavens."[91] Comets during the Romantic period perpetuated a whole range of symbols both religious and superstitious, but the most accepted representation was that of a vengeful God.[92] Comets were unpredictable celestial bodies, those that could move beyond the fixed system designated by Newton's celestial mechanics, and yet they *predicted* impending doom—usually political or natural cataclysm.[93] The comet's ability to predict political change perhaps refers to the impending Swing riots in 1830, but however Moorhouse uses the comets, its unpredictable movements represent the dissolution of Newton's mechanics and the ushering in of Herschel's new dynamic philosophy. Coleridge viewed comets as "the

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[91] As quoted in Holmes, 172.
[92] Gaull, 38.
[93] Janowitz, 476.

products of the out-breathing of the System, and the organ of respiration correlative to inspiration,"[94] and they were celestial bodies that functioned outside of and exhaled from the immoveable, unalterable system into the boundless operations of the imagination. Moorhouse's Space is inspired by its unpredictable nature, and the capricious chaos that starkly contrasts with the predictability of his experiences as a Thrasher becomes the lifeblood of his universe.

In line 20 of his poem, Moorhouse claims that God "form'd and regulates the whole," which sounds like a very Newtonian gesture. No matter how dynamic and chaotic Moorhouse describes the deep reaches of space, he still finds comfort in God's initial presence. He does not completely commit to the darker implications of Herschel's theories like that of Coleridge in his unpublished poem "Coelie Enarrant." Coleridge's poem expresses the psychological disruption cosmogony had on the perception of time and the universe, instructing one to "turn from the portent—all is blank on high."[95] Coleridge's text of nature is not in need of revision because it is dying and does not really exist; the stars do not last and neither will God's covenant to man. However, Moorhouse's poem does not press the issue of mortality in the same way as Coleridge as evidenced by the end of his poem:

Teach me aright their beauties to admire
To rise to thee, and virtue's path pursue!
That when these mortal eyes shall set in night,
My disencumber'd soul may wing her way,
To reap an endless harvest of delight,

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[94] See Coleridge's letters to *Blackwood*.
[95] For more on "Coeli Enarrant" see Dometa Brothers' "Coleridge's Web of Time."

In brightest realms of everlasting day (ll 31-6).

Moorhouse's poem ends in immortal salvation and not troubling desperation. Moorhouse wishes to understand "aright" (31) Herschel's universe without sacrificing God's role in the eternal afterlife. The fields of ether are transformed into an "endless harvest of delight," placing the static nature of time *not* in the physical realm of the industrial fields but in the transcendent realm of the afterlife. Moorhouse seems to straddle the Newtonian/Herschelian universe with a keen sense of balance. Keeping with the working-class poetic trope of rectifying the humble soul's dejected state through God's awesome power, Moorhouse's poem ends in Bamford's fields of Paradise. Unlike Coleridge, Moorhouse's universe is complex, changing, and dynamic but not devoid of God.

Herschel's theories not only introduced a possibly chaotic and, according to Coleridge, Godless universe, but it also hinted at the dematerialization of the physical world. Although Herschel was no where near explaining his collapsing nebulae as producing black holes, to Herschel the Newtonian concept that atoms and corpuscular matter were indivisible proved faulty. Newton's atoms were indivisible and assigned certain masses and density that allowed the ineluctable laws of nature to predictably control them for infinity with little to no interference, which does not bode well for Moorhouse as an industrial laborer. This materiality in the physical world directly influenced the forces of economics that ushered in industrial capitalism. Like the predictable parabolas of Newton's projectiles, Newtonian economics was "a closed, autonomous system, ruled by endogenous, mutually interdependent factors…self-regulating and moving toward a determinate, predictable point of equilibrium."[96] Gravity and its effects upon matter was a relationship of cause and effect, which directly influenced economic practices; even if something went wrong in the material world, matter was still *matter,* and the universal laws would act upon that matter and restore it's function. The moving forces of both space as well as goods and services were all based on the (false) assumption that future events could be predicted by inevitable laws to arrive at determinate solutions, which justified the fairness of the free market and industrial system.[97] If anything went wrong, then the laws of the universe would correct it—all in good time.

The principles of economics and the principles of space were all bound in Newton's vision of the clockwork universe. This metaphor of matter, money, and men as a part of this large self-regulating machine of a watch is destroyed in Moorhouse's poem, "The Watch." In this poem, the material clock is presented as a physical body that is dying. The title immediately employs the trope of the clockwork universe, but through the description of the watch, it becomes evident that this mechanism is prone to decay:

His motions are wavering and quite incorrect,
His pulse beating quick, which is one bad defect,
Also, I perceive that his temper's uneven,

[96] Walter Weisskopf, "The Method is Ideology: From a Newtonian to a Reisenbergian Paradigm in Economics," *Journal of Economics,* 13 (1979), 871.

[97] I would like to distinguish between the experiences of the industrial system and the philosophies of free trade. Free trade, philosophically, was viewed internationally beneficial, and the abolition of the Corn Laws in 1846 marks a significant victory for Britain's free trade ideals and the working classes advocated its repeal. However, Moorhouse was directly affected by the industrial system, and it's the factory conditions, the long work hours, and the *machine* of industrial exploitation and abuses to which this chapter refers to when the term "industrial system" is used.

And of that great fault I beg you relieve him;

Sometimes he so wearieth and sluggishly creeps,

That I oft find him slumbering, and sometimes he sleeps;

Therefore, I'll entreat you'll examine and prove,

That his bad dispositions henceforward remove;

It grieves me to think, and I do not recoil,

But I am opinion that his body is foul;

So, purge him and cleanse him from all his pollution,

That his pulse may beat truly in their revolution;

Make him vibrate in motions according to truth

(ll, 6-18)

The trope of the clockwork universe is literally destroyed through the figurative representation of the watch as a sick human, "wavering" (6), with an irregular "pulse" (7), an "uneven temper" (8), and a "foul body" (15). Moorhouse literally figures the metaphorical clockwork universe as diseased, dysfunctional, and, like Herschel's own theories on the universe, mortal. Structurally, the poem begins with an Alexandrine line, but the rhythm becomes faulty as the poem progresses: lines 7 and 8 are both missing a syllabic foot. These limping lines not only reflect a broken body but also Newton's mechanics. The laws regulating matter are not guaranteed, and just as the Shepherd is displaced in the industrial fields, Newton's metaphorical clockwork universe cannot withstand, physically, the changing theories on how matter operates within this universe.

Once again, Moorhouse destroys an archetypal analogy using the shifting paradigms in the fields of physics.

The destruction of the watch exemplifies the falsehood and unreliability of Newtonian mechanics, and Moorhouse directly connects this dissolution of the mechanical philosophy with the economic enterprise. The poem is prefaced by an address to a Watchmaker: "An Address to a Watch-Maker, sent with the Author's Watch, where it had been twice before to be repaired." This poetic address places the reader in an economic exchange of goods where the production processes have gone wrong, proving that this "built environment"[98] requires *maintenance*:

Now again in your hands him once more I shall place
And hope that his conduct you'll thoroughly trace
And when from his ways he is truly converted,
To agree with these lines I have briefly inserted,
You may then send him back with consideration
With a bill of the charge drawn in strict moderation;
Then, pleas'd, I will send the remittance to you,
If in case that I find my companion is true (ll 19-26)

The literal exchange of goods for a "remittance" underscores the dysfunction of the commercial sector within this mechanical industrial system. The exploitation of the laborer in the industrialized fields or in the factories adversely disturbs the actual end products. The production processes, whether in a field or in a shop, encounters uncontrollable, unpredictable forces that require direct interference, not by God, who

[98] Wai Chee Dimock, "Nonbiological Clock: Literary History against Newtonian Mechanics," *The South Atlantic Quarterly*, 102 (2003): 153-77.

regulates from a distance, but a direct, mediating person that can fix and respond to erratic matter. It is not until the watch is "truly converted" (21) that Moorhouse will grant a remittance, and this religious language of a dramatic, all-encompassing shift in beliefs, a conversion, echoes the paradigmatic shifts from a mechanical to an evolutionary philosophy of economics.

The mechanical natural philosophy supported materialism devoid of any kind of mediation, either divine or domestic. The Creator was responsible for the first cause, designing the material world, but the second causes, the laws of nature, maintained the material world. These immutable laws of nature distanced God from the equation; he's the creator but not the ever-present maintainer.[99] The mechanical natural philosophy, then, was a world devoid of a permeating divine energy. This disconnection from God and the passivity of matter came under sever scrutiny by the middle of the eighteenth century. The dynamical philosophers such as Kant and Hume sought to infuse space with god-like ether that facilitated the movement of matter—active powers were infused in the very fabric of space. The composition of this material ether will be discussed more thoroughly in the next chapter, but these two competing ideas on the materiality of space and God's role in the movement of matter becomes a pressing subject for Moorhouse. In his sonnet "On Ignorance", these two competing theories of Newton's deism and dynamism's divine ethereal activism are pitted against each other:

Can genius give content, or learning ease?

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[99] While revisionist studies of Newton's mechanical natural philosophy claim that his theories were not wholly deistic, having purported the theory of a mediating ether in his 1717 *Optiks,* the common conception of Newton's deism as well as the theories of first and second causes from his *Principia* had already proliferated. See Heimann's "Voluntarism and Immanence: Conceptions of Nature in Eighteenth-Century Thought," *Journal of the History of Ideas*, 39.1 (1978): 271-83.

Can thoughts refin'd or deep researches please?
Awhile they may—but soon the bubble's o'er,
Dull ignorance has better joys in store;
Tis hers to sooth the anguish of mankind,
And make men happy, while she makes them blind.
Could I like Newton, wander round the pole,
Or search, with Priestley, for a human soul;
The studied search no certain point would find,
But busy doubts distract the wandering mind.
Then to be happy here, and kindly blest.
Study but little, let wild fancy rest;
Tread the plain track our pious fathers trod,
Too little known, the service of a God!

Thematically, the sonnet questions the very nature and moral implications of scientific study. The impact of scientific information on the mind is a double-edged sword: ignorance cripples while intelligence only provides limited satisfaction. Ignorance is bliss, but it also maims, making one blind. Quite literally in the center of this debate about the benefits of scientific study are the two scientists, Isaac Newton and Joseph Priestley.

Priestley, the famous eighteenth-century chemist and preacher, was a proponent of Newton's theories, but his works in chemistry encouraged him to consider matter as containing inherently dynamic principles.[100] However, he took this dynamism one-step

[100] Studies in Chemistry started to reveal that matter might not be an indivisible atomic structure, but that it might actually be composed differently depending on the medium,

further. Publishing *The Disquistions Relating to Matter and Spirit* in 1777, Priestley takes issue with the deistic dualism in Newton's theories (the idea that divine active forces are separate from the passive material objects), stating, "the divine being is necessarily cut off from all communication with, and all action and influence upon, his own creation."[101] Priestley remedies this divine disconnection by concluding matter was "a substance possessed of the property of extension and of powers of attraction or repulsion."[102] Matter was inherently endowed with the divine active forces, but to Priestley matter *was* not spiritual, and the spiritual *was* not matter. This materialism, though dynamic, caused quite a stir in Priestley's community of Calne and after his home, laboratory, and church were attacked and burned down by a mob, he was forced to flee to America in 1794 to escape persecution.

Priestley's scientific studies forced him from his home, and even though Herschel was not subject to such abuse, the discovery of how God functions within the material world is a dangerous enterprise. Moorhouse's lines "Could I like Newton, wander round the pole / Or search with Priestley, for a human soul" (ll 7-8) hints at this ever-evolving debate about the nature of matter and the consequences of scientific study. The cyclical movement of wandering around the poles and searching for a soul is methodical and does not necessarily deliver an answer, as "The studied search no certain point would find" (9). For Moorhouse, the ability for scientific practice to lead to an understanding of God's operation belongs in the church, and he cautions one to "Tread the plain track" (13) of his religiously devout ancestors. Because of Priestley's experiences with

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such that the matter of electricity, heat, and chemicals differed from the matter of solids. This variety of material properties hinted at the dynamic nature of matter.

[101] Priestley, 298.

[102] Priestley, 268.

scientific practice and the religious persecution he faced, the sonnet reads as a caution to dissenting radicals.

It is not that Moorhouse is denouncing scientific study; after all, it is ignorance that makes men blind. However, scientific practice and knowledge carries with it a dangerous social risk. Navigating the mechanical and dynamic fields of physics challenged deeply entrenched religious and spiritual dogmas, and this hazard underscores the essence of his sonnet. Physics strived to build a connection between God and man, to close the gap between the divine and the material, but as science guides closer to God so too does it dangerously distance one from the social traditions. To understand God scientifically means to sacrifice certain social securities, and it is this sacrifice that is "Little known" (14). The last line in the sonnet also lacks a resolution as to which material philosophy is correct: "Too little known the service of a God" (14), admits to the unexplainable mystery of God's role and power within the material world. Whether you are Newton or Priestley, serving God through scientific research or searching for how God serves the material world, the answer is still quite unclear.

Ironically, Priestley held a very enlightened vision of science, proposing that "Science compels every object around us to contribute, in some way or other, to our pleasure, to our profit, to our comfort, or to our convenience…which alleviates human suffering."[103] And, yet, Priestley suffered extreme injustice and abuse because of his scientific and religious beliefs. The Newtonian mechanical natural philosophy created order but it also oppressed and it did not "alleviate human suffering." This necessary

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[103] As quoated in Kramnick. Isaac Kramnick, "Eighteenth-Century Science and Radical Social Theory: The Case of Joseph Priestley's Scientific Liberalism," *Journal of British Studies,* 25 (1986):1-30. See Thomas Cooper, *Introductory Lecture of T. Cooper*, Professor of Chemistry at Carlisle College (Carlisle, 1812), 7.

shift needed to replace the oppressive mechanical philosophy with the dynamism of Herschel is expressed by the term “bubble’s o’er” in line 3: “Can genius give content, or learning ease? /Can thoughts refin’d or deep researches please?/ Awhile they may—but soon the bubble’s o’er” (1-3). The description of knowledge as a bursting bubble is best explained in a letter William Cowper wrote to a Reverend published in 1806. The letter discusses how the ever-evolving scientific fields of thought continually usurp the scientific theories of the natural world:

> One project indeed supplants another. The *votices* of Descartes, gave way to the gravitation of Newton, and this again is threatened by the electrical fluid of a modern. One generation blows bubbles, and the next breaks them.[104]

Cowper’s bursting bubbles echo Moorhouse’s “bubble’s o’er.” The Newtonian reign over physics is a bubble waiting to be popped, and it is Herschel who usurps his throne. Like Herschel’s dying stars, the scientific gems of geniuses must die and be replaced in order to continue towards a more profound interpretation of the universe, creating an evolution of scientific thought that will lead to a more profound society.

If “one generation blows bubbles, and the next breaks them,” as Cowper suggests, then Moorhouse’s poetry is just one pin that pops it. When examined through these paradigms of physics, Moorhouse transforms into an interesting literary figure whose commentary on the natural world carefully considers the conditions and implications of the two systems. The social benefits of Herschel’s dynamic universe usurp the stagnant archaic mechanical natural philosophy of Newton, and Moorhouse transforms his fields of labor into dynamic, divine-infused fields of ether.

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[104] William Hayley, *The Life and Posthumous Writings of William Cowper* (London: J. Seagrave, 1806).

CHAPTER 4. VICTORIAN SPIRITUALITY IN THE SPACES OF SPACE IN GERALD MASSEY'S "TALE OF ETERNITY"

The mechanical and dynamical natural philosophies that Moorhouse grapples with in his edition were continually debated throughout the nineteenth century. Kant's 1755 *Metaphysical Foundation of Natural Science* marks only the beginning of the deliberation on the operation of matter that wages well into the nineteenth century. As skeptics such as Hume and Priestley challenged Newtonian mechanics, experiments in electricity, light, and magnetism ushered in new theories on molecules and intermolecular forces, culminating in the theory of the electromagnetic field. Electromagnetism, first proposed as a dynamical theory by James Clerk Maxwell in 1858, unified the field of physics during the Victorian period, proving that light, heat, electricity, and magnetism were composed of the same particles with mutual characteristics.[105] These particles did not operate through mechanical contact action or through action at a distance; rather, they were particles endowed with energy transferred through ether.

In this chapter, the examination of mechanical and dynamical theories will move from Herschel's universal scale to concentrate on the composition of this ether and its effects on the minutest forms of atomic matter, as well as the impact of this recent discovery of the electromagnetic field on the religious phenomenon of Spiritualism in Victorian England. The electromagnetic field imagined space filled with a luminiferous ether and matter *as energy*, and its development coincides with the social phenomenon of Spiritualism, the controversial practice of communicating with spirits. The

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[105] Not only did the electromagnetic field pave the way for Einstein's Theory of General Relativity, but it also becomes the stepping-stone to subatomic composition (electrons, neutrons, protons), and these particles of electricity, light, and magnetism are what we now refer to as photons.

electromagnetic field explored the contents of what actually *lies between* two atoms, a mysterious ether that transferred energy. It is no wonder then that Spiritualism's growing fervency in America and England beginning in 1848 coincides with the development of electromagnetic technology. This dynamical composition of space sparked the imagination of the practitioners of Spiritualism, especially the avid spiritualist and working-class Chartist poet, Gerald Massey. Space was no longer conceived as an inactive vacuum but constituted as a constantly active substance, blurring the boundaries between material and spiritual worlds. Massey was an outspoken spiritualist who believed in communicating and interacting with spirits, and the electromagnetic field becomes a source of validation, allowing Massey's spirits to exist and travel through this ether and the spaces of space.

Massey was born in Tring on May 29, 1828, the same year Moorhouse's edition was published, and Massey's time in London with the politically charged Chartist movement connects Massey to the scientifically saturated community and the emerging trends in electromagnetism. Massey was a radical chartist and most of his poetry has been viewed through this politically radical lens. In Volume Two of the *Biographical Dictionary of Modern British Radical since 1770* published in 1988,[106] Massey receives a passing mention as a fervid and influential Chartist, claiming his poem "The Sound of the Red Republican" as his most influential piece of poetry. Martha Vicinus's 1974 *The Industrial Muse: A Study of Nineteenth-Century British Working-Class Literature* and Peter Scheckner's *Anthology of Chartist Poetry* (1989) both concern themselves with his

[106] Joseph Baylen and Norbert Gossman, *Biographical Dictionary of Modern British Radicals since 1770* (Brighton, Harvester Press, 1988).

employment of chartist rhetoric,[107] and the preoccupation with proletarian verse in the eighties garners Massey attention in Christopher Ricks' *The New Oxford Book of Victorian Verse* in 1990.[108] In 1995, David Shaw published the most comprehensive study on Massey, a solid biography featuring Massey's life, his writings, and his lectures.[109] It is Shaw's compilation that not only supports recent publications on Massey such as Michael Sander's "Constellating Chartist Poetry: Gerald Massey, Walter Benjamin, and the Uses of Messianism"[110] but also this chapter. Shaw's biographical sketch offers a comprehensive overview of Massey's life and work, and becomes a foundational text for connecting Massey to the larger scientific community.

Even though Massey came from humble means, born into a laboring-class family in the town of Tring and working in a silk factory when he just eight years old, his interactions with the Chartist party facilitated literary and scientific connections that fostered his Spiritualist philosophy. The Chartist party offered Massey two important resources: an avenue for publication and contact with scientific lectures. Massey contributed to and served as editors for the radical papers and pamphlets of the Chartists, including the *Uxbridge Pioneer* and *Uxbridge Spirit of Freedom* in 1849, and these issues provided perfect avenues for supporting Massey's poetry. Furthermore, Massey also had access to both Chartist and Scientific lectures in London. As David Shaw explains:

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107 Martha Vicinus, *The Industrial Muse: A Study of Nineteenth-Century British Working-Class Literature* (London: Croom Helm; New York: Barnes and Noble, 1974), and Peter Schekner, *Anthology of Chartist Poetry: Poetry of the British Working Class, 1830s-1850s* (New Jersey: Associated University Press, 1989).

108 Christopher B. Rick, *The New Oxford Book of Victorian Verse* (Oxford: Oxford University Press, 1990).

109 David Shaw, *Gerald Massey: Chartist, Poet, Radical and Freethinker* (London: Buckland Publications, 1997). Revised internet edition published 2009 at geraldmassey.org.

110 Michael Sanders, "Constellating Chartist Poetry: Gerald Massey, Walter Benjamin, and the Uses of Messianism," *Victorian Poetry* 45 (2007): 369-89.

> London in the 1840s was a centre for meetings, lectures and oratory, particularly in the broad sphere covered by the term 'radicalism'…Educational and political lectures were held at the Hall of Science, 58 City Road, which moved, following termination of lease in 1866, to 142 Old Street, and became the headquarters of the National Secular Society. The equally prestigious Social, Literary and Scientific Institution, at 23 John Street, Fitzroy Square, was used also by many radicals. [111]

These lecture halls and institutions were not only politically relevant but also scientifically informative, and Massey's exposure to the oratory of politics and science encouraged him to conduct his own lectures on Spiritualism later in his life, traveling even to America in the 1870s.

Further motivating his Spiritualism was his marriage to Rosina Jane Knowles in 1850, a popular clairvoyant with the supposed ability to read while blindfolded and to perceive and diagnose illnesses. Rosina's disposition for prophetic enlightenment and medical prognostication greatly influenced Massey's conceptions of matter and spirit, becoming involved in not only Mersmerism but also a devout proponent of Spiritualism. Spiritualism stressed the specific communication with dead spirits through a guiding medium, and the cultural movement itself did not have a strict doctrine or hierarchical dogma, making it appealing to dissenters such as Massey and Rosina. Massey had five children with Rosina, although only three survived passed infancy and one passed away as a young child. Rosina experienced severe mental afflictions resulting in erratic behavior and extreme alcoholism, and two of Massye's patrons offered the family a rent-

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[111] Shaw, 26.

free cottage in 1865 in Little Gaddesden in Witchcraft Bottom in the hopes that Rosina would recover her faculties.

Although settled in a new place free from financial burdens, Rosina's strange actions in the new neighborhood earned her the reputation as a witch—witnesses claimed to have seen her moving objects such as saucers and teacups without touching them, while others heard her make strange predictions about the deaths of certain townsfolk.[112] These supposed premonitions climaxed when Rosina claimed the cottage was haunted by a poltergeist; both Massey and Rosina claimed to have heard peculiar noises at night, and Rosina concluded that the phenomena was connected with a spirit who murdered his illegitimate child and buried it in the garden. The story was never confirmed, even though Massey did recover the bones of a child under a tree in the garden.

This supernatural event inspired Massey's longest and most scientifically informed poem, "The Tale of Eternity," first published in 1870. It continued to appear in his subsequent editions and it was published again in his 1889 publication of *My Lyrical Life: Poems Old and New* as "The Tale of Eternity, The Haunted Hurst".[113] The poem is a six-part 2000-plus-line poem in rhyming couplets, which elicited mixed reviews; however, Robert Buchanan of the Quarterly Review praised "A Tale of Eternity" for its scientific accuracy:

> Mr. Massey's Poem is full of scientific allusions, and we do not detect any mistakes. Wheatstone's electric experiments and Humboldt's earthquake experience, Darwin's theories and Huxley's protoplasm, the structure of Saturn's rings and the formation of the Atlantic ooze—all furnish the material for beautiful

[112] Shaw, 253.

[113] Gerald Massey, *My Lyrical Life: Poems Old and New* (London: Richard Clay and Sons, 1889), 293. The poem will be referred to as "The Tale of Eternity".

> similes; as do also the phenomena of the spectrum, of complementary colours and the velocity of light, singing flames and sunshine stored in coal, the earth's visibility from the planets, Parry's Arctic experience, Moncrief's discovery for lifting cannon, the leaf-simulating Mantis, and the facts of botany and philosophy. [114]

Although Massey is noted for his accurate use of a broad range of scientific schools of thought, from biological evolution to geology, to astronomy and chemistry, to electricity and optics, to botany and entomology, this chapter will explore Massey's "The Tale of Eternity" for the relationship he builds between Spiritualist phenomenon and the recently developed electromagnetic field by both Michael Faraday and James Clerk Maxwell. Even though neither Faraday's studies nor Maxwell's theory are mentioned in the review, I believe that the discovery of and the technologies developed from the electromagnetic field had a profound influence on Massey's poetic images and the boundaries he establishes between the physical and spiritual worlds.

At the time Massey published the "Tale of Eternity" in 1870, Spiritualism was an extremely popular practice in both working class and aristocratic circles. Spiritualism started in the United States with the Fox sister who claimed to interact with ghosts in 1848, but the trend of table rapping and "table turning" quickly found its way to England. The practice originated as séances, where men and women gathered to contact spirits, witnessing raps and knocking on tables, chairs, and doors by visiting spirits. The practice eventually evolved to include a medium, a person who channeled the spirits and

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[114] Robert Buchanan, "Poetry, Fiction and Belles Lettres," *The British Quarterly Review* 52 (1870), 253.

interacted with spectators, talking with them, flirting and even dancing.[115] Spiritualism was a radical alternative to the oppressive orthodoxy of the Anglican and Catholic churches, and a doctrine or dogma of spiritualism never developed but remained a controversial extension of Christianity. The democratic appeal of spiritualism as an unsegregated spiritual practice, as well as its ability to provide proof of an after life, made it a provocative and popular phenomenon.

The cultural controversy of Spiritualism, however, dates all the way back to the middle of the eighteenth century. Spiritualism developed out of the tradition of Mesmerism and "animal magnetism." Although Mesmerism and "animal magnetism" are two arcane terms in the modern scientific lexicon, the theory that humans emanated a powerful healing energy, "fluidic ether,"[116] was a viable and popular scientific preoccupation first purported by the Swedish scientist Franz Anton Mesmer in the 1780s. Building off classical principles of holistic medicine, Mesmer believed people were endowed with certain abilities to heal people by focusing their gaze on others or touching them through the use of magnets.[117] Mesmer's claims captured the imagination of Europe, but not exactly the approval of the Royal Society. Mesmer's inability to provide empirical proof of controlling the ether through magnets garnered sour feedback for his costly lectures and demonstrations.[118] He left Paris in 1793.

Mesmer's progeny, Marquis Chastenet de Puysegur, perfected the hypnotic trance, or what he termed "The magnetic sleep." The first experiments with hypnosis

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[115] Marlene Tromp, "Spirited Sexuality: Sex, Marriage, and Victorian Spiritualism," *Victorian Literature and Culture,* (2003): 67-81. Mediums were usually female.
[116] Maria Tatar, *Spellbound:Studies on Mesmerism and Literature* (New Jersey: Princeton University Press, 1978).
[117] Tartar, 15.
[118] Roy Porter, "Under the Influence: Mesmerism in England," *History Today,* 35 (1985): 22-29.

were performed using peasants; the hypnotic-induced peasants were more articulate and had the keen ability to diagnose illnesses and even predict deaths. These hypnotic states spurred a cultural curiosity with the limitations of the psyche and the power of the mind over matter. Over 200 publications in France during the Romantic period were devoted to Mesmerism. England, however, was much more skeptical of the practice. Introduced in England by the French physician Du Popet in 1837, Mesmerism and hypnosis still struggled as a viable medical science.[119] John Elliotson, a professor of practical medicine at the University College Hospital conducted the most publicized and popular experiments involving diagnostic mesmerism with the O'Key sisters; however, his reputation was affected by his theatrical displays of hypnosis.

Mesmerism and hypnosis endorsed politically radical concepts, and its ability to empower the hypnotized, usually the lower classes, with unique abilities illuminated a subversion that threatened the social and political orders. As Tim Fulford and others claim,[120] Mesmerism eradicated the political boundaries of scientific practice, allowing any and all classes to participate in the phenomenon and served as "a weapon against the hierarchy of professional knowledge."[121] Mesmerism required no professional scientific training, but allowed, as in the case of the O'Key sisters, for the lower classes to take the

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[119] Betsy Van Schlun, *Science and Imagination: Mesmerism, Media, and the Mind in the Nineteenth Century English and American Culture* (Leipzig: Galda and Wilch Verlag, 2003), 54. Schlun notes that other practicing Mesmerists transported Mesmer's philosophies to Britain, but it was Du Potet who was the primary influence on John Elliotson, the medical professor who performed the most extensive experiments on medical mesmerism in England.

[120] Alison Winter, "Mesmerism and Popular Culture in Early Victorian England," *History of Science,* 32 (1994): 317-42; Richard Noakes, "'Instruments to Lay Hold of Spirits': Technologizing the Bodies of Victorian Spiritualism," Ed. Iwan Rhys Morus. *Bodies/Machines* (NY: Berg Publishing, 2002), 125.

[121] Tim Fulford, "Conducting the Vital Fluid: The Politics and Poetics of Mesmerism in the 1790s," *Studies in Romanticism,* 43 (2004): 57-78.

scientific stage.[122] Because of the loose boundaries surrounding the practice, Mesmerism lost medicinal and scientific authority by the middle of the nineteenth century. Practitioners of Spiritualism adopted the philosophies of Mesmer's magnetism to push the boundaries between the spiritual and material worlds; however, the practice was also striving for scientific validation.

Richard Noake's several studies in Victorian Spiritualism all designate the desire to scientifically *prove* spiritualist phenomenon.[123] The technological and scientific developments of the Victorian period provided new avenues for exploring the physical legitimacy of communicating with the deceased. The inventions of the telegraph, advancements in photography, and the development of the telephone revolutionized geographical communication, and these new electrical powers bridged the gaps between the living and the dead; people reported hearing mysterious whispers across the phone lines and the appearance of ghostly apparitions in miscellaneous photographs. Not only did the advancements in electrical technology influence Spiritualist phenomenon, but the developments in medical practices proved the bodily encounters with spirits could be measured, quantified, and calculated: "Human bodies were not only more closely integrated with and disciplined by such [technological] systems but were increasingly represented by medical and scientific practitioners as machines whose performance could

[122] Schlun, 63. Schlun as a nice description of the O'Key experiments.
[123] Robert Noakes, "Spiritualism, Science and the Supernatural in mid-Victorian Britain," Eds. Nicola Bown, Carolyn Burdett, and Pamela Thurschwell, *The Victorian Supernatural* (Cambridge: Cambridge University Press, 2004): 23-43; "Ethers, Religion and Politics in Late-Victorian Physics: Beyond the Wynne Thesis," *History of Science,* 43 (2005): 415-455; "Telegraphy is an Occult Art: Cromwell Fleetwood Varley and the Diffusion of Electricity to the Other World," *British Journal for the History of Science,* 32 (1999): 421-459; '‘‘Instruments to Lay Hold of Spirits': Technologising the Bodies of Victorian Spiritualism," Ed. Iwan Rhys Morus, *Bodies/Machines* (Oxford: Berg Publishers, 2002): 125-163.

be measured by instruments."[124] Spiritualism allowed scientists to explore with the tools of science the operation of the body during Spiritualist rituals. Noakes's studies prove that a communal confidence in spiritualism relied just as much on science as it did on faith, and science and spiritualism were inextricably linked during the Victorian period.

Surrounding Spiritualism are the two dichotomies of mechanical and dynamic theories of physics. The electromagnetic field theory developing in the middle of the century introduced a dynamical theory of matter, one that proposed matter was actually waves emanating through ether. Energy was all around, containing kinetic and potential energy—matter *was* energy. Even the language used to describe the electromagnetic field lends itself to psychic vocabulary: a "medium" is used to "transmit motion from one part to another," and this ether is not "gross" matter, but a finer "aetherial substance."[125] This luminiferous ether of the electromagnetic field was, in fact, quite ghostly. Using the electromagnetic field to justify the spiritualist phenomenon becomes quite a logical and natural connection, and as the electromagnetic field of physics unified the field of physics, so too does Massey attempt to fuse the material world with the spiritual.

Electricity and magnetism were relatively unknown fields in physics until the beginning of the nineteenth century, and its early developments still embodied Newtonian action-at-a-distance theories. Han Christian Oersted of Copenhagen first observed the unity between electricity and magnetism in 1820. When he observed that an electrical current in a wire deflected a magnetic needle, he realized electric currents produced

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[124] Noakes, Instruments to Lay Hold of Spirits, 3.
[125] James Clerk Maxwell's *A Dynamical Theory of the Electromagnetic Field* annotated in Thomas K. Simpson's *Maxwell on the Electromagnetic Field* (New Jersey: Rutgers University Press, 1997), 250.

magnetic fields.[126] The Biot-Savart law quickly followed in 1825, an equation developed by the French scientists Jean-Baptiste Biot and Félix Savart to explain the magnitude, direction, and length of the magnetic field generated by the electric current.[127]

Following the Biot-Savart's law were the studies by the French physicist, André-Marie Ampère, who developed the Ampère Law in his 1827 *Memoir on the Mathematical Theory of Electrodynamic Phenomena, Uniquely Deduced from Experience.* Ampère's experiments showed how two parallel wires carrying electric currents repelled or attracted each other depending on the direction of the current's flow. His Law that followed stated that the power of action of two current-caring wires are determined by the proportions of their lengths and the intensities of their respective currents.[128] These Laws reveal that up until the 1840s, scientists were still trying to understand the electromagnetic phenomenon through Newtonian philosophies. For example, Ampère believed that the electromagnetic current was simply very small electric fluid particles in motion, which explained the directions of his currents.[129] The shift between the mechanical and dynamical view of the electromagnetic field did not occur until the English physicist and electrician, Faraday, completed his experiments on the electromagnetic field during the 1830s.

Faraday was the first to adopt a dynamical approach to the electromagnetic phenomenon, encouraged by Herschel's idea that light and sound were vibrating wave motions in his *Preliminary Discourse on the Study of Natural Philosophy* published in

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[126] Bhag Guru and Huseyln Hiziro glu's *Electromagnetic Field Theory Fundamentals.* (Cambridge: Cambridge University Press, 2004), 177.
[127] Guru and Hiziro glu, 179.
[128] James R. Hofmann, *Andr*è*-Marie Ampère* (Cambridge: Cambridge University Press, 1995), 348-49.
[129] Hofman, 349.

1830.[130] Wave motions inspired him to conceive this interaction between electricity and magnetism as waves operating through space. Faraday's theories described the phenomenon as a series of strain rather than mechanical fluids, resulting in a polarity of "*contiguous* action rather than action at a distance."[131] Transmission of energy was a result of this strain or polarity, which appeared, physically, as wave motions. The wave formation of the magnetic force required a magnetic medium, and his magnetic lines of force filled the role of transferring energy. Even though Faraday did not yet propose the idea of the field as comprised of mediating ether, he still challenged the action-at-a-distance theory. Faraday's experiments were not accompanied with sound mathematics, leaving them exposed to interpretations by both mechanists and dynamists,[132] but when James Clerk Maxwell approached the phenomenon, he mathematically quantified the electromagnetic field *as* dynamical.

Maxwell, an English scholar from Cambridge, unified the experiments of Faraday and the mechanical equations of William Thomson in his 1865 publication *The Dynamical Theory of the Electromagnetic Field*. Building off of Faraday's theories on wave strain and polarity, Maxwell believed the tension was assisted by an ether containing kinetic and potential energy:

> We may therefore receive…the existence of a pervading medium, of small but real density…transmitting motion from one part to another with great, but not infinite velocity. Hence the parts of this medium must be so connected that the

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[130] John Hendry, "Electromagneticms before Maxwell," *James Clerk Maxwell and the Theory of the Electromagnetic Field.* (Bristol: Adam Hilger, Ltd., 1986), 76. Also see Richard Becker, *Electromagnetic Fields and Interactions* (NY: Blaisdell Publishing Company, 1964), 3.

[131] Hendry, 82. Emphasis my own.

[132] William Thomson, in correspondence with Faraday, attempted to quantify Faraday's theories into the mechanical philosophies.

> motion of one part depends in some way on the motion of the rest; and at the same time these connexions [sic] must be capable of a certain kind elastic yielding, since the communication of motion is not instantaneous, but occupies time. [133]

This elastic yielding of the material ether becomes an important distinction in Maxwell's study, making matter constantly active with energies merely displaced, either kinetic or potential, but never *devoid* of active forces. This ether alters the shape of space and gives a new identity to the substance residing between atoms—it was no longer a vacuum but composed of interlocking matrices of a mediating substance that continually changed to accommodate various material constructions, transporting energy over a certain length of time.

Massey corroborates Faraday and Maxwell's study with his own interests in Spiritualism. This new mediating ether, a pure substance that transports matter, becomes an avenue for transporting the energy of the spiritual world. His poem, "The Tale of Eternity," explores the eternal damning effects of sin through a dialogue between a murderous ghost and a human Mesmerist. Beginning in the bedchambers, the poetic persona struggles to fall asleep due to the unexplained and unsettling noises occurring in the house. "A ring of iron on the stones" (25) or "a sound / as if of granite into powder ground" (26) disturbs the night until the man is visited by both the ghost who killed his lover and unborn child (and subsequently buried them in the garden) and an ethereal guardian angel monitoring the encounter. The poem immediately establishes two worlds, one spiritual and one material; however, Massey is frightened at his own inability to control his brain, which causes the divide between the spiritual and material to dissolve:

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[133] Maxwell, *Dynamical Theory,* 256.

I felt the Presence on that other side
Grope where some secret door might open wide.
I knew the brain might strike the electric spark
Which should make live this phantom of the
Dark (ll 51-54).

The spiritual world is intimately connected with the material world, and the human mind is figured as a machine that can "strike the electric spark" (51) to make the ghost appear. The brain's ability to transfer and manipulate energy echoes Noakes notion of the body as machine, but it also demonstrates the transference of energy on a minute, molecular level. The mind's ability to actively create electricity places kinetic and potential forces within mental processes, and it echoes Mesmer's skill of psychically healing and manipulating matter. The mind is constantly emanating energy, and Massey's use of "might" (53) highlights the brain's unpredictable tendencies to produce a spiritual connection. Supposing the brain as inherently possessing irregular forces of energy resonates with the dynamic philosophies of Maxwell. In a lecture on molecules, he states that "the smallest portion of matter which we can subject to experiment consists of millions of molecules, not one of which ever becomes individually sensible to us. We cannot, therefore ascertain the actual motion of any one of these molecules."[134] The action of molecules within this new dynamical field is unpredictable and mysterious, and it is this mystery of molecular motion that provides a platform for Massey's unpredictable ghostly encounters.

[134] Maxwell's "Molecules" 1873.

Massey's emphasis on the electrical productions of the human body echoes the Mesmerist factions of animal magnetism. While gazing at a picture, the poetic persona experiences a hypnotic trance that causes the murderous phantom to materialize:

Upon a Picture I had fixed mine eyes,
Till slowly it began to magnetize.
So the Ecstatics on their symbol stare,
Until the Cross fades and the Christ is there!
Thus, while I mused upon the picture's face,
A veil of white mist wavered in its place;
And to a lulling motion I sank deep,
With spirit awake and senses fallen asleep,
Down through an air that palpitatingly
Breathed with a breath of life unknown to me;
And when the motion ceased, against the gloom,
There lived another Form within the room,
As if the Dark had suddenly made a face
I saw the haunting Presence of the Place
Embodied (ll 205-19).

Describing a prototypical Spiritualist encounter, the magnetization of the photograph causes the phantom to appear. Faraday published images of magnetic curves traced by iron fillings in his 1848 study *Researches in Electricity*, illustrating for the first time how the magnetic lines of force emanated from the source of the magnet in sweeping lines of, what he thought, were composed of an incompressible liquid.[135] For the first time, the magnetic energy that Franz Anton Mesmer claimed existed finally manifested in a physical, pictorial form. The material existence of magnetic lines of force creates a material, discerning, and optical image rather than merely a psychical connection. Massey describes how his continued focus on the face obscures the photograph, so that "A veil of white mist wavered in its place" (210). Faraday's iron etchings appear as thin, delicate, white wavering lines on a black background, appearing like the veil of white mist Massey describes. The veil was a common tool in Spiritualist practices, usually used to disguise the medium during the ritual of possession, but here Massey uses the veil to describe the magnetic process of changing matter. The face of the photograph is transformed and energy is transferred by way of Faraday's magnetic lines of force. The immaterial spiritual world uses the electromagnetic field to become material. Photographs were an important part of the Spiritualist ritual, often using them as a physical representation of the deceased; however, the photograph takes on a new meaning when the mind magnetizes the photograph, manifesting a physical form.

The psychic connection between the mind and the spiritual becomes a material relationship with the publication of Faraday's lines of force, and the magnetic interaction between the mind and the photograph is verified through Faraday's experiments with electricity. Faraday's lines of force preceded Maxwell's theory of the electromagnetic field, and served only as a mechanical analogy for the constitution of electromagnetic energy; it was void of physical properties or of the ether that propagated the energy. Maxwell observed that these physical lines of force were "mechanical illustrations to

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[135] Simpson, 254.

assist the imagination, but not to account for the phenomena."[136] Massey uses Faraday only as an optical image to assist the reader's imagination in the manifestation of this phantom. It was not until Faraday discovered the magneto-optic effect that the dynamical rather than mechanical theory of electromagnetic waves developed. Using Faraday's work, William Thomson and Maxwell proved the lines of force were actually axes of rotations in ether and that the medium contained particles set in circular motion by the magnetic field.[137] Magnetism was not an incompressible fluid but particle waves, and Massey describes this change in the operation of particles later in his poem:

That spirit-hands withdraw our curtains round;
That spirit between particles can pass
Surely and visibly, as light through glass;
With power to come and go, stand upright, loom
Dense to the eye, outlined against the gloom (ll 276-80).

The spirit can move between the material and spiritual worlds through the revolving particles in Maxwell's electromagnetic field of ether. The spinning particles allow spirits to transfer their energy into the material. Faraday's experiments, often the genesis of the electromagnetic field, allowed for a mechanical analogy of how magnetic lines of force affected matter, but Maxwell's electromagnetic field and its dynamism explains how the spiritual world traverses the material. The creation of Massey's ghostly apparition then evolves from Faraday's experiments as a pictorial representation of this energy into

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[136] Maxwell would prove that these lines were not fluid but wave particles; however, Faraday's experiments were the first extensive experiments on the electromagnetic field, and it's interesting that Massey begins his poem with the first experiments on the electromagnetic field.

[137] P.M. Harman, *The Natural Philosophy of James Clerk Maxwell* (Cambridge: Cambridge University Press, 1998), 115.

Maxwell's theory of dynamic ether to demonstrate the physical construction of how the spirit interacts with the material world.

The evolution of the electromagnetic field from the mechanical explanation of Oersted and Ampère to the more dynamical assumptions of Faraday and Maxwell changed the relationship between matter and gravitational forces. Massey confronts this new theory on gravity in "The Tale of Eternity" when he describes how not all souls are able to reach heaven:

More Laws than Gravitation keep us down
To the old place from whence the soul had flown
Not every one in death can get adrift
Freely for life. Some have no wings to lift
Their weary weight: the body of their sin
Which they so evilly have laboured in:
Others will touch as 'twere the window-sill
To flutter back upon the ground-floor still (ll 811-18).

The capitalization of "Laws" and "Gravitation" (811) suggest Massey is referring to Newton's immutable, mechanical laws, and prefixing the phrase with "More" belies the changing paradigms between the mechanic and dynamic conceptions of matter. This directly influences the soul's connection to heaven. Gravity is not an instantaneous force influencing matter, just as the soul does not have an instantaneous connection to heaven. The caesurae in lines four and five disrupts the movement of the lines and reflects the stasis of the soul when belabored with too much sin. The soul, influenced by gravity as well as *something else*, something "More" (811) than gravity, echoes Maxwell's aetherial substance. The soul returns to Earth, to the material "upon the ground floor still" (818), which makes the soul subject to gravity's power. Influenced by gravity but not wholly affected by it, the soul is a quasi-material substance much like Maxwell's ether, and like his ether, its relationship with and connection to the Earth is dynamic, changing, and unpredictable.

Faraday and Maxwell's studies not only challenged Newton's laws of gravity, but they also instigated a further connection between electromagnetism and light theory, which until this time was thought to be two completely different subjects of inquiry. Massey's description of particles moving as "light through glass" (278) refers to Faraday and Maxwell's experiments on the theory of light as a wave. It was Faraday who first observed the magneto-optic effect in his 1845 experiments. He observed that a light wave passing through a piece of heavy glass in a strong magnetic field rotated proportional to the strength of the field and the distance traveled through the glass, indicating that magnetism and light were both operating through vibrating and rotating wave particles of the ether field.[138]

Faraday's magneto-optic effect established the relationship between light and electromagnetism, but it was Maxwell who determined that the movement of magnetic and electrical currents observed by both Faraday and Thomson were of the same velocities of light. The light passing through the glass traveling at the same speed as the electromagnetic current was termed "luminiferous ether," which was the same elastic solid medium that propagated electromagnetic phenomenon. Faraday, Thomson, and Maxwell unified light theory within the theory of electromagnetism. Electric energy, magnetic energy, and light were all explained as conforming to one theory of operation,

[138] John Hendry, *James Clerk Maxwell and the Theory of the Electromagnetic Field* (Bristol: Adam Hilger, Ltd., 1986), 189.

which has a profound impact on optical perception. For Massey, the luminiferous ether, the specific ether that transported light, also transported the soul:

A luminiferous motion of the soul
Pervades the universe, and makes the whole
Vast realm of Being one;—all breathing breath
Of the same life that is fulfilled in death (ll 1429-32).

The soul moves the same as light through this luminiferous ether, and just as Maxwell and Faraday unified light, electricity, and magnetism into one theory, so too does Massey unify life and death into one coalescing medium using the electromagnetic theory. Space, filled with the luminiferous ether is living; this "vast realm" (1431) that is "breathing" (1431) is imagined as a material entity. The soul itself is considered void or absent of "matter," but space provides another medium for existence—the ether "makes the whole" (1430) and encompasses everything. Once the soul leaves the body, it can navigate this materiality of space. Maxwell's luminiferous ether transports the soul, proving that matter does not simply become immaterial but is transformed and then *transferred*.

Maxwell defends this transference of energy through the luminiferous ether in his *Treatise on Electricity and Magneticism.* Implicit in his rhetorical questions concerning the displacement of matter are the same sentiments that reverberate through Massey's poetry:

> The undulatory theory of light has met with much opposition…But in all these theories the question naturally occurs:-- If something is transmitted from one particle to another at a distance, what is the condition after it has left one particle and before it has reached the other? …How are we to conceive this energy as

> existing in a point of space, coinciding neither with the one particle now with the other? In fact, whenever energy is transmitted from one body to another in time, there must be a medium or substance in which the energy exists after it leaves one body and before it reaches the other[139]

Although only referring to the theory of light, Maxwell's questions prompt the problems concerning all material objects both large and small. Maxwell questions Newton's conceptions of the mechanical view of matter; matter is not an unalterable, finite atomic structure and space is not a void or vacuum; rather, matter is dynamic in that it can change and influence space in complex ways. Massey extrapolates that if energy affects matter through mediating ether, then energy from matter does not disappear but is relocated, and Massey places his spiritual beings in this liminal space between material objects and the medium. If energy is transferred from one material body to the next by way of the luminiferous ether, then cannot the energy of the soul navigate this ether after it has left the body? The energy expelled from matter through death is not destroyed but traversing the electromagnetic field of ether from one material object to the next.

The electromagnetic field not only changes the way matter and spirit function, but Maxwell's theories and experiments with the operation of light dramatically affects how the spirit is visually perceived. Maxwell decided that he would separate the theories between light and color, and his experiments in optics and the color spectrum coincides with the developing photographic technology. Maxwell combined red, green, and violet filters to create the first color photograph in 1861, and his experiments are apart of a long line of photographic developments in the Victorian period. The Daguerreotype

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[139] James Clerk Maxwell, *A Treatise on Electricity and Magentism* (London: Clarendon Press, 1898), 423.

photographic process of 1839 quickly gave way to the more detailed Calotype photography in 1841. Ten years later, the wet plate negative of the Collodion process became the dominant practice of film development by the middle of the century. The process was a bit tricky, but produced the most detailed photographs to date and sparked the Spiritualist imagination. The photographs were produced in darkrooms, where the subjects of the images slowly appeared, luminous at first and then evolving into more substantial, ghost-like figures. Massey uses the photographic process to represent not only the murdering phantom but also the heavenly guardian watching over the poetic persona. The Collodion process of developing photographs was quite intricate, but the muted tones it produced can be seen in Massey's description of the phantom:

A face in which the life had burned away
To cinders of the soul and ashes gray:
The forehead furrowed with a sombre frown
That seemed the image, in shadow, of Death's
crown;
His look a map of misery that told
How all the under-world in blackness rolled.
A human face in hideous eclipse;
No lustre on the hair, nor life i' the lips;
The faintest gleam of corpse-light, lurid, wan,
Showed me the lying likeness of a Man! (ll 223-232)

The figure is described in muted tones of grey and black and immersed in shadows, which matches the dark tones produced by the collodion process. The wet plate collodion process allowed the photographer to make an unlimited number of copies of a finely detailed image, showing dramatic improvements over previous processes of the Daguerreotype and the Calotype processes of photography. The process involved an emulsion of a wet glass plate in iodides, bromides, ether and alcohol to create a negative.[140] The negative was then placed in contact with Albion paper, a combination of egg whites and silver nitrate that was then used to develop the actual paper image.

Several publications illustrating the Collodion wet process advised the photographer to develop the negative picture "over a barrel or bucket, so as to receive into it the developing solution…What settles on the bottom as pure metallic silver."[141] Recycling the silver became an important part of the process, so that even "The paper containing Silver, such as filters…can be burned and the ashes kept." The face of Massey's figure describes this process of burning the filters: "A face in which the life had burned away / To cinders of the soul and ashes gray" (223-34). The life of the figure has been destroyed through this burning process, reminiscent of his time in Hell, but because the photograph Massey magnetized is a finished print, there is no silver to collect: "finished prints contain too small an amount of Silver to be worth keeping the ashes."[142] Massey uses the photographic process to create an effect of photographic dross—the figure's face is left over ashes, worthless, grey, and dull.

Just as electromagnetism inspired a new relationship between life and death, photography also became a metaphor for visually depicting this relationship, and Massey employs the chemistry of photography to enhance the description of his phantom. The distortion of light describing the phantom, the "corpse-light" (231), the eclipsed face, and

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[140] Charles Waldack, *Treatise on Photography,* (Cincinnati: H. Watkin Printer, 1863): 243.
[141] Waldack, 245.
[142] Waldack, 249.

the lack luster hair and eyes are reminiscent descriptions of a photograph in the developing stages of a photograph. The eerie figures in photographs slowly emerge from the darkroom only to assume the "lying likeness of a man" (239). The electromagnetic field becomes a creative tool for explaining how light operates, but like Faraday's lines of force, it is the photograph that constructs an image of this operation.

The black and white phantom contrasts with Massey's other form that enters the room, the angel who seems to be monitoring Massey's encounter with the ghost. The colors in his descriptions of the heavenly figure employ the three primary colors Maxwell used to compose the first color photograph, which were red, green, and violet:

She wore a purple vesture thin as mist,
The Breath of Dawn, upon the plum dew-kissed.
No flame-hued, flame-shaped, Golden-Holly tree
Ere kindled at the sun so splendidly
As that self-radiant head, with lifted hair
A-wave in many a fiery scimitar.
The purple shine of Violets wet with dew
Was in her eyes that looked me through and through.
We think of Shades as native to the night;
We photograph the other world in white,
That will not paint its tints upon our sight.
But there are Colours of the Eternal Light,
And these were of them; pulsing such live glows
As never reddened blood or ripened rose (ll 243-254).

Massey describes the figure using three colors. First, the figure is cloaked in "purple vesture" (243) and "Violets wet with dew" (249) are in her eyes. Secondly, her hair is the brightest, fullest Golden Holly, which is ultimately a green plant fringed with gold. Thirdly, she is "pulsing such live glows / As never reddened blood or ripened rose" (253-54). The heavenly figure is composed of Maxwell's[143] three primary colors, but it is important to note that Massey uses these colors within a spectrum—they are *light* waves. They are the same light waves Maxwell used for his first color photograph (See Appendix D). The photograph is actually a piece of knotted ribbon,[144] but it looks similar to angel wings flying through the night, and the blurred, sporadic lines of violet, red and yellow fringing the object create an effect of pulsing. Maxwell's photograph and his theories of light waves have inspired Massey's angelic apparition. Light is a purer substance of color, having its own energy that navigates the material world. While the dross from the photographic negative creates the hell-bound ghost, the pure energy of light transports heavenly energy to create the angelic figure.

The description of the angel encompasses the immense impact the electromagnetic field had on the senses—it explained not only atomic matter but also heat, light, and color. Massey incorporates all of these new theories into his poetry to cross the boundaries between the spiritual and material worlds. Massey's use of the electromagnetic field, including its relationship to theories of light and photography, becomes his personal orthodoxy for supporting spiritualism. It is no coincidence that Faraday and Maxwell's field theories coincide with the phenomenon of communicating

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[143] Maxwell adopted the three primary colors from Thomas Young; however blue eventually replaced violet as a primary color because it was a "stronger ray."

[144] James Clerk Maxwell, "Tartan Ribbon," Photograph. n.d. Free Domain. *victorianweb.org,* Ed. Jacqueline Banerjee, 1 Mar 2012.

with the deceased; rather, the dynamical theories of matter become its supporting foundation. In the last lecture Massey delivered in America on spiritualism in 1874, one year after Maxwell published his *Treatise on Electricity and Magnetism*, Massey says that science and spiritualist phenomenon are threatening the oppressive orthodoxy of Christianity:

> Spiritualism is undermining [orthodox churches] on the one hand as fast as science saps them on the other, and they are at war against the facts of both, on behalf of a belief established on the ground that both are destroying day by day—on behalf of a religion that is at once non-scientific and non-spiritual.[145]

The electromagnetic field fulfills Massey's radical disposition toward religious institutions. The church becomes weak because it is non-scientific and non-spiritual. While it is Spiritualism that eventually dissipates, Massey recognizes that a connection with the spiritual requires a scientific medium. Noakes's recent study into the theories of Victorian ether challenges the ideas that the ether theories were so popular because they supported the conservative Cambridgean philosophies of natural order, a unifying substance that reflected the unity for traditional moral and social order. This chapter on Massey adds to Noakes's argument that challenges these conservative views of ether theories. The luminiferous ether of Faraday, Thomson, and Maxwell expresses a variety of political and religious views. For Massey, it is the dynamism, the "argument against a determinist and materialist cosmology… a mediator between the terrestrial and spiritual existences"[146] that fuels his religious and political dissent.

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[145] Massey, Gerald. "Brotherhood of Labour." *Uxbridge Pioneers,* London. February 1, 1849. *Geraldmassey.org.* 20 Mar 2012.

[146] Noakes, "Ether", 118.

CHAPTER 5. CONCLUSION

In his lecture delivered in 1851 titled "The Brotherhood of Labour," Gerald Massey sketches the limitless breadth of science to his audience, and his summation of the ever-expanding influence of scientific knowledge brings this project full circle:

> Science, standing with one foot on sea, and one on land—and with hands grasping and gauging the Infinite—unfolds the mysteries of the universe, and makes us the astronomers of the world's glorious future and humanity's proud destiny![147]

Science's powers to demystify the tumultuous natural and political worlds overwhelming the laborer and to empower him to interpret, like an astronomer, the future trajectory of humanity verifies the crucial role scientific exploration played in the laborer's diurnal setting. By 1851, the Chartist movement that Massey was so dedicated to had failed; the threat of a violent revolution called for patience rather than persistence, and the movement dissipated. However, Massey never relinquished his social optimism, continually rallying and unifying the fraternity of the laboring class to push for social progress, and science plays a key role in this progress. In Massey's metaphor, Science stretches its long legs across the expanse of both ocean and land, encompasses the world, defies geographical borders, its hands open the pages of the universe, to become an authorizing instrument for steering society toward a "proud destiny."

For the working classes, science was not out of reach, an imponderable practice, but as Massey notes in another of his lectures, "Public experimental research, the printing-press, and a Freethought platform have abolished the need of mystery. It is no

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[147] Gerald Massey, "To Our Reader," *Uxbridge Pioneers,* London, February 1, 1849.

longer necessary for Science to take the veil."[148] This project echoes these sentiments and confirms Massey's unveiling. The nineteenth century experienced an inauguration of scientific thought at all levels of society. From William Herschel's nebular theory, to the botanical pub clubs practicing Linnaean classification, to Massey's Spiritual magnetism, the study, practice, and comprehension of science was inextricably embedded in nineteenth-century culture.

Science was not only pervasive, but it was also imaginative, creating new metaphors and new language for interpreting and identifying man's place within the natural world. New technologies in telescopes, microscopes, telegraphy, photography offered alternate ways of viewing and perceiving what was once imperceptible, creating rich poetic images. The working class participated in the new material, scientific markets of botany and mineralogy, profiting from rare plant and rock specimens. Science created, but it also destroyed, challenging and eliminating classical paradigms and ushering in new hypotheses that shook the epistemological foundations of metaphysical certainty. Science questioned anthropocentrality and redefined humanity's relationship with nature. Just as the working-class movement of Chartism challenged to socially reform society, so too did science challenge and transform traditional social, political, and religious ideologies.

Despite the profound impact of science on the culture and the countless academic studies on Victorian science and the countless *revisionary* approaches to nineteenth-century science, the working-class poet has been excluded from much of this scholarship. As Anne Secord explains, "with a few notable exceptions, the study of working-class

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[148] Gerald Massey, "The Seven Souls of Man," *Gerald Massey's Lectures* (London, 1900).

science has revealed more about the dominant middle-class ideology than its supposed subject matter,"[149] but by focusing on the individual laborer and their individual connections to the natural and scientific worlds, I believe this project avoids Secord's pitfall. Studying the local habitats of working-class scientific practices proves hegemony was not so prevalent and that our modern perspectives are able to focus on how the working classes accepted or rejected particular philosophies. For literary scholars to assume that the working-class poet was immune to or ignorant of the scientific cultural phenomenon of the nineteenth century is a grave oversight and presents a large gap in scholarship in the literary community.

This project seeks to close that gap, to offer a new lens in which to view working-class poetry. However strong my efforts have been, I still believe this project produces more questions than it answers. The intricacies and complexities of historiographical studies of science prove that the meaning and intellectual authority of science changes based on where this information is produced, where it is consumed, and by whom.[150] To this end, the complexities of composing an historical overview of nineteenth-century science is just as complex as composing an overview of the nineteenth-century working classes, and exploring where these two separate bodies of research converge requires a more thorough investigation; this study could not possibly take into account all the levels of social, religious, political, and philosophical diversity of the nineteenth-century working class and all their differing relationships to the scientific enterprise.

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[149] Secord, 314.
[150] Alison Winter, "Orthodoxies and Heterodoxies in the Early Victorian Life Sciences," *Vitorian Science in Context,* Ed. Bernard Lightman (Chicago: University Chicago Press, 1997), 323.

As Bamford, Moorhouse, and Massey demonstrate, the influence of science on the working classes is multidimensional, each poet employing scientific concepts and philosophies for their own political, religious and social agendas. While the working-class poet's relationship with science dramatically alters our own modern assumptions on the working class's pursuit of knowledge, the task of recovering these scientific connections in working-class literature is just beginning. To achieve a holistic account of Romantic and Victorian science, the voices of other working-class authors must be added to the trifecta featured in this thesis. Hundreds of working-class poets flooded the nineteenth-century literary market, and while even the collection of working-class poetry into anthologies is still a work in progress, such as Goodridge's three-volume anthology *Nineteenth-Century Labouring Class Poets,* I believe there are several poets, anthologized or not, who demonstrate their interest in and connection to science.

I have not yet forayed into how female poets, such as Ellen Johnston, who proclaims in her poem, "Lines: On Behalf of the Boatbuilders and Boilermakers of Great Britain and Ireland," that "the man that's master o' the pen is master o' an art, / That on the tower o' science still hauds the master part." Women also recognized the utility of science as a source of social authority and control, but it was also an androcentric enterprise. Even though the avenues for females to pursue science were not as readily available as they were to men, I believe the sciences of botany and Mesmerism were particularly important to the female working-class poet, both schools of science becoming quite feminine ventures during the Victorian period.

Other unknown poets, such as Richard Furness, who was a working-class man from Derbyshire and known as "The Poet of Eyam," also deserve more attention as aspiring naturalists. The idea of the working-class naturalist still remains quite elusive, but records of artisan groups forming around interests in entomology, horticulture, ornithology, and even mathematics,[151] as well as artisan societies such as the Banksian Society, provide whole new avenues for historical and literary studies. Furness is one such naturalist, and John Goodridge features him in his anthology and claims Furness read at night with a box over his head and a lit candle in order to devour every piece of literature he could get his hands on. Goodridge mentions that Furness was a "factory worker, Wesleyan preacher, volunteer soldier, musician, bone-setter and toothpuller, schoolmaster, poet, sign-writer, and father of nine." But, what Goodridge does not mention in his introduction to Furness's poetry is that he was also an amateur mathematician and obsessed with studying science, especially chemistry.[152]

Goodridge also excludes in his anthology Furness's poem "The Astrologer," first published in his 1836 edition of *The Rag Bag*. The poem is dedicated to the miners in Derbyshire, and using the developments in astronomy, chemistry, mineralogy, and physics, Furness deprecates Francis Moore, the eighteenth century astronomer, for promoting his "sister science" and situates the contemporary scientific practices of his generation as having solved the mysteries of the natural world:

Let Priestley—Davy—analyse the mass;
Let Henry weigh, and Thomson gauge the gas;
Nice Brandt and Saussure clearly can explain
What salts, or earths, old almanacs contain;
With Voltaic pile, or Galvan' trough assail

[151] John Percy's "Scientists in Humble Life: The Artisan Naturalists of South Lancashire." University of Manchester.

[152] Furness's biographer, G. Calvert Holland, published "The Poetical Works of the Late Richard Furness" in 1858, and it describes the poet's avid interest in astronomy, mineralogy, and chemistry, as well as his interest in mathematics.

Old Saturn's ring, or melt a comet's tail[153]

While learned Scheele, and Plisson clear, expound

If ought but water in its head is found;

Then, let some knowing chymic connoisseur,

With Dalton, nicely atomise[154] Old Moore.

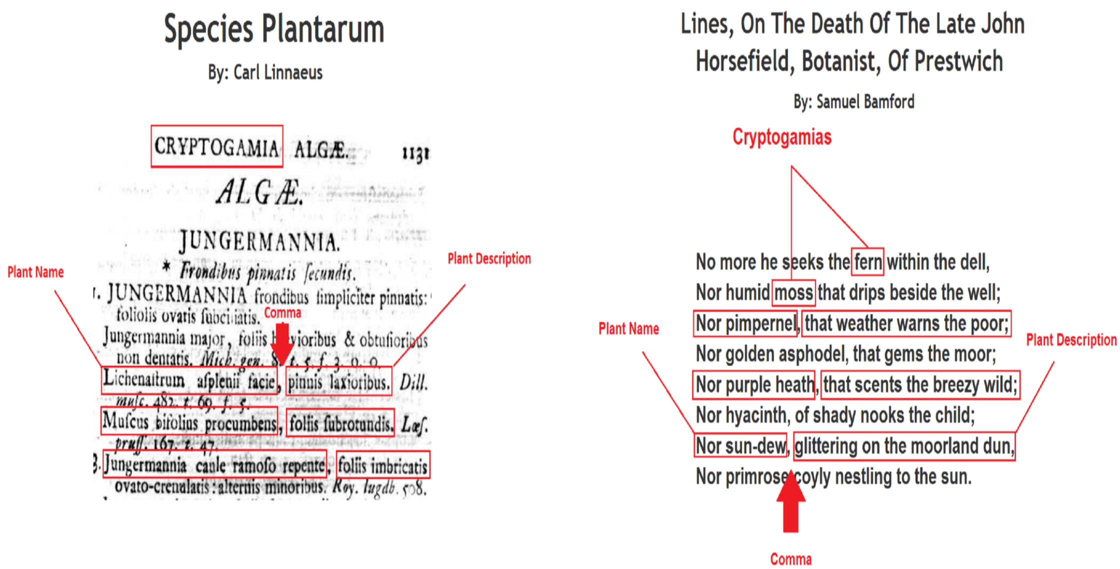
Furness mentions a total of eleven scientists in this ten line stanza, and he includes footnotes describing the diverging theories on the composition of comets as well as the chemical textbooks to which he refers. From Priestley to Thomas Thomson, from Alessandro Volta to Luigi Galvani, from George Brandt to Carl Wilhelm Scheele, from England to Scotland, from Germany to France, and from Sweden to Italy, Furness incorporates a diverse and international scientific community into this ten-line stanza. Furness exhibits that even though scientific knowledge is scattered all over the world, it still finds its way into the most intimate, secluded settings of the working-class environment. The exploration of working-class verse for the scientific is not over. Science was not only extending its legs over the wide ocean or shooting through the sky as a comet or a falling star, or even planting itself in the pub, but it was also plunging deep underground into the miner's shaft, and these private, withdrawn and unpublicized working-class scientific communities deserve further investigation.

[153] Furness footnotes "One astronomer thinks these illustrious strangers are *bodies of fire;* a second affirms them to be *water;* while a third supposes them to be *vast charcoal carts*, which supply the sun with fuel; a fourth, who knows more about them than the other three, declares that he knows nothing at all."

[154] Furness footnotes "See Dr. Dalton's ingenious Atomic Theory; and for the names and discoveries of the eminent chemists alluded to, consult Henry's Chemistry, in 2 vols., 8vo. Ed."

APPENDIX A. LINNAEAN FRONTISPIECE

APPDENDIX B. CARL LINNAEUS AND SAMUEL BAMFORD COMPARISON



APPENDIX C. SAMUEL BAMFORD'S ELEGY TO HORSEFIELD

Lines, On The Death Of The Late John Horsefield, Botanist, Of Prestwich.
By Samuel Bamford

Another of the humble great departs,
And sadness clouds the light of many hearts;
Those of his house, who held him truly dear,
Indulge in deep regret, and bitter tear;
Whilst the companions of his leisure day
Sigh, when they find that Horsefield is away:—
The office vacant he so often bore—[155]
His words of thoughtful teaching heard no more.

No more he seeks the fern within the dell,
Nor humid moss that drips beside the well;
Nor pimpernel,[156] that weather warns the poor;
Nor golden asphodel, that gems the moor;
Nor purple heath, that scents the breezy wild;
Nor hyacinth, of shady nooks the child;
Nor sun-dew, glittering on the moorland dun,
Nor primrose coyly nestling to the sun.
He cares not for the choicest herb that grows,
Since life hath failed and he takes repose.
Thou'st journey'd long—the storm is on the plain;
Come weary one, and rest, and live again.

And thus it is,—we pass like dew away,
Or, like the summer flowers, that will not stay.
The germ of life, becomes a plant, and dies;
And in its place another plant doth rise.
'All flesh is grass,'—the myriads rise and grow,
And, quickly as they come, so quick they go.
Whilst one awakes, another disappears;
And death, the friendly, wipes the dying tears.
Oh! wondrous life, through which we laugh and weep!
Oh! beauteous death, that lulls to placid sleep!
And still a change-for knowledge certifies,
Death is but life beneath another guise.
Our day recedes, and scarce the curfew rings,
Ere death enfolds us in her cloudy wings,
And opes a world where life anew begins,

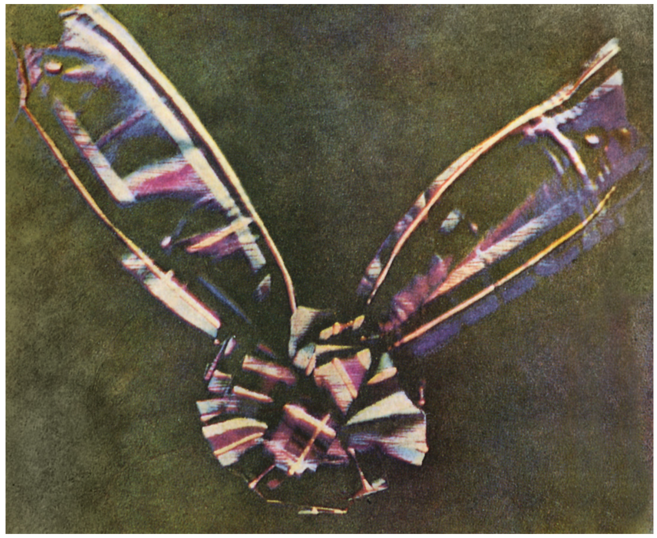
[155] That of chairman of rural botanical meetings
[156] Often called the poor man's weather glass.

A race of change where every starter wins. The goal is won—the goal is instant pass'd—
The race goes on, and shall for ever last
The dead are living, and the living die!
Oh! God, what is this great eternity?
Humbly I ask, and God doth answer send—
'Tis endless change, and time without an end.'
Thus live and perish breathing creatures must,
They come from dust, and all return to dust.

So farewell, husband, ever dear and true,
Parent, receive our last, our long adieu.
Neighbour, farewell, our kindly greetings o'er;
Companion dear, we part to meet no more.
So, husband, parent, neighbour, steadfast friend,
All ties dissolve when human life doth end;
Until in spirit-life, again we rise,
And meet thee in the fields of Paradise.

London, November 11th, 1855

APPENDIX D. MAXWELL'S COLORED PHOTOGRAPH



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