To the Graduate Council:

I am submitting herewith a dissertation written by Thomas C. Call entitled "Science and the Spirit of the Age: Blake, Wordsworth, and the Romantic Scientific Paradigm." I have examined the final paper copy of this dissertation for form and content and recommend that it be accepted in partial fulfillment of the requirements for the degree of Doctor of Philosophy, with a major in English.

Nancy Moore Goslee, Major Professor

We have read this dissertation
and recommend its acceptance:

Accepted for the Council:

Vice Chancellor and Dean of
Graduate Studies

SCIENCE AND THE SPIRIT OF THE AGE: BLAKE, WORDSWORTH, AND THE ROMANTIC SCIENTIFIC PARADIGM

A Dissertation

Presented for the

Doctor of Philosophy

Degree

The University of Tennessee, Knoxville

Thomas C. Call

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Thesis
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DEDICATION

To loved ones, present and absent.

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ABSTRACT

The reaction of the first wave of English Romantic poets to the Enlightenment scientific establishment is by this point well understood. As Blake once noted, "All that is Valuable in Knowledge is / Superior to Demonstrative Science such as is Weighed or Measured," a view subsequently echoed by Wordsworth: "How insecure, how baseless in itself, / Is the Philosophy whose sway depends / On mere material instruments." Not quite so clear, however, is the relation between these pre-eminent Romantic poets and the Romantic scientific paradigm emerging at the turn of the nineteenth century. Both in its mainstream version, which would become modern scientific praxis, and in its most extreme variant, the *Naturphilosophie* of Schelling, Oken, *et al.*, Romantic science differed from its Enlightenment predecessor by positing organic metaphors over mechanical ones, a conception of nature as process rather than product, and a historicist rather than ahistorical view of the universe. Given this orientation, a question emerges: Why did the first wave of English Romantic poets, Blake and Wordsworth particularly, fail to embrace the new Romantic science as an alternative to Enlightenment science when so many of its aspects seemed to harmonize with their personal politics and sense of aesthetics—at least, as these beliefs are articulated in their works? Why, in fact, does it appear that they pointedly rejected it?

Romantic science resonated with the "Spirit of the Age," but within its view of a dynamic, evolving, and boundless universe—and the redefinition of materialism that this view engendered—were philosophical propositions even more dangerous to these poets

than those within its Enlightenment counterpart. What is more, there is reason to believe that these poets had a clear sense, arrived at by the differing philosophic approaches that defined them, where this particular scientific revolution might be headed in the century to come—toward the production of a culture wherein science would be irrevocably dominant, spiritual endeavors discredited, and poetry marginalized.

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Chapter One

Introduction: Science and the Spirit of the Age

The reaction of the first wave of English Romantic poets to the Enlightenment scientific establishment is, by this time, quite clear.[1] As Blake once noted, "All that is Valuable in Knowledge is / Superior to Demonstrative Science such as is Weighed or Measured," a view subsequently echoed by Wordsworth: "How insecure, how baseless in itself, / Is the Philosophy whose sway depends / On mere material instruments."[2] Less clear, however, is the relation between these poets and the Romantic scientific paradigm emerging at the turn of the nineteenth century. Both in its mainstream version, which would become modern scientific praxis, and in its most extreme variant, the *Naturphilosophie* of Schelling, Oken, *et al*., Romantic science differed from its Enlightenment predecessor by positing organic metaphors over mechanical ones, a conception of nature as process rather than product, and a historicist rather than ahistorical view of the universe. Given this orientation, a question emerges: Why did the first wave of English Romantic poets, Blake and Wordsworth particularly, fail to embrace the new Romantic scientific paradigm as an alternative to Enlightenment science when so many of its aspects seemed to harmonize with their personal politics and sense of

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[1] Since the divide between Enlightenment science and Romantic poetry is often characterized as an ideological one, it might be useful here to define "ideology" for the purposes of this study. The definition advanced by Michael Ferber in *The Social Vision of William Blake* is as good as any—namely, "a set of related ideas, images, and values more or less distorted from the 'truth' . . . through the impact on it of the material interests, conscious or unconscious, of those who believe and propagate it, insofar as they are divided from one another in classes with conflicting interests" (10).

[2] Blake's annotations to *The Works of Sir Joshua Reynolds* (Ed. Edmond Malone. London, 1798), 209; E659. Wordsworth's *The Excursion* 8.223-25.

aesthetics—at least, as these beliefs are articulated in their works? Why did they, in fact, by all appearances, pointedly reject this alternative?

In the last three decades, a number of scholars, among them Marilyn Gaull and Donald Ault, have established analyses of the complex reactions of these poets to the science of their day. Building upon the works of these analysts, this study will examine the view that, by preserving the old system as foil rather than embracing the revolutionary alternative, the position of these poets amounts in practical terms to the maintenance of an *opponent philosophy of choice*—with Blake and Wordsworth, whether consciously or not, serving in the role of loyal opposition to the Enlightenment scientific paradigm they so vocally resist. Romantic science resonated with the "Spirit of the Age," but within its view of a dynamic, evolving, and boundless universe were, I will argue, philosophical propositions even more dangerous to these poets than those within its Enlightenment counterpart.

Marilyn Gaull, in her groundbreaking 1990 essay "Under Romantic Skies,"[3] addresses Blake and Wordsworth's response toward not only the established Enlightenment scientific worldview, but also toward the new, philosophically distinct strain of science emerging at the close of the eighteenth century. "During this period," Gaull writes, "sciences such as biology, astronomy, geology, and physics were revealing a world so novel, a world so alien in its departure from traditional concepts of space, matter, and time, that artists, writers, even the scientists themselves . . . had considerable trouble dealing with them" (34-35). But despite being presented with a compelling

[3] *The Wordsworth Circle* 21.1 (1990) 34-41.

alternative to the Enlightenment scientific paradigm, important figures in the first wave of English Romanticism continued to support the established view, in particular its depiction of the universe as an orderly and unchanging entity, finite in time and space, and ultimately knowable, a view in direct conflict with the unfolding model—a model informed by the tenets of what we would now call Romanticism[4]—which proposed a dynamic and evolving universe, one depthless in time and space, and eloquently suggestive of the limits of human knowledge—a universe, as Gaull notes, "that aesthetically would have won the hearts of those who cultivated the sublime" (36).

While these poets did relentlessly question the Enlightenment scientific establishment in their works—and in large part shape its eventual popular perception by their attacks—they also continued to affirm (and at times exaggerate) Enlightenment science's pervasive cultural influence, maintaining it, as it were, as an opponent philosophy against which they might define themselves—in short, presenting the old regime as the face of *all* science when there was plentiful evidence that the face of science was changing. But despite the rhetorical resistance directed toward the old science—which with varying degrees of critical accuracy has traditionally been labeled the "Newtonian" worldview—perhaps more actively worrisome for Blake and Wordsworth were the intimations of the new science emerging—"Romantic" in character and yielding, by its revealed tenets, a materialist philosophy that encompassed infinity and eternity. It was precisely this redefinition of materialism, I would argue, that threw Romantic science into collision with the simultaneously emerging institution that was

[4] I would argue here for the most expansive use of the term "Romanticism" and not the set of descriptive characters derived from Romantic creative literature alone.

English Romantic poetry.

In a variety of its fundamental aspects—its transformative possibilities, its historicism, and its acknowledgement of the inevitability of change—there was much to recommend the Romantic scientific paradigm to the Romantic poetic sensibility. But this was a revolution largely without partisans in poetic circles—again, at least among the first wave of English Romantics. Following the work of Marilyn Gaull, I will argue in this study that this omission suggests a deep philosophical resistance on the part of Blake, Wordsworth, and their poetic contemporaries. It takes some critical reorientation to reconcile how an otherwise open-minded, learned, and scientifically inclined individual such as Coleridge could have been so resistant to the new science as to describe it as "revolting" in its dissimilarity to "all our other experiences of nature"[5]; nonetheless, this study will present the argument that Romantic science represented an alternative "Spirit of the Age" that the first wave of English Romantic poets consciously turned away from, not only on philosophical grounds, but also because of pragmatic issues of exigency, their professional rationale being that if any cultural entity were to depose the Enlightenment scientific establishment—which, by their efforts, they had succeeded in defining as a monument of rigidity, limitation, and oppression—then that entity should be Romantic *poetry*, not another form of science that could conceivably become just as troublesome as its predecessor.

In *Visionary Physics*, the landmark 1974 study which ushered in the current age of Romantic literature and science studies, Donald Ault identifies precisely what was at

[5] Levere, *Poetry Realized* 141. Coleridge was referring in particular to Kant's nebular hypothesis of cosmic origins.

stake in the aforementioned cultural contest—that being nothing less than which interpretive strategy would emerge as the authoritative "arbiter between contending world systems . . . as the mediator to which all disputes about system [would] be referred" (24). In its analysis of this contest, this study will aim to tie together the work of leading scholars on this question, such as Gaull and Ault, and then take the next step. Gaull, for her part, suggests the central question regarding Blake and Wordsworth's response to science, but—since it lies just outside the range of her thesis—does not answer it.[6] Ault answers the question, but only in regard to physics and only for Blake. This study will attempt to broaden the discussion to areas of the natural sciences left untouched by both critics.

In its attempt to move beyond the innovative groundwork laid by these two analysts, this study will draw upon the works and arguments of a host of researchers within the field of science history and the philosophy of science, as well as literature and science studies. Ernst Mayr's exhaustive analysis of science's history will help trace the development of the discipline both before and after its critical juncture in Europe at the turn of the nineteenth century, with a particular emphasis on the paradigm split unfolding at that time. Thomas Kuhn will be recruited to provide additional insight into the change of paradigms identified by Mayr, particularly in regard to the parallels between political and scientific revolutions. Scholars within the field of eighteenth-century studies,

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[6] Gaull's thesis holds that, as analogical thinkers, the first wave of Romantic poets were unable to embrace the evolutionary model of cosmology because it defied their attempts at analogy. Gaull's argument is well-supported and perfectly valid, but there are other equally tenable arguments. I would suggest that these poets' rejection of concepts revealed by the new science had its grounds more in threats to their philosophical positions than in their preferences regarding conceptual structures—that is, it was more about matters of ideology than analogy.

including Roy Porter and Lorraine Daston, will assist in this study's attempts to complicate the depiction of Enlightenment science beyond the usual monolithic stereotype established by the Romantic poets and perpetuated by later literary analysts; these critics, I would note, at the same time will help legitimize the employment of "Enlightenment science" as a contrasting entity to both Romantic poetry and Romantic science once that necessary complexity has been acknowledged.

The work that Mark Lussier has done on the interface of Romanticism and the physical sciences supports the central argument that a change was underway in the sciences during the Romantic era, a change that Andrew Cunningham and Nicholas Jardine argue has been largely written out of science history. Even though Cunningham and Jardine adhere to a definition of Romantic science as it is usually and limitedly characterized—that is to say, to the German *Naturphilosophie*—their critical work in support of its contribution is nevertheless indispensable. Hans Eichner, who shares a similarly narrow view of Romantic science, will nonetheless aid in providing an analysis of the character and longevity of Romanticism as a cultural movement broad enough to reach to the sciences, including his influential views on the very different legacies Romanticism has left behind in the humanities and the sciences.

As for insights into the works of the poetic figures at the heart of this study, literary analysts such as Stuart Peterfreund and James Averill will advance a fresh perspective on Blake's and Wordsworth's anti-materialist rhetoric and—regardless of these poets' differing views on the subject—their shared objections to Enlightenment science's approach to nature. Alan Bewell and John Wyatt, among others, will

meanwhile contribute analyses of the Romantic poetic reaction to the revolutionary sciences of Blake and Wordsworth's time, particularly those scientific disciplines fundamental to Romantic science's redefinition of the natural world. As with the aforementioned contributions of Gaull and Ault, this study, in the course of its discussion, will attempt to create a new critical vision that moves beyond the works of all of the analysts mentioned, with the principal aim of shedding new light on old assumptions regarding Romantic anti-scientism, as well as revising (by way of expanding) the traditional perceptions of what constitutes scientific Romanticism.

The Two Cultures

In *From Knowledge to Wisdom*, Nicholas Maxwell observes: "It never occurred to the 'philosophers' of the Enlightenment to divorce passionate concern for the inner life of man from the imaginative and critical exploration of the natural world being undertaken by natural science. Romanticism created this divorce" (265). The representatives of Romanticism that Maxwell has in mind here, I presume, are the Romantic poets, since in the view of Romantic scientists (the German *Naturphilosophen*, in particular), science and poetry did not constitute culturally distinct and antagonistic entities, but rather interrelated philosophies within a common culture. However, the debate regarding the "two cultures" of literature and science, the subject of C. P. Snow's famous essay,[7] does bear directly upon the times in which Blake and Wordsworth wrote. It may be considered particularly relevant to Wordsworth's experience in that he is

[7] Snow's original essay appeared in *New Statesman*, 6 October 1956. It was elaborated upon in *The Two Cultures and the Scientific Revolution*, Cambridge UP, 1959.

frequently cited in literature and science studies as a founding influence on the concept as Snow frames it. But despite these associations, we do not find in Wordsworth—specifically, in the views he expresses in the 1802 Preface to *Lyrical Ballads*—the origin of the two cultures concept; instead, the poet simply confirms the *existing* tensions between the two camps. The best evidence for this assertion lies in the text of the Preface itself. First of all, in terms of the rhetoric employed, Wordsworth does not approach the discussed division between science and poetry as an idea that needs to be in any way demonstrated to his astute reader; its presence is just assumed. Secondly, Wordsworth's tone in the Preface is—ostensibly, at least—one of reconciliation between the two factions, suggesting, once again, not only an existing split but one that has been around long enough to require mediation.[8]

While there is broad, but not universal, agreement that such a split occurred at some point, opinions on the timing of its appearance, and whether it was ever as dire as Snow characterizes it, range widely. William Powell Jones, in *The Rhetoric of Science*, observes that the "conflict between the visionary power of the artist and the analytical method of the scientist did not exist . . . in the late seventeenth and early eighteenth centuries, when poets greeted the advancement of Science with enthusiasm" (1). According to Mark Greenburg, "the rift between science and literature" predates the arrival of the Romantics, having its origins "in the early decades of the eighteenth

[8] At the same time, it is clear from Wordsworth's tone that he considers himself to be sounding the alarm for a cultural conflict not *generally* acknowledged at the time: "And if, in what I am about to say, it shall appear to some that my labour is unnecessary, and that I am like a man fighting a battle without enemies, I would remind such persons, that . . . a practical faith in the opinions which I am wishing to establish is almost unknown" (255). All citations from the Preface to *Lyrical Ballads* in this study are drawn from the Brett and Jones edition (New York: Routledge, 1991).

century" ("Scientific Discovery" 116). Then there is Thomas Hankins' observation, in *Science and the Enlightenment*, that "[b]y the nineteenth century the separation of science from literature was almost complete" (8). Thus far, the range of opinions cited yields a more or less clean timeline—with no split evident in 1700, the beginnings of a split visible in the early 1700s, and the split complete by 1800. Science historian David Knight, however, sees no split at all in 1800:

> Around 1800 'science' was not opposed to 'arts'; there was nothing like the 'Two Cultures' of C. P. Snow's famous essay. Indeed the then current classification of subjects would have put engineering among the arts, a useful rather than a fine art, while almost all other subjects now taught in university, such as chemistry, history and theology, would have been sciences. The real division was between the realm of science, governed by reason, and that of practice. ("Romanticism" 14)

If nonexistent in 1800, then what is the nature of the division that Wordsworth is addressing? Knight offers no ready answer; while his essay repeatedly references Coleridge and Davy, Wordsworth's name is conspicuously absent.

Finally, we have Snow's own somewhat vague opinions on the dating of the split. Writing in 1959, the author identifies the separation as existent in 1900—"The two cultures were already dangerously separate sixty years ago" (54)—and still growing—"I believe the intellectual life of the whole of western society is *increasingly* being split into

two polar groups" (46; emphasis added).[9] Snow, for his part, is clearly more concerned with the existence of the split than its dating. An advocate of cultural unity, he warns of the danger inherent in creating opponent philosophies within culture. "The number 2 is a very dangerous number," he writes, "that is why the dialectic is a dangerous process. Attempts to divide anything in two ought to be regarded with much suspicion" (50). Despite its apparent rejection of the Hegelian premise of progress through antithesis—which is possible only through the dialectic—Snow's concept of the two cultures remains useful for the insights it provides into culturally divisive entities and their creation of opponent philosophies, though this does lead to some mixed conclusions regarding the aims of Romantic poetry. For it was the anti-scientific rhetoric of the first wave of English Romantic poets—with its characterization of an untenable scientific regime in opposition to a restorative and liberating poetic alternative—that most strenuously attempted and perhaps succeeded in codifying a division such as the one Snow describes and Wordsworth's Preface ostensibly mediates.

One of science's principal appeals has always been its efficacy—its ability, when applied, to yield practical material benefits; it has long been an appeal with the potential to displace Western culture's reliance on other interpretive strategies. A response was required from the arts, and it was the first wave of English Romantic poets who pioneered

[9] Snow's thesis holds that, in the final analysis, both the sciences and the humanities suffer from limited perspective, which might be summarized as the laboratory versus the ivory tower, with each having a distorted view of the other. But despite all of their potential contentiousness, the two cultures, in Snow's view, do not represent worlds in collision. That, he notes, would be interesting. Rather, they are worlds drifting apart: "The clashing point of two subjects, two disciplines, two cultures—of two galaxies, so far as that goes—ought to produce creative chances. In the history of mental activity that has been where some of the break-throughs came. The chances are there now. But they are there, as it were, in a vacuum, because those in the two cultures can't talk to each other" (54).

the critique of science as dehumanizing, an attack facilitated by Enlightenment science's embrace of the mechanist metaphor. The Romantic resistance to this metaphor, articulated by its chief poets, was unequivocal, on both human and artistic grounds—Blake's assertion that "A Machine is not a Man nor a Work of Art it is Destructive of Humanity & of Art"[10]—as well as spiritual grounds—Wordsworth's denunciation of "presumptuous thoughts that would assign / Mechanic laws to agency divine."[11] The charge of dehumanization was an amazingly effective claim rhetorically, one that the discipline finds itself pressed to answer to this day. "[N]o other species does science as much or as well as we," Carl Sagan writes in the polemically entitled *The Demon-Haunted World: Science as a Candle in the Dark*, "How then can science be 'dehumanizing'?" (268). To counter the view of science as a soulless occupation, its partisans frequently attempt to communicate the "romance" of the enterprise—their efforts usually taking the form of sentimental paeans to its spirit of discovery, the simple elegance of the reductionist view, and so on. Consider, for example, this excerpt from Lewis Thomas's hugely popular *Lives of a Cell* from 1974, on the topic of science as a social enterprise:

> It sometimes looks like a lonely activity, but it is as much the opposite of lonely as human behavior can be. There is nothing so social, so communal, so interdependent. An active field of science is like an immense intellectual anthill; the individual almost vanishes into the mass

[10] Public Address (N39; E575).
[11] "The Cave of Staffa: After the Crowd Had Departed" (2-3).

of minds tumbling over each other, carrying information from place to place. (101)

It does not require a skilled rhetorician to realize that the anthill, with its associations of hive mentality, is precisely the wrong metaphor here, with Thomas subverting his own argument by seconding Wordsworth's view of science as an activity that inclines the vital individual toward anti-Romantic anonymity.[12]

Romanticism's Span

The relation between Enlightenment science and Romantic poetry, at least as it is represented by the Romantic first wave, ironically assumed the form of a scientific model—namely, that of geo-magnetic poles.[13] The advent of Romantic science, however, disrupted this model. It did so by undermining the characterization of science advanced by these poets, thus throwing into question the very concept of cultural poles. Before we will be able to define what constitutes the disruptive entity that is Romantic science, and decide whether what is advanced here and elsewhere as Romantic science actually belongs under the Romantic rubric, we must first address the larger question of what defines Romanticism—an undertaking I approach in this study with the clear-eyed understanding of the unlikelihood of complete success. In the past, such efforts at

[12] Even for those whose model of the human is defined communally rather than individually, the concept of a group mind, with one's individuality subsumed, is still worrisome. In the 1802 Preface to *Lyrical Ballads*, Wordsworth explicitly contrasts the "Man of Science" with the figure of "the Poet," the latter being characterized as "a man pleased with his own passions and volitions" rather than those of the collective (255-56).

[13] Snow picks up on this same model when he writes, "[T]he whole of western society is increasingly being split into two polar groups" (46).

definition have traditionally begun—and been most contentious—in regard to literary Romanticism, so let us begin there.

Once proposed as a movement, or even more daringly (and datedly) as a "school" of poetic practice, literary Romanticism now requires statements of support simply to underwrite consideration of its very existence. As early as 1924, we have Arthur Lovejoy's argument that "the word 'romantic' has come to mean so many things that, by itself, it means nothing,"[14] a view he expanded upon in 1941 when he observed that the "new ideas of the period were in large part heterogeneous, logically independent, and sometimes essentially antithetic to one another in their implications."[15] The discussion in academic circles as a result became one of "Romanticisms." Contemporary critics are no less skeptical. As John Wyatt notes, "both 'Romanticism' and 'science' are themselves modern constructs, largely built by those who wrote in the years after the very active decades of cultural innovation between 1770 and 1850 (the period of Wordsworth's life)" (4), a view supported by Marilyn Butler in *Romantics, Rebels and Reactionaries* when she writes that "Romanticism, in the full rich sense in which we know it, is a posthumous movement; something different was experienced at the time" (2).

There have been dissenting voices, however: Lovejoy's argument was most famously taken to task by René Wellek in "Romanticism Re-Examined," an essay included within both the author's *Concepts of Criticism* (1963) and the anthology *Romanticism Reconsidered* (1963), wherein editor Northrop Frye notably gives Wellek the last word. "I would not be understood as minimizing or ignoring national differences

[14] "On the Discrimination of Romanticisms," *PMLA* 39 (1924): 232.
[15] "The Meaning of Romanticism for the History of Ideas," *Journal of the History of Ideas* 2 (1941): 261.

or forgetting that great artists created something unique and individual," Wellek acknowledges within the course of an argument wherein he traces "the history of the terms 'Romantic' and 'Romanticism' in order to show the large measure of agreement about their meaning during the age in all countries," arguing that "even without the use of the terms the consciousness of a specific change was universal at that time" (133, 108).[16] Beyond Wellek's influential rebuttal, a more general and practical affirmation lies in the fact that, even in the twenty-first century, leading scholars continue to speak unironically about the "Romantic Period" and "Romanticism."

Thus, despite the challenges, a case can and continues to be made for the existence of Romanticism as a break from what preceded it. But even granting that our present perceptions of the period actually map onto something existent at the time, these perceptions need to be qualified and informed by current critical insights. First and foremost, as Jerome McGann reminds us in *The Romantic Ideology*, we must be on guard against "an uncritical absorption [of] Romanticism's own self-representations"(1)[17]—in other words, we must be conscious of Romanticism as an ideology subtly attempting to impose its assumptions upon us. Similarly, we need to be attuned to the not-so-subtle insights Romantic poetry occasionally offers into its own operations. For example, Wordsworth, in closing the twelfth book of *The Prelude*, describes the moment he received his charge to promote his poetic vision:

I seemed about this period to have sight

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[16] This change was characterized, Wellek argues, by the induction of "imagination, symbol, myth, and organic nature . . . as part of the great endeavor" (132).

[17] It is interesting to note that McGann does not prohibit the absorption of Romanticism's self-representations, only that we not do so uncritically.

Of a new world—a world, too, that was fit
To be transmitted and made visible
To other eyes, as having for its base
That whence our dignity originates,
That which both gives it being, and maintains
A balance, an ennobling interchange
Of action from within and from without:
The excellence, pure spirit, and best power,
Both of the object seen, and eye that sees.
(*The Prelude* 1805 12.370-79)

Never far from our awareness must be this Romantic notion of "participatory mind," whereby the human psyche "half-creates" the reality it perceives. With such an awareness comes the realization that Blake and Wordsworth are in large part *creating* their opponent ideology in their works—in this case, "Enlightenment science"—rather than simply responding to it.

Romantic Science as a Romantic Entity

In that they share a common descriptor, we would assume that there is at least some discernable overlap between the tenets of Romantic literature and Romantic science, an overlap which might allow glimpses of the outline of Romanticism as a general entity. And, indeed, the generally acknowledged characteristics of literary Romanticism—which include emphases on the individual, the non-logical, the ordinary,

and the natural—almost all have direct and significant parallels in Romantic science.[18] Literary Romanticism's orientation toward the individual and the subjective is mirrored in Romantic science's challenges to the ideal of objectivity, particularly its highlighting of the difficulties inherent in separating observation and explanation. The emphasis on non-inferential reasoning as a supplement to logic dovetails with the new science's wide-ranging approach during the process of theory genesis, with its willingness to entertain unconventional methods in pursuit of the resolution of persistent problems. The renewed interest in the ordinary holds parallels with the anti-hierarchical aspects of Romantic science, which cast aside the Great Chain of Being, replacing it with the proposition of common descent among organisms, as well as its view of a universe probably not specifically created with human beings in mind. Finally, literary Romanticism's focus on a living nature[19] ties in with the new science's interest in natural processes as opposed to just natural products, the emphasis being on organic development over static mechanical cycles.

Because of the astounding endurance and popularity of Romantic poetry—particularly English Romantic poetry and the arguments it embodies—Romanticism continues to be perceived as a largely anti-scientific institution. Even still, as I hope the preceding section confirms, there exist points of commonality from which we might

[18] I can think of only two exceptions: Fascination with the supernatural has no easy parallel, but it is certainly enticing to speculate on its connections with Romantic science's acceptance of chaos and unpredictability, as well as there being limits to human understanding. The tenet of "infinite striving," embodied by ambitions to knowledge, has no discernable expression in Romantic science, but it is interesting that the most famous examples of this particular drive in Romantic literature tend to be men of science—*viz.*, the title characters of Mary Shelley's *Frankenstein* and Goethe's *Faust.*

[19] Regarding this element, Wordsworth is the exemplar; Blake, the most notably exception. This diversity is one of the reasons this study has brought these two figures into critical conjunction.

intimate the origins of these two differing expressions of Romanticism, origins with their roots in the same cultural impulse.

Romantic Science as a Scientific Entity

Among its many related objectives, this study will attempt to confirm the stated view of Romantic science as an entity conceptually distinct from the Enlightenment era science that preceded it; it will then attempt to demonstrate how Romantic science evidences characteristics consistent with what we now think of as modern scientific theory and practice. But arguing that Enlightenment science and Romantic science differ is not the same as arguing that the distinction between them is always immediately clear. These two views of the natural world occupy a spectrum[20] that Kuhn's theory of non-cumulative developmental episodes in science history serves to complicate but does not negate.[21] There is doubtless going to be occasional ambiguity in regard to which practitioners and works to assign to a particular tradition, and I advance the following list with the caveat that such assignment is invariably subjective and provisional. Another complicating consideration to be factored in is that many of the most important innovations and discoveries within Romantic science came from visitors to the field rather than from full-time residents such as the German *Naturphilosophen*. Indeed, the

[20] For this argument, I choose the description of a spectrum (the distribution of a phenomenon) rather than a continuum (an arbitrarily divided whole) for obvious reasons.

[21] As for the fundamental question of what constitutes "science" itself: For the purposes of this study, our working definition will be that science is a systematic approach to the study of the natural world, incorporating investigative and analytical practices consistent with either of the aforementioned paradigms, those practices being by turns rational, empirical, observational, experimental, generalizing, particularizing, deductive, or inductive. This is admittedly a broad definition, but it is one that acknowledges the complexity and diversity of the field of human activity it hopes to describe.

most important and enduring Romantic science was not performed by "Romantic scientists" at all, but rather by practitioners within the eighteenth-century scientific mainstream. In this light, Romantic science may be more properly seen as a *kind* of scientific theory and practice that emerged from and existed in parallel with its Enlightenment counterpart.

If one is to be at all credible in the advancement of such claims, then one must name names. The following figures, in my view, represent the foundation of the mainstream Romantic scientific paradigm, their works reflecting a radical new view of the universe as organic, dynamic, transformative, chaotic, infinite, and timeless,[22] a view in direct opposition to the Enlightenment paradigm as it was popularly conceived.

In his *Theory of the Earth* (1795), James Hutton (1726-97) advanced a picture of the world which conspicuously avoided any conjecture about its beginning or its end—"we find no vestige of a beginning—no prospect of an end," he wrote—effectively separating geological science from Western theology.[23] Hutton is an exemplary case of the visiting contributor to Romantic science. Even though his view of an extended geological past was fundamental to the evolutionary view of a slowly developing earth, he personally subscribed to a theory of endless and mechanical geological cycles. Still,

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[22] I would distinguish between the allied terms "dynamic" and "transformative" by characterizing changes in conditions as the former and changes in entities as the latter.

[23] In that the latter proposed defined dates of creation and apocalypse coinciding with humanity's tenure on this earth. Hutton's work suggested a world that had long pre-existed, and might persist long after, the human race.

the revolutionary concept of "deep time"[24] which he pioneered was contribution enough to the new paradigm.

William Herschel (1738-1822) is another excellent example of a mainstream scientist in service to the new paradigm. Because of both his Hanoverian patronage under George III and his emphasis on observational over theoretical astronomy, Herschel embodies many of our conceptions of a professional scientist of the Enlightenment era. Yet in terms of his contributions—debunking the notion of fixed stars by proving that all stars move, expanding the scale of the universe in size and age by estimates of light travel times, and corroborating Kant's nebula hypothesis of cosmic genesis—he stands as one of the most important contributors toward the verification of the Romantic theory of an evolving cosmos unfolding within the context of deep time and space. It should also be noted that when Herschel propounded these theories, he grounded them in exhaustive observational research; thus his views on cosmological evolution had a weight they would not have otherwise had for many colleagues. Perhaps more than any other figure, Herschel demonstrates how the rigorous scientific methodologies of the seventeenth and eighteenth centuries served to suggest, support, and eventually realize the tenets of what would become mainstream Romantic science.

The views of chemist John Dalton (1766-1844) were fundamental in establishing the essential materialism of this new universe of infinite time and space. Dalton's atomic

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[24] Coined by John McPhee in *Basin and Range* (New York: Farrar, Straus & Giroux, 1981) to describe geological time scales. Paralleling the descriptor "deep space," it is meant to suggest a similar temporal expanse. The term itself, of course, was not in use during the Romantic period, but the concept it frames does originate from that time, thus its employment here.

theory, first presented in a lecture to the Royal Institution in December 1803,[25] also incorporated the radical notion of the conservation of mass, which holds that matter—in that it is neither created nor destroyed—is for all practical purposes eternal.[26] Within the frame of this newly defined material universe, we may place the theories of Immanuel Kant (1724-1804) and the Marquis Pierre Simon de Laplace (1749-1827), who independently advanced slightly differing models of cosmological evolution. As Trevor Levere notes:

> Kant in his *Allgemeine Naturgeschichte* [1755] assumed an initial even distribution of individual atoms throughout space and invoked Newtonian attractive forces to produce condensation of the atoms into stars, suns, and planets. . . . Laplace's theory, presented in his *Exposition du systeme du monde* (2 vols., Paris, 1796), is also evolutionary, but is limited to an account of the solar system, postulating that the sun was originally a vast nebula rotating slowly and contracting as it cooled by radiation. As it contracted, it rotated faster, flinging off successive rings of matter in the plane of its equator [, forming planets]. (*Poetry Realized* 142-43)

The Kant/Laplace nebular hypothesis is the cornerstone theory of Romantic cosmology, presenting an evolutionary alternative directly challenging the steady-state universe of Newton. In terms of science history, this is more than a little ironic in that Laplace had

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[25] They were further articulated in his *New System of Chemical Philosophy* (1808).

[26] In *Jerusalem*, Blake would appear to reject this alternative take on eternity, which poses a challenge to the primacy of spiritual/imaginative eternity, when he attacks "Atomic Origins of Existence; denying Eternity / By the Atheistical Epicurean Philosophy" (67.13; E220). Epicurean philosophy, here as elsewhere, represents for Blake a perspective focused on material existence.

been dutifully toiling away on the normal science[27] of the Newtonian paradigm when he happened upon his entirely new and competing model; his researches and theories had been the result of efforts to resolve Newton's stated concerns over cumulative perturbations in planetary orbits eventually throwing the solar system into disorder. Despite these intentions, Laplace embodies the first criterion Kuhn sets forth for practitioners who initiate new paradigms in that the astronomer's attention had become "intensely concentrated upon the crisis-provoking problem" facing the established paradigm (144).

Shifting the emphasis from the evolving cosmos back to the evolving earth, I would acknowledge other contributors such as Abraham Gottlob Werner (1750-1817), the father of the neptunian theory of geology, and catastrophist Georges Cuvier (1769-1832). Cuvier, working within a view of earth's geological history as measured in the thousands of years, reasoned that only the timetable afforded by catastrophic events could account for the earth's dramatic physical features. He was wrong on both counts, but from the perspective of the emerging Romantic scientific paradigm, both he and Werner are notable for their historical views of an earth shaped by a succession of events and processes. As for insights into the historical processes of life on such a changing earth, Erasmus Darwin (1731-1802) and Jean Baptiste Larmarck (1744 -1829) were both on the leading edge of the biology of their day, and both supported the belief that changes in the environment (as revealed by the geological record) could induce changes in organisms, even though they had no clue as to the actual mechanism. Erasmus Darwin, like his

[27] As defined by Kuhn, the research conducted by practitioners within a given paradigm; it traditionally serves to shore up the paradigm and expand its application.

famous descendant, had a keen and abiding interest in the question of biological origins—the difference being that what the grandfather entertained as intellectual curiosity the grandson succeeded in structuring as workable science. Still, the elder Darwin's speculations were not without their influence: In *The Temple of Nature* (1803), he offers a theory of evolution that clearly foreshadows that of his grandson, wherein he attempts to demonstrate the relation of all living things as part of a family tree reaching back to the origin of life itself:

> Organic life beneath the shoreless waves
> Was born and nurs'd in ocean's pearly caves;
> First forms minute, unseen by spheric glass,
> Move on the mud, or pierce the watery mass;
> These, as successive generations bloom,
> New powers acquire and larger limbs assume;
> Whence countless groups of vegetation spring,
> And breathing realms of fin and feet and wing. (295-302)

Lamarck, meanwhile, is nearly (and unfairly) more famous for his errors—for example, the theory that new characteristics can arise simply out of need—than for his general and accurate insights into the fossil record's testament to the reality of species change.

Among the constituent elements of the revised view of nature proposed by the Romantic scientific paradigm, it was biological evolution that would emerge as the most

contentious as the nineteenth century unfolded, particularly for the Victorians.[28] Spirited debate continues over whether or not these notions, which reached fruition with the 1859 publication of *Origin of Species*, had their genesis in Romantic science. Compelling evidence by a number of contemporary scholars, to be examined in detail in Chapter Two, suggests that it did and laments the lack of inquiry by intervening generations into these connections. As Hermione de Almeida notes,

> The Victorian period—and Victorian literature and culture—have always had, certainly for obvious reasons, a large and ongoing body of multidisciplinary work devoted to the subject of Darwinian evolutionary theory. No such comparable inquiry or sustained interest exists for the romantic era and its literature. . . . This is the case even though the subject and speculations on evolutionary life by English and European natural historians were at least as pertinent and significant to the culture of romantic Britain and, though diffuse, far more varied and various, than they were to Victorian Britain. ("Triumph of Life Sciences" 131)

De Almeida then proceeds to identify the probable cause for this discrepancy: "The genius and originality of romantic evolutionists have not been recognized by the generations of scholars who have followed them. Perhaps this is because of the aggressive proselytizing of the Victorian Darwinians who looked to the historic past with the intention of finding only Charles Darwin" (133). For these and other reasons, our

[28] While notions of biological evolution were troubling to the Romantic poets, particularly as they extended to the origins of our own species, such considerations were still somewhat nascent. More pressing for the Romantic poets, I would argue, was the *context* that cosmological and biological evolution require—the "unfathomable depths" (to use Herschel's phrase) of time and space that provided the innumerable venues and unlimited calendar for evolution's operations—rather than the concept of evolution itself.

present institutionalized history of Romanticism and its relations with science, whether intentionally revisionist (as de Almeida suggests) or not, is incomplete and distorted. It creates difficulties for the accurate analysis of history, both literary and scientific, but it is not entirely surprising—not in a climate in which Romantic thought is so completely identified with non-scientific ends that modern science has sought to distance itself from that aspect of its origins, or where Romanticism, perhaps as a result, has come to be considered almost exclusively a literary phenomenon. Redressing this received account will be one of the principal aims of this study.

I would here again clarify the following: Romantic science as it is conceived in this study is not scientific practice that simply happened to be temporally concurrent with the Romantic movement. It is science informed—but not overwhelmed—by the fundamental tenets of Romantic thought. This last distinction is important. I would also strenuously reiterate that the German expression of Romantic science—*Naturphilosophie*—is *not* synonymous with Romantic science; it is merely one manifestation of it. In critical circles, this synecdoche has led to some persistent and pervasive generalizations. In their place, I would propose a more nuanced set of characterizations for describing this crucial shift in scientific perspective. To that end, in this study I will adhere to the following nomenclature and would advocate its adoption in future studies: When discussing the more important and enduring variation of scientific theory and practice that the revolutionary new Romantic paradigm produced—incorporating the concepts of organicism, deep time and space, and historical process—I would suggest the use of the descriptor "mainstream Romantic science." When referring to the more offbeat and

colorful continental variation that took those defining concepts to extremes, the term "*Naturphilosophie*" is most appropriate. Finally, when referring to these two varieties' common origins, or their shared principles, then and only then would I endorse the generic descriptor "Romantic science."

Scientific Revolution and Its Political Parallels

To state it unequivocally, Romantic science as it is defined in this study—not the science of the Enlightenment era—is the direct conceptual antecedent of contemporary science. Further, Romantic science is not simply Enlightenment science with an infusion of Romantic thought; there is a clear paradigmatic shift, along the lines outlined by Thomas Kuhn in *The Structure of Scientific Revolutions*. In his influential and controversial study of science history, Kuhn, drawing parallels between the political realm and the scientific, notes that in "both political and scientific development the sense of malfunction that can lead to crisis is prerequisite to revolution," adding that both varieties are "inaugurated by a growing sense . . . that existing institutions have ceased adequately to meet the problems posed by an environment" (92). Since both species of revolution seek to change existing institutions "in ways that those institutions themselves prohibit," their success, Kuhn observes, "necessitates the partial relinquishment of one set of institutions in favor of another, and in the interim, society is not fully governed by institutions at all" (93). This is as good a description as any of the volatile times, both politically and scientifically, in which Blake and Wordsworth wrote—a volatility that yielded differing and defining responses from these poets, the character of which will be

addressed in Chapters Three and Four.

I should note here, however, that some analysts have begun to question the long-standing political assumptions central to popular conceptions of the Romantic period, particularly whether Romanticism can continue to be considered as aligned with revolution. Marilyn Butler, for one, has written extensively on the complex differences between political revolution and other forms (particularly literary) and has brought to light the historical argument that identifies the French Revolution as an outgrowth of, not a reaction to, the French Enlightenment.[29] As Butler notes,

> The German writers who first called themselves Romantics were not supporters of the French Revolution at all. They were, on the whole, German patriots, who increasingly came to approve of the involvement of the various German states in the war against republican France. . . . In both France and England during these decades, it was the classical or antique style that was commonly linked with republicanism. (4-5)

Interestingly, Butler concludes that "it is much easier to connect the first wave of European Romanticism with the conservative cause than with radicalism" (Butler 5). We must here, of course, be sensitive to the differing national strains of both Romanticism and the Enlightenment, but, still, Butler's remarks are provocative in the parallel they evoke with Blake and Wordsworth's seeming attachment to aspects of the established scientific regime. Overall, however, none of this is enough to discount the fact that the recognized tenets of English literary Romanticism, cited earlier in this chapter, almost all

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[29] These views are outlined in *Romantics, Rebels and Reactionaries*, in which Butler's thesis concerns the social context (versus the artistic isolation) of Romantic poetry.

incorporate some aspect of radical change from the preceding eighteenth-century status quo.[30]

Ultimately, the status of scientific Romanticism as revolution or counter-revolution is as complicated as that of literary Romanticism, in part because, as history teaches, the Romantic conception of the universe as an organic entity was not so much an innovation as it was a return (with modifications) to the strictly classical view—a view which Enlightenment science, in an earlier paradigm shift, had itself overthrown. As Ernst Mayr writes, in the seventeenth and eighteenth centuries, the

> Greek concept of the universe as an organism (with a soul) was . . . replaced by that of the universe as a machine kept going by a set of laws. The gradual acceptance of the new way of thinking [was] referred to as the mechanization of the world picture. . . . [God] still was the first cause for everything that exists, but subsequent to creation all natural processes were regulated by 'secondary causes,' exemplified by general laws. (313)

In concluding this section of the introduction, I would argue that the characterization of Romanticism in general—and Romantic science, specifically—as either revolution or reaction is of less import than the resulting outcome of paradigm change. This is not to say, however, that the political analogy thus far invoked should be undervalued. On the contrary, in light of the analogy's usefulness in conceptualizing social systems in change,

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[30] For example, literary Romanticism's subjective, first-person approach to the world countered the preceding age's ideal of an objective, consensus view. Its interest in the ordinary constitutes an unmistakably clear expression of the democratic impulse, as well as a response to entrenched notions of hierarchy. The embrace of supernatural elements, with its gleeful subversion of natural laws, represents an endorsement of the unorthodox, which is frequently decoded as a challenge to social norms. Its sense of what has been called "infinite striving" represents a similar challenge to conventionally conceived notions of social and human limits.

this study will continue to follow Kuhn's lead in drawing parallels between the ongoing scientific shift at the turn of the nineteenth century and concurrent events within the political sphere,[31] but it will strive to do so always with a clear understanding of the limits of such an analogy.

Overview of Chapters within the Study

Setting the Context: Establishment of Scientific Culture at the Turn of the Nineteenth Century (Chapter Two)

It is impossible to talk about Romanticism without reference to the Enlightenment, particularly Enlightenment science. It is the contrasting context, the historical foil against which any approach to conceptualizing Romanticism (in any of its aspects) must take place. Unlike some analyses of the past, this study will attempt to refrain from trying to fit all of eighteenth-century science into a tidy and unflattering monolithic history. As an institution, Enlightenment science possessed an astonishing range of diversity, which this chapter will attempt to reflect. A pressing question this chapter will raise, and which the two chapters following it will attempt to answer, is: Were Blake and Wordsworth at all guilty of misrepresentation in constructing their cases against science (and in support of their own poetic programs) or were they faithfully reproducing the institution as they understood it and experienced it?

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[31] One example: It could be convincingly argued that, as the idea of a steady-state world increasingly came into question in both the political and natural sciences, the awareness of historical processes long associated with politics was transferred to the scientific sphere. At that point, natural history became just that: not a record of nature's tenure under timeless and universal laws, but rather an account of its developmental episodes, with one set of temporal and local conditions yielding to another, a view we would today call the historicism of nature.

It is important to note that on the European continent questions of philosophy between poets and scientists never became as contentious as they did in England. Indeed, just across the channel, poets and scientists were finding great ideological agreement. Continental Romantic science, dominated by German *Naturphilosophie*,[32] facilitated this not only by rejecting the mechanistic metaphors that it perceived as limiting the scientific enterprise, but also by its emphasis on philosophical reasoning, particularly of the idealist variety, as an avenue to knowledge. Creative forces were championed, and static matter was subordinated, as dynamism became the organizing principle. This chapter will examine in detail the arc of this most colorful expression of Romantic science, charting its rapid rise and precipitous fall, and, most importantly, how by the intensity of the dispute between its proponents and critics it has come to dominate popular conceptions of scientific Romanticism.

The diversity of scientific and quasi-scientific beliefs competing for acceptance in Britain at the turn of the nineteenth century was astonishing: mechanism and organicism, creationism and evolutionism, catastrophism and uniformitarianism, to name but a few. Many of these beliefs had deep and complex historical roots; others were just emerging. Some were on the rise; some were in decline. All, however, were still operative and advocated by some authority somewhere, and all informed the scientific debate of the time, shaping the cultural landscape that Blake and Wordsworth inhabited as working poets.

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[32] Indeed, *Naturphilosophie*, it is generally agreed, was conceived as a mediating envoy between the sciences and the humanities.

The Poet Chapters

One of the central questions that must be posed of this study regards its chosen focus—namely, why Blake and Wordsworth? The answer is two-fold. For one, these two figures make an interesting match in that they are not aligned in obvious ways. In fact, together they represent the broad spectrum of English Romantic poetic practice, both conceptually and stylistically. The second reason is that, by cross-referencing the approaches of these two distinct representatives of English poetic Romanticism, one may gain insights into the operations of the Romantic ideology as it engages an opponent philosophy. Of particular interest to this study is the response of this ideology when its opposing philosophy ceases to conform to the programmed model. Within their works, these two poets appear to exhibit a nearly identical rejection of the emerging Romantic scientific paradigm, yet this rejection in each case is arrived at independently and for a different set of reasons.

In terms of its structure, each chapter dealing with a particular poet will include four sections. One section, further divided into relevant sub-sections, will address the poet's attitudes toward science in general. It will be in this section that I examine certain critical misperceptions surrounding the poet on this topic. Specifically, this study will attempt to explode as over-simple the binary thinking that all too often attempts to promote these figures either as proto-scientists in their own right or as rigidly anti-scientific minds. Also within each chapter will be a section analyzing evidence of the poet's awareness of the ongoing scientific revolution of the time, cross-referencing it with its political equivalent, again with a critical eye toward the limitations always

inherent in this type of analogy. Another section will deal with the specific reasons for the poet's apparent rejection of the emerging Romantic scientific paradigm on philosophical grounds—a rejection, I will argue, based on the "material objections" that define that particular poet. A final section will address the poet's specific creative response to all of the above, that response often focusing on a particular scientific field of interest or concern.

Blake (Chapter Three)

This chapter will examine Blake's role in the Romantic poets' "loyal opposition" to the Enlightenment scientific establishment. While the Enlightenment and Romantic scientific paradigms were both unacceptable to Blake, the Enlightenment model was the more established and more familiar adversary. It was also the weaker of the two philosophically and aesthetically, and thus provided the better foil for his poetry. Within this characterization exists a partial challenge to the usually unquestioned visionary purity of the motives underlying Blake's poetic revolt. While avoiding the representation of Blake as a self-serving poetic partisan, this study will advance the proposition that the philosophical and aesthetic beliefs expressed in his works were almost certainly in part dictated by his identity as a professional artist and poet.

The Enlightenment scientific paradigm, both mechanist and materialist, was Blake's opponent philosophy of choice. Opposing it provided the foundation as well as the exigency of the poetic program he pursued. The emerging entity of Romantic science, I would argue, threatened to disrupt this program by its rejection of mechanism

and its redefinition of materialism toward a view recognizing a physical universe unbounded in time and space. Having painstakingly worked out his anti-materialist argument, tracking the progression of the culturally poisonous concept from its origins in religion to its apotheosis in science, Blake could hardly have welcomed the notion that his view of limiting materialism might itself be limited, perhaps even unimaginative.

The works by Blake considered in this study will be those that most directly address—usually in mythic form—the origins, motives, and consequences of science as a human activity. These will range from early works such as *There is No Natural Religion* (1788), for Blake's views on the stagnating effects of experimental science, to *The Marriage of Heaven and Hell* (1790-93), for his observations on both the cruelty of biological nature and the divinity of life. *America* (1793) and *Europe: A Prophecy* (1794) are also of interest: *America* for its various astronomical passages, including Blake's vision of the origin of the solar system (in response to the theories of Kant and others); *Europe* for Blake's additional exercises in astronomical imagery, along with more observations on the cruelty of biological nature. *The Book of Urizen* (1794) will be examined for the embodiment of science that Blake presents within its title figure; *The Song of Los* (1795) for its vital glimpses into humanity's aforementioned downward slide from materialist religion to materialist science. The most frequently analyzed works within this chapter, however, will be the major prophetic books: *The Four Zoas* (1795-1804), for its elaborations on the inversion of internal and external experience and Blake's provocative mentions of "sweet Science"; *Milton* (1804-08), for details of his inverted model of the cosmos, as well as critiques on nature and natural religion, cause

and effect, and vortices, capped with Blake's statement of the anti-science mission of the poet; and *Jerusalem* (1804-20), for its extended rail against natural religion, the importance of casting off "Demonstrative Science,"[33] and Blake's own views on governing paradigms ("I must Create a System, or be enslav'd by another Mans"[34]). *A Vision of the Last Judgement* (1810) provides a useful summary of Blake's views on the material world. Outside of poetic sources, *An Island in the Moon* (1784-85) will be considered for its light dramatic satire of scientific thinking and trendiness. Finally, this study will draw upon Blake's letters and annotations to works within his personal library for clarification and amplification of his views on a variety of topics.

Wordsworth (Chapter Four)

Wordsworth, even within his identity as a Romantic poet, manifests an early affinity with the material world, evident in his appreciation of nature and his acknowledgement of its ability to evoke a religious sense of awe. But the sublime—at least, Wordsworth's conception of it—was pushed to the breaking point by the new science's questioning of the necessity, and perhaps even the relevance, of the previously essential element of the human observer. Wordsworth, like Blake, was possessed of a deep philosophical commitment to the notion of *material limits*, a belief directly contradicted by Romantic science's newly limitless material universe. Wordsworth's resulting anxiety with the new view of the universe, I argue, is most prominently manifested in his obsession with matters and metaphors of scale, an often-overlooked

[33] *Jerusalem* 12:14.
[34] *Jerusalem* 10:20-21.

aspect of his work which this chapter will hope to foreground for the reader.

In examining the poet's aforementioned affinity with the natural world, manifested in his oft-stated belief that the human mind and nature form a complementary pair ("How exquisitely the individual Mind . . . to the external World / Is fitted"[35]), this chapter will attempt to find balance between this view and the poet's equally long-standing sense of alienation from the physical realm and the role it plays in firing his transcendental aspirations. These conflicts reach a resolution of sorts (but only of sorts) in a series of epiphanies at various mountain locales in *The Prelude*,[36] wherein the reader shares in the poet's hard-won realization about nature and receives a glimpse into a Romantic mind attempting to come to terms with the material versus the imaginative in an intellectual landscape suddenly rendered unstable—in large part, I would argue, by the new science.

The works covered in this chapter will include the poems of *Lyrical Ballads* (in its various editions) for insights into Wordsworth's views on the interaction of the active senses and the participatory mind. Also examined within *Lyrical Ballads* will be the Erasmus Darwin-influenced psychological case studies, such as "Goody Blake and Harry Gill." The prose Preface to the 1802 edition will also figure prominently, with its discussion of "What is a Poet?"—particularly as Wordsworth contrasts that social role with the "Man of Science." Another prose work, the *Guide to the Lakes Region* (1810) will prove revelatory in regard to Wordsworth's views on geological issues. Early works

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[35] "Home at Grasmere" (1800), lines 816-19.
[36] Mont Blanc, Simplon Pass, and Mt. Snowdon (*The Prelude* 1805: 6.452-461, 6.488-524, 13.10-119, respectively).

such as "The Ruined Cottage" (1798) and "Home at Grasmere" (1800), which later reappear as elements of *The Excursion* (1814), will be explored in detail in that they provide some of the poet's more provocative and often quoted views on the subject of science, views often attributed to an older and more conservative Wordsworth. But principally it will be the two turn-of-the-century incarnations of *The Prelude*—the Two-Part *Prelude* of 1799 and *The Prelude* of 1805 in Thirteen Books—that will inform this chapter's analysis of Wordsworth's relations to the scientific enterprise. These early versions of Wordsworth's landmark long poem, not incidentally, also benefit from the expressiveness of the poet at the height of his creative powers.

Conclusion: Romanticism and the Philosophy of Science (Chapter Five)

In the framework I have proposed, Romantic poetry represents one model for conceptualizing, evaluating, and—when necessary—resisting the role of science in culture. By the time this study reaches its concluding chapter, the reader, it is fervently hoped, will have a more detailed understanding of the Romantic poets' success or failure in regard to this last point. Independent of this last point, however, yet just as intriguing from the position of this study, are those first two less-emphasized points, concerning the conceptualization and evaluation of science, because together they raise new and provocative questions regarding the role that Blake, Wordsworth, and rest of the first wave of English Romantic poets played as critics of science and the role that their criticism played in the discipline's eventual self-redefinition. From this perspective, Romantic poetry could be seen as serving a purpose akin to the *philosophy of science*—

that branch of the humanities providing useful critical analysis of the discipline from outside the field. But Romantic poetry's role as philosophy of science is sometimes hard to assess: the analysis of the subject it provides is so compromised by interdisciplinary rivalry that it becomes difficult to separate Romantic poetry's ideological agenda from what might be its unbiased social and cultural verdicts regarding science. The influence Romanticism in general has had on the philosophy of science, however, is far clearer. Indeed, it is the position of this study that there exist identifiable Romantic roots to at least two of the key concepts that shaped the twentieth-century philosophy of science debate: the institutional acceptance of limits to scientific knowledge and the acknowledgement of the inexorably compromised nature of objectivity.

Romantic Science Studies in the Present Day

In the preface to a recent issue of *Studies in Romanticism*,[37] issue editor Hermione de Almeida acknowledges the problems inherent in the field of Romantic science studies: "I had full and early warning of the problems of perception and reception that work in the sciences of the period faced: it was under-recorded because scattered across several disciplines, and it was marginalized because of the common presumption that science was unromantic and therefore anathema to the period" (3). She goes on to note, however, that "[s]cholarly work of the new century has done much to foster consciousness of the importance of science in Romantic thought and culture" (3). I would here acknowledge

[37] Vol. 43. No. 1. Spring 2004.

the reciprocal influence of Romantic thought and culture on the emerging science of the time.

Noah Heringman, editor of the anthology *Romantic Science* (2003), shares de Almeida's concerns and optimism, finding numerous reasons to continue work in this area of literature and science studies. "Such a project," he writes, "benefits from the fruitful paradox implied by 'Romantic science' . . . a paradox because hostility to science is still a major feature of most popular definitions of Romanticism" (7). But despite present critical perceptions that Romantic science presents such a paradox, fruitful or otherwise, the awareness of the extent to which Romantic thought irrevocably impacted our Western concepts of nature is at long last leading to the conclusion that it must have similarly and permanently influenced our concepts of the scientific institution that studies that nature.

As for how these concepts impacted the central figures of this study, William Blake and William Wordsworth, it would be ideal if there were incontrovertible documentary evidence regarding the views of these poets on the topic of Romantic science *vis-à-vis* its Enlightenment counterpart, as well as its relations to the poetic enterprise. The fact that their rhetoric toward science did not alter during this period of great scientific change is one indicator, albeit a tacit one, that the new science held no more appeal for them than did its predecessor. Then, of course, there is the countering argument—to my knowledge almost entirely unsupported—that Blake and Wordsworth neither knew nor cared about the scientific changes occurring during their years of poetic production. It is an argument that subsequent chapters of this study will engage head on.

Marilyn Gaull, for one, expresses skepticism toward such a view, suggesting that insights into the new science were part of an available discourse that, "[g]iven the amazing dissemination of scientific ideas in journals, periodicals, lectures, . . . ordinary men and women, as well as philosophers and scientists, were encountering" (*English Romanticism* 373). If these poets seem largely silent in regard to the epic cultural changes going on around them—changes which, I would argue, they could scarcely have been unaware—ultimately it is within their poetry that they break this silence, providing indirect but interpretable evidence of their views.

Chapter Two

Setting the Context: Establishment of Scientific Culture at the Turn of the Nineteenth Century

When the term "science" first entered the English language sometime in the fourteenth century, it was understood to mean knowledge in general, but by the closing decades of the eighteenth century that definition was well into the process of change.[1] Blake and Wordsworth, along with the rest of their generation, were witnesses to this change, clearly perceiving multiple contemporary meanings for "science" amid the term's contraction to describe specialized and systematized areas of inquiry, as well as its ongoing separation from "art." In differing ways and to differing degrees, both of these poets work the ambiguity of the term during this transitional period. There exist within the poetical works of each unmistakable instances where the archaic definition is employed, usually somewhat wistfully, and other instances where the more narrow meaning of natural science is clearly operative and almost universally negative in tone.

The term "natural philosophy," which arrived on the scene about a century after "science," was long considered the more formal and flattering descriptor before it came under fire as dated and inexact language. In the year 1834, Trevor Levere notes, Samuel Taylor Coleridge "stood up in Cambridge to forbid the British Association for the Advancement of Science the use of the word 'philosopher' to describe any student of the

[1] All dates based on *OED* references.

material world" (*Poetry Realized* 73).[2] At the time, however, there was strong resistance among those assembled to losing the cachet of philosophy and an open rejection of the descriptor "science," which many perceived as marginalizing. "Whatever Coleridge . . . may have determined," John Wyatt observes, referencing the same episode in *Wordsworth and the Geologists*, "men who dealt with material things saw themselves as part of a unified high culture"(6). But before the nineteenth century was out, the change from natural philosophy to natural science would be complete, the revised terminology quietly adopted by both philosophers and scientists in a move to dispel any lingering association of the discipline with the humanities. The resulting refashioning of "science" had the effect of bequeathing an established title upon an upstart discipline—the reduced and reductionist specialty suddenly becoming the namesake of "all knowledge." It is this turn of events that Wordsworth addresses in the Addendum to "The Ruined Cottage" (1798), as he acknowledges science's pretense (and present inadequacy) within the context of a call for its reform:

> Science then
> Shall be a precious visitant; & then,
> And only then be worthy of her name.
> (42-44)[3]

If, as characterized in the introduction to this study, poetry and science may be considered as differing and often competing interpretive strategies within a common

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[2] Levere draws from William Whewell's original account in the *Quarterly Review* 51 (1834).
[3] *"The Ruined Cottage,"* Cornell Wordsworth, Ed. James Butler, 265. The passage cited was later incorporated into Book 4 of *The Excursion* (1814), lines 1251-53.

culture, as two distinct avenues of pursuing and receiving knowledge, then Blake and Wordsworth, within their poetic works and within their identities as representatives of poetry,[4] make the case for a kind of knowledge obtainable by other than scientific means. Their rejection of the worldview engendered by scientific activity is, as I have argued, more complex than generally acknowledged, extending to not only the established Enlightenment science of the day, as one would expect, but also to the emerging (and, by most appearances, more ideologically appealing) alternative of Romantic science. To explore the outlines of and reasons for this second rejection—which unfolds not only within the context of poetic philosophy, but also of religious belief and secular scientific practice—it will be necessary to define and contrast in detail the cultural entities that were Enlightenment science and Romantic science.

Complicating Perceptions of Enlightenment Science

It is virtually impossible to characterize Romanticism, let alone praise it, without criticizing the Enlightenment. One of the principal reasons that Enlightenment science continues to receive a bad rap, Lorraine Daston argues convincingly, stems from a present misunderstanding of the mindset of the times, attributable to Romantically influenced biases regarding issues of imagination, facts, subjectivity, and independence. Within the essay "Enlightenment Fears, Fears of Enlightenment," Daston sets out "to explore what the Enlightenment was afraid of, and to contrast those fears to what we

[4] On the topic of terms in transition, we must also acknowledge the status of "poetry" as a contracted signifier. Once synonymous with all literature, even all art, it now occupies an interpretive range even more tightly prescribed than that of "science." Frequently in the course of this study, the term must be qualified and expanded from its contemporary definition to meet Wordsworth's and Blake's view of it, which could extend to any creative endeavor of the mind.

currently fear about the Enlightenment" (116). In short, she argues that the Enlightenment continues to represent for many the tyranny of science—particularly, scientific facts. Such a view, Daston points out, errs in that it mischaracterizes the Enlightenment's faith in such facts.

Contrary to the popular perception, Enlightenment thinkers, far from perceiving facts as being unassailable, were instead consumed by an awareness of their fragility: "No observer was immune to the blandishments of the imagination; hence no natural fact could be trusted implicitly" (Daston 120). Such revelations were of no great concern to the Romantics, Daston continues, in that from their perspective "[f]acts are only trivially true" in the first place—"inadequate to create beauty in art, inadequate to instill virtue in character, inadequate to give meaning to history" (124). The Enlightenment mentality, however, could not get beyond this fear.[5] But because they were so fragile, facts were simultaneously perceived as being incredibly precious; it was for this reason that the Enlightenment revered them, lifting them up above all else. Enlightenment thinkers, as a result, were ruled by facts—but it was a rule conferred by their own consent. It is perhaps this crucial difference in sensibility between the eighteenth century and the present that best explains the lingering sense of antipathy toward the Enlightenment in some quarters.

If modern views of Enlightenment science continue to be shaped by Romantic views on the subject, then the historical analysis of the root causes of the original

[5] "[T]he errors that most terrified Enlightenment savants in theory and practice were errors of construction, the fear of fashioning a world not reflected in sensation but made up by the imagination. . . . To be mad was no longer, as it was in the seventeenth century, to suffer an excess of black bile, or to be possessed by demons; it was to prefer a personal world of the imagination to the shared world of society" (Daston 118, 122).

Romantic disaffection is certainly relevant and worth investigating. In the fourth volume of *The Cambridge History of Science*, Roy Porter identifies and reviews a number of reasons for Enlightenment science's negative reception in Blake and Wordsworth's day. First of all, there was the matter of its explosive rate of spread and its eventual spillover into apparently unrelated disciplines. These episodes, which Porter sees as instances of science's methods being appropriated by other fields, may well have been interpreted by analysts of the time, such as the Romantic poets, as examples of imposition or contamination. There was also, Porter notes, the issue of the Enlightenment not living up to its promises or potential: "For the *philosophes*, scientific inquiry was the new broom par excellence that would sweep mystifications and obscurantism aside, removing the mumbo-jumbo of the Church and the 'feudal' ways that kept the masses poor, hungry, and oppressed" (10). But despite its potential to liberate, Porter notes in a section addressing the dark side of Enlightenment, "some of the most important recent work on Enlightenment science has explored the recruitment of science as a disciplinary and regulatory authority" (12).[6] But by far the most prominent reason for Enlightenment science's negative characterization within the pages of Romantic poetry lay in its astounding success and ever-increasing power as a social and cultural entity. Indeed, as Porter notes, the surest measure of science's authority is revealed

> in the vehemence of the Romantic revolt against it. The antiscience satires of the Augustan era—poking fun at virtuosi who peered down telescopes and mistook flies for elephants on the moon—give the impression that,

[6] Foucault, in particular, has analyzed "the role played by scientific rationality in creating new regimes and technologies of power, often for the management of populations and environments" (Porter 12).

> around 1700, humanists still hardly discerned a scientific 'threat.' . . . In stark contrast, there was something quite new in the venom of William Blake, directed in the late eighteenth century at the infernal trinity of Bacon, Locke, and Newton. (7)

Indeed, as George S. Rousseau observes, "Blake-the-phenomenon is unimaginable without Enlightenment science" ("Science" 795).

Outside the skeptical assessments of Romantic poets, which, again, are not altogether unexpected, eighteenth-century science does not always fare well even from the standpoint of science history. Typically portrayed in

> subdued tones . . . [t]o most historians it lacks the heroic quality of what came before—the martyrdom of Bruno, Galileo's titanic clash with the Vatican, the 'new astronomy' and 'new philosophy' of the 'scientific revolution,' the sublime genius of a Descartes, Newton, or Leibniz. . . . Given such judgments, it is not surprising that muted terms such as 'consolidation'[7] have come to mind for characterizing the natural sciences in the eighteenth century. (1-2)

But the eighteenth century *was* an era of scientific innovation, as Porter continues: In the physical sciences, "astro-physicists were . . . making striking innovations—observational, computational, theoretical. . . . [C]onservation laws were developed that theorized the cosmos in terms alien to the cosmology of divine intervention championed by Newton, pointing toward Laplace's nebular hypothesis" (3-4). In biological circles,

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[7] A term which for science historians suggests the stagnation of Kuhnian "normal science," wherein practitioners toil away within an established and often obsolete paradigm.

> [t]he first evolutionary theories were advanced, associated (obliquely) with Buffon and (explicitly) with Erasmus Darwin and Lamarck. It is not crudely Whiggish or merely celebratory of the so-called 'forerunners of [Charles] Darwin' to insist that theorists of life were finding that the static, hierarchical, and Christian Chain of Being no longer possessed explanatory power and that the living needed to be conceptualized within a more dynamic framework and an extended timescale. (5-6)

It is not intended to subvert this acknowledgement of eighteenth-century innovation to note that the majority of the crucial discoveries cited by Porter in his study—particularly those serving to establish theories of cosmological and biological evolution—belong to the *late* eighteenth century. I would similarly hope it does not seem paradoxical or inconsistent for this study to argue that the Romantic scientific offshoot that eighteenth-century science gave rise to stands as compelling evidence of the latter's richness and diversity. As a century, it was not without innovation—no one argues that anymore—but at the same time, the rate, number, and character of those innovations were for a time significantly bound by the established paradigm. All of these factors set the necessary conditions for the changes that ensued.

Scientific culture at the turn of the nineteenth century remains a complex and elusive context, a rich matrix of differing philosophical approaches. It was also, more importantly, the setting for the transition from one paradigm of scientific theory and

practice to another.[8] If, following Kuhn's model, scientific Romanticism can be considered a reaction provoked by crisis-inducing elements within Enlightenment science, it would be worthwhile at this point to back up the chronology and examine in detail how the Enlightenment scientific paradigm—defined by its mechanist metaphors—became the eighteenth-century establishment that scientific Romanticism would eventually challenge.

Mechanism as a Paradigm to Be Overthrown

The record suggests that the mechanist metaphors of Enlightenment science, arising in the seventeenth century and consolidated in the eighteenth century, initially attracted adherents largely because of their great explanatory power. There was a near perfect fit between the machine as a model of natural systems and Bacon's call for a knowable universe. As Steven Shapin writes,

> Machines in general had a determinate structure: the materials and motions required to make them, and to make them go, were knowable by human beings and, in principle, specifiable. That is to say, machines were accounted wholly *intelligible*. . . . [T]here was nothing mysterious or

[8] To reiterate the characterization of the two paradigms' views of nature:

Enlightenment Science	Romantic Science
static	dynamic
immutable	transformative
orderly	chaotic
hierarchical	egalitarian
finite	infinite
temporal	timeless
mechanical	organic

> magical, nothing unpredictable, nothing capricious about a machine. (*Revolution* 36)

Mechanical metaphors were also seen as conducive to the production of an objective perspective, which, as an epistemological approach, had considerable utility. Western science, it is generally argued, benefited greatly from the distance between subject and object provided by these metaphors and their view of nature as *other*. "Many Eastern religions," Kenneth Miller notes, "take the view that reality is entirely subjective, and that man can never truly separate himself from the nature he wishes to understand" (196). Western natural philosophy had no such conceptual liabilities. Through the clear explanatory lens of the mechanical model, nature was seen as a distinct and separate entity, amenable to a reasoned approach from without, with no insurmountable barriers to its knowability. Importantly, this view of nature as external object to humanity's subject not only contributed to the productivity of the scientific enterprise, it also came to shape science's mission as well—namely, *to describe, explain, predict, and (whenever possible) control the natural world*—a mission easily aligned with existing Western religious belief.[9] Indeed, in addition to its secular explanatory and epistemological appeals, the theological aspects of the mechanical model proved compelling—particularly mechanism's apparent support of the design argument.[10] "This clear evidence of contrivance in the natural world," as Robert Boyle (1627-1691) once noted, is "'one of the great motives' to religious belief" (Shapin, *Revolution* 143).

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[9] Genesis, for example, describes Adam's naming of the animals and his having dominion over nature.
[10] "Design" here defined as "the relation between structure and function" (Shapin, *Revolution* 144).

Eighteenth-century views on design in nature find their most famous expression in the work of William Paley (1743-1805). Paley's *Natural Theology* (1802) begins with the finding of a watch upon a heath, which prompts the author's logically derived observation that, given that it had not always existed, "the watch must have had a maker: that there must have existed, at some time, and at some place or other, an artificer or artificers, who formed it for the purpose which we find it actually to answer; who comprehended its construction, and designed its use" (3).[11] This opening statement is followed by Paley's generalizing claim that "every indication of contrivance, every manifestation of design, which existed in the watch, exists in the works of nature" (17-18). Readers of Paley's essay are then invited to conclude similarly that the various elements of nature, like those of the watch, could not have come together by chance.

Though skillfully presented in a rhetorical sense, Paley's argument in support of design offers nothing terribly new. More critically, it glosses over standing objections raised decades earlier by David Hume (1711-76). To summarize Hume's objections: No matter the evidence marshaled from the natural world, design arguments can "never prove the existence of God, certainly not the existence of the Christian God with all his moral attributes" (Luscombe 41). Hume questioned on logical grounds any evidentiary approach to knowing God, particularly the design argument, which by the late 18th century had a chorus of critics—from advocates of revealed religion to skeptics who questioned the logic of its highly presumptive analogies. Despite the fact that Hume, in

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[11] Even though he devotes the entirety of *The Blind Watchmaker* to debunking Paley's claims, Richard Dawkins gives Paley his due, noting that while the theologian "gave the traditional religious answer to the riddle . . . he articulated it more clearly and convincingly than anybody had before" (4).

the *Dialogues concerning Natural Religion*, was able to concede that "the order of the universe strikes us on occasion with enough force to support the design argument," that argument in itself, he notes, does not support traditional Western religious faith "unless we do the greatest violence to logic" (Price 143).

Origins of the Enlightenment/Romantic Science Split

Despite its many compelling features, mechanism held hidden costs, both theological and scientific, which the passage of time would reveal. Theologically, these problems manifested themselves in the remote, uninvolved God implied by the mechanical model of the universe. Scientifically, but still entangled with issues of theology, were problems inherent in its view of a universe driven by natural laws, problems which in time would trigger a split between physicists and naturalists (i.e., biologists). As Ernst Mayr notes:

> The mechanization of the world picture caused a serious dilemma for the devout. If he followed the claims of the physical scientist, he had to assume that the world had been created at a single time and that at the same time natural laws ('secondary causes') had been established which required only a minimal amount of divine intervention in subsequent periods. . . . This interpretation fitted the phenomena of the physical world reasonably well but was completely contradicted by the phenomena of the living world. Here such a diversity of individual actions and

> interactions is observed that it becomes inconceivable to explain it by a limited number of basic laws. (103)

As it turned out, however, these physicists' assumptions regarding the simplicity and sufficiency of the mechanical model of the universe were overstated. One of the most momentous developmental episodes within Enlightenment science, in fact, emerged out of a rift in the mechanist camp between Sir Isaac Newton (1642-1727) and Gottfried Wilhelm Leibniz (1646-1716) on just this issue.[12] In regard to the operations of the machine-universe, for Newton all questions of God's workmanship took a back seat to observed facts and calculated problems:

> In order to support . . . the story of Genesis that the world was created in a single act, [Newton] argued . . . that the world is stable and has remained unchanged since creation. But he could not prove this point, since he admitted that, according to his theory, the gravitational pull among several members of the solar system would tend to modify their orbits; hence . . . God in his providence must intervene from time to time to reset the clockwork of the heavens. (Stecchini 93)

The famous correspondence between Leibniz and Newton's associate Samuel Clarke (1675-1729) between the years 1715 and 1716 centers on this contentious issue of divine intervention. As Ezio Vailati notes in his monograph on the subject:

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[12] The two also differed importantly on other questions that affected the direction of science: most notably, Newton's championing of the causes of empiricism and inductive experimentation versus Leibniz's predilection for the rationalist speculation and deductive hypotheses of traditional Cartesian philosophy.

> Leibniz thought that [Newton and] Clarke had tied God and nature too closely, thus debasing the divinity. God's constant physical intervention showed him [to be] a bad engineer. . . . For [Newton and] Clarke, Leibniz had separated God from nature . . . too much . . . in making God an *intelligentsia supramundana* and nature a mechanism that never needs rewinding. (10)[13]

Interestingly, both sides in this debate felt that the other's position diminished God and paved the way for atheism: Leibniz seeing Newton's scheme of a universe of disruptive causal interactions requiring intervention as suggesting an incompetent creator, and Newton seeing Leibniz's universe of independent parts functioning in preordained harmony as yielding a remote and redundant one.

Though credited along with René Descartes (1596-1650) as one of the principal architects of mechanism, Newton himself evidenced a profound awareness of the mechanical model's shortcomings.[14] His *de facto* position as leader of the interventionist camp, in itself, says a great deal about his doubts regarding mechanism's sufficiency. Still, Newton's positions on the limits of mechanism—and of scientific knowledge in

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[13] Aside from questions of God's workmanship, there was another consideration wholly outside the spheres of science or theology that might explain why some embraced or opposed a non-interventionist view of the universe—namely, its political analogy. "The mechanical philosophy," Luscombe writes, "provided an ordered picture of the universe, ruled by God through the mechanism of law, just as the sovereign ruled a well-ordered kingdom, and without any need for the potentially destabilizing direct intervention of God at every moment" (30). The inference that divine intervention is both undesirable and unnecessary is hard to miss here, and it suggests the political volatility of this concept. Clarke and Newton, for their part, argued that a good monarch is an actively involved monarch.

[14] As Ault notes, "Newton placed himself squarely in opposition to the Cartesian 'mechanists,' who assumed that the world was sufficiently stable not to require the constant intervention of God" (8). Arguably, it was Descartes' dependence upon mechanical metaphors, with their assumptions regarding the subject's predictability, that misled him into relying so heavily upon deductive speculation rather than empiricism and experiment in the verification of his theories against natural phenomena.

general—tend to be under-reported, even though the historical record on this matter is fairly clear. "By the end of the seventeenth century and early eighteenth," Steven Shapin writes, "Newton . . . was expressing impatience at global philosophical attempts to give mechanical explanations. Newton's reluctance to specify a mechanical cause for gravitation" is perhaps the best example of this (*Revolution* 157). As Donald Ault confirms, Newton "repeatedly said that he did not know the cause of gravity, or whether that cause was material or 'immaterial'"(9). Further, Newton's doubts regarding mechanism as an explanatory and epistemological model extended beyond his views on gravity. As Shapin notes,

> similar limits to mechanism also informed his treatments of, for example, magnetism, electricity, and the phenomena of life. . . . If other practitioners equated proper natural philosophy with the provision of mechanical accounts, Newton here professed contentment with the ultimate inscrutability of nature. (*Revolution* 157)

Newton's reservations regarding the mechanistic metaphors at the heart of the Enlightenment science stemmed from problems with the paradigm that few except he had the insight to see and which he personally resolved with the compromise of intervention. It was a workable compromise for Newton, and for the many who followed his lead, but it was one at odds with the fundamental appeal of a self-sufficient universe that had established the concept of mechanism in the first place.

A collateral effect emerged from the rift between interventionists and non-interventionists, one which manifested itself within the expressions of scientized faith

prevalent in the seventeenth and eighteenth centuries. As mentioned earlier, questions inherent in the mechanist view of a universe driven by natural laws exacerbated differences in perspective between physicists and naturalists, eventually leading these two groups to very different interpretations of nature. In *The Growth of Biological Thought*, Mayr further clarifies these differing perspectives: "The God who made laws at the time of creation and then abdicated his authority, so to speak, in favor of secondary laws was far more remote than the God of the naturalist, who left the imprint of his design on every detail of living nature" (372). The divine but uninvolved creator Mayr describes, embraced by practitioners within the physical sciences, became the distinguishing characteristic of deist theology. "Deism," Mayr continues, "was—one might say—almost a logical consequence of the development in physics. . . . The order and harmony of the universe made the physical scientist search for laws, for wise institutions in the running of the universe, installed by the creator" (372, 371)

Far and away the most culturally significant manifestation of natural religion,[15] deism's scientific approach to faith was manifested in its theologically reductionist tenets, which it maintained were derivable independent of any particular historical revelation. These included, as summarized by Ian Barbour, "the existence of a Supreme Being, the immortality of the soul, and the obligation to moral conduct" (21). While a large part of deism's appeal was due to its "scientific" character, this same claim to scientific validity also created liabilities as the eighteenth century wore on. Deism was particularly vulnerable within the context of ongoing scientific discovery, in that its hands-off, self-

[15] "Natural religion," as it is defined in this study, refers to any evidentiary approach to faith.

sufficient model of the universe required a "static, controlled, finished creation" (Miller 197). But by the close of the eighteenth century, such a view was becoming less and less tenable, and in the nineteenth century, it would be overthrown completely. Once the inevitability of change in natural systems was accepted, a troubling question arose—namely, *who or what was actively directing this change and keeping it orderly?* In time, the system's own self-ordering, non-teleological drift would be identified and accepted, but for a time this open question provided a strong arguing point for a competing faction of natural religionists: the adherents of empirical theism.[16]

As an alternative to deism, empirical theism had its own philosophical problems with which to contend. Dedicated to the notion of discerning the hand of a traditionally conceived creator[17] by a close study of his works, these researchers applied themselves to a painstaking analysis of the "perfection" of the natural world. However, by the 1790s, this close scrutiny began to raise unsettling questions, particularly in regard to the extinction of scores of divinely crafted and adapted species, as well as some glaring examples of less than optimal design in others. It could be said that empirical theism, just like the Higher Criticism of the Victorian age, highlighted the problem with belief by exhaustive study—namely, that inconsistencies and contradictions invisible to the casual observer can in time become overwhelming when one focuses exclusively on the holy "text"—in this case, nature.

While deism was the more widespread religious response to the Enlightenment

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[16] Hume, not surprisingly, was skeptical of both approaches, lumping the deists and empirical theists together under the general heading of "empirical theologians."

[17] In this respect, empirical theists demonstrated a much higher tolerance for revealed religion, which further served to differentiate them from the deists.

scientific enterprise, empirical theism stands as perhaps the more interesting from the perspective of this study, particularly in regard to the elements it shares with what would come to take shape as the Romantic scientific paradigm, raising the question of whether empirical theism might be considered the direct lineal antecedent of Romantic science. In that empirical theism, like deism, was locked into the view of a static, steady-state universe of finite time and space—*no*, it was not, largely because it did not and could not entertain the possibility of change on an evolutionary scale. It pondered the imperfections and inconsistencies of creation, but it did not pursue alternative explanations. However, in its belief in an active and immanent creator, its embrace of the unpredictability of life (which opened the door to the organic metaphor), and in its skepticism toward the sufficiency of secondary causes (natural laws) in governing nature, empirical theism does demonstrate interesting parallels with Romantic science and in all likelihood did contribute conceptually to the new paradigm.

The Methodology Issue and Its Political Analogy

In *The Structure of Scientific Revolutions*, Thomas Kuhn proposes that various groundbreaking scientific innovations in the past have

> served for a time implicitly to define the legitimate problems and methods of a research field for succeeding generations of practitioners. They were able to do so because they shared two essential characteristics. Their achievement was sufficiently unprecedented to attract an enduring group of adherents away from competing modes of scientific activity.

> Simultaneously, [they were] sufficiently open-ended to leave all sorts of problems for the redefined group of practitioners to resolve. (10)

This passage, from the second chapter of the text, advances Kuhn's definition of a "paradigm" within science. Evaluated against these criteria, one can say with confidence that mechanism, as an element of the larger edifice of Enlightenment science, served precisely this role during the seventeenth and eighteenth centuries. Later in his study, Kuhn advances his definition of what constitutes a "scientific revolution," describing them as "those non-cumulative developmental episodes in which an older paradigm is replaced in whole or in part by an incompatible new one" (92).[18] Kuhn's qualifier—*"or in part"*—is important, in that it explains why the landscape is not always completely transformed after a shift in paradigm and why there may be lingering vestiges of the previous regime.[19] But this scrupulous qualification can also be misleading. Mainstream Romantic science, as defined by this study, is not simply Enlightenment science redressed with a few organic touches. The two paradigms are incompatible views, the discrimination of which is complicated by both their temporal concurrence at the turn of the nineteenth century and by their sharing of the protocols of "the scientific method," that networked system of approaches which arose concurrent with—but were not peculiar to—mechanist science, and which includes induction, empiricism, and experimentation. To clarify a fine point regarding Kuhn's non-cumulative definition of scientific

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[18] In *The Structure of Scientific Revolutions*, Kuhn addresses the paradigm-shaking contributions of four scientific practitioners central to this study's discussion: Hutton (15), Herschel (115-16), Dalton (130-35), and Laplace (32).

[19] One reason for this is that these vestiges may still have useful day-to-day applications as close approximations. Newtonian physics, for example, though completely inadequate for a number of purposes, is still regarded as accurate enough for use in architecture and engineering.

revolutions, we are speaking here of the overthrow of reigning paradigms, not their operational infrastructures. There is a difference, I would argue, between a paradigm's ideology and its methodology. Thus, the methods that Romantic science inherited (and not all of its offshoots embraced) should not be viewed as inextricably wedded to the mechanist paradigm that they, for a time, faithfully served and supported. I insert the qualifier "for a time" because, as history shows, it was these same methods that would eventually reveal mechanism's inadequacies.

Scientific Romanticism

To review, the new science that emerged around the turn of the nineteenth century differed from its Enlightenment predecessor first and foremost in regard to its organizing central metaphor. In "any Romantic natural science," David M. Knight writes, practitioners reject "mechanical metaphors in favour of organic ones" ("Romanticism" 14).[20] Indeed, as Levere notes, "'mechanical' became the great polemical adjective of the romantic movement in its contemplation of nature" (*Poetry Realized* 63). The change in thinking that led to the ouster of the old mechanistic regime ushered in a new sense of freedom and expanded possibilities within the sciences. Evidence of this new latitude is

[20] There exists an ongoing debate about what meaning the term "organic" conveyed at the turn of the nineteenth century. Alan Richardson, in *British Romanticism and the Science of the Mind*, is almost assuredly correct in his assertion that organic at the time carried the meaning of "embodied" (5) or "realized in bodily organs" (71)—in short, corporeal. It is an important historical distinction, but one outside the objectives of this study. This study argues only that the character of the emerging science of the time adheres to our present definitions of the term, not the Romantics' use of it. For the record, Richardson himself employs the usual reading of the term (as a contrasting modifier to mechanistic) when he writes, "If Romanticism involves promoting feeling and emotion at the expense of 'mere' reason, [and] preferring organic to mechanistic theories of nature (including human nature) . . . then the innovative brain science of the late eighteenth and early nineteenth centuries can usefully be thought of as Romantic" (Richardson 34-35).

immediately apparent in regard to approaches to research. Within the paradigm of Romantic science, the individual investigator's objective distance from nature was seen to be a fiction. Humankind was no longer isolated from nature, able only to grasp its mechanical functioning by mathematical equations (to use the Romantic poets' favored caricature); it was now in intimate, subjective communication with nature through use of the senses, reason, imagination, and intuition, and thus privy to inside information. Within the "context of discovery," the phase in which scientific theories are born, all of the above faculties now came into play. Within the "context of justification," meanwhile, the phase in which these theories are actually tested, differences quickly became apparent between the two principal variations of Romantic science identified within this study—namely, mainstream Romantic science and the German *Naturphilosophie*.[21]

There is precedent, I would note, for drawing such distinctions within the broader entity of Romantic science. Even though he advances a differing set of defining characteristics, Robert J. Richards writes,

> The kind of scientific perspective that emerged in Germany[22] usually bears variously the names *Naturphilosophie* and "Romantic science." I distinguished the different sets of ideas traveling under these designations. *Naturphilosophie* specifically focused on the organic core of nature, its

[21] "[I]n the idiosyncratic process of inventing scientific theories, all methods are in principle admissible—deduction, induction, analogy, intuition and even hallucination—and the only real criterion is pragmatic. On the other hand, the justification of theories must be rational" (Sokal 81). This spill-over of methodology from the context of discovery to the context of justification would eventually emerge as one of the primary factors leading to the demise of *Naturphilosophie*. (Note: Despite Sokal's status as *persona non grata* in the circles of literary criticism following his infamous 1996 hoax involving the journal *Social Text*, his views on the workings of science as a discipline, I would hope, may be considered apart from his views on literary critics' (mis)use of that discipline.)

[22] In this passage, Richards is addressing the period 1770 to 1830, spanning the intellectual communities of Jena, Weimar, Berlin, and Halle.

> archetypal structure, and its relationship to mind. . . . Friedrich Schlegel, who coined the term *romantisch*, used it [(i.e., "Romantic")] to indicate a specific kind of poetic and morally valued literature. I have used it to distinguish a type of science that retains this aesthetic and moral heritage. (516)[23]

Andrew Cunningham and Nicholas Jardine, editors of the anthology *Romanticism and the Sciences*, similarly acknowledge that *Naturphilosophie* and "Romantic science" are not synonymous, defining the latter classification as a general heading that includes a wide range of disciplines, among them:

> *Naturphilosophie*, cosmology and cosmogony; developmental history of the earth and its creatures; the new science of biology; investigations of mental states, conscious and unconscious, normal and abnormal; experimental disciplines concerned to unveil the hidden forces of nature—electricity, magnetism, galvanism and other life-forces; disciplines concerned to read essences, inner natures and ideal types from outward and visible appearances, signs and symptoms—physiognomy, phrenology, meteorology, mineralogy, 'philosophical' anatomy, etc. (6)[24]

It was, in other words, a broad rubric, covering some of the most popular (if ephemeral) "sciences" of the day.

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[23] Curiously enough, Richards makes *Naturphilosophie* the more inclusive entity of the two: "Thus, as I have used the terms, all Romantic thinkers were *Naturphilosophen*, though not all *Naturphilosophen* were Romantics" (516).

[24] The period that Cunningham and Jardine are addressing in this passage is "[a]round 1800" and spans the cultures of continental Europe and Britain (1).

The German Experiment

For all its charisma, *Naturphilosophie* is the evolutionary dead-end of the Romantic science family tree. And within its rise and fall are lessons for any interpretive strategy that would attempt to understand a mysterious cosmos. While it did re-invigorate the scientific enterprise, especially in the regard to the approaches allowed during the process of theory formation, *Naturphilosophie* at the same time demanded huge accommodations from the discipline it sought to revitalize. Describing the repercussions of the arrival of German Romantic science to other areas of Europe, Sten Lindroth observes that "the new intellectual climate . . . was not in itself inimical to natural science . . . but it had to be pursued in accordance with certain rules of play. . . . Rational conclusions and exact calculations authorized no conclusions about physical reality" (14).[25] Indeed, as a species of natural philosophy anticipated by Georg Wilhelm Friedrich Hegel (1770-1831)[26] but principally articulated by F. W. J. Schelling (1775-1854),[27] *Naturphilosophie* proceeded with "gross simplifications and an uninhibited use

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[25] In his biography of chemist Jöns Jacob Berzelius (1779-1848), Lindroth gives a compelling account of the scene in the 1810s when Romanticism swept into Berzelius' native Sweden and of the chemist's indecision regarding a proper institutional response: "This mysterious and beautiful gospel took hold of the young like a revelation. . . . As long as it was confined to poetry and the fine arts, there was surely no reason for a chemist to intervene. But Romanticism had totalitarian pretensions, it came with a new way of experiencing and interpreting the world, and it sought to transform even the natural sciences" (13).

[26] Hegel's role in the establishment of German Romantic science remains a topic of lively debate. As Knight points out, Hegel "exalted the understanding at the expense of the intuition; he favoured speculation, within limits. . . . [Still,] in Germany the reaction of [empirical] scientists . . . against *Naturphilosophie* must have produced a climate unfavourable to the systematic, speculative and dynamical science of Hegel. . . . [A]lthough Hegel is remarkably hard-headed, and critical of the 'unbridled imagination and thoughtless reflection' to be found in *Naturphilosophie*, his science is, superficially at any rate, not very different" ("Physical Sciences" 66-67).

[27] Schelling's works on the subject include: *Ideen zu einer Philosophie der Nature* (1797) (Ideas for a philosophy of nature), *Von der Weltseele, eine Hypothese der hoheren Physik zur Erklarung des allgemeinen Organismus* (1798) (On the world soul, a hypothesis of the higher physics for the clarification of universal organicity), and *Erster Entwurf eines Systems der Naturphilosophie* (1799) (First sketch of a system of nature philosophy). All title translations by Robert J. Richards in *Romantic Conception*, p. 127.

of symbols, analogies, and images" (Lindroth 13-14). However, *Naturphilosophie*'s prescription for what it saw as the stagnant methodologies of Enlightenment science proved to be a huge over-correction, lending support to what has been identified by some analysts as one of the hallmark weaknesses of Romanticism—namely, its attempt "to escape the dilemmas of [Enlightenment] mechanical philosophy by replacing all its basic assumptions by the exact opposites" (Eichner 14).

Modes of instruction within the sciences at German universities in the late eighteenth century certainly provided fertile ground for the rise of *Naturphilosophie*: most learning at the time was book-centered, with virtually no laboratory or experimental protocols required. Such a climate, particularly in Jena before 1800, was conducive to deduction based upon hazy premises, which contrasted with the more rigorous inductive and empirical model that the British had embraced since Newton.[28] But it was also within the German academy that the backlash toward *Naturphilosophie* was most pointed, coming principally from luminaries influenced by that self-same British empirical tradition. As Cunningham and Jardine note, "In the course of the nineteenth century strong opposition arose to the new Romantic approaches in the sciences exemplified by Goethe's color theory[29] and the Nature Philosophy (*Naturphilosophie*) of Schelling and his followers" (xix). What followed was a particularly contentious

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[28] As for the response it garnered in other parts of Europe: "The French," Levere notes, "were in general quite as hostile to *Naturphilosophie* as the English were, and they were skeptical of discoveries inspired by German philosophy" (69).

[29] In the view of this study, Goethe's color theory is a particularly fascinating expression of scientific Romanticism, neither quite mainstream Romantic science nor *Naturphilosophie*. Goethe held that color was created at the boundaries of light and darkness, that colors were, in fact, a mixture of light and darkness—an interaction mirroring that within the human soul. Despite his exhaustive empirical and experimental verification, Goethe got it wrong, misled in part by the essential polar dynamism of Romantic science but more crucially by his own spiritual metaphor.

intellectual debate, with the rhetoric both in support of and against *Naturphilosophie* becoming quite heated. John Reddick notes that the "polemical intensity of the battle can be readily gauged from the scathing . . . tone of [chemist] Justus von Liebig." Liebig, Reddick writes,

> attacked the *Naturphilosophen* and their doings as "the pestilence, the Black Death, of the nineteenth century."[30] Much later, Liebig pronounced on *Naturphilosophie* in more moderate, but more devastating terms: "We look back on German *Naturphilosophie* as though on a dead tree that bore the most beautiful foliage and the most magnificent flowers—but no fruit." (335)

In addition to attacks from without by hardline scientific empiricists, there were—as alluded to earlier—a number of internal causes for *Naturphilosophie*'s speedy demise. Some of its elements, as Cunningham and Jardine observe, were "so solipsistic as to rule out communal enterprise," others were "too speculative to allow attainment of consensus," and others were simply "too esoteric to form disciplines" in the first place (7). But a thorough post-failure analysis of *Naturphilosophie*, Reddick notes, reveals an even more fundamental and systemic failing:

> At its zaniest, *Naturphilosophie* [veered] towards a ludicrously absolute and unproductive extreme. [But even] in its normal, median condition as a classical mode of scientific inquiry enshrined in all the universities of the land, its subordination of experiment to *a priori* ideology ensured that it

[30] "Walpurgis-nightmare" was another of the epithets Liebig and his colleagues directed at *Naturphilosophie*.

could not survive against professional skepticism, the questioning subjection of hypotheses to experimental testing. (335-36)

It was precisely this *a priori* orientation, along with its reliance on intuition and speculation as tools in the verification of theories, that served to separate *Naturphilosophie* from its more mainstream counterpart. The same could be said of its strong resistance to analysis. In terms of its practice, Reddick concludes, *Naturphilosophie* was almost invariably "deductive and integrative, never inductive and atomistic: whereas the Baconian always starts with the part (and in the view of the *Naturphilosophen* can never get beyond it), they begin with the whole—which indeed they believe to be always immanent in every last particle" (334).

For the reasons cited above, the true importance of *Naturphilosophie* does not lie so much in the legitimate scientific contributions made by its practitioners—though multiple examples exist[31]—but rather in how it boldly "extended the realm of the thinkable" (Reddick 336)—its willingness to pursue unconventional avenues, particularly at points of impasse. But despite this considerable contribution, the most important and enduring innovations within Romantic science, without argument, came from other practitioners who explored the new paradigm with the established methods inherited from Enlightenment science—in other words, within the context of Romantic science as a

[31] As Eichner notes, "There were researchers in the Romantic tradition who did make important discoveries. . . . J. W. Ritter, one of the great pioneers of electrochemistry and the first experimenter to succeed in separately collecting the hydrogen and oxygen produced by electrolysis, owed his discovery of ultraviolet light directly to Schelling's supposed 'law of polarity,' from which he concluded, after hearing of Herschel's discovery of infrared light, that there must be a similar phenomenon at the other end of the spectrum. Similarly, H. C. Oersted succeeded in demonstrating the connection between electricity and magnetism, after many years of experimentation, because he was convinced by Schellingian speculations that such a connection must exist" (23-24).

mainstream practice.

The Missed Opportunities of *Naturphilosophie*

Given its ahistorical orientation, an orientation rooted within its acceptance of an unchanging mechanistic universe,[32] Enlightenment science concerned itself primarily with observable phenomena, leaving the issue of origins to theology and metaphysics. Practitioners of Romantic science found this approach limiting. Inspired by the organic metaphor, and applying it broadly, they avidly pursued the ancient origin and subsequent development of systems both animate and inanimate. *Naturphilosophie* took the lead in this endeavor. Indeed, as a subspecies of Romantic science, it was in large part defined by its quest for the Ur-phenomenon. Some analysts might argue that this belief in "the idea of a single, progressive developmental tendency in nature culminating in human complexity" could be construed as decidedly anti-Romantic in its reductionist character (Jahn 82), but adherents of *Naturphilosophie* would have flatly rejected this charge, seeing such change instead as a transcendental and decidedly spiritual approach to the question of life's origins. If spiritual, *Naturphilosophie*'s take on original forms was also classically philosophical. As Knight observes, "To see the Ur-plant in the rose or the daisy is akin to seeing the 'form' of something in Plato's . . . philosophy" ("Romanticism" 16). But having stumbled upon their one great, enduring discovery, the concept that would make all of science a unified endeavor—namely, evolution—the

[32] This widely held belief in an unchanging universe is another example of Leibniz's influence, for if this were the "best of all possible worlds," as Leibniz famously argued, then any change would be for the worse, which a benevolent God would disallow.

Naturphilosophen let this innovation languish, apparently more interested in the philosophy than in the science. They were, as Knight concludes, "not in the business of genealogy, [or] constructing family trees, but [in] searching for natural kinds" ("Romanticism"16).

Despite this emphasis, Schelling did break with Platonic tradition in a useful way with his evolutionary premise of *werden*.[33] As Hans Eichner explains,

> Western thinkers had taken for granted that whatever is 'lower' or further from perfection must have been created by, or emanated from, something 'higher' or more nearly perfect. . . . According to the new vision, the reverse is true: the 'higher' developed from the 'lower,' the more perfect from the less; the world was not created once and for all by a perfect supreme being but has grown or developed—and [is] growing, 'becoming.' (15)

The *Naturphilosophen*, however, encountered problems in developing a working model of biological evolution because of their strong conceptual resistance to the process's actual mechanism[34]—namely, heredity. Zenker[35] advocated the development of organisms "from primitive forms to increasingly perfect ones"; however, he did not believe that the transformation of a species could be accomplished by means of descent, but rather, as Ilse Jahn notes, "by means of new generation [i.e., spontaneous mutation]

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[33] Literally, "becoming."
[34] I use the term "mechanism" cautiously here. Given the organic context of life's processes, the term's figurative quality is, I hope, quite evident. But, admittedly, its prevalence as a linguistic convention can create problems in discussions of this kind, as the next section of this chapter will make clear.
[35] Carl Jonathan Zenker (1799-1837), botanist, eventual chair of Natural History at Jena.

or by hybridization" (84-85). Voigt,[36] meanwhile, "used the *Hemmungstheorie*[37] of Schelling and with it argued that all species must have originated before they acquired *sex*, because it is impossible to build new species through sexual reproduction" (Jahn 86)—the thinking being that breeding tends to water down new, non-normative characteristics. In a world without selection pressures, this would be true.

The grounds for this strong resistance to hereditary change circles back to these practitioners' philosophical orientation: "Since all of the best-known representatives of *Naturphilosophie* . . . were essentialists," Mayr writes, "they were quite unable to develop a theory of common descent" (387). All plants from an Ur-plant, yes, but that Ur-plant existed in the beginning, with no antecedents and no common ancestry with other original forms. It is unfortunate but somehow fitting that *Naturphilosophie* was unable to capitalize on its greatest conceptual breakthrough due to innate flaws in its makeup, both philosophical and methodological—fitting in that it maintains this variant's reputation as the fascinating, if fated, prodigal of Romantic science.

The Case for Evolution as a Romantic Science

Theories of evolution, particularly biological evolution, constitute the defining contribution of the Romantic scientific paradigm in general. Even though the schemes of organic development allowed by the new paradigm would not reach their culmination in the life sciences for over half a century, with the 1859 publication of *The Origin of*

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[36] Friedrich Siegmund Voigt (1781-1850), botanist, appointed Director of the Ducal Botanical Gardens (Jena) in 1807.

[37] Translated as "inhibition theory"—and frequently associated with Oken rather than Schelling—this is *Naturphilosophie*'s version of "ontogeny recapitulates phylogeny." Lorenz Oken (1779-1851), German naturalist, appointed Professor of Medical Sciences at Jena in 1807.

Species, the Romantic ancestry of Charles Darwin's theory is still clear to many analysts. In some quarters, however, the view persists that evolution as envisioned by Darwin represents an altogether anti-Romantic conception of the natural world and its processes—with speciation and adaptation as merely mechanical processes driven by the "secondary cause" of natural selection.[38] In *The Romantic Conception of Life*, Robert J. Richards rebuts this argument in depth. Richards reviews the charge as it is usually articulated by skeptics:

> It might be thought that the influence of . . . Romanticism on Darwin was only of slight significance, that his fundamental conception of nature, at least as presented in the *Origin of Species* and the *Descent of Man*, had stripped off metaphysical assumption and aesthetic decoration, so that only the cold machinery of the living world might lie exposed. . . . I do not think this conception of Darwin's accomplishment to be sound. (526)

Richards goes on to claim that "a fair examination of his principal evolutionary tracts" reveals "the deep penetration into Darwin's thought of a . . . Romantic view of nature" (526). This Romantic view of nature is most prominently demonstrated, he argues, in Darwin's views regarding "the archetypal unity displayed by nature" and in nature's fundamentally "organic and non-machine-like aspect" (526).[39]

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[38] "Secondary causes," once again, being synonymous with natural laws; the primary cause, of course, being the creator who instituted those laws.

[39] For this section of the discussion, I would like to advance a deeper analysis of the distinctions between the traditionally opposed concepts of "organic" and "mechanical," with detailed definitions of each concept (adapted from the *OED*). "Organic," for the purposes of this discussion, refers to an entity having the characteristics of a living organism; it is intimately integrated into its environment and possesses an organization characterized by the connection and coordination of its parts into a single, harmonious whole manifesting continuous and natural development. A "mechanical" entity, on the other hand, while also

Archetype theory, which advanced the notion of natural types, had its origins in the works of several leading figures in early nineteenth-century German biology—among them, Lorenz Oken. Richards resumes his account at this point, noting that

> [w]hen archetype theory migrated from Germany to Britain . . . it underwent a reductive process. Goethe thought of the archetype as containing all its potential variations—hence visible only to the mind's eye. . . . Darwin [meanwhile] suggested that the generalized archetype of [organisms] did not lie hidden away as an idea in the mind of God; rather, it was [in] the form of a creature that walked the earth many generations ago. (532)[40]

In advancing the argument for evolution's organic character, Richards asserts that the fairly widespread conception of evolution as a mechanical process is primarily the fault of linguistic convention: "No phrase," he states, "comes so trippingly to the lips of contemporary biologists as 'the *mechanism* of natural selection.' Almost reflexively, we think of natural selection, paradoxically, in nonorganic terms" (533). Still, Richards maintains, "Darwin never referred to or conceived natural selection as operating in mechanical fashion" (534). He did, however, come close on one occasion. In Chapter IV of the *Origin*, comparing the operations of artificial versus natural selection, Darwin writes,

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manifesting organization, may be viewed as not so much a whole as an assemblage of discrete parts of independent origin functioning together; it is, as a rule, an entity incapable of development or adaptation, and one whose behavior conforms strictly to mathematical models.

[40] In that it resided in the organisms themselves, Darwin's conception of the archetype represented more of an Aristotelian view than the Platonic one advanced by *Naturphilosophie*.

> As man can produce and certainly has produced a great result by his methodical and unconscious means of selection, what may not nature effect? . . . She can act on every internal organ, on every shade of constitutional difference, on *the whole machinery of life*. Man selects only for his own good; Nature only for that of the being which she tends. . . . It may be said that natural selection is daily and hourly scrutinizing, throughout the world, every variation, even the slightest; rejecting that which is bad, preserving and adding up all that is good; silently and insensibly working, whenever and wherever opportunity offers, at the improvement of each organic being in relation to its organic and inorganic conditions of life. (83-84; emphasis added)

The phrase "machinery of life" in this excerpt, Richards points out, "is the only instance of any form of that word appearing in the *Origin*," adding that "[t]he context makes clear it has no semantically significant role in [Darwin's] description" (534). I would say that Richards is correct in this assessment. The striking aspect of this excerpt is not that Darwin employs a mechanical metaphor but rather the overwhelmingly organic, even sentient character he attributes to natural selection, the process itself arising out of the active agency of nature which Darwin repeatedly personifies as "she."[41] Given this characterization in the *Origin*, it seems somewhat unlikely that Darwin would have

[41] This sense of active, involved agency driving the process has, of course, since been refuted by the scientific community, but it is a salient aspect of Darwin's original thesis and evidence of its Romantically influenced, anti-mechanist character.

conceived of nature and its processes as "clanking along in the manner of a nineteenth-century steam engine" (Richards 539).

The Antecedent of Modern Science

Science changed in the midst of the Romantic poetic response to Enlightenment science. This change, generally characterized in this study as the rise of scientific Romanticism, emerged as an unavoidable new element of the cultural landscape at the turn of the nineteenth century. It was also a persistent change, in that the view of the natural world inaugurated by this shift in scientific paradigms endures to this day. In *Romantic Dynamics: The Poetics of Physicality*, author Mark Lussier—while declining to acknowledge the differences between Enlightenment and Romantic science, seeing it all of a cloth against which Romantic poets rebelled—at least seems to concur with the assertion of this study that what emerged during this period is, within certain key disciplines, recognizable as modern science:

> [B]y the close of the eighteenth century, the established cosmological model against which Romantic poetry rebels had begun to assume *a relatively modern guise*; the cosmos had expanded into multigalactic dimensions; the solar system had itself undergone spatial inflation; and the dominion of gravity extended to light itself. (21; emphasis added)[42]

I find this co-identification of Romantic and modern science to be a compelling idea, but admittedly it is not yet a widely held one. Hans Eichner, for example, in "The Rise of

[42] I would note that the central poetic figures of the title chapter of Lussier's study (from which the above excerpt is drawn) are Blake and Wordsworth.

Modern Science and the Genesis of Romanticism," offers his views (advanced within a Kuhnian perspective) on what he perceives to be the vastly differing outcomes that Romanticism experienced in the humanities and in the sciences:

> I would have to say . . . that when turning against Newtonian science, the Romantics adopted a new paradigm or research tradition. . . This new tradition brought about substantial progress in the humanities and . . . in such 'human' studies as psychology. In the hard sciences, however, the Romantic tradition turned out to be a dead end, while the tradition the Romantics rejected continued to flourish. (23)[43]

I would respectfully disagree with Eichner on this last point: The scientific tradition the Romantics rejected—namely, mechanism—did not continue to flourish; what did continue were the baseline scientific *methods* embraced by Enlightenment science, methods which originated under—but, again, were not contingent upon—that eclipsed paradigm.[44] As I noted earlier, in an environment in which Romanticism is so closely associated with non-scientific ends, such connections are almost inevitably de-emphasized. This situation is fueled by the refusal on the part of many analysts to open up the Romantic scientific paradigm beyond the boundaries of *Naturphilosophie*—the apparent reason being that if its most extreme examples are taken to be representative of

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[43] Eichner, like many critics, identifies Romantic science with the extreme of *Naturphilosophie*, viewing Romanticism in general as "a desperate rearguard action against the spirit and the implications of modern science"—identified by Eichner with its Enlightenment expression—"a rearguard action that . . . liberated the arts . . . but that was bound to fail in the proper domain of science" (8).

[44] I will grant that this is a large claim, but the point being argued is not without precedent. To support it, I would once again draw upon the argued parallels between political and scientific institutions. Within science, practices and paradigms are separable, just as institutions and ideologies are separable within the political sphere. The two elements can and often do support one another, but they are also modular. A democratic and a totalitarian state will, for example, both have departments of state, education, and defense that function almost identically.

the paradigm as a whole, then the insights of Romantic science can be fairly effortlessly dismissed. Despite this, I would decline to characterize the present received account of Romanticism and its relations with science as a consciously constructed "revisionist history"; I would instead characterize it as simply a misunderstanding of the transforming changes that occurred within the scientific discipline at the turn of the nineteenth century. Other analysts have not been as generous in their assessment; among them, Cunningham and Jardine, who conclude,

> [J]ust as the Romantics wrote histories which portrayed the natural history and natural philosophy of their predecessors as limited and outmoded, so in turn the new breed of professional natural scientists of the 1840s, 1850s and 1860s used history to promote their own ideology and to discredit Romanticism in the sciences. We may well suspect that both the stereotype of the Romantic sciences as speculative, fantastic, mystical and ill-disciplined, and their alleged defeat by the empirical natural sciences, are polemical constructs rather than the fruits of unbiased historical research. (7-8)[45]

This chapter has focused on the interpretive strategy of science and the ways in which it has interacted historically with other interpretive strategies. In the context of this discussion, I have argued that during the course of the eighteenth century this interpretive strategy at some point split into two distinct and competing paradigms, each

[45] Cunningham and Jardine, while they also largely identify Romantic science with non-mainstream expressions such as *Naturphilosophie*, do agree that a "new natural science" emerged in the early nineteenth century and that it differed from its Enlightenment predecessor. Further, they observe that this new variant, identified as the antecedent of contemporary science, "owed much to Romanticism and *Naturphilosophie*" (8).

with differing risks and rewards for culture. Before closing this chapter, I would like to acknowledge that within any distinctions I have drawn here, there are finer distinctions still in the form of opposing sub-factions—for example, deists and empirical theists within the ranks of natural religionists, interventionists and non-interventionists within the ranks of mechanists, and so on. It was a remarkably rich and complex age, in which a multitude of belief systems—theological, scientific, political, and philosophical—were all competing head to head for allegiance. This was the context in which Blake and Wordsworth lived and wrote. If we take Romantic poetry by its own definitions—and even if we do not—it had a clear stake in these ongoing cultural contests, which included not only its own high-profile conflict with science, but also the divisions emerging between what would become distinct species of scientific theory and practice.

Chapter Three

Blake

Material Opposition

The observation that William Blake's vision of the universe stands in defiant opposition to the one advanced by Enlightenment science comes as no surprise to contemporary students of literature and science studies. As S. Foster Damon long ago described it, Blake's universe is one of "immediate sensuous and imaginative perception, not of geometric logic; [it is] psychological, not material" (417). The Enlightenment model of the universe, meanwhile, established in large part by Isaac Newton, was rationally explanatory, internally consistent, and in most aspects machine-like. Because this model required no supernatural explanations for physical phenomena, it appealed to newly prevailing trends in Western thought. To Blake, however, it was an untenable scheme, palatable only to those content to dwell in a state of "Single vision."[1] At the same time, Blake was sensitive to the genius behind Newton's plan and the persuasive

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1 Now I a fourfold vision see
And a fourfold vision is given to me
Tis fourfold in my supreme delight
And three fold in soft Beulahs night
And twofold Always. May God us keep
From Single vision & Newtons sleep.
(Letter to Thomas Butts, 22 November 1802; E722)

I include Damon's still serviceable definitions: "Single vision . . . is seeing with the physical eye only the facts before it. . . . Twofold vision is seeing 'through' the eye, the perception of the human values in all things. . . . Threefold vision . . . is the creative state, where thought appears in emotional form. Fourfold vision is mystical ecstasy" (436-37). "Newton's sleep" Blake defines as an unquestioning belief in the material universe and reliance upon the physical senses in apprehending it.

force it possessed as a result; he therefore dedicated himself to attacking what he viewed as its central errors—its materialist and mechanist orientation.[2]

As the principal architects of the ascendant materialist worldview, Newton along with Bacon and Locke constituted for Blake an infernal trinity, their life's work dedicated to advancing an agenda antithetical to the poet's own program of imagination and vision. Bacon, as the leader of this trinity, earned Blake's condemnation for his founding role in establishing experimental science, which Blake viewed as a strategy for intellectual stagnation, one requiring a poetic response:

> If it were not for the Poetic or Prophetic
> character. the Philosophic & Experimental would soon be at the
> ratio of all things & stand still, unable to do other than repeat
> the same dull round over again. . . .
> He who sees the Infinite in all things sees
> God. He who sees the Ratio[3] only sees himself only.
> (*There Is No Natural Religion* [b]; E3)[4]

Locke's philosophy of the five senses is one example of such a ratio. In his annotations to a copy of *The Works of Sir Joshua Reynolds*,[5] Blake writes of having read (and having

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[2] "Materialism" is defined for this study as being the theory that all experience and phenomena are the result of manifestations of physical matter, and that these manifestations constitute reality. Within his works, Blake certainly devotes more criticism toward the material than the mechanical aspects of the Enlightenment worldview. This may not indicate any distinction in Blake's thinking; he may simply have felt that criticism of mechanism was superfluous, in that notions of mechanism presuppose a materialist metaphysics.

[3] Calculating, sense-limited reason and its intellectual products.

[4] All Blake citations referenced in this study are drawn from David V. Erdman's *The Complete Poetry and Prose of William Blake*. For excerpts having no identifying line numbers, the specific page number in Erdman's text has been included.

[5] Edmond Malone, ed. London, 1798.

similarly annotated) Locke and Bacon in his youth, documenting his reaction at the time and his continuing resistance:

> I read Locke on Human Understanding & Bacons Advancement of Learning[6] on Every one of these Books I wrote my Opinions. . . . I felt the Same Contempt & Abhorrence then; that I do now. They mock Inspiration & Vision . . . my Eternal Dwelling place. how can I then hear it Contemnd without returning Scorn for Scorn[?] (244; E660-61)

Despite this resistance, the Enlightenment view of nature, the earth, and the larger cosmos was one that Blake, and similarly Wordsworth, was apparently unable to part with completely, even once a viable alternative appeared. To a certain extent, it may be that these Romantic poets were simply accustomed to the established view, a product of their education and religious indoctrination. But beyond that, I would argue the retention of the principles of Enlightenment natural philosophy proved necessary to provide the framework and all-important foil for their own opposing philosophical positions. Blake's view of the physical universe, after all, was one underwritten by the concept of *material limits*—both spatial and temporal—a view which the finite, ordered, and stable universe of Enlightenment cosmology had endorsed for over a century, but which the new scientific aesthetic of the late eighteenth century had begun to question. In Blake's visionary model, space is defined as a concept characteristic of—and limited to—the material universe. The same holds true for time. Both are consequences of the "fall,"[7]

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[6] Locke's *Essay concerning Human Understanding* (1690) articulates the philosopher's opposition to the notion of "innate ideas" and advances the claim that all knowledge comes from experience. *The Advancement of Learning* (1605) outlines Bacon's systematic division of knowledge.

[7] Equated by Blake with the materialist concept of the creation.

with infinity and eternity as their corresponding divine forms. But these fallen forms exist for a reason.

Blake's views on the function of "created" space and time are elaborated in a series of episodes wherein the mythic figure of Urizen becomes associated with the Satan of Milton's *Paradise Lost*,[8] episodes spread over a number of the prophetic books. In Chapter III of *The Book of Urizen*, the title figure is cast out of eternity[9] for his errors—chiefly, his separatist tendencies.

> Los round the dark globe of Urizen,
> Kept watch for Eternals to confine,
> The obscure separation alone;
> For Eternity stood wide apart,
> As the stars are apart from the earth. (5.38-6.1)

At this point, a policy of containment begins. Undertaken by Los—embodiment of the poetic imagination—it takes the form of a material creation separated from eternity, a process enabled by the fact that Los—in concert with his emanation, Enitharmon—wields control over the domains of time and space:

> He could controll the times & seasons, & the days & years
> She could controll the spaces, regions. (*The Four Zoas* 1.9.27-28)[10]

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[8] A more detailed analysis of the parallels between Urizen and Satan will be featured in a later section of this chapter dealing with materialist religion.

[9] Blake, as a rule, usually subsumes the spatial concept of infinity and the temporal concept of eternity under the collective heading of "Eternity."

[10] This identification of domains is confirmed in Blake's *Milton*: "Los is by mortals nam'd Time[.] Enitharmon is nam'd Space" (24.68).

In Night 8 of *The Four Zoas*, Los, addressing Rahab, embodiment of the most fallen form of nature[11] and its materialist offshoot of worship in Natural Religion, describes Enitharmon's "merciful" creation of a protective space for Satan/Urizen, in essence giving Rahab the story of her own origin:

> Enitharmon in tears
> Wept over him Created him a Space closd with a tender moon
> And he rolld down beneath the fires of Orc a Globe immense
> Crusted with snow in a dim void. here by the Arts of Urizen
> He tempted many of the Sons & Daughters of Los to flee
> Away from Me. (*The Four Zoas* 107[115].14-19)

In *Milton*, Blake offers another glimpse of this same episode:

> So Leutha[12] spoke. But when she saw that Enitharmon had
> Created a New Space to protect Satan from punishment;
> She fled to Enitharmons Tent & hid herself. Loud raging
> Thundered the Assembly dark & clouded, and they ratify'd
> The kind decision of Enitharmon & gave a Time to the Space,
> Even Six Thousand years. (13.12-17)

Enitharmon is the creator of protective spaces, but the question becomes: *protective for whom?* These limited spaces are "kind" in that they limit the spread of error embodied by Satan/Urizen to the material earth. The Assembly of Eternals' (and Los's) temporal limits are likewise kind in that they restrict its tenure to only six thousand years. In short,

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[11] Generally identified with the figure of Vala.
[12] Usually interpreted as the human sense of guilt over one's "sins."

time and space were meant to be merciful constructs of limitation, inhibiting the expanse and duration of the materialist error, a precept that the emerging science of the Romantic era was jeopardizing which each new discovery. Romantic science, with its unfolding view of an unfathomably ancient, perhaps ageless cosmos, unbounded in three-dimensional space, threatened to co-opt for materialist science notions of infinity and eternity that had once been the exclusive province of the spiritual realm. It was this radical materialist revisionism that perhaps best explains the apparent alienation from the new science that Blake evidences from time to time. It also perhaps informs the sense of distress Blake vocalizes earlier in *Milton*:

> The nature of a Female Space is this: it shrinks the Organs
>
> Of Life till they become Finite & Itself seems Infinite. (10.6-7)

Given the overt sexual subtext of so much in Blake, we might be tempted to dismiss this passage as simply that, with Blake lamenting some sense of male inadequacy, whether personal or collective. But the feeling of disorientation within infinite spaces that Blake voices here, I would argue, could well be more generalizable.

In Blake, material incarnation bears the traditional neo-Platonic liabilities: the material being seen as that flawed element of spiritual eternity that was cast out and deposited in/as this world. Blake's curious mix of allegiance to, and dissatisfaction with, the materialist view is seen in his stubborn (though stylized) assertion of a model of the limited physical universe—namely, the "Mundane Shell," which he describes in *Milton* as

a vast Concave Earth: an immense
Hardend shadow of all things upon our Vegetated Earth
Enlarg'd into dimension & deform'd into indefinite space,
In Twenty-seven Heavens and all their Hells; with Chaos
And Ancient Night; & Purgatory. (17.21-25)

Note that Blake characterizes the above as occupying "indefinite space," not infinite. The twenty-seven heavens, meanwhile, point toward the twenty-seven constellations of the northern hemisphere sky that Blake accepted; he allots twenty-one to the southern hemisphere.[13] Taken together, they yield "the Mundane Shell, a mighty Incrustation / Of Forty-eight deformed Human Wonders of the Almighty" (Milton 37.53-54).

Matters of Primacy

The cornerstone of Blake's anti-materialist argument, as it is usually advanced, is his rejection of materialism's unquestioned assumptions, starting with the reality of the earth beneath us. "Such are the Spaces called Earth & such its dimension," Blake writes in *Milton*, that it bears "false appearances which appears to the reasoner, / As of a Globe rolling thro Voidness, it is a delusion of Ulro"[14] (29.14-16). But if Blake is correct in his claim that what we apprehend with our physical senses is largely delusional, then why mount such an enormous and ambitious poetic response? The reason seems to be that such views—in the form of the beliefs of others that are imposed upon us—have

[13] Details such as this provide evidence of Blake's acquaintance with astronomical instruments of the period (star maps, etc.), though, as David Erdman has noted, Blake's assessment of the number of constellations is low, even for the time ("Front Matter" 269).
[14] Ulro: The material universe.

consequences, both physical and spiritual. It is just this oppression that Blake addresses in *The Marriage of Heaven and Hell*. Among these oppressive assumptions for Blake was the age's increasing emphasis on material phenomena as a source of truth, borne out by his vehement resistance to any form of "Natural Religion." The probable conclusion that emerges from a considered analysis of Blake's rhetoric questioning the veracity of physical phenomena is that its chief aim was not so much to challenge the *reality* of matter as it was to challenge its *primacy*. For Blake, there was the active concern that if reality were to be deemed primarily a material proposition, then the poetic imagination would be demoted to the status of a secondary phenomenon—simply an abstraction of matter, instead of the other way around.

Blake's central thesis, of course, is quite the opposite—namely, that material reality is a production of our intellectual and imaginative lives.[15] Evidence of the material world's subordination to the imaginative and the spiritual, Blake contends, lies in the fact that the material world serves a spiritual purpose. That purpose, once again, is to contain error. This is where the new scientific paradigm intrudes, for if the material is now realized to be infinite and eternal, then this resident error is not and cannot be contained. Error thus becomes eternal by default because of the new science.

It is a fundamental tenet of Blake's poetic philosophy that infinity and eternity underlie material existence. They are the truth underlying appearances. But the concept

[15] This is, of course, a debate that Blake picked up from Enlightenment philosophers such as Locke, Berkeley, and Hume. Each figure contributed, in his own way, to the eighteenth century's understanding of the "real": Locke arguing that knowledge is acquired only through the five senses and the process of reflection; Berkeley, that nothing exists without perception; and Hume, that there is no knowledge except that which is directly observed.

of a timeless material infinity throws a wrench into these distinctions.[16] Insight into Blake's verdict on material infinity, a notion supported by the observations and theories of the new science, may be gleaned by examining one prominent instance of that very concept at work within his poetry. In *The Marriage of Heaven and Hell*, Blake presents his vision of a bounded material space made limitless—and abomination—namely, the infinite cavern of the "Abyss":

> [D]own the winding cavern we groped
> our tedious way till a void boundless as a nether sky appeard
> beneath us & we held by the roots of trees and hung over this
> immensity; but I said, if you please we will commit ourselves
> to this void and see whether providence is here also.
> . . . . . .
> By degrees we beheld the infinite Abyss, fiery as the smoke
> of a burning city; beneath us at an immense distance was the sun,
> black but shining. (18; E41)

In Blake's vision, the metaphysically mixed construct implied by material infinity combines the worst of both realms, constituting, in short, a material hell—a realm wholly different in character from the creative "hell" of imaginative energy envisioned elsewhere in *The Marriage of Heaven and Hell*.

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[16] Blake, it should be mentioned, *does* open the door to alternate visions of infinity, but only on condition. In his annotations to Swedenborg's *Divine Love and Divine Wisdom*, he writes, "That there is but one Omnipotent . . . I agree but / that there is but one Infinite I do not" (E602). The condition that Blake sets, however, is that these alternate expressions of infinity be likewise creative and spiritual in nature.

Materialist Religion

If true and not simply apocryphal poetic legend, then Blake's famous childhood visions at Peckham Rye and elsewhere, enshrined by early biographer Alexander Gilchrist, had to have had an indelible effect on the young poet-to-be:

> On Peckham Rye (by Dulwich Hill) it is, as he will in after years relate, that while quite a child, of eight or ten perhaps, he had his first "vision." Sauntering along, the boy looks up and sees a tree filled with angels, bright angelic wings bespangling every bough like stars. . . . Another time, one summer morn, he sees the haymakers at work, and amid them angelic figures walking. (I, 7)

Once finding his voice as an adult artist, Blake went on the ideological offensive, mounting a ceaseless campaign in support of the premise that there is another world beneath, behind, and beyond the material world we see. One proof for this claim Blake found within the context of his early demonstration that, even via logic, he could overthrow his opponents' rationalist position: In direct response to Locke's "Philosophy of Five Senses,"[17] he observes in *There is No Natural Religion* (1788), "None could have other than natural or organic thoughts if he had none but organic perceptions" ([a] IV; E2). This campaign against the philosophic positions represented by materialism was a mental war that Blake waged on multiple fronts, engaging not only the sciences but religion as well.[18] For just as surely as materialism had contaminated the science of this

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[17] *The Song of Los* 4.16.

[18] Writing Thomas Butts in January 1803, Blake confesses, "The Thing I have most at Heart! more than life or all that seems to make life comfortable without. Is the Interest of True Religion & Science & whenever any thing appears to affect that Interest . . . It gives me the greatest of torments" (E724).

world, it had, in Blake's opinion, at an even earlier date corrupted its religion. Indeed, in Blake's view, it was materialist religion, separated from its visionary essence, which had laid the groundwork for the eventual triumph of materialist science seen in the seventeenth and eighteenth centuries.

In Blake's anti-materialist theology, all things pre-existed their "creation" in Genesis, the narrative of which simply describes the process of their materialization during the fall.[19] Blake's unorthodox beliefs on this topic were in large part influenced by Gnostic tradition, particularly its view of a flawed creation issuing from a flawed creator—a demi-god (the Demiurge) who, like Urizen, mistakenly believes himself to be God, but who in truth is only an alienated fraction of the original divine essence. The writings of Jakob Boehme (Behmen)[20] were also deeply influential, sensitizing Blake to the possible materialist assumptions of his faith, principally by Boehme's suggestion that the Bible be interpreted symbolically. Such an orientation led Blake in time to reject vast tracts of the scriptures, including the Ten Commandments, which he saw as representing the ultimate embodiment of "One Law."[21] An interesting question here is whether such moral reductionism had its roots in scientific reductionism, or vice versa. Drawing upon the chronology cited earlier in this section, the fact that its moral articulation in *The Marriage of Heaven and Hell* (c. 1790) precedes its scientific articulation in *The Book of Urizen* (1794)[22] is intriguing, but is by no means conclusive. The same may be said

[19] "Error is Created[.] Truth is Eternal" (*A Vision of the Last Judgment* N95; E565).
[20] German theologian and mystic (1575-1624).
[21] The defining statement of Blake's rejection of the reductionist view, found on plate 24 of *The Marriage of Heaven and Hell*: "One Law for the Lion & Ox is Oppression" (E44).
[22] Put forth in Urizen's annunciated ideal of "one weight, one measure / One King, one God, one Law" (4:39-40).

regarding the progression described in *The Song of Los*, wherein the Decalogue and other biblical laws stand implicated in humanity's downward slide to a pervasively materialist culture:

> Thus the terrible race of Los & Enitharmon gave
> Laws & Religions to the sons of Har[23] binding them more
> And more to Earth: closing and restraining:
> Till a Philosophy of Five Senses was complete
> Urizen wept & gave it into the hands of Newton & Locke.
> (4.13-17)

In his published *Diary*, Henry Crabb Robinson (1775-1867) recounts a conversation with Blake wherein the poet asserted that, as it is experienced by human beings as a material entity, "Nature is the work of the Devil."[24] When Robinson protested that according to Genesis it is God who "created the Heavens and the Earth," Blake responded that "this God was not Jehovah but Elohim'" (qtd. in Symons 298).[25] "[T]here is a God of this World," Blake writes in his annotations to Watson's *An Apology for the Bible*, "A God Worshipd in this World as God & Set above all that is calld God" (33; E618). Under this heading, Blake would place the God of the deists, noting:

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[23] Identified in Blake's *Tiriel* as the father of all mankind.

[24] The discussion that follows highlights a major point of frustration for Blake scholars: Blake's religious views are among his most ambiguous and self-contradictory, borne out by his conflicted stands on the divinity of Christ, the "cruelty" versus the "mercy" of creation, etc. The problem here, I propose, is not so much one of Blake's unorthodoxy, but rather that Blake's belief system, if anything, is not sufficiently differentiated from its parent ideology.

[25] Blake is revising conventional theology to his own ends here: The Elohim (plural), as they are usually interpreted, are absentee creators evidencing no contact with or interest in humanity, but who are by all accounts benign. Yahweh, usually interpreted as the on-site manager of creation, is present and active in human affairs but is seen as vengeful and judgmental. Since Blake associates the former with the deist God, and supports the notion of supernatural involvement represented by the latter, he apparently proceeds to revise both entities to his liking, freely transposing characteristics between the two.

"Deism, is the Worship of the God of this World by the means of what you call Natural Religion and Natural Philosophy" (*Jerusalem* 52 Prose; E201). It is this same remote view of the Godhead that Blake attacks in "To Nobodaddy":

What art thou silent & invisible
Father of jealousy
Why dost thou hide thyself in clouds
From every searching Eye

Why darkness & obscurity
In all thy words & laws.
(Notebooks, E471)

As recorded in the preceding chapter, varying schemes of natural religion had come to dominate the theological landscape by the second half of the eighteenth century. In general, Blake did not trouble himself to differentiate between deism—with its absentee God—and empirical theism—with its interventionist one. It was his habit to include under the rubric of "Natural Religion"—and subsequently dismiss—*any* evidence-based approach to faith if that evidence consisted of physical facts rather than metaphysical premises. The "Outward Creation," he writes, "is as the dirt upon my feet [and] No part of Me."[26] This is not to say, however, that the figure of the Creator was unimportant to Blake. On the contrary, creative forces, in all their aspects, are central to Blake's poetic vision. Indeed, his mythos is just as concerned with the "created" material realm—its

[26] *A Vision of the Last Judgment* N95; E565.

origins and its consequences—as it is with that of its imaginative counterpart. In fact, as established in *The Book of Urizen* and elaborated upon in *The Four Zoas*, Blake accords responsibility for the material realm as it exists to not only the actions of the tyrannical, materialist, and scientizing aspect of the eternal human whole (embodied by Urizen), but also the well-intentioned but still divisive actions of the imaginative element (embodied by Los), which sought to isolate the other element and limit its extent.

Blake's attitudes regarding the contingent from hell, perhaps not surprisingly, are no less complicated than his views on a creator God. Blake's early and arguably more interesting take on Satan—patterned almost solely after Milton's interpretation in *Pardise Lost* and reflected in *The Marriage of Heaven and Hell*—depicts the adversary as a heroic figure of resistance to restraint. This yields to a more conceptual view of the entity in later prophetic books. In these works, Satan emerges as the embodiment of a state—specifically, the state of "Error."[27] The traditional (if unstated) purpose of Satan in orthodox Christianity has been to give an external form to error so that it might be cast out, a role clearly paralleling that of materialism in Blake's poetic philosophy.[28] Perhaps as a result of this, Blake's depiction of Satan gets conflated with materialism and everything associated with it, achieving a level of complexity nearly unequalled in the

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[27] "Yet they are blameless & Iniquity must be imputed only / To the State they are enterd into that they may be deliverd: / Satan is the State of Death, & not a Human existence" (Jerusalem 49.65-67).

[28] On the twelfth plate of *Jerusalem*, Blake, through the persona of Los, voices what he perceives to be the main function of materialism (and by extension, materialist science) in this world:

> I saw the finger of God go forth
> Upon my Furnaces, from within the Wheels of Albions Sons:
> Fixing their Systems, permanent: by mathematic power
> Giving a body to Falshood that it may be cast off for ever.
> (10-13)

On the same plate, Blake states that "Ulro"—i.e., the material universe—"is the space of the terrible starry wheels of Albion's sons" (12:51).

poet's mythos, ultimately encompassing Urizen, the creator "God of this World," and science.

The figure of Urizen is the dominant member of this association advanced by Blake, and, in general, Urizen might be best viewed as a composite of the worst aspects of the traditional God and Satan. He is a being of error who misleads mankind, as well as the flawed creator of the fallen world. Urizen's career as creator begins, as does Satan's career as adversary, during the course of his fall, when he is cast out of eternity. Urizen, in effect, falls into the state which is Satan (i.e., error) because of his need to create division and subsequently dominate the products of that division.[29]

Urizen's parallels with Satan, particularly Milton's Satan in *Paradise Lost*, have long been acknowledged and for a simple reason; they are obvious parallels that Blake cultivates. Cast out of Eternity in Chapter III of *The Book of Urizen*, and materially isolated by Los in Chapter IV, Urizen, as the narrative continues in *The Four Zoas*, finds himself in his new domain:

> Endless had been his travel but the Divine hand him led
> For infinite the distance & obscurd by Combustions dire
> By rocky masses frowning in the abysses revolving erratic
> Round Lakes of fire in the dark deep the ruins of Urizens world
> Oft would he sit in a dark rift & regulate his books
> Or sleep such sleep as spirits eternal wearied in his dark
> Tearful & sorrowful state. then rise look out & ponder

[29] In truth, Urizen creates nothing. He simply mistakes the material products of his division of the eternal whole as new creations.

His dismal voyage eyeing the next sphere tho far remote
Then darting into the Abyss of night his venturous limbs
Thro lightnings thunders earthquakes & concussions fires & floods
Stemming his downward fall labouring up against futurity
Creating many a Vortex fixing many a Science in the deep.
(6.72.2-13)

In acknowledgment of his previously unfallen form, once he is in his new estate Urizen is frequently (and accusingly) addressed by his former title, which he also shares with the biblical Satan:

Thou Knowst me now O Urizen Prince of Light
And I know thee[. I]s this the triumph this the Godlike State
That lies beyond the bounds of Science[?]
(*The Four Zoas* 7.80.40-42)[30]

While Urizen has his parallels and associations with Satan, the case is usually made that Blake does not intend for him to be co-identified with that entity. However, on occasion, he is, as in *Milton*:

Then Los & Enitharmon knew that Satan is Urizen
Drawn down by Orc & the Shadowy Female into Generation.
(10.1-2)

Similarly, the case is made that while Urizen is associated with both Satan and science,[31] those two entities are likewise not meant to be co-identified, even though in *The Laocoon*

[30] See also *The Four Zoas* 8.102.23-29.

Blake explicitly references "Antichrist Science" (prose; E274). Still, these explicit identifications are rare, and one must be careful not to push them too far. After all, Urizen, as an embodiment of the rational faculty, can be redeemed from his fallen state—as, indeed, he is at the conclusion of *The Four Zoas*, with his reunification with Eternity and the appearance of "sweet Science." Satan, meanwhile, cannot be redeemed. This notion of scientific reasoning representing a reparable error can and should be interpreted as a hopeful note in Blake.

Blake's Science

To the best of our knowledge, Blake had no formal education in mathematics or the sciences such as Wordsworth received at Hawkshead and later Cambridge. What he had instead was multiple years of arts instruction and an engraving apprenticeship in his youth, followed by a brief stint at the Royal Academy of the Arts. Despite this, Nelson Hilton makes the case for the lay scientific resources at Blake's disposal, citing the likely contribution of three individuals: James Basire, Joseph Johnson, and Emmanuel Swedenborg. Hilton argues that "Blake's apprenticeship to the engraver for the Royal Society . . . , his prolonged association with one of England's significant publishers of medical and scientific works, [and] his intent reading of the century's noted scientist-turned-theosopher all point to an available scientific discourse that was an important part of Blake's environment" (417). Among the three, it is Johnson who will provide Blake

[31] *Jerusalem* offers the description: "Urizen, cold & scientific" (38.2; E184).

with the most demonstrable access to scientific information, but before examining the publisher's contribution, let us briefly address the other two possible influences cited.

In 1772, Blake was apprenticed to James Basire, who two years earlier had been appointed Engraver to the Royal Society, the pre-eminent scientific body in Britain at the time. The apprenticeship lasted for the next seven years, of which not a great deal is known, but it appears that the studies that Blake did for Basire (again, that we know of) were non-scientific, chiefly architectural in nature.[32] However, Basire's connections in the sciences were extensive, as engraving artists became more and more integral parts of scientific publishing. Among these connections were the eminent anatomist John Hunter and his older brother William, also a noted figure in the field.[33]

Ironically, Blake's interest in Emanuel Swedenborg's occult writings may have contributed to his scientific awareness. Biographer Peter Ackroyd confidently dates Blake's first acquaintance with the works of Swedenborg to 1787.[34] Other researchers are more guarded. "It is not clear when Blake first took to reading Swedenborg," writes Charles Gardner, adding:

> There is no trace of his influence until *The Songs of Innocence and Experience* [(1789-94)]. Some of Swedenborg's early scientific works had been translated into English. But of his theological works only one volume out of twelve of the *Arcana Celestia* had been translated into

[32] Blake's entry in *The Oxford Dictionary of Art* describes these as "drawings of the monuments in Westminster Abbey and other London churches."
[33] Carmen Kreiter has confirmed that "Basire, Blake's engraving master until 1779, did occasional work for both the Hunters" (113).
[34] This was two years before he and wife Catherine first attended a meeting at the "Swedenborgian chapel in Great East Cheap" (102). That meeting occurred on Sunday, April 13, 1789. The texts from this period that Ackroyd posits acquaintance with are the *Arcana Celestia* and *Heaven and Hell*.

English; and, for the rest, those who could not read Latin had to be content with samples. (55)[35]

Arguably as significant as Blake's access to Swedenborg's theosophical works was his possible exposure to the mystic's earlier scientific writings, which, as Gardner indicates, *were* available in Britain before the publication of the *Arcana Celestia* and might well have been sought out by his interested English followers.[36]

Ultimately, however, it was the demands of his professional life that led Blake into his closest probable contact with the sphere of scientific culture in Britain. During the early and mid-1780s, Blake occupied himself with a variety of commercial ventures. It was during this period that friend and colleague Henry Fuseli introduced Blake to bookseller and publisher Joseph Johnson. Though he had completed one early assignment for Johnson in 1783, Blake's close working association with the publisher would not begin in earnest until 1788.[37] Johnson's political sympathies were, by his own description, liberal—others might say radical—and these were the authors he chose to publish. He became friends with a number of these figures and was in the habit of inviting them to weekly dinner parties at his home. By 1791, the year of Blake's peak

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[35] Swedenborg's dates of publication and translation: *A Treatise Concerning Heaven and Hell, and of the Wonderful Things Therein, as Heard and Seen, by Emanuel Swedenborg* (published 1758, English translation 1784), *Divine Love and Divine Wisdom* (published 1763, English translation 1788), *Divine Providence* (published 1764, English translation 1790), and *Marital Love* (published 1768, English translation 1790). The primary sources for these dates are David V. Erdman, *The Complete Poetry and Prose of William Blake*, and Morris Eaves, *et al.*, *William Blake: The Early Illuminated Books*.

[36] The cornerstone of Swedenborg's scientific work was his three-volume *Opera Philosophica et Mineralia* (1734), the first volume of which, the *Principia Rerum Naturalium*, is the most important. In it, Swedenborg details his view of the universe as mechanism and outlines his first approach to a philosophic system. The most detailed analysis of Swedenborg's scientific theories may be found within Cyriel Sigstedt's *The Swedenborg Epic* (New York: Bookman, 1952).

[37] Recorded in Gerald Tyson's biography of Johnson 113-14.

association with Johnson, the bookseller's shop had become, as Gerald Tyson reports, a renowned meeting place for radical minds (121).

Blake's inclusion in these events has become something of a point of contention in Blake studies. Of particular interest is the question of whether Blake, a scientific layman, might have received uncommon insights into the discipline by direct social contact with some of its most eminent British practitioners. The more conservative view holds that Blake likely secured such information on his own. In this category is Peter Ackroyd, who notes that on scientific topics Blake had "the eclectic instincts of the autodidact" (135). In the other camp are S. Foster Damon, Charles Gardner, and, at one time, David Erdman. In his biography of the poet, Gardner argues that Blake mingled intimately in Johnson's circle and was a frequent guest—a flattering view, but probably an exaggerated one. In Tyson's account there is no record of Blake being on the list of frequent visitors to the publishers home, though his occasional participation has been confirmed.[38] In the end, Tyson straddles the fence diplomatically, writing: "The large number of engravings for Johnson at this time indicates . . . that Blake was in *relatively close* contact with the publisher and his circle" (113; emphasis added). Overarching such a debate, of course, is the question of what real relevance lay in Blake's having direct social contact with these scientific luminaries versus his merely having contact with their

[38] Tyson lays out Johnson's guestlist of regulars and semi-regulars during the 1780s: "The extended group would eventually come to include Mary Wollstonecraft, Gilbert Wakefield, John Horne Tooke, Alexander Geddes, [Henry] Fuseli, Thomas Christie, and, more briefly and somewhat sporadically, Erasmus Darwin, William Blake, Joel Barlow, William Godwin, Thomas Paine, [Joseph] Priestley, and many others less well known" (66). By 1791, when "Johnson's bookshop had become a meeting place for radicals," the guestlist had expanded considerably, still including Wollstonecraft, Godwin, Darwin, Fuseli, Paine, and Priestley, but by now Blake's name is conspicuously absent (121). Tyson goes on to note that later visitors would include "William Wordsworth, Henry Crabb Robinson, William Hazlitt, Maria Edgeworth, Humphrey Davy, and T. R. Malthus" (121). The chief source of information we have about these gatherings, Tyson notes, is William Godwin's *Diary*.

ideas through their works. I would offer that it is most likely relevant in regard to what it has to say about Blake's degree of immersion in the world of these ideas, and how his subsequent acceptance or rejection of these ideas might have been a personal as well as an academic matter for him.

From the perspective of Blake's relations to science, particularly in regard to his access to contemporary scientists and scientific ideas, *An Island in the Moon*[39] stands as a fascinating entry in the poet's canon. An intermittently witty send-up of the philosophical excesses of its day, cast in the form of a "plurality of worlds" fantasy,[40] the *Island* telegraphs its satirical intent in its opening line: "In the Moon, is a certain Island near by a mighty continent, which small island seems to have some affinity to England, &, what is more extraordinary the people are so much alike & their language so much the same that you would think you was among your friends" (E449). The associations with Johnson's famed dinner parties were perhaps inevitable from the structure of the piece, even though Blake presents his various hosts and guests as laughable leisure class dabblers and eccentrics, nothing at all like the dynamic circle of minds that gathered around Johnson's table. Nevertheless, identification of the principal characters[41] within the work to actual historical figures (both inside and outside of Johnson's circle) has become something of a parlor diversion in its own right. Early on, Damon staked out the

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[39] An unfinished prose satire dating from the mid-1780s, though revision of the work is possible up through the year 1789, since it contains early drafts of three of the *Songs of Innocence*: "Holy Thursday," "The Nurse's Song," and "The Little Boy Lost."

[40] In another work, Blake approaches the same "plurality of worlds" notion much more seriously: In *Visions of the Daughters of Albion*, Bromion speaks of "places yet unvisited by the voyager . . . in worlds / Over another kind of seas, and in atmospheres unknown" (4.17-18).

[41] These include the "three Philosophers"—Quid the Cynic, Sipsop the Pythagorean, and Suction the Epicurean—plus Etruscan Column the Antiquarian, Obtuse Angle the Mathematician, Inflammable Gass the Wind-finder (an experimental scientist), Jack Tearguts the Surgeon, Steelyard the Lawgiver, and others.

following associations: "Inflammable Gass is obviously Joseph Priestley. . . . Jack Tearguts is the famous surgeon [and anatomist] Dr. John Hunter. . . . But whoever they were, they were certainly friends and acquaintances of Blake" (199).[42] Subsequent critics have raised objections to this kind of one-to-one identification with specific persons and especially the notion of presumed social familiarity. Nancy Bogen, for one, has taken exception with Priestley's identification as Inflammable Gass on these grounds:

> [W]ere Blake and [Priestley] actually friends? Is there any evidence to show that one, an unknown artist, and the other, a famous scientist and philosopher, twenty-four years his senior, were intimate to the extent of paying each other visits at home? The answer is no—emphatically no. (110)

Bogen's persuasive argument notwithstanding, Blake's personal acquaintance with Priestley, again, was not required for him to have gained an awareness of the scientist's work, which *An Island in the Moon* clearly suggests he did. Chapter 10 describes a group visit to the home of Inflammable Gass, during which the host attempts to entertain his guests with his experiments: "[H]e went up stairs & loaded the maid, with glasses, & brass tubes, & magic pictures" (E462). Upon returning, the host presents his collection of natural specimens; he then proceeds to pneumatic experiments with an air-pump,

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[42] An alternate point of entry for Blake into the social circles of intellectuals hinted at in *An Island in the Moon* could well have been the salon of the Rev. A. S. Mathew. Mathew, along with sculptor John Flaxman, had financially underwritten the printing of Blake's *Poetical Sketches*. "In the Mathew salon," Johnson and Grant note, "Blake sang his songs to tunes he composed himself" (*xxx*). There, Blake would also have had occasion to make the acquaintance of several eminent figures, among them, Krieter states, the anatomist John Hunter (n112), identified by Blake's own notes with the character of Jack Tearguts.

during the course of which a bottle of "Flogiston"[43]—actually privy gas—is broken, driving the assembled company from the premises.

More important than Priestley's association with the *Island*'s experimentalist is the question of what Blake might have found so ridiculous or threatening about Priestley's inquiries into phlogiston that it required censure. One possible answer is suggested by Blake's anti-materialist posture. Though one of the four earthly elements of antiquity, fire is the most ethereal and thus the least material. Phlogiston theory sought to emend that perception. It has long been known that fire held a special significance for Blake, particularly as a symbol of inspiration. On plate 6 of *The Marriage of Heaven and Hell*, he describes "walking among the fires of hell, delighted with the enjoyments of Genius, which to Angels look like torment and insanity." Further evidence of fire's opposition to the materialist scientific viewpoint is enacted through the character of its mythic embodiment, Fuzon, and his eventual rebellion against his father Urizen in the *Books of Urizen* and *Ahania*.

Aside from encounters with Johnson's social circle, there are other means by which Blake might have accessed the scientific thought of the day while under the publisher's patronage. Johnson, as Tyson notes, had a reputation for his active participation in ongoing scientific controversies, usually backing "the iconoclastic side" of a particular argument (47). Johnson published Erasmus Darwin's *Botanic Garden*, a work that for its time was certainly on the cutting edge scientifically, if mired in neoclassical conventions poetically. Darwin, as noted previously, was also an occasional

[43] Cf. Priestley's *phlogiston*—the proposed flammable component of matter, released during burning into the atmosphere.

member of Johnson's circle, and the publisher, in point of historical fact, commissioned Blake to execute four engravings of the Portland vase for Darwin's volume.[44] It does not strain credibility to suggest that Blake could have gleaned a wealth of information on contemporary science from the text of the resulting publication. "The footnotes alone," Ackroyd notes, "cover such subjects as geology and biology, the production of iron and the power of magnetism, the formation of star clusters and the nature of salt crystals, pumps and steam-engines, volcanoes and electricity" (135). Given the indications we have of Blake's interest in not only opposing materialist science, but of being an informed opponent of that philosophy, then his incentive to pursue such knowledge might have been strong indeed.

In regard to Blake's knowledge of Romantic science as a discrete species of scientific thought, things become more speculative. The question is whether Blake was interested in and engaged with the emerging science of his time, particularly as that science sought to redefine the physical universe he presumed to understand in the course of his attacks upon it—a physical universe that now sought to extend its domain, even to the point of overlapping and usurping the realm of the spiritual. The answer would seem to be: How could he not have been? His access to these ideas is another matter. As

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[44] For works by Erasmus Darwin, Blake completed a total of six engravings, none of them scientific in content. These include the four views of the Portland vase, plus two mythic representations: "The Fertilization of Egypt" (for the first edition of *The Botanic Garden* in 1791) and "Tornado" (for the third edition in 1795), both from original illustrations by Fuseli. Recent research by Tristanne Connolly sheds some additional light on the likelihood of Blake's scientific awareness coming as a result of the graphic assignments he performed: "Blake did not produce anatomical drawings as a commercial engraver, though he was associated with James Basire, and Joseph Johnson, both of whom dealt with medical publications. The closest Blake came was his work for James Earle's *Practical Observations on the Operation for the Stone*. The plates in this book portray urinary tract stones, and the tools used to extricate them. . . . Blake engraved plates for two other medical books, John Brown's *Elements of Medicine* and Thomas Henry's *Memoirs of Albert de Haller*, but they were portraits of the physicians, and the books contained no other plates" (34).

Romantic science has been traditionally construed by critics, its sources would have been largely foreign and might have required a concerted effort on Blake's part to discover.[45] However, in its expanded definition, as I have proposed in this study, I would argue that the sources of Romantic science were largely domestic and readily available—present within the works of Herschel, Hutton, Dalton, E. Darwin, and others. As Marilyn Gaull notes in "Coleridge and the Kingdoms of the World," the sources of access to the new science were broad and dispersed.

> [T]hese sciences, the sciences of the [17]90's, seem designed for literature and for the literary mind in both origin and style. . . . There were presented to the non-specialist, to learned societies (which were largely recreational) or, in this first great age of publication, in magazines, books, and reviews alongside sermons, topographical poetry, history, gothic novels, and economic theory. And since much scientific inquiry was both followed and practiced as a hobby, science itself, before it was institutionalized, was accessible, familiar, engaging to anyone with an interest in "the world of life." (47)

In short, these revolutionary scientific ideas, like their political counterparts, were simply in the air; they infused conversations and current events. And in that respect, access to the basic principles of Romantic science—again, in the broader definition that I have proposed—required nothing more from Blake than a healthy interest in his own culture.

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[45] This might be overstating the case, however. German *Naturphilosophie* had energetic ambassadors—the most notable of which was Danish physicist and philosopher H. C. Oersted, who was multi-lingual and possessed contacts and colleagues within the scientific circles of nearly every European capital, including London. And then, of course, there were cultural translators like Coleridge, deeply in tune with the principles outlined by F. W. J. Schelling. Coleridge, in fact, went to Germany with the intent of translating German works for a London bookseller (Levere, "Coleridge" 297).

Physics, Visionary and Otherwise

Given its identity as opposing philosophy, Newtonian physics played a commanding role in shaping Blake's anti-materialist vision. Despite the century separating their creative primes, Blake's choice of Newton as his philosophical opponent was in many ways fitting. Newton, after all, was popularly perceived as the chief prophet of the materialist worldview.[46] Blake scholars in the late twentieth century, notably Donald Ault and Stuart Peterfreund, have commented on the degree to which Blake appreciated the "imaginative appeal" of Newton's model—a scientific system so complete that it intellectually satisfied the mind in a way that previously only poetry and religious faith had. These analysts have also communicated how strongly Blake felt that such a system posed a spiritual threat to Western thought. That these beliefs provoked a reaction on Blake's part is unquestioned: Newton's *Principia* and Blake's *Milton*, Peterfreund argues, can best be understood as constituting thesis and antithesis ("Blake and Newton" 205-06). But beyond that, as Ault observes in *Visionary Physics*, "the increasing complexity of Blake's mythology" over the years can be seen in large part as a direct response to "the increasing threat the Newtonian perspective posed to Blake's own imaginative powers" (1). However, while Ault and Peterfreund agree that Blake's system constitutes a studied, intentional dialectic with Newton's system, both are quick to observe that it does *not* constitute a point-by-point refutation. Still, within his works,

[46] Though it remains open to debate whether Newton was ever as lost a materialist soul as Blake perceived him to be. As noted in the preceding chapter, Newton was resistant to the global philosophical mechanism of Descartes and not unconflicted on the question of materialism as a final explanatory philosophy.

Blake does provide narratives and mythic structures by which he is able to advance challenges to the Newtonian view.

In that the works of Newton lie chiefly within the domain of the physical sciences—and in that Blake, once again, viewed Newton as his chief ideological and philosophical opponent—Blake's views on physics are particularly revelatory of his overall poetic response to Enlightenment era science. But it will be necessary to first clarify what constituted "physics" in Blake's view. The discipline of physics, in its most general sense, deals with how the universe works; chiefly, it is the study of its active forces. Given that for Blake the greater universe included the actions of the non-material and unseen realms, his view of the subject was likely an expansive one—one expressive of his opposition to what Mark Lussier has termed "the visionary contraction" of Newtonian physics (36-37).

In formulating a response to the materialist/mechanist model, Blake's visionary approach to physics was shaped by diverse and unorthodox influences from the worlds of both science and theology. One such influence was Paracelsus (1493-1541), the noted Swiss physician and (al)chemist, whose influence on Blake is evident in their shared spiritualist approach to natural philosophy, manifested in the desire to understand the invisible forces that govern the universe. Also influential was Jakob Boehme, for his view that "will is the original force" and that "all manifestation involves opposition" ("Jacob Boehme" 115). In Blake's response to Newton, the final legacy of both philosophers is found in the poet's concept of a universe driven by polarities and his

belief that accepted physical laws are simply "an expression of the spiritual realities underlying them" (Damon 40).

In *Jerusalem*, Blake proclaims, "I must Create a System, or be enslav'd by another Mans."[47] One might note that Newton's revolutionary theory of physics was itself the product of his discomfiture living under another man's system—namely, the one proposed a half century earlier by René Descartes. Blake's rejection of Newton's response, however, should in no way be construed as an endorsement of its Cartesian predecessor. While Blake does depict Urizen as "[c]reating many a Vortex" in the course of his fall—during which "many a Science" is fixed "in the deep"[48]—he does not draw upon the concept of the vortex in any way that Descartes would recognize, choosing instead to interpret these vortices *figuratively*, in this instance as portals along the path of human experience, with this material world being just one stop on a much longer journey:

> The nature of infinity is this: That every thing has its
> Own Vortex; and when once a traveller thro Eternity.
> Has passd that Vortex, he percieves it roll backward behind
> His path, into a globe itself infolding; like a sun:
> Or like a moon, or like a universe of starry majesty,
> While he keeps onwards in his wondrous journey on the earth
> . . . . . .

[47] The larger quote reads: "I must Create a System, or be enslav'd by another Mans / I will not Reason & Compare: my business is to Create" (10.20-21). Drawing upon the evidence of Blake's collected works, the reader is led to the conclusion that the system(s) the poet is responding to here is not just Newton's but *any* system that would attempt to dominate.

[48] *The Four Zoas* 6.72.12-15.

Thus is the earth one infinite plane, and not as apparent
To the weak traveller confin'd beneath the moony shade.
Thus is the heaven a vortex passd already, and the earth
A vortex not yet pass'd by the traveller thro' Eternity.
(*Milton* 15.21-35)

As Blake describes it, a vortex is an involuted road forever circling back toward its—or rather, the traveler's—point of origin in "Eternity." As admittedly ambiguous as the preceding excerpt is, one aspect does clearly emerge, and that is Blake's strategy of engaging the opponent philosophy—whatever its manifestation, whether new or old, established or radical—by co-opting and adapting its concepts to his own poetic ends. As with his approach to the religious scriptures, Blake frequently chooses to read science symbolically. But in a twist perhaps unique to Blake, he not only recasts the literal as figurative, but, just as importantly, in some cases he chooses to interpret science's figurative conventions literally. This literalizing of the figurative—this imposing of the constructs of imagination upon the material form of the universe—is, I would suggest, a defining element of Blake's poetic response to the science of his day. This pattern of response becomes most apparent in Blake's consideration of the astronomical universe, particularly science's means of conceptualizing physical space, specifically the conventions of the star map and the sky globe.

Revisioning the Mundane Shell

As David Erdman writes, "William Blake . . . thought of himself as opposing the 'corporeal war' of swords and muskets with the mental war of Art. And he often thought of his staging area as the night sky (bordered by dusk and dawn) where the old Heaven of tyranny is replaced by a new Heaven of freedom" ("Art Against Armies" 296). Without question, the night sky was an ideological territory that Blake strove to control poetically. In the essay "Under Romantic Skies," Marilyn Gaull takes note of the Romantic poets' employment of the predictable, mechanistic universe of Enlightenment astronomy as a foil for their poetic arguments, choosing largely to ignore the shifting currents within the astronomy of the time. For whatever reason—whether Enlightenment astronomy was too useful an adversary to dispense with or, as I have argued, because the tenets of the new astronomy posed perhaps even greater threats to the Romantic poetic ideology—"[a]stronomical allusions in Romantic art and poetry are normally Newtonian, refer to a universe that [is] stable, symmetrical, mechanical, bounded in space and time rather than the vast, tumultuous, infinite, volatile one contemporary astronomy was revealing" (Gaull 35). Though he is specifically exempted by Gaull,[49] I would suggest that Blake, too,

[49] Gaull exempts Blake from this group on the basis of what she sees as elements of "Romantic astronomy" finding expression in Blake's "mythic representations" (35). By Romantic astronomy, Gaull means "the astronomy of Swedenborg, who influenced Kant's *Universal History and Theory of the Heavens* (1755), who in turn influenced William Herschel's "On the Construction of the Heavens" (1784), . . . who in turn influenced La Place's *Celestial Mechanics* (1796). The unifying element here, as I interpret it, is the "nebular hypothesis" of the solar system's formation from a diffuse and rotating cloud of cosmic gas, or some precursor of that theory. More than one critic has remarked on the seeming parallels between Blake's description of the origin of the earth-moon system in *America: A Prophecy* (b:3-7) and a similar passage from Erasmus Darwin's *The Botanic Garden* (I:103-12)—the latter being a work heavily influenced by Herschel. In truth, the connection between the two passages is somewhat tenuous. While both describe the violent process of one body being ejected from another, Darwin is interested in it as a scientific process while Blake focuses on the event principally as a manifestation of the separation of the male spectre from its female emanation, a dynamic central to his mythology. More importantly, both

when presented with this compelling alternative, similarly chose to perpetuate the Newtonian view as the view of the scientific community because it was in his poetic interests to do so.

Despite the likelihood of Blake having absorbed, as David Worrall claims, "some near contemporary astronomic theories" (281),[50] it appears that Blake's astronomical preferences ran toward the traditional, if not the antique. One example occurs on plate 19 of *The Marriage of Heaven and Hell*, wherein Blake and his Angel voyage to "the void between Saturn and the fixed stars" (E42). The notion of fixed stars, long suspect, had been officially buried in 1783 by William Herschel, whose observations of the proper motions of several bright stars established that the sun and its stellar neighbors were indeed moving through space. That Blake would continue to cling to the notion of fixed stars, at least poetically, is not all that surprising. In this work, as in others, he is most likely echoing the universe Milton constructs in *Paradise Lost*. Also, as Anthony Low has noted, Blake, being a poet, did not feel compelled to "promulgate any astronomical 'truth' in his poem" (267). Despite these considerations, Blake's complete failure to mention the planet Uranus, discovered in 1781 by Herschel, remains surprising. Blake *had* to be aware of the discovery and the man who made it: Herschel was the first

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works might simply be interpreted as a description of events occurring at the moment of creation, with no ensuing eons of cosmological development implied.

[50] In "The 'Immortal Tent,'" Worrall supports this claim, advancing the intriguing association of Orc—the central figure of Blake's *America: A Prophecy* and *Europe: A Prophecy*—with the variable "Demon Star" Algol (285). The brightest star in the constellation Perseus, Algol marks the severed head of the Gorgon, which the hero Perseus holds at arm's length. Worrall's association is strengthened by Blake's illustrated rendering of Orc throughout the two works, always depicting "the spirit of revolution" with wild, unruly hair that does indeed resemble a nest of snakes. Orc's variations are explained as the result of his being covered and uncovered by the shroud of Enitharmon (illustrated on plate 4 of *Europe*), paralleling the observed variations in the brightness of the star.

individual since antiquity to find a new planet.[51] In addition, he was an Englishman (albeit naturalized). But Blake never once refers to Herschel in print—not within his poetry, prose, or known correspondence. What could explain such a slight? It is interesting to speculate that Blake perhaps scorned Herschel for reasons that had nothing to do with science, but rather because of the astronomer's attempts to curry favor and patronage with the court of George III. Herschel had, after all, originally named his newly discovered world "Georgium Sidus": the Georgian Planet. Another possibility—closer to the focus of this study—could be that Herschel had alienated Blake by his contributions to the expansionist view of the material universe, which had begun with the small step of adding a new outer planet and had culminated with his declaration that the depths of space were—from our human perspective—unmeasurable. But one question remains: If Herschel's contributions conflicted with Blake's views, just as Newton's theories had, then why does the astronomer not merit the same kind of notorious mention Blake gives Newton in his works? The answer could be that, in contrast to his well worked-out response to Newton's long-familiar reasonings, Blake had no ready answer to the new view of the universe that Herschel's work supported.

The vista of Blake's poetic works, as Erdman has noted, is a vast cosmic battlefield in the war against the universe envisioned by materialist science. And it is the site of a conflict in which Blake is willing to play whatever role is necessary, whether radical or reactionary. An example of the latter, identified by Worrall, occurs in *America,*

[51] John Keats' sonnet "On Chapman's Homer" (1816) suggests the level of acknowledgement of this achievement during the later Romantic period: "Then felt I like some watcher of the skies / When a new planet swims into his ken" (9-10). Keats is obviously referencing Herschel's discovery; as stated above, no one had discovered a major planet (as opposed to an asteroid) since antiquity, and no one would again until the discovery of Neptune in 1846 by LeVerrier and Adams.

in the passage wherein Blake portrays Orc as a comet "wandering dangerously out of orbit" (284).

> Albions Angel stood beside the Stone of night, and saw
> The terror like a comet, or more like the planet red
> That once inclos'd the terrible wandering comets in its sphere.
> (*America* 5.1-3)

In this passage, Blake succeeds in both vividly communicating Orc's revolutionary spirit and, at the same time, subverting the image of comets prevalent since Edmund Halley (1656-1742). In Blake's revisioned, politically informed cosmos, comets are not the conformist periodic visitors of Newtonian science, but rather the imaginatively invested comets of antiquity: unpredictable harbingers of war, calamity, and inevitable change.

But Blake could also play the astronomical radical. Perhaps the best example of this position is seen in his aforementioned literalizing of the figurative in regard to the conventions of science. In "Visionary Astronomy," Paul Miner makes the following claim: "[T]he illumination on plate 12 of *Europe* can be read as a star map: on lines which divide the page the way lines of latitude and longitude divide the heavens we see a gigantic web full of spiders and flies; this north and south placement accords with the astronomers' charting of the flies Musca Australis and Musca Borealis" (308).[52] In this assertion, Miner confidently projects an astral coordinate system of declination and right ascension where a less alert observer might see only a somewhat loose rendering of a spider's web. His assertion is supported, however, by both the accompanying text of the

[52] Miner's inversion of the order of the Southern and Northern Flies is curious, but it does not alter the thrust of his argument.

plate—which describes the sky of that "deadly night," where "[b]etween the clouds of Urizen the flames of Orc roll heavy" (6, 32)—and by their combined association with a similar cosmic web glimpsed earlier, in *The Marriage of Heaven and Hell*:

> [B]eneath us at an immense distance was the sun,
> black but shining[;] round it were fiery tracks on which revolv'd
> vast spiders, crawling after their prey; which flew or rather
> swum in the infinite deep, in the most terrific shapes of animals
> sprung from corruption. & the air was full of them, & seemd
> composed of them. (18; E41)

These two episodes are united in presenting a similarly visionary and hellish interpretation of the night sky, with "the most terrific shapes of animals sprung from corruption" usually interpreted as yet another unflattering take on the constellations by Blake.[53]

A glimpse of a conventional star map of the time, its coordinate system of celestial longitude and latitude projected onto the night sky, appears to have evoked a creatively literal response in Blake, as if the scientists by their convention might have brushed up against some kind of cosmic truth. Blake appropriates this figurative device and imposes it upon the heavens as a literal—if visionary—structure in service to his poetic mythology. As we might suspect, this web of the night sky, derived from an instrument of practical scientific utility, emanates from the fallen Urizen:

> Cold he wander'd on high, over their cities

[53] Recall that in *Milton* Blake refers to them as "immense / Hardend shadow[s] of all things upon our Vegetated Earth" (17.21-22) and as the "Forty-eight deformed Human Wonders of the Almighty" (37.54).

In weeping & pain & woe!

And where-ever he wanderd in sorrows

Upon the aged heavens

A cold shadow follow'd behind him

Like a spiders web, moist, cold, & dim

Drawing out from his sorrowing soul

The dungeon-like heaven dividing.

Where ever the footsteps of Urizen

Walk'd over the cities in sorrow.

Till a Web dark & cold, throughout all

The tormented element stretch'd

. . . . . .

And all calld it, The Net of Religion.

(*The Book of Urizen* 25.5-22)

This constraining Net of Religion is the counterpart of the Tent of Science—woven by the Eternals to shield them from view of our world (*Urizen* 19.2-9)—providing more evidence of the shared origins of materialist science and religion, and another level of separation between the material earth and the heavens. Blake elaborates on the emanation of this net in *The Four Zoas*:

Travelling thro darkness & whereever he traveld a dire Web

Followd behind him as the Web of a Spider dusky & cold

Shivering across from Vortex to Vortex drawn out from his mantle of years

A living Mantle adjoind to his life & growing from his Soul

And the Web of Urizen stre[t]chd direful shivring in clouds

. . . . . .

. . . winding round to the heavens of heavens

Within the dark horrors of the Abysses lion or tyger or scorpion.

(6.73.31-39)

To leave little doubt that he is describing the astronomical heavens here, Blake again references the Abyss, as well as the constellations of Leo and Scorpius, and perhaps Lynx.[54]

On plate 27 of *Jerusalem*, Blake writes, "You have a tradition, that Man anciently containd in his mighty limbs all things in Heaven & Earth. . . . But now the Starry Heavens are fled from the mighty limbs of Albion" (E171). Blake's stated ideology regarding the individual as the center of his or her own cosmos—a hierarchy expanding outward from the divine inner self to the fallen outer world—lies at the very heart of his vision of the universe. In Blake's cosmology—like the perspective offered by another practical convention of astronomical science—namely, a sky globe[55]—the orientations of

[54] On the contents page of the *Bulletin of Research in the Humanities* (84.3), Erdman notes that in the eighteenth century the constellation Lynx was alternately known as the Tiger. He further speculates that the inspiration for the smiling, "rather amiable Lynx" seen in Bode's *Uranographia* (1801), which, I would note, depicts the traditional constellations against the backdrop grid of celestial longitude and latitude, perhaps likewise "influenced Blake's illustration to 'The Tyger' in the *Songs of Experience*," published 1794.

[55] A conceptual scientific instrument which maps the heavens as seen from the earth onto the convex surface of a globe.

inward and *outward* are reversed, with "Eternity" lying at the center of all. This proposed inversion of the material and the eternal is presented by Blake as yet another consequence of the fall. When humankind fell, he argues, its collective senses turned outward: "Their eyes their ears nostrils & tongues roll outward they behold / What is within now seen without" (*The Four Zoas* 2.25.22-23). From that moment forward, nature appeared as a material entity separate from man, himself now also clothed in "vegetative" matter.[56] Both conclusions are false, Blake maintains:

> [I]n your own Bosom you bear your Heaven
> And Earth & all you behold, tho it appears Without it is Within.
> (*Jerusalem* 71.17-18).

This involuted view of the cosmos, this refashioning of its structure to affirm the notion of eternity within and the spiritual and creative meaning lying beneath and beyond surfaces, is not original to Blake. It has been a central tenet of theosophical belief systems since their inception. But it is nonetheless radical, and thus representative of that aspect of Blake's approach to revisioning the universe of materialist science.

Change in the Natural World

Blake's commitment to radical change in this world—most notably in the social and political realms—has become a central part of his identity for critics. But in keeping with his character, Blake's view of change is not uncomplicated, particularly as it is played out in the sphere of living things. A defining moment in regard to Blake's views

[56] Vegetable/vegetative: In general, Blake intends these terms to mean the corporeal/physical. In specific instances, it also suggests life without thought or sentience.

on the biological world occurs early in *Europe: A Prophecy*, the Preludium of which centers around the lament of the Shadowy Female[57] as she agonizes over nature's inherent cruelty and its incessant cycle of fertility and death.[58]

> Unwilling I look up to heaven! unwilling count the stars!
> Sitting in fathomless abyss of my immortal shrine.
> I sieze their burning power
> And bring forth howling terrors . . .
> Devouring & devoured roaming on dark and desolate mountains
> In forests of eternal death. (2.1-6)[59]

It is, as Blake later affirms in *Jerusalem,* a "Creation that groans, living on Death, / where Fish & Bird & Beast & Man & Tree & Metal & Stone / Live by devouring, going into Eternal Death continually" (50.5-7).[60] In characterizing these harsh dynamics of nature, Blake establishes his dichotomy of life, introducing on plate 16 of *The Marriage of Heaven and Hell* the archetypes of "The Prolific and the Devouring."

> Thus one portion of being, is the Prolific. the other, the
> Devouring: to the devourer it seems as if the producer was in
> his chains, but it is not so, he only takes portions of existence
> and fancies that the whole.

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[57] In Blake's system of myth: this material earth.
[58] Cf. "Hence, as more individuals are produced than can possibly survive, there must in every case be a struggle for existence" (Darwin *Origin of Species* 63).
[59] Cf. The "forests of the night" in "The Tyger"—another avatar of predatory physical violence.
[60] The tree is sustained by "devouring" the nutrients of decomposed organisms in the soil. As for the metal and stone, one must assume that Blake is referring to the process of vulcanism, wherein the earth's crust itself is recycled. Thus, every extant entity is indebted to the demise of some predecessor—a process that, as Blake indicates at the close of *Jerusalem*, stops only in Eternity.

> But the Prolific would cease to be Prolific unless the
>
> Devourer as a sea recieved the excess of his delights. (E40)

As it is instituted, Blake argues, this earthly realm of corporeal existence is based on cruelty[61] and cannot continue without it: "These two classes of men are always upon earth, & they should be enemies; whosoever tries to reconcile them seeks to destroy existence."[62] As painful and perhaps wasteful as it is, Blake argues, still, the struggle between these contraries offers progress.

As the previous excerpt illustrates, these distinctions of Prolific and Devouring exist not only between species, but also within the same species. In a subsequent passage of *The Marriage of Heaven and Hell*, Blake offers up a scene in which these roles are just so co-identified. It occurs midway through the work, when Blake turns the tables on his guiding "Angel," remarking, "[N]ow we have seen my eternal lot, shall I shew you yours?" (19; E42).

> I descended driving the Angel before me, soon we saw seven houses
> of brick, one we enterd; in it were a number of monkeys,
> baboons, & all of that species chaind by the middle, grinning and
> snatching at one another, but witheld by the shortness of their
> chains: however I saw that they sometimes grew numerous, and then
> the weak were caught by the strong and with a grinning aspect,
> first coupled with & then devourd, by plucking off first one limb

[61] "Eternity," by contrast, is characterized by "mercy." Whatever "mercy" the material creations of time and space possess are, Blake argues, the product of their merciful transience.
[62] *The Marriage of Heaven Hell* 16-17; E40.

and then another till the body was left a helpless trunk. this
after grinning & kissing it with seeming fondness they devourd
too. (19-20; E42)

Blake's proffered vision of humanity's *descent to*—rather than *ascent from*—a simian hell is, like the rest of the episodes in *The Marriage of Heaven and Hell*, intended to be instructional, in this case allowing the reader to witness firsthand a stylized and nightmarish spectacle of a species' self-predation. The provocative question is why Blake chooses monkeys for this depiction.[63] One possibility, one that relates to the previously articulated thesis of Blake's engagement with the speculations of the new science, is that they are there because of their manifest similarities to human beings. But these similarities are muted by important differences. Thus one is left to speculate whether Blake intends to suggest that what separates monkeys from men constitutes a narrow gap or an uncrossable gulf.

To suggest that this primate context might be meant to evoke, at least in part, the question of human origins does not require any claims that Blake is here anticipating concepts contained within Charles Darwin's *Origin of Species*—which would not be published for another seventy years.[64] We need simply only acknowledge the scientific arguments and speculations ongoing at the close of the eighteenth century, for the later work of Charles Darwin lies clearly grounded in the nascent concepts articulated by,

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[63] One answer might be that since, according to folk tradition, there are apes in hell anyway, why not use them? The trope of unmarried women "leading apes in(to) hell" was well established in literature—perhaps the most famous example being that in Shakespeare's *Much Ado About Nothing*, wherein Beatrice answers Leonato that her intent is to lead the apes of any potential suitors up to the gates of hell, then simply step aside as they march in (2.1.31-46).

[64] *The Marriage of Heaven and Hell* composed circa 1790.

among others, his own grandfather. We may note that Coleridge, responding to Erasmus Darwin's speculations in a letter to Wordsworth, criticizes "the absurd notion of . . . Darwin . . . of Man's having progressed from an Ouran Outang state—so contrary to all History, to all Religion, nay, to all Possibility."[65] On this topic, Blake's views appear to align with those of Coleridge, and, indeed, Blake's resistance to the idea of biological evolution would be wholly consistent with the ideology staked out in his works.

In "Eternity," as Blake envisions it, entities are unchanging, since—in the perfection of eternity—nothing need change:

> In Eternity one Thing never Changes into another Thing Each Identity is Eternal. . . . A Man can never become Ass nor Horse some are born with shapes of Men who may be both but Eternal Identity is one thing & Corporeal Vegetation is another thing Changing Water into Wine by Jesus & into Blood by Moses relates to Vegetable Nature.
>
> (*A Vision of the Last Judgment* N79; E556)

The last two lines here, however, would appear to open the door to evolution in the *material* realm.[66] Note, however, that the two instances of such a change that Blake cites are the result of divine miracles wrought by God or his representative, reflecting a break in the normal history of the world.[67] In regard to the connection between the material and eternal realms as it presently exists—i.e., pre-apocalypse—Blake proposes that "every

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[65] *Selected Letters* 188.

[66] What to make of the fact that Blake elsewhere forbids such miracles is unknown (see Annotations to Watson 12; E616-17).

[67] Blake describes another change in the material world scheduled to occur under similar circumstances—namely, the transforming renovation due at the outset of the apocalypse and the arrival of the "New Earth" (*Vision of the Last Judgment* N84; E561).

Natural Effect has a Spiritual Cause" (*Milton* 26.44). This would seem to imply that changes in material forms could only stem from precipitating changes in their underlying spiritual forms. To revisit the distinctions between the *dynamic* and the *transformative* from Chapter One, where the former describes changes in conditions and the latter changes in entities, it would seem that Blake would tend to endorse the former and deny the latter, writing in *Milton* that "States Change: but Individual Identities never change nor cease" (32.22-23).

Other critics have drawn less skeptical conclusions regarding Blake's views on this topic. In "Evolution and William Blake," Carmen Kreiter argues for Blake's advanced knowledge and possible support of a precursor to the biogenetic law of "ontogeny recapitulates phylogeny"[68] some sixty-five years before Darwin published the *Origin* and seventy-two years before his disciple Haeckel first enunciated that extrapolated axiom.[69] Kreiter's argument is based upon three lines from *The Book of Urizen* (1794):

Many forms of fish, bird & beast

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[68] Since discredited. More correctly stated, the ontogeny of higher organisms recapitulates ancestral ontogenies.

[69] Any claim of this kind, of course, requires some form of provenance. Kreiter suggests that "one of Blake's acquaintances may have possessed advanced scientific knowledge" (111). In Kreiter's assessment, Blake possibly had such a contact in the person of "England's famous surgeon John Hunter [1728-93], who was also a great anatomist and embryologist" (112). Ultimately, Kreiter draws the conclusion that a "concatenation of facts and internal evidence suggests that the details of embryology, anatomy, and evolution utilized by Blake in *Urizen* were indeed drawn from John Hunter" (112). In *William Blake and the Body*, Tristanne J. Connolly, while supporting this proposed connection between Blake and John Hunter, finds little direct evidence of contact but does succeed in establishing a credible connection between Blake and Hunter's older brother William, who might not only have been a conduit of ideas but could have possibly provided direct access and entry to John Hunter's world. As Connolly writes, "William Hunter was Professor of Anatomy at the Royal Academy from 1768 to 1783; Blake joined in 1779. . . . As a student at the Royal Academy, Blake probably would have attended some of the lectures and demonstrations offered" (35). In this instance, I would offer that the question of actual acquaintance becomes more relevant, since John Hunter's views on embryology were not in print when Blake wrote *The Book of Urizen*.

Brought forth an Infant form

Where was a worm before.[70]

(19.35-37)

"It is possible," Krieter suggests, "that Blake was using the new biogenetic law to indicate straightforwardly his acceptance of a new and much debated scientific theory of man's origin" (118). Once again, the notion that Blake might postulate on evolutionary theory in the 1790s is not remarkable. The idea, after all, was in the air at the turn of the nineteenth century. As noted in Chapter One, it is explicitly outlined in Erasmus Darwin's posthumously published *Temple of Nature* (1803).

Organic life beneath the shoreless waves

Was born and nurs'd in ocean's pearly caves;

First forms minute, unseen by spheric glass,

Move on the mud, or pierce the watery mass;

These, as successive generations bloom,

New powers acquire and larger limbs assume;

Whence countless groups of vegetation spring,

And breathing realms of fin and feet and wing.

But if the description of Orc's development from *Urizen* is to be taken as Blake's acknowledgement of evolutionary theory, an important question arises in regard to how this passage bears upon Blake's subsequent assertion in *Vision of the Last Judgment*

[70] Blake association of human beings with worms appears to be grounded in Job 25:6. In the context of the comparison that not even stars are pure in God's sight, the speaker asks: "How much less man, *that is* a worm? and the son of man, *which is* a worm?" The obvious associations with mortality are also in play.

(1810) that "one thing never changes into another." Is there a contradiction here? There might be if Blake actually accepted evolutionary theory, with its central tenet of species change. As it stands, he may simply be acknowledging that all organisms, even humans, develop within the context of their lifespans—that we, like other creatures, might pass through the equivalent of a "larval" stage.[71] This would not preclude him from holding the still dominant belief of the time that the essential forms of species—that is, their *types*—were fixed. Krieter would appear to concede this:

> Blake's three lines, in themselves, can be said to only reflect the pre-Darwinian observation that the embryo of a human being passes through various forms resembling the adult forms of lower life—*a fact that does not necessarily entail species evolution.* (111; emphasis added)

An alternative view regarding episodes of apparent evolutionary thinking in Blake posits that, in any identification of such processes in Blake, we must raise the possibility that what the reader is witnessing is simply the process of materialization—the physical incarnation initiated by the creation/fall—drawn out to an agonizing degree. Even Kreiter might admit that this is a more likely interpretation of such imagery in Blake, since, as she writes, the poet's acceptance of this "new and much debated scientific theory of man's origin . . . would not appear to agree with Blake's known prejudices" (118).

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[71] On the two schools of embryology active at the time, Tristanne Connolly writes, "Theories of development took two major forms: preformationist and epigenesist. . . . 'Preformationists understood growth as an increase in size of an already complex creature—one whose limbs, organs, and so forth were understood to be initially invisible only because of limitations of the human eye.' . . . Epigenesists, whose view began to prevail at the turn of the century, believed 'that the embryo develops and becomes more complex in it organization, that it changes morphologically rather than just in size'" (81). Kreiter's argument would place Blake with the camp of epigenesists.

There is one last fundamental obstacle in regard to Blake's possible acceptance of an early iteration of evolutionary theory: biological evolution, like the other proposed revisions of the new Romantic scientific paradigm, likely represented for Blake simply another reworking—if not an outright metaphysical expansion—of material processes he was forced to reject out of principle. Further, this specific scheme in all likelihood would have been especially unpalatable to him, in that it sought to link more intimately humankind with "vegetable" nature. While Blake was undoubtedly accustomed to the notion of change in the natural world—generation, birth, maturity, decay, and death—evolutionary theory proposed a new order of change and a further testament to the powers of matter.

Material Revolutions

At the close of this chapter, in a bid to further establish the link between political and scientific revolutions raised earlier, I would here note that Blake's critiques of science, usually expressed within the context of diatribes directed toward the figure of Urizen, from time to time take on the unmistakable aspect of anti-monarchical political rhetoric,[72] with Blake, within the personae of various figures, threatening to depose science. In *The Four Zoas*, "The Eternal Man" confronts Urizen with his demands for reform:

[72] Blake's own identified connections between the political and scientific spheres are evident in his observations on the state of the arts in Europe and England in the early nineteenth century, with the "wretched state of the Arts in this Country & in Europe originating in the Wretched State of Political Science which is the Science of Sciences" (Public Address N20; E580).

[I]f thou darest obstinate refuse my stern behest

Thy crown & scepter I will sieze & regulate all my members

In stern severity & cast thee out into the indefinite

Where nothing lives, there to wander. (9.120.34-37)

Blake, like Wordsworth, like many poets of the era, certainly drew inspiration from the political events transpiring in America and in France—particularly the latter, where the events of the early Revolution were viewed with almost apocalyptic anticipation. They saw the possibility of the Last Judgment being realized in their lifetimes and, with it, the long-awaited redemption of a fallen world. But Last Judgments, like the revolutions that presage them, can be figurative things. In Blake's eyes, once he adjusted his vision, a last judgment became an event that occurred whenever error was recognized and cast out.[73] It became an event synonymous with the recovery of one's imaginative vision, producing not so much a change in the world as a change in one's worldview. In the case of Blake, one after-effect of such a philosophical realignment was that the portrait of the French Revolution in his works became a largely negative one. Debate still rages whether this was because the revolt was doomed to fail from its inception because its means were physical rather than imaginative. There is, however, an appreciable difference in the revolutionary rhetoric on display in *The Marriage of Heaven and Hell* (c. 1790)—"France rend down thy dungeon" (25)—and that of *The Four Zoas* (1797-1804)[74] and *Jerusalem* (1804-1820) on the subject of "Mental" versus "Corporeal War."[75]

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[73] "[W]henever any Individual Rejects Error & Embraces Truth a Last Judgment passes upon that Individual" (*A Vision of the Last Judgment* N84[b]; E562). This reassessment occurred sometime after 1793 and before 1810, *VLJ*'s year of publication.

[74] Urthona rises from the ruinous walls

Our wars are wars of life, & wounds of love

With intellectual spears, & long winged arrows of thought.

(*Jerusalem* 34.14-15; E180)

This same characterization and subsequent rejection of materiality by Blake might be extended to Romantic science. Despite its many ostensive attractions, embodied in its fundamental differences from its Enlightenment predecessor, it was still a materialist science. Its concepts, such as organic evolution and material infinity, *were* revolutionary, enough so to topple the Enlightenment scientific paradigm. However, by successfully separating materialism from mechanism and by expanding materialism's domain, it only more strongly advanced the primacy of matter and, in the process, "Single vision." Blake's intent, meanwhile, and his final destination, was the achievement of the mystical ecstasy of fourfold vision, which no earthly science could approach.

In all his ancient strength to form the golden armour of science
For intellectual War[.] The war of swords departed now.
(*The Four Zoas* 9.139.7-9; E407)

Urthona is the eternal form of Los, now reunited with his emanation Enitharmon.

[75] *Milton* Preface; E95.

Chapter Four

Wordsworth

The Spirit of the Age

In "English Romanticism: The Spirit of the Age," M. H. Abrams questions William Hazlitt's long-standing assumption that it was the French Revolution and Wordsworth's sojourn in France (1791-92) that served as the instrumental sources for the poet's republican views.[1] Far earlier, Abrams finds, the poet was influenced in this regard by his religious sympathies.[2] Beyond that, there is another important self-documented early influence—namely, the poet's college years:

> Nor was it least
> Of many debts which afterwards I owed
> To Cambridge and an academic life,
> That something there was holden up to view
> Of a republic, where all stood thus far
> Upon equal ground; that we were brothers all.
> (*The Prelude* 1805 9.226-31)[3]

Kenneth Johnston, who has examined Wordsworth's political development in detail,

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[1] Expounded in Hazlitt's own *The Spirit of the Age* (1825).

[2] Abrams cites Wordsworth's "subservience from the first / To God and nature's single sovereignty" (*The Prelude* 1805 9.237-38; *The Prelude* 1850 9.233-35). Particularly influential were the writings of the New Testament, grounded in "the radical paradox that 'the last shall be first'" ("Spirit" 65).

[3] Whenever possible, excerpts from *The Prelude* within this study have been drawn from the 1805 version, with the corresponding line numbers from the 1850 version cited in footnote. In this instance, the passage from *The Prelude* 1850 (9.222-27) interestingly omits any specific reference to Cambridge.

notes that this "idealized view of Cambridge sits very ill with Wordsworth's account of it in Book III [of *The Prelude*], and even less well with his actual performance there" (183). It was in October of 1787 that Wordsworth first entered St. John's College at Cambridge, where, as biographer George McLean Harper notes, "[h]aving a year's start of the other freshmen in mathematics, he neglected that branch of learning" (30).[4] Evidence indicates it was Wordsworth's lack of interest in the discipline, rather than his lack of aptitude, that held him back at the university and explains his lackluster performance there. Jonathan Wordsworth, *et al.*, examining the correspondence of Dorothy Wordsworth, note that "Dorothy ascribed her brother's failure to achieve a fellowship to his dislike of mathematics, the dominant subject at Cambridge, and at this period the only one in which academic distinction could be achieved: 'William, you may have heard lost the chance, indeed the certainty, of a fellowship by not combating his inclinations'" (*Prelude* n110).

Though it did not constitute a period of academic distinction, Wordsworth's time at Cambridge (October 1787 to January 1791) did serve the purpose of exposing him to activist political influences.[5] Often overlooked, however, is the changeable nature of these influences, particularly in regard to university views toward the Revolution. In 1789, Nicholas Roe notes, "Cambridge University welcomed the French Revolution," with "a great number of members of the Senate" actively friendly to the cause (*Radical*

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[4] Wordsworth's grammar school years at Hawkshead (1779-1787) had centered around a curriculum stressing mathematics, for which he displayed an above-average level of ability. Wordsworth reflects on his college experience with math and what he describes as his modest skills in that area in *The Prelude* 1805 6.135-53 (*The Prelude* 1850 6.115-32).

[5] While pervasive at the university, such influences were, as Harper observes, anything but officially sanctioned. Harper adds that Wordsworth's embrace of these influences may well have contributed to the alienation he felt there, emphasizing that "English universities of [Wordsworth's] day were not, in a broad sense, national institutions. They were organs of the Church of England. . . . In academic groups religious and political doubt were treated with the disgust due to filial ingratitude" (32, 36).

Years 17). Then came the 1790 publication of Edmund Burke's *Reflections on the Revolution in France*, and everything changed:

> The mood of Cambridge after 1790 reflected growing anti-French opinion elsewhere in the country. This change provides a significant demarcation between the period leading up to Wordsworth's departure from St. John's in January 1791, and Coleridge's arrival at Jesus on 16 October of that year. . . . Wordsworth's Cambridge had joined with liberals and dissenters throughout the country in welcoming the Revolution, whereas Coleridge's Cambridge was divided by the argument as to what the Revolution had achieved. (*Radical Years* 17-18)

Recent scholarship is divided regarding Wordsworth's individual political orientation. For example, while Johnston agrees that Wordsworth "sympathized with the direction of liberal reform and republican sentiment," at the same time the author points out that "[Wordsworth] also contained within himself tendencies of a sharply opposite nature" (184).[6] The evolving point of discussion has now become whether Wordsworth ever actually had any radical principles to compromise in later life or revolutionary impulses that needed to be sublimated—as Abrams has famously speculated—by an "inward turn"[7] to the medium of poetry. One view of Wordsworth gaining support, Johnston notes, proposes that

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[6] Johnston argues that "[Wordsworth's] own personal, family politics, his *interests*, were Pittite all the way" (184). William Pitt, British Prime Minister from 1783 to 1801, began his political career as a protégé of Whig leader Charles Fox. His later political evolution saw him transformed into a moderate PM and finally into a loyalist collaborator and leader of the crackdown on dissent.

[7] Abrams writes, "When the later events in France dashed their faith in political revolution as a means to the millennium, a number of Romantic writers salvaged their apocalyptic hope by giving it a new

> he and his poetry existed much more within the confines of *established social and cultural norms* than the traditional romanticizing of his poetical revolution acknowledges. His later conservatism thus appears less as a betrayal of his younger self than as its continuation in more public (and more extreme) forms. This was a suspicion that his younger contemporaries always had of him and that recent scholarship has substantially confirmed. (669; emphasis added)[8]

If, however, for the sake of argument, Wordsworth's radical leanings were sincere,[9] and a philosophical involution along the lines of an "inward turn" did actually occur,[10] it would have a clear parallel in Wordsworth's and also Blake's apparent rejection of the emerging paradigm of Romantic science, in that these poets may have felt compelled to turn their backs on the scientific revolution of their day for exactly the same reason it is speculated that they renounced active political revolt—namely, the consequences they perceived its materialist orientation as having for the imaginative and spiritual elements at the heart of

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interpretation. They transferred the agency of apocalypse from mass action to the individual mind—from a political to a spiritual revolution—and proposed that "the new earth and new heaven" of Revelation is available here, now, to each man, if only he can make his visionary imagination triumph over his senses and his sense-bound understanding" ("Romantic Period" 15).

[8] In one of the most direct challenges to Wordsworth's radical credentials, James Chandler, in *Wordsworth's Second Nature*, has noted the parallels between the writings of Wordsworth and Edmund Burke. Indeed, Wordsworth's deeply nationalistic views on liberty, far from being forward-looking, do resemble Burke's in the aspect of their being "profoundly indebted to the English past" (Chandler 61).

[9] And there is strong evidence that Wordsworth did *at one time* possess genuinely radical beliefs: The poet's unpublished 1793 pamphlet, *A Letter to the Bishop of Llandaff*, contains both a justification of the execution of King Louis XVI ("I am sorry that you attach so much importance to the personal sufferings of the late royal martyr" (*Prose Works*, I, 32-33) and an apology for the subsequent Terror ("Alas! the obstinacy & perversion of men is such that [Liberty] is too often obliged to borrow the very arms of despotism to overthrow him, and in order to reign in peace must establish herself by violence" (*Prose Works*, I, 33-34).

[10] As tenuous as the premise of the inward turn presently seems, it is grounded in the observation, which Roe corroborates, that "[a]s the French Revolution became increasingly bloody, its supporters were encouraged to . . . identify alternative spheres in which human amelioration might yet be practicable" (*Politics of Nature* 2).

their poetic programs.

Matters of Scale

Romantic science, for all of its conceptual innovation, was still science. Even in its most extreme varieties, it still advanced a fundamentally materialist explanation for experiential phenomena. On this basis alone, as I have noted, Blake's impulse would have been to reject the new science outright. Wordsworth's reaction was more subdued. Not as intractably at war with the material world as Blake, Wordsworth likely would have been much more disturbed by Romantic science's unique twist on materialism than by its simple inclusion. The suggestion that Wordsworth might have rejected the new science on the basis of its expansive stretching of spatial and temporal boundaries could come as a bit of a surprise, especially given that he, like his close associate Coleridge, had been "habituated to the Vast"[11] from the period of youth onward. In Book IV of *The Excursion*,[12] Wordsworth poses the question of what is truly eternal. The answer, voiced by the sage Wanderer, is that the material universe—with absolute certainty—*is not*. But for Wordsworth and others of his generation, the new science would have challenged this certainty.

In addition to the soul, the imagination and the mind in which it dwells could both be reasonably considered infinite, in that, while both share a corporeal platform, they

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[11] As a result of the fantastic reading of his childhood, Coleridge writes in October 1797, "my mind has been habituated *to the Vast*—and I never regarded *my senses* [versus his reason and imagination] in any way as the criteria of my belief" (*Letters*, Griggs, I, 354-55).

[12] Though published in 1814, portions of this work, particularly key passages dealing with issues of science and culture, date from the turn of the century. These will be noted when cited. This passage (beginning at line 66) in all likelihood was composed later but is germane to this discussion.

themselves have no physical existence. But everything else in our experience would seem to be subject to the limitations the Wanderer describes. The concept of an *infinite material universe*, however, extending endlessly in all four dimensions, presented for Wordsworth a metaphysically adulterated construct of disorienting character and disruptive implications. In regard to physical nature, there was for Wordsworth it seems a distinction between the awe-inspiringly vast and the alienatingly infinite. While the latter would seem to meet the criterion of the sublime, careful consideration reveals that it simultaneously pushes the concept to its breaking point, in that the sublime in the Romantic sense is defined in a comparative context between the object in question and the essential human observer—specifically, nature's ability to affect the mind of the observer by merit of its power, grandeur, or scale—all of which is underwritten by the religiously informed sentiment that this affect on the observer is the *purpose* of such natural sublimity. But the view ushered in by the new science was, as Gaull describes it, one of "an alien and inaccessible external universe . . . created long before and with little relevance to human beings" (*English Romanticism* 373). The new regime, by challenging the relevance of this previously defining element of necessary human perspective, had the result of yielding a universe that magnified the non-human physical void at the expense of the human poetic vision and voice, an outcome which Wordsworth would later appear to lament in Book III of *The Excursion*:

> Voiceless the stream descends into the gulf
> With timid lapse;—and lo! while in this strait
> I stand—the chasm of sky above my head

Is heaven's profoundest azure; no domain
For fickle, short-lived clouds to occupy,
Or to pass through; but rather an abyss
In which the everlasting stars abide.[13]

Within these lines resides a vivid, through grantedly speculative, assessment of poetry's future, with the "chasm of sky . . . an abyss / In which the everlasting stars abide" suggestive of the newly conceived physical universe, fathomless now in both scale and duration, and the human voice intimidated into silence. In a move of characteristic healthy self-estimation, Wordsworth responds to this bleak scenario with a direct address to his own mental powers:

Hail Contemplation!
. . . . . .
hither come and find a lodge
To which thou mayst resort for holier peace,—
From whose calm centre thou, through height or depth,[14]
Mayst penetrate, wherever truth shall lead;
Measuring through all degrees, until the scale
Of time and conscious nature disappear,
Lost in unsearchable eternity!

[13] This excerpt and the following are found between lines 3.92-112.
[14] The realm of three dimensions—i.e., physical space.

There is little doubt that the "eternity" Wordsworth reasserts here is a contrasting and traditionally conceived *spiritual* eternity, subsuming and exceeding the dimensions of the newly configured physical universe.

Engaged with the science of his day, Wordsworth, the evidence suggests, actively responded to the concern that if the universe was in truth limitless, humanity might subsequently be demoted and decentered—in short, lost in the scale of creation. The resulting preoccupation with matters of scale that one finds in Wordsworth's poetical works serves to support claims of the poet's resistance to this notion of humanity as something perhaps spatially and temporally incidental. Metaphors of scale in regard to the effects of science in particular—for instance, the repeated use of descriptors suggesting division and dwindling[15]—communicate not only the traditional poetic concern about science making the individual investigator's spirit a meaner thing, but also a new warning that the enterprise collectively labors to diminish humankind in the grand scheme of time and space. Wordsworth's gravest concern, in all likelihood, lay in how these issues might affect the final estimation of the human poetic imagination, the fear being that it, like ourselves, could be diminished by the ultimate scale, and that it might come to be viewed as a transient rather than a transcendent faculty.

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[15] One example: Wordsworth questions whether in the course of scientific investigation "'twas ever meant / That we should pry far off yet be unraised; / That we should pore, and dwindle as we pore" (*The Excursion* 4.958-60). Excerpt originally composed 1798, as part of the Addendum to "The Ruined Cottage" (58-60).

The New Materialism

Wordsworth is clearly not averse to the notion of *spiritual infinity*, the existence of which is frequently suggested to him by scenes from the natural world. For example, here at Mt. Snowdon, in Book XIII of *The Prelude* 1805:

> I beheld the emblem of a mind
> That feeds upon infinity, that broods
> Over the dark abyss, intent to hear
> Its voices issuing forth to silent light
> In one continuous stream; a mind sustained
> By recognitions of transcendent power. (73-78)[16]

That we come from infinity is in large part the argument of the Intimations Ode (1802-1804); thus, such infinity cannot be considered alien.[17] The same, however, cannot be said for infinity's new material expression—at least, not by Wordsworth around this time. By later in his career, however, in a passage not present in *The Prelude* 1805, the poet *seems* to have come to terms with—or at least can finally acknowledge—the new view of the universe, and mathematical science's role in establishing it:

> [B]y what process led,

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[16] *The Prelude* 1850 14.70-75.

[17]
> Our birth is but a sleep and a forgetting:
> The Soul that rises with us, our life's Star,
> Hath had elsewhere its setting,
> And cometh from afar:
> Not in entire forgetfulness,
> And not in utter nakedness,
> But trailing clouds of glory do we come
> From God, who is our home.
> (Intimations Ode 5.1-8)

Those immaterial agents[18] bowed their heads

Duly to serve the mind of earth-born man;

From star to star, from kindred sphere to sphere,

From system on to system without end.

(*The Prelude* 1850 6.124-28)[19]

But in the lines immediately following this insert, Wordsworth reverts back to the traditional (and comfortable) notion of a materially bounded universe, with its unquestioned inferiority to the eternal and infinite spiritual realm.

[T]here,[20] [I] recognised

A type, for finite natures, of the one

Supreme Existence, the surpassing life

Which—to the boundaries of space and time,

Of melancholy space and doleful time,

Superior and incapable of change,

Nor touched by welterings of passion—is,

And hath the name of, God.

(*The Prelude* 1850 6.132-39)

Though it has not been noted by other commentators, I would argue that the existence of a corresponding (if less developed) equivalent of this latter passage in the 1805 version[21]

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[18] The "abstractions" of "geometric science" (lines 117 and 123).

[19] As Jonathan Wordsworth, *et al.*, note, "The 1850 *Prelude* is the result of three full-scale reworkings of the poem, and numerous minor revisions. In 1816/19, 1832, and 1839, new faircopies were made, and from the last of these *The Prelude* was finally printed just ten weeks after Wordsworth's death" (xi).

[20] In mathematics.

[21] *The Prelude* 1805 6.154-57.

confirms that the passage preceding it in 1850 is indeed an insert, an enhancement of his 1805 position, indicating—if not a shift in Wordsworth's attitude in later decades—then at least the eventual recognition on his part of a change in the scientific viewpoint.

Wordsworth's response to the new materialism proposed by Romantic science, as well as the old materialism of Enlightenment science, usually finds expression within a context of generalized anti-scientific rhetoric, which can lead to the voicing of some unexpected characterizations and conclusions on the poet's part, particularly toward the material object of science's study—namely, the natural world. In contrast to our divine origins cited in the opening lines of stanza five of the Intimations Ode, our earthly experience, described later in stanza five and stanza six, is presented in a comparative critique of nature wherein "Shades of the prison-house" soon close about the "Inmate Man" (5.10; 6.6). A decade later, on the topic of science's "dominion over nature," Wordsworth writes, without apparent irony:

> yet do I exult,
> Casting reserve away, exult to see
> An intellectual mastery exercised
> O'er the blind elements; a purpose given,
> A perseverance fed; almost a soul
> Imparted—to brute matter.
> (*The Excursion* 8.199-204)

Within the context of this darker perspective, a strategy of sorts emerges on Wordsworth's part—not one of confrontation, but rather one of letting materialism run its course and play itself out. The preceding passage continues:

> [W]ith the sense of admiration blends
> The animating hope that time may come
> When, strengthened, yet not dazzled, by the might
> Of this dominion over nature gained,
> Men of all lands shall exercise the same
> In due proportion to their country's need;
> Learning, though late, that all true glory rests,
> All praise, all safety, and all happiness,
> Upon the moral law. (*The Excursion* 8.208-16)

This hands-off response to the actions of material science is not a move of resignation on Wordsworth's part, but apparently one of faith: a deep and abiding faith in the failings inherent in the materialist viewpoint. In a late poem, "Musings near Aquapendente" (1837), Wordsworth speculates on the dark fate awaiting the ever-expanding scientific enterprise; employing a variation on the "river of time" metaphor, he reflects on the scientific character of the nineteenth century thus far:

> The Stream
> Has to our generation brought and brings
> Innumerable gains; yet we, who now
> Walk in the light of day, pertain full surely

To a chilled age, most pitiably shut out
From that which 'is' and actuates, by forms,
Abstractions, and by lifeless fact to fact
Minutely linked with diligence uninspired,
Unrectified, unguided, unsustained,
By godlike insight. To this fate is doomed
Science, wide-spread and spreading still as be
Her conquests, in the world of sense made known. (321-32)

The concluding lines here referring to the "wide-spread and spreading . . . conquests" of science are, of course, quite provocative and suggest the possible argument that science's fatal flaws, as Wordsworth sees them, are in no way ameliorated, and perhaps are even exacerbated, by the expanding materialist vision of the cosmos fostered by the ongoing change in the scientific paradigm. Interestingly, this poem dates from the same period as the final revisions to *The Prelude* 1850, and thus may be concurrent with that poem's earlier identified explicit acknowledgement of the new material infinity of Romantic science.[22]

Wordsworth and the New Science: Access and Issues

As a working poet during the turn-of-the-century period for which he is of most interest to literary historians, Wordsworth's views on the subject of science were shaped by a variety of sources, none more important than his association with Samuel Taylor

[22] *The Prelude* 1850 6.124-28.

Coleridge, which from the year 1795 forward brought Wordsworth into close contact with the world of contemporary scientific thought. Of this astonishingly productive period of poetic collaboration, James Averill writes,

> The year of almost daily contact in Somersetshire cause[d] Wordsworth to become aware of contemporary scientific inquiry. References to "Science" and requests for books of natural philosophy begin to appear in his poems and letters, as he makes an intense, if short-lived, attempt to comprehend and exploit poetically the scientific discoveries of the age. (235)

Coleridge did unquestionably endeavor to keep Wordsworth involved in this area. One notable account, in a 1801 letter from Coleridge to Humphry Davy,[23] relates Coleridge's unrealized plan for starting up a "Chemical Laboratory" and recruiting Wordsworth into the venture with the intent of supplying his friend with some much needed diversion from the demands of poetry, Coleridge writing, "[H]e feels it . . . necessary for him to have some intellectual pursuit less closely connected with deep passion than poetry and is of course desirous, too, not be so wholly ignorant of knowledge, so exceedingly important."[24]

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[23] Davy was a personal acquaintance of Wordsworth as well (through Coleridge). As Roger Sharrock reports, before discontinuing his term of residence in Bristol, "Davy had corrected the proofs of the second edition of *Lyrical Ballads*, receiving them in batches from Wordsworth with his directions. It was a convenient arrangement since Biggs & Cottle, the publishers, were in Bristol and Wordsworth was far away in Grasmere . . . [and because] Wordsworth was averse to the drudgery of correction" (57). Through their contact, Davy was likely an important influence on Wordsworth's attitudes toward science but, as noted above, not as large an influence as Coleridge would have liked.

[24] *Letters*, Griggs, Vol. 2, 670.

The pursuit of scientific knowledge had a definite influence on the poetic collaboration of Wordsworth and Coleridge. Wordsworth's letter of March 11, 1798, to James Losh makes clear one of the principal motives behind the poets' publication of *Lyrical Ballads*—namely, to provide funding for what was envisioned as in part a scientific expedition to Germany: "We have come to a resolution, Coleridge, Mrs. Coleridge, my Sister, and myself of going into Germany, where we purpose to pass the two ensuing years in order to acquire the German language, and to furnish ourselves with a tolerable stock of information in natural science."[25] Given the timing of this announcement, and their declared destination, the knowledge that Wordsworth and especially Coleridge sought would have included elements of the *Naturphilosophie* of Schelling, *et al*. As Trevor Levere describes it: "Schelling had formulated a philosophy tending in the same direction as Coleridge's thought and feeling," one that showed the way toward "a dynamic science that would oppose and topple sterile, dead, mechanical science"; in short, "Coleridge became persuaded that he needed to go to Germany" (*Poetry Realized* 68, 16).[26]

Coleridge's selective attraction to some species of Romantic science—such as *Naturphilosophie*[27]—and resistance to others—such as Erasmus Darwin's evolutionary

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[25] *Early Letters* 189.

[26] Once actually in Germany, it should be noted, Coleridge and the Wordsworths promptly split up. William and Dorothy, because of their finances, wound up in Goslar, where they rode out a hard winter in the rustic setting. Coleridge's destinations, meanwhile, included the university towns of Ratzeburg and Gottingen, where he pursued his interests. The actual duration of their stay abroad was less than a year.

[27] Among the species of Romantic science in existence at the turn of the century, the German variant did prove to be the most accommodating and popular choice for Romantic poets, at least for a time. Coleridge, for one, was an adherent until he became dissatisfied with its failure to discriminate between the speculative and the empirical (Levere, *Poetry Realized* 68). Coleridge's views on empiricism are complex, but, in essence, what he saw as a vice in poetry he could allow as a virtue in science.

speculations[28]—is significant in that Coleridge's views exercised a direct influence on Wordsworth's views. Beyond the concept of material infinity and the challenge it posed to the anti-materialist rhetoric of the Romantic poetic program, the most vocal flashpoint between the practitioners of the new poetry and the new science lay within the concept of evolution. On the topic of biological evolution, particularly, Coleridge had a keen interest; which is not to say that his expressed sympathies for a dynamic and developing natural system extended to the history of humankind. On the contrary, Levere writes,

> Coleridge repeatedly remarked nature's self-anticipation—instinct in ants foreshadowing understanding in man, the anatomy of the apes foreshadowing human anatomy. . . . But between the lower anticipation and the higher manifestation there was always an absolute separation. . . . "[T]he impassable Chasm between the highest Orders of Animals and the Man . . . cannot be filled up or bridged over. . . . [The preceding] dim Prophecies [are] not incipient Fulfillments." (*Poetry Realized* 214)

In Coleridge's view, there *is* an observable ascent of life—a ladder being the key metaphor—but it is a *created* rather than a *developed* hierarchy, with the spaces between the rungs of the ladder every bit as important as the rungs themselves. In Coleridge's scheme, humanity was the crowning achievement of nature, embodying all of the refinements modeled by lower organisms.

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[28] To reprise Coleridge's opinion of E. Darwin's speculations: "[T]he absurd notion of . . . Darwin . . . of Man's having progressed from an Ouran Outang state—so contrary to all History, to all Religion, nay, to all Possibility" (*Selected Letters* 188).

A generalized Romantic poetic resistance to the notion of biological evolution, clearly evident in Coleridge, may be traced to two intricately related perceptions regarding the earliest version of the theory: first, that it required no creator, and, second, that it defied logic. Disallowing any consideration of the timeframe necessary for the processes of evolution to work, as most theories of origin did prior to Hutton's revised estimate of earth's age, the alternative to intelligent design was not gradual development over the ages but rather the instantaneous and "fortuitous concourse of atoms" that Lord Byron once derided.[29] If the universe and the ancestor of every living thing came into existence in its present form in a single instant, then creation by divine agency was the only logical argument. As for Wordsworth's own views on evolution, a telling episode is recorded in the closing passages of the Preface to *Lyrical Ballads*: In regard to the futility of analyzing whether a work constitutes good poetry or bad if it has not yet been ascertained that it is poetry in the first place, Wordsworth observes, "Why trouble yourself about the species till you have previously decided upon the genus? Why take pains to prove that an Ape is not a Newton when it is self-evident that he is not a man?" (270). Altogether, it is an interesting choice of metaphor for the time.

Research and Rebellion

A fascinating thesis advanced by James Averill suggests that a good deal of the anti-scientific rhetoric one observes in Wordsworth's work at the turn of the century

[29] "[A] creator is a more natural imagination than a fortuitous concourse of atoms" (*Letters and Journals*, ed. Leslie Marchand, IX, 46-47)

resulted from the poet's resistance to the oppressive weight of the *Recluse* project[30] particularly the staggering amount of research he felt was required for its creation. The story begins in April 1797, when Coleridge, writing to Joseph Cottle,[31] outlines the preparation—including the scientific preparation—necessary to write a truly epic poem for the times. Before undertaking such a poem, Coleridge writes, "I would be a tolerable Mathematician, I would thoroughly know Mechanics, Hydrostatics, Optics, and Astronomy, Botany, Metallurgy, Fossilism, Chemistry, Geology, Anatomy, Medicine—then the *mind of man* then the *minds of men*."[32] Perhaps in recognition of the limits of his own discipline as a writer, Coleridge ceded his idea to Wordsworth, who agreed it to be a worthy plan and promptly set to work. In March of 1798, Averill notes, Wordsworth "industriously begins a program of extensive reading." Interestingly, and probably not coincidentally, a recurrent theme within *Lyrical Ballads* (published that very same year) is "the pointlessness of such reading" (Averill 244).

As for the nature of this research, Desmond King-Hele, in a separate study, notes that toward the end of February, 1798, Wordsworth requested that Cottle send him a copy of Erasmus Darwin's two-volume *Zoonomia; or, the Laws of Organic Life*:[33] "I write merely to request (which I have very particular reasons for doing) that you would

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[30] In the Preface to *The Excursion* (1814), Wordsworth outlines the three-part *Recluse*, conceived as the *magnum opus* of his career, of which *The Excursion* is Part II and *The Prelude* merely the abstract for Part I.

[31] Bristol publisher of *Lyrical Ballads*.

[32] *Letters*, Griggs, Vol. I, 320.

[33] Volume I published in 1794 by Joseph Johnson. The two-volume edition that Wordsworth consulted appeared in 1796.

contrive to send me Dr. Darwin's Zoönomia by the first carrier."[34] King-Hele goes on to note that "Wordsworth probably received the volumes about March 10, and kept them until May 9, two months when several of the Lyrical Ballads were written" (116). As useful as Darwin's work was to Wordsworth in regard to its psychological case studies, clearly something in the scientist's approach rubbed the poet the wrong way, with Darwin becoming a central figure in the poet's anti-science backlash. In "A Poet's Epitaph," which appears in the 1800 edition of *Lyrical Ballads*, Wordsworth interrogates the object of his contempt: "Physician art thou? One all eyes, / Philosopher! a fingering slave, / One that would peep and botanize / Upon his mother's grave?" Averill, with strong justification, speculates that Wordsworth has "a particular 'physician-philosopher' in mind" (245). The identification with Darwin is strengthened by the offending party's penchant for "botanizing"—a not-so-subtle reference to Darwin's most famous work, *The Botanic Garden*. Ultimately, Averill writes, the "rejection of the aggressive quest for knowledge, implicit in [such works as] 'The Tables Turned,' and in its companion poem, 'Expostulation and Reply,' reflects . . . Wordworth's rebellion against his own ambition to write the all-encompassing poem" (244). We may also read into it a sense of frustration at his lack of progress on the epic, and perhaps his eventual realization that, as originally envisioned by Coleridge, such a work constituted an essentially Enlightenment project.

It is worth noting that Wordsworth's inquiries into contemporary science in support of the *Recluse* project continued beyond the September 1798 publication of

[34] In *The Early Letters of William and Dorothy Wordsworth*, editor Ernest de Selincourt places this undated piece of correspondence in a sequence of letters from the summer of 1797 (169).

Lyrical Ballads, and were pursued both at home and abroad. But these efforts were not always immediately a success—at least, not in the way projected. Take for example the intended researches of Wordsworth and Coleridge's excursion to Germany in the closing months of 1798. In regard to both aims of their journey abroad—first, "to become profitable translators" and, second, to investigate German natural philosophy—Wordsworth was handicapped by "his low rate of progress in learning the language" (Johnston 627, 625), a struggle expressed in his exasperated comment: "A fig for your languages, German and Norse."[35] "As I have had no books," Wordsworth wrote to Coleridge from his winter isolation in Goslar—meaning no books in English he could actually *read*, "I have been obligated to write in self-defence."[36] And on that score, at least, it was an incredibly productive period. As for the acquisition of German natural philosophy: Ironically, what Wordsworth came to know of it, he appears to have absorbed from Coleridge once back in Britain.

The Preface

In *The Study of Poetry* (1880), Matthew Arnold critically examines the altered roles of poetry, science, and faith in the second half of the nineteenth century. Arnold organizes his discussion around a quotation by Wordsworth from the 1802 edition of *Lyrical Ballads*:[37] "Poetry," Wordsworth writes in the work's Preface, "is the

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[35] The first line of "Written in Germany, on one of the coldest days of the century," composed in Goslar and published in the 2nd edition of *Lyrical Ballads* in 1800.

[36] *Early Letters* 204.

[37] The 1798 edition of *Lyrical Ballads* carried only a brief prefatory "Advertisement." The second edition of 1800 carried the first full-length Preface. For the third edition of 1802, Wordsworth added the now famous "What is a Poet?"/ "Man of Science" insert.

impassioned expression which is in the countenance of all science" (259). Even within its original context, Wordsworth's remark is somewhat ambiguous.[38] To Arnold, however, Wordsworth's meaning is clear—namely, that poetry possesses within it the means of fulfilling the mission of science. Indeed, Arnold says, "Without poetry, our science will appear incomplete" (1445). As the essential prose document of Wordsworth's relations to science at the turn of the nineteenth century, the Preface of 1802 stands as an unparalleled resource. Within its pages, Wordsworth acknowledges the tensions building between the scientific enterprise and other epistemological systems; in the process, he makes the case for constructing an integrated role for the "Man of Science" in the order that is to come.[39] Whether motivated by a generous sense of inclusion or by an anxious sense of necessity, Wordsworth in the Preface seems to advance a rhetoric of reconciliation:

> If the labours of men of Science should ever create any material revolution, direct or indirect, in our condition . . . the Poet will sleep then no more than at present, but he will be ready to follow the steps of the Man of Science, not only in those general indirect effects, but he will be at his side, carrying sensation into the midst of the objects of Science itself. (259-60)[40]

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[38] The ambiguity of the quote Arnold selects unfortunately dredges up the entire semantic debate regarding science as all human knowledge versus the more narrowly defined systematic study of the natural world.

[39] When Wordsworth speaks of the "Man of Science" in the 1802 Preface to *Lyrical Ballads*, evidence indicates he is responding personally to Humphry Davy on the occasion of the chemist's introductory lecture at the Royal Institution of Great Britain, on January 21, 1802, the topic of which had been the noble role of the scientist in culture.

[40] All citations from the Preface to *Lyrical Ballads* in this study are drawn from the Brett and Jones edition (New York: Routledge, 1991).

It is worth noting here that science—in the form of Romantic science—had by this time already created such a "material revolution" in its revisionist view of the dimensions, origins, and processes of the physical universe. And what is immediately striking is that Wordsworth, in his capacity as poet, is not busying himself with the cultural assimilation of these particular "objects of Science." Perhaps an important point to consider is the one raised by Ralph Crum in *Science and Literature*—namely, that "[w]hile Wordsworth did not deny the possibility of scientific thought finding expression in poetry . . . for him, this was in the future" (188).[41] Unfortunately, this deferring of the integration of poetry and science to another time—and to a succeeding generation of poets—has raised questions about the sincerity of Wordsworth's commitment to the reconciliation he proposes.

When the Preface to *Lyrical Ballads* is cited in Wordsworth and science studies—and it almost invariably is—the discussion usually focuses upon a single passage: the nearly 3000-word insert added to the third edition of April 1802. This addition, embedded within an examination of what constitutes the appropriate language for poetry, begins with Wordsworth's assertion that poetry and prose are not antithetical entities as, say, poetry and science are antithetical. In regard to the insert's central question—namely, "What is a Poet?"—the answer seems to be that he or she is everything the scientist is not. Indeed, within the Preface, Wordsworth misses no opportunity to contrast

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[41] As the Preface continues, Wordsworth states that the "remotest discoveries of the Chemist, the Botanist, or Mineralogist, will be as proper objects of the Poet's art as any upon which it can be employed, if the time should ever come when these things shall be familiar to us, and the relations under which they are contemplated by the followers of these respective Sciences shall be manifestly and palpably material to us" (260). In other words, poetry shall become more scientific when culture in general does, when the scientific knowledge of the layman permits, and when the motives of the scientific community are *clear*. Again, for Wordsworth, this is a scenario to be played out in some indefinite future—perhaps because, as Geoffrey Hartman has speculated, at that time "science's human significance was still too remote or uncertain for him" (195).

favorably the role of the poet with that of the scientist, going so far as to suggest that a good deal of poetry's radiance stems from its shining so brightly in comparison to science, a view that Wordsworth sees as an inescapable by-product of their underlying philosophical differences:

> [T]he Poet, prompted by this feeling of pleasure which accompanies him through the whole course of his studies, converses with *general* nature with affections akin to those, which, through labour and length of time, the Man of Science has raised up in himself, by conversing with those *particular* parts of nature which are the objects of his studies. (259; emphasis added)

Reading between the lines, we gather that, in that poetry is generalizing and science is particularizing, poetry appeals to our sense of unity while science caters to our predilection for division—in short, it boils down to a question of the synthetic versus the analytic. There is an implicit values judgment in this comparison for Wordsworth. He then proceeds to shore up this comparative argument with a theological metaphor: "The Man of Science seeks truth as a remote and unknown benefactor; he cherishes and loves it in his solitude: the Poet, singing a song in which all human beings join with him, rejoices in the presence of truth as our visible friend and hourly companion" (259). This casting of science's truth as the remote deist god and poetry's truth as the engaged theist equivalent is unquestionably done with a clear understanding of the conclusions these associations evoke—namely, that poetry's truth is immanent and ever-present, while science's is disconnected and far removed from human affairs.

Qualified Criticism

As noted in Chapter Two of this study, "science" was still a term in transition at the turn of the nineteenth century, its newly specialized connotation seen by Romantic poets as being emblematic of the intellectual fragmentation the discipline itself promoted. In the case of Wordsworth particularly, it appears that this contraction of the signifier—contrasted with poetry's inclusiveness—comes to represent the chief failing of the signified and that this perceived failing goes on to inform a good deal of the poet's subsequent criticism of institutional science. With his status as future laureate making him the highest-profile figure among the early English Romantics, Wordsworth has historically served as the focus of polarizing arguments by ensuing generations of critics in regard to poetic Romanticism's response to the scientific enterprise. In the text of a presentation before the Wordsworth Society in 1884, R. Spence Watson references Leslie Stephen's even earlier work, the *History of English Thought in the Eighteenth Century* (1876), in which

> Stephen says that Wordsworth 'hates science, because it regards facts without the imaginative and emotional colouring.' The statement is not correct, but it expresses the belief generally held. And that this unfounded view should be the common one is scarcely surprising when we consider the way in which Wordsworth speaks of science and her votaries in the few writings known to the general reader. (201)

The truth is, poetic partisans would not have to concern themselves with explanations of an author's apparently anti-scientific rhetoric if science itself were a historically

unambivalent force. But the reality is that even as its cultural presence has remained constant, science's reputation has waxed and waned, with the discipline cycling in and out of popular favor;[42] keepers of Wordsworth's poetic legacy, meanwhile, have been sensitive to how the artist's reputation might be affected by these shifts. Over the years, these analysts of Wordsworth's poetry have been fairly united in their insistence that what the poet opposes is not science but simply science's excesses, de-emphasizing any perceived criticisms of the innate character of the enterprise. In the Victorian era, Watson, in the aforementioned presentation to the Wordsworth Society, himself essayed this line of rhetoric, arguing that the issue for Wordsworth was not science's penchant for specialization, but rather its potential for *over*specialization:

> Wordsworth's warning voice is of even greater value in our time than it was in his own. For this is the day of specialised study—of specialised life. In all branches of human affairs, intense competition, the pressure of numbers, the desire to go far, the wish to know much, and to know it accurately, have led to subdivision of labour, to the individual man's becoming a specialist. (216)

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[42] One of the more famous essays on this subject is Stephen Toulmin's "The Historical Background to the Anti-Science Movement" (1972), wherein the author writes, "I do not think we shall understand the anti-science movement properly unless we look at it in its longer-term historical context"; he then proceeds to describe such fluctuations as "things that come and go—recurrent if not permanent features of human experience, which are normally below the surface, and have occasionally blown up to serious proportions" (23). Toulmin concludes: "Looking back at the whole history of public attitudes to science, in fact, I have sometimes wondered whether they were not a generational or secular phenomenon, as predictable as the tides. Throughout the last half-millenium . . . anti-scientific attitudes seem to have peaked at intervals of 130 years or so, if not every 65 or 30-35 years" (24). Among these periodical revivals, Toulmin specifically addresses the Romantic Period and 1960s counter-culture, citing as common threads the renewed interest in such issues as humanism, individualism, and imagination.

A half century later, in 1925, Alfred North Whitehead zeroed in on a different excess: In "The Tables Turned," Whitehead notes, Wordsworth "discloses the intellectual basis of his criticism of science" (121):

> He alleges against science its absorption in abstractions. His consistent theme is that the important facts of nature elude the scientific method. . . . He felt that something had been left out, and that what had been left out comprised everything that was most important. . . . Wordsworth opposes to the scientific abstractions his full concrete experience. (121, 112, 118)

Interestingly, Whitehead claims that, in his critique of science, "Wordsworth was not bothered by any intellectual antagonism" (112), though eight pages later he cites Wordsworth's "dislike of science" as a flaw in the poet's arguments regarding nature (120).

Whitehead also mentions Wordsworth's objections to science's habit of analysis: "Wordsworth emphatically bear[s] witness that nature cannot be divorced from its aesthetic values; and that these values arise from the cumulation, in some sense, of the brooding presence of the whole on to its various parts" (127). That Wordsworth is hostile to such analysis is manifestly clear, particularly the removal of the object of study from its natural context:

> Oh! there is laughter at their work in heaven!
> Inquire of ancient Wisdom; go, demand
> Of mighty Nature, if 'twas ever meant
> That we should pry far off yet be unraised;

That we should pore, and dwindle as we pore,

Viewing all objects unremittingly

In disconnection dead and spiritless;

And still dividing, and dividing still,

Break down all grandeur . . .

. . . . . .

. . . waging thus

An impious warfare with the very life

Of our own souls! (*The Excursion* 4.956-68)[43]

Some might again argue that what Wordsworth is objecting to here is science's excesses, not its essence, but that does not obviate the fact that every one of the characteristics Wordsworth criticizes—specialization, abstraction, and analysis—is a defining aspect of the enterprise,[44] making his critique much more problematic than generally acknowledged.

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[43] Lines 958-68 of this excerpt originally appear as lines 58-68 of the Addendum to "The Ruined Cottage" (1798). The bulk of this poem would go on to form the core of Book I of *The Excursion* (see pages 139, 376, and 402 in *The Poetical Works of William Wordsworth,* Vol. 5 (DeSelincourt and Darbishire, eds.)). In the Cornell Wordsworth edition of *The Ruined Cottage*, editor James Butler notes that this "reconciling addendum" numbered 146 lines total (20). The excerpt cited here constitutes lines 57 to 67 of that addendum in Butler's numeration of the original manuscript (see pages 267-69); this is a minor variance from that recorded in previous sources. As Butler also notes, the precise dating of the addendum has not yet been determined, but speculation exists primarily in regard to which month in early 1798 it was composed (20-21).

[44] Granted, these characters apply more to some scientific disciplines (such as biology) than to others (such as astronomy). Still, *all* are implicated. In "Star Gazers" (1806), Wordsworth observes, "Whatever be the cause, 'tis sure that they who pry and pore / Seem to meet with little gain, seem less happy than before" (29-30). The rhetoric here—in addition to its echoes of the preceding passage from "The Ruined Cottage"—is not all that different from that in "A Poet's Epitaph," with its criticism of the biological scientist who would "peep and botanise / Upon his mother's grave" (19-20).

Other analysts are willing to grant a certain fractious tone to Wordsworth's youthful opinions on science but argue that that these views moderated during the course of his long lifetime, moving from tolerance to acceptance to even qualified endorsement in some cases. This view parallels, and in all likelihood is grounded in, the poet's popularly perceived shift in political views from radical to conservative during the same period. In regard to science, however, there is not much evidence to support this claim. There *is* Wordsworth's somewhat unexpected (and completely un-ironic) take on natural and scientific harmony within the oft-cited lines from "Steamboats, Viaducts, and Railways" (1833), wherein the poet allows that "Nature doth embrace / Her lawful offspring in Man's art." On the other hand, this sonnet stands as anything but a ringing endorsement of science and technology. In light of the fact that those concluding lines of faint praise are prefixed by cutting observations regarding science's possessing a presence that "mar[s] / The loveliness of Nature" (4-5) and "harsh features" disowned by "beauty" (9-10), the work seems more a gesture of poetic expansiveness than anything else, with Wordsworth generously acknowledging that nothing is all bad.

A number of critics have noted the comment to amanuensis Isabella Fenwick, recorded in 1843, wherein Wordsworth does the once unthinkable and makes a case for the aesthetic appreciation of nature through scientific analysis:

> Some are of the opinion that the habit of analysing, decomposing, and anatomizing is inevitably unfavourable to the perception of beauty. . . . Admiration and love, to which all knowledge truly vital must tend, are felt by men of real genius in proportion as their discoveries in natural

> Philosophy are enlarged; and the beauty in form of a plant or an animal is not made less but more apparent as a whole by more accurate insight into its constituent properties and powers. (qtd. in Evans 136)

This is another generous but hardly emphatic or universal endorsement. Note first of all that the scientifically mediated perception of beauty Wordsworth cites is limited to those who toil in the natural sciences; second, recall that, as the Preface to *Lyrical Ballads* makes clear, in Wordsworth's opinion a scientist's and a poet's sense of aesthetics are two very different and unequal things.

I would say in concluding this section that any acknowledgment of the complexity of Wordsworth's views regarding science, the willingness to go beyond simplistic pro and con caricatures, is laudable and valuable. However, the ameliorist views of many critics, from Watson to Whitehead to the present day, appear at times to be a bit too selective in that they fail to satisfactorily account for the numerous and blatant examples of overt anti-scientism found in Wordsworth. The risk is that Wordsworth's views may once again become oversimplified—in this case, towards the positive and the conciliatory—when real grounds and documented evidence of contention exist. Again, this is not to say that Sir Leslie Stephen's overbroad edict that "Wordsworth hates science" is any more accurate than it ever was, simply that the grounds on which he based that assessment are not a complete mirage.

"The Pre-eminent Science of Revolution"

Just as discoveries within astronomical science were redefining this culture's understanding of material space, a science much closer to home, during the same period, was expanding material concepts of time. Geology was a strikingly diverse field at the turn of the nineteenth century, incorporating under its umbrella a wide range of activities. The developmental history of the earth as revealed by sedimentology, stratigraphy, and geomorphology, as well as the history of organisms revealed by paleontology, provided striking evidence for a new view of earth's history and the changes that had unfolded within its span. The two most prominent theories of the day each presented a distinct view of that history and each possessed a piece of the truth; these theories were the catastrophism of Cuvier and the uniformitarianism (gradualism) of Hutton. The former, though misguided in its belief in a young earth, had the benefit of allowing the possibility of radical change, while the latter, positing an unfathomably ancient world of "deep time," allowed only gradual change at an exceedingly slow pace.

The key reference in regard to Wordsworth's views on these matters of scientific interest is, like the Preface to *Lyrical Ballads*, once again a prose work—namely, the poet's popular *Guide to the Lakes*.[45] Within the *Guide* are various examples of Wordsworth's philosophical ambivalence regarding geological issues, with the poet apparently accepting one view, uniformitarianism, as scientific fact, while embracing the

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[45] Wordsworth's *Guide* originally appeared in 1810 as an introduction to *Wilkinson's Select Views*; it was later published separately, the first edition appearing in 1822. The excerpts cited in this study are from the 1835 edition: *A Guide Through the District of the Lakes in The North of England with a Description of the Scenery, &c. for the Use of Tourists and Residents, Fifth Edition with Considerable Additions, 1835.*

other, catastrophism, for its Romantic aesthetics.[46] "The sea appears to have been *retiring slowly for ages* from this coast," Wordsworth writes in the *Guide*. "From Whitehaven to St. Bees extends a track of level ground, about five miles in length, which formerly must have been under salt water so as to have made an island of the high ground that stretches between it and the sea" (*Prose Works* 188n; emphasis added). Implicit in such a reference as this is the poet's acceptance of the role of gradualist processes in shaping the earth's surface.[47] But at the same time, Wordsworth elsewhere refers to the waters of the Deluge as reaching up to the highest peaks of the Alps.

The reason such a discussion is of interest is that the issues raised in the geological science debates of the era had implications that extended far beyond the field itself. Indeed, by the closing decade of the eighteenth century, "geology," as Alan Bewell notes, "had assumed the status of *the* preeminent science of revolution" (246)—not just in regard to how geological concepts (such as deep time) required a rethinking of established systems of human knowledge, but in regard to how the very processes of geology themselves appeared to model the dynamics of radical political change. There occurred within the science, John Wyatt notes in *Wordsworth and the Geologists*, "a recognition of significant 'revolutions.'. . . Violations of earth's structure . . . followed

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[46] In the *Guide*, Wordsworth reaches a compromise view of sorts, allowing that the gross features of the earth were created at the time of its possibly violent formation, but that they have since been modified by steady processes over the span of ages: "Sublimity is the result of Nature's first great dealings with the superficies of the earth; but the general tendency of her subsequent operations is toward the production of beauty. . . . That uniformity which prevails in the primitive frame of the lower grounds among all chains and clusters of mountains where large bodies of still water are bedded, is broken by the secondary agents of nature, ever at work to supply the deficiencies of the mould in which things were originally cast" (*Prose Works* 181).

[47] Edward Proffitt notes that "throughout Wordsworth, there are passages that suggest an evolutionary reading of the landscape consonant with his developmental conception of human growth. . . . [I]n Book IV of the *The Excursion*, for instance, the Wanderer speaks of 'nature's gradual processes' (l. 288)" (89).

by periods with 'new' environments and different organic forms" (39). This revolutionary model and moral was not lost on the Romantics.

In regard to the connection between earth science and earthly politics, Wordsworth, without question, found in geology a compelling source of imagery for human environments undergoing enormous change. The geological and political merge in a particularly memorable episode from Book IX of *The Prelude*. At the site of the Bastille, stormed two years previously, Wordsworth gathers up a stone as a souvenir of the time and place:

> Where silent zephyrs sported with the dust
> Of the Bastille, I sate in the open sun,
> And from the rubbish gathered up a stone,
> And pocketed the relic in the guise
> Of an enthusiast. (9.63-67)[48]

But despite the deceptive tranquility of the scene in 1791, Wordsworth is not lulled, realizing that as

> Year follows year, the tide returns again,
> Day follows day, all things have second birth;
> The earthquake is not satisfied at once.
> (*The Prelude* 1805 10.72-74)[49]

It is interesting to note that in the excerpt from Book IX Wordsworth picks up the stone in the guise of a *geology* enthusiast—the scientific discipline providing him with

[48] *The Prelude* 1850 9.67-71.
[49] *The Prelude* 1850 10.83-84.

ideological cover, as it were, allowing his youthful self to assume the pose of a detached scientific observer at this historically charged site—as opposed to an emotionally invested, perhaps even sentimental supporter of the revolutionary cause. Interesting, too, is how Wordsworth's temperament on this occasion (at least, as he recalls it in 1805) is muted by this scientific posture—"I looked for something which I could not find, / Affecting more emotion than I felt" (9.70-71).[50] In short, the older, post-revolutionary Wordsworth of 1805 finds a use for the scientific mentality and its distance from its object of inquiry, if only in this one instance when the process of change went so horribly awry.

Mind and Matter

In his annotations to Wordsworth's *Poems*, William Blake writes, "Natural Objects always did & now do Weaken deaden & obliterate Imagination in Me[.] Wordsworth must know that what he Writes Valuable is Not to be found in Nature" (E665). Whereas Blake viewed matter as a fallen and passive expression of existence, its failings evident in its need for "animation by the activities of consciousness" (Lussier 53), Wordsworth, in general, strikes a more cordial tone toward the world of material phenomena—at least, in its most familiar expression in nature, particularly his own beloved Lakes region. Reflecting that view, Wordsworth advances the following assertion in the verse Prospectus to *The Recluse*:[51]

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[50] *The Prelude* 1850 9.72-73.

[51] Contained within the Preface to *The Excursion* (1814). The verse Prospectus itself, however, consists of the last section of the earlier, unpublished "Home at Grasmere" (1800). Within that poem, the following excerpt occupies lines 816-21.

How exquisitely the individual Mind
(And the progressive powers perhaps no less
Of the whole species) to the external World
Is fitted:—and how exquisitely, too—
Theme this but little heard of among men—
The external World is fitted to the Mind. (63-68)[52]

Blake's response to this notion was characteristic: "You shall not bring me down to believe such fitting & fitted I know better."[53] Whether Wordsworth "believed" it either, as opposed to advancing it simply as a philosophical position, is an open question. While the Prospectus /"Home at Grasmere" seems a confident assertion of humanity and nature's long history of compatibility and mutual belonging, there has also been identified in Wordsworth, as suggested earlier, a simultaneous sense of alienation from the material world, which becomes first noticeable just after the turn of the century and which underwrites a good deal of the transcendental impulse frequently seen in his work. Within Wordsworth's poetic output during this period, we have the opportunity to trace the progression of his views on the topic of humanity's functional and aesthetic "fit" with the natural world as they are played out against the backdrop of this coexistent sense of alienation from nature's essential materiality.

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[52] Wordsworth here, it should be stressed, is not arguing for any evolutionary sense of adaptive complementarity; his thesis is simply that mankind and nature were made (i.e., created) for one another.
[53] From the Annotations to Wordsworth's Preface to *The Excursion, being a portion of The Recluse, A Poem*; E667.

In The Two-Part *Prelude* of 1799, within the "Blessed the infant babe" passage, Wordsworth finds his "best conjectures" for tracing the "progress of our being" (2.267-69):

> No outcast he, bewildered and depressed;
> Along his infant veins are interfused
> The gravitation and the filial bond
> Of Nature that connect him with the world. (2.291-94)

The infant, though a new arrival, is clearly not an outsider in Wordsworth's eyes, experiencing instead a genuine and powerful connection to this world. Wordsworth's choice of metaphor for this attractive force, "gravitation," is interestingly scientific. In "Home at Grasmere" from the following year (1800), Wordsworth describes a subsequent developmental stage, still harmonious, in which the human mind is productively "wedded" to the material world, yielding an experience on earth evocative of "Paradise, and groves / Elysian, [and] Fortunate Fields" (800-01).[54] It is within this same work that the concept of "fit" is originally raised—a notion which is seconded in the Preface to the 1802 edition to *Lyrical Ballads*:

> To this knowledge[55] which all men carry about with them, and to these sympathies[56]. . . the Poet principally directs his attention. He considers man and nature as essentially adapted to each other, and the mind of man

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[54] For the discerning intellect of Man,
When wedded to this goodly universe
In love and holy passion, shall find these
A simple produce of the common day. (805-08)

[55] The knowledge that "man and the objects that surround him" can be seen as "acting and re-acting upon each other" (258).

[56] "[S]ympathies yielding enjoyment" (258).

as naturally the mirror of the fairest and most interesting qualities of nature. (258-59)

A change occurs, however, during the period of the composition of the Intimations Ode (1802-04).[57] In this work, Wordsworth rewinds the developmental arc back to its beginning, and in this run-through, the beauty and sufficiency of the physical world are called into question. In the Ode, the initial stage of life is still beatific, but not because it marks our closest point of connection with this world, but rather because our lingering memories of pre-existence are freshest then.

Various theories have been advanced to explain the shift in Wordsworth's poetic temperament towards nature during this period. In *The Hidden Wordsworth*, Kenneth Johnson offers the explanation that at this time Wordsworth's choice of poetic subjects shifted from the social to the natural, with uneven results that shook the poet's faith in his own powers.

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[57] It has long been acknowledged that the three distinct thematic passages of the poem were composed in two installments, separated by two years. These thematic passages include: the loss and temporary recovery of the imaginative vision of childhood (stanzas I-IV), the advancement of the doctrine of pre-existence as an explanation for this loss (stanzas V-VIII), and, finally, the restorative power of imaginative episodes recollected from childhood (i.e., the "spots of time" referenced in *The Prelude*) in enabling a new vision of nature—again made beautiful, if no longer transcendent—informed by our mortal human perspective (stanzas IX-XI). Within this general framework, however, the specifics of the poem's compositional history have been debated back and forth, with claims about the poet's philosophical progression during this transitional period tied to the dates of completion of these various passages. In 1927, H. W. Garrod, citing Wordsworth's own statements to Isabella Fenwick in 1843, asserted, "The *Ode*, so far as it was carried at this time [1802], ended with the fourth stanza; and was not completed in its entirety until 1806" (113). Four decades later, Russell Noyes challenged that view, stating that "the ode [was] left unfinished in 1802 with the eighth stanza" (244), a belief seconded by Jared Curtis in *Wordsworth's Experiments with Tradition*. This revised view would come under scrutiny nearly two decades later in Gene Ruoff's *Wordsworth and Coleridge*, which returns to Garrod's original assessment and the acceptance of Wordsworth's own account of the poem's dating. Though he feels Curtis is correct in his assessment that "the crisis of the poem . . . comes not at the end of the fourth but the eighth stanza, and that stanzas I-IV and V-VIII consequently have more in common with one another thematically than with the rest of the work," still, Ruoff concludes, "Curtis wants more of the Ode to have been composed in 1802 than he can demonstrate" (25).

> Wordsworth soon turned from this small cast of poor people [the subjects of *Lyrical Ballads*] to a large number of natural objects. . . . There are nearly two dozen poems like "To a Cuckoo," "To a Butterfly," and "To the Daisy," in which the connection between external nature and human nature is presented in the most uncomplicated manner imaginable. . . . Not that there's anything fundamentally wrong with such simple equations between natural beauty and human happiness. . . . [But Wordsworth's] specifically poetic problem . . . concerned . . . the status of his own imagination. In 1798 and 1800 he could turn almost anything into a strong poem, but in 1802 his capacity for invention . . . fell mainly on flowers, birds, and insects, and the results were not nearly as impressive. (774-75)

No one was more sensitive to the diminished quality of the work, Johnston notes, than Wordsworth himself. The sense of reassessment toward nature that followed was in all likelihood profound. It was also persistent—by all appearances still in play a decade later and visible, once again, in that surprising excerpt from Book VIII of *The Excursion*:

> yet do I exult,
> Casting reserve away, exult to see
> An intellectual mastery exercised
> O'er the blind elements; a purpose given,
> A perseverance fed; almost a soul
> Imparted—to brute matter. (199-204)

The mastery of nature endorsed here—on the condition that such mastery be morally driven—does differ from the anti-Romantic notion of nature subdued, but it is still a concept, I would argue, that the earlier Wordsworth would have hesitated to support.

Other possibilities exist to explain Wordsworth's "estrangement from Nature" around this time, not all of them convincing. One possibility is that he was simply weary of the pantheism charges and over-compensated in terms of his rhetoric. Or perhaps his previous uncritical reverence for physical nature came into conflict with the rising tide of Romantic idealism. Also, there is the possibility that after the *Lyrical Ballads* of 1798, 1800, and 1802, he was now the *de facto* leader of the new poetry, which, its gestures of "conciliation" aside, was still highly critical of science in its public posture (as the 1802 Preface attests). But this would assume that nature for Wordsworth had by this time become inextricably identified with its scientific study, which is a rather large assumption to make. Whatever its origin, this sense of unraveling connection with nature becomes even more pronounced in *The Prelude* 1805,[58] becoming the well-spring of the poet's feelings of anti-materialist alienation. And it will be in *The Prelude* 1805 that these feelings find their final articulation and resolution, in the passages addressing Wordsworth's revelations at Mont Blanc, Simplon Pass, and Mt. Snowdon, wherein he most acutely confronts the limits of earthly experience.

In addition to their widely divergent views on the compatibility of the physical world and the spiritual mind, Wordsworth and Blake hold markedly different views in regard to the senses that mediate the relationship between these two entities. Indeed, it is

[58] Though, I would note, the initial connection cited in the "Blessed the infant babe" passage from the Two-Part *Prelude* of 1799 (2.267-310) persists without apparent revision in *The Prelude* 1805 (2.237-80).

the physical senses that enable the "fit" that Wordsworth earlier celebrates, giving these faculties a valued role in Wordsworth that Blake would vehemently disavow. While Blake describes the senses as innately passive receptors of stimuli—with no conscious sense of "wise passiveness"[59] required on our part—Wordsworth instead speaks of the restlessness of the senses:

> The eye—it cannot choose but see;
> We cannot bid the ear be still;
> Our bodies feel, where'er they be,
> Against or with our will.
> ("Expostulation and Reply" 17-20)

But there is a fine line between restlessness and implacability, and all too easily the ceaseless action of the eye can become oppressive. Reflecting on the limits of such empiricism—both scientific and artistic—Wordsworth confronts the "tyranny of the eye"[60] in *The Prelude* 1805. We catch an early glimpse of it in Book VI, in the poet's recollection of his arrival at Mont Blanc, the oppression in this instance manifesting itself in the form of the deflation of the imaginatively born expectations he and his traveling companion had brought with them to the Alps:

> That day we first
> Beheld the summit of Mont Blanc, and grieved
> To have a soulless image on the eye

[59] "Nor less I deem that there are Powers / Which of themselves our minds impress; / That we can feed this mind of ours / In a wise passiveness" ("Expostulation and Reply" 21-24).

[60] It is, however, as Wordsworth makes clear, the tyranny of an inferior faculty. It asserts itself over the imaginative, but it cannot match that which it usurps. More troubling, the tyrannical eye (being inferior) inevitably diminishes that which it observes—in this instance, nature—forcing a critical re-evaluation.

Which had usurped upon a living thought

That never more could be. (452-56)[61]

This sense of disappointment with the "real" as it is visually experienced, measured against the expectations cultivated in the imagination, is an idea echoed in the subsequent episode at Simplon Pass (6.501-24), leading Wordsworth to the conclusion that nature is more powerful in the mind than it is in the world—a foreshadowing of the poet's final epiphany, occurring the following year on the slopes of Mt. Snowdon, that the natural world, because of its inescapable materiality, is limited to a symbolic role as a *signifier* of transcendence rather than embodying transcendence itself.

The Science of Mind

Concern with the relation of the mental to the material is central to Wordsworth's poetic philosophy, not only in regard to the mind's interface with the physical world (in other words, nature), but in regard to the mind's own essence. On this issue, Wordsworth's position was much more amenable to a scientific approach than Blake's, but the resulting science—psychology—was a provisional one in Wordsworth's eyes, separate from the body of general scientific practice in its acknowledgement of the intangible element of spirit. Wordsworth was not alone in such an opinion. In "Remaking the Science of Mind: Psychology as Natural Science," Gary Hatfield writes that in the eighteenth century,

[61] Later in Book VI, Wordsworth helpfully suggests a somewhat circular means of usurping the tyranny of the eye over the imagination—and the larger enslavement of the mind to the verifying senses—by the action of "Imagination . . . lifting up itself / Before the eye" (525-26).

> The mind or soul was considered by many to be a natural thing, a thing in nature. . . . Given these understandings, *psychology* was considered by a great many eighteenth-century authors to be a science. . . . Many considered it to be a natural science based on experience, including those who considered themselves to be studying an immaterial substance. (187)

But there was a new view of the human mind emerging at this time that would more intimately connect the realms of mind and matter. Regarding this corporeal theory of mind, Alan Richardson in *British Romanticism and the Science of Mind* writes that

> Wordsworth came of age . . . at a time when the bodily . . . nature of the mind had been boldly asserted by Joseph Priestley, when the medical and physiological account of mind developed in Erasmus Darwin's *Zoonomia* had caught the fancy of avant-garde intellectuals, and when sensory and cognitive deficits gave fuel to arguments for the mind's dependence on, if not identity with, the brain. . . . Only in the Romantic era, in fact, was the brain definitively established as the organ of thought, although this seemingly inevitable notion would continue to be challenged on religious and other grounds well into the 1820s. (xiii, 1)

For the record, Richardson finds much more accommodation between the corporeal theory of mind and Romantic poetic philosophy than this study can.[62] Examining the

[62] The "mind" in Wordsworth's poetry appears to be predominantly associated with the spirit. "A Plea for Authors, May 1838" speaks of "works that came / From mind and spirit" (7-8); indeed, it is like the spirit in many respects, particularly in its religious aspect: *In The River Duddon: A Series of Sonnets, 1820*, the poet longs to advance "in calm of mind / And soul, to mingle with Eternity!" (13-14). The physical "brain," meanwhile, appears in Wordsworth largely in a pathological sense, as an organ prone to "ailments," manifested as disturbances and dysfunctions of the thought processes. These range from the

poetical works of these authors, I find much more evidence of resistance to this notion than acceptance, and for a reason consistent with the overarching thesis of this project: If such an embodied view of the mind were accepted as true, it could not help but mark yet another expansion of materialism into the domain of the infinite, and, by extension, another challenge to the Romantic poetic ideology.

In his essay, Hatfield chooses to define psychology as "the science of mind or of mental phenomena" and includes under this heading the faculties of "sense perception, imagination, memory, understanding or reasoning, feeling, and will" (184), and, indeed, such a "faculty psychology" was dominant during the eighteenth century (and after). But as Hatfield continues, "An alternative to faculty psychology began to be widely discussed in the middle of the eighteenth century: the associationist theory of mind. Hume, David Hartley, and others[63] attempted to explain many or all phenomena of mind by appeal to laws of association" (188). In the associationist scheme, the various aspects of mental functioning identified by faculty psychology were brought together under the auspices of

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milder aspects, observed within those with "a fretted brain" ("Hark! "Tis the Thrush, Undaunted, Undeprest" 7), a "distracted brain" ("The White Doe of Rylstone" 894), or "a brain confounded" (*The Prelude* 1805 10.378), to more severe manifestations—"the phrenzy-stricken brain" of "To the Moon" (42) and the tragic, unstable protagonist of "The Thorn" who had "a brain so wild!" (13.4). Mentions of a diseased *mind* are rare in Wordsworth, but there are examples: "The Matron of Jedborough" describes an ill-fated title character afflicted by "Ill health of body; and . . . worse ailments of mind" (73-74). Still, the overall trend in Wordsworth is toward the depiction of the mind as a non-physical entity. The same holds for Blake. While it is preeminent within the vegetated human form, the brain—in contrast to the "Eternal mind"—is presented as fallen, limited, and confined with the "cavern" of the skull (*The Marriage of Heaven and Hell* 14).

[63] "To these . . . theorists of mind must be added Erasmus Darwin, whose *Zoonomia; or, the Laws of Organic Life* of 1794-96 was dedicated, among others, to those who 'study the Operations of the Mind as a Science.' In this work, Darwin presented a sophisticated version of the associationist theory, replete with novel empirical observations. . . . Living and sentient things possess a 'spirit of animation,' which is a vital principle residing in the brain and nerves, and subject to 'general or partial diminution or accumulation' (and hence material)" (Hatfield 209). It could well be that this materialist view of the mind was what ultimately alienated Wordsworth from Darwin.

a single process, "one that promised explanatory unification under a few basic [reductionist] laws" (Hatfield 188).

> Hume signaled his . . . intentions in the subtitle to his *Treatise of Human Nature: Being an Attempt to Introduce the Experimental Method of Reasoning into Moral Subjects*; in the introduction to the work, he explicitly compared his methods and modes of explanation to those of Newton. . . . Hume was not unique in claiming to be the Newton of the mind; he shared [this] invocation of Newton with David Hartley. (208)

Anyone interested in the study of the mind at the turn of the nineteenth century had to acknowledge—and, in large part, work past—Hartley's model of associationist psychology, simply because of its influence and popularity. Wordsworth, for one, certainly did. Hartley's views on the operations of the mind, set forth in his *Observations on Man*,[64] attempts "to explain association as the result of sympathetic vibrations among nerve fibers in the brain" (Hatfield 208). In a more practical sense, as a theory it argues that there is no innate moral sense within humanity, but rather that morality is shaped by the association of ideas and actions, specifically as episodes of pain and pleasure become linked with particular behaviors. While this theory did influence Wordsworth and Coleridge to some extent during the period of *Lyrical Ballads*,[65] in time both would

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[64] "*Observations on Man*," Fred Wilson notes, "is truly the earliest book that, when opened by a practicing scientific psychologist, will be recognized as a book in his discipline . . . so long as he does not read it as far as part 2," which is given over to "proofs for the existence of God, arguments aimed to justify Christian beliefs, and exhortations to virtue" (348).

[65] As with most matters of science, Coleridge was the conduit by which these ideas reached Wordsworth. We might date the peak of Coleridge's own attachment to these ideas to 1796, when he named his first-born son after Hartley. Wordsworth's attachment to Hartleian association is less clear. Within the Preface to *Lyrical Ballads*, the term "association" appears a number of times, but, in almost all instances,

distance themselves completely from Hartley's model because of what they perceived as its mechanistic oversimplification of the human mind. An example of such distancing is perhaps found in the verse Prospectus to *The Recluse*, wherein Wordsworth writes,

> Not Chaos, not
> The darkest pit of lowest Erebus,
> Nor aught of blinder vacancy, scooped out
> By help of dreams—can breed such fear and awe
> As fall upon us often when we look
> Into our Minds, into the Mind of Man—
> My haunt, and the main region of my song. (35-41)[66]

The dramatic imagery of the underworld that Wordsworth presents in this passage argues for a quintessentially Romantic view of the human mind—a darkly poetic psychological sublime that, it is tempting to speculate, constitutes Wordsworth's answer to Hartley.[67]

Despite his rejection of the mechanical operation of the mind proposed by the associationist model,[68] Wordsworth did not, as Wilson notes, "reject the notion that there is a causal [i.e., scientifically accessible] structure to human psychology" (378). On the contrary, in the 1802 Preface, Wordsworth speaks plainly of his intent to trace "the primary laws of our nature" (244-45). An important influence on Wordsworth's study of

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Wordsworth seems to be referring to the reintegration of thought and feeling rather than any kind of cause-and-effect scheme influencing behavior. In all likelihood, Wordsworth simply appropriated the term for his own purposes.

[66] "Home at Grasmere" (788-94).

[67] "The descent into hell," Donald M. Hassler has noted, "is an ancient convention that Wordsworth and Coleridge returned to in order to image the awesome and ineffable imagination" (26).

[68] "Mechanical" in that association psychology attempted to apply explanatory models of mechanist philosophy to the study of the human mind, by positing that complex mental phenomena are reducible to basic elements derived from experience.

the mind in this particular aspect would have been Erasmus Darwin. As I observed in the earlier section on Wordsworth's scientific researches, critics such as James Averill and Desmond King-Hele have identified Wordsworth's debt to Darwin's medical treatise *Zoonomia*. It was within that volume's discussion of diseases of "Increased Volition" (i.e., mental illness) that Wordsworth first came across the anecdote of Goody Blake and Harry Gill.[69] Wordsworth's contributions to *Lyrical Ballads* in general reflect the influence of Darwin's case study approach to psychological phenomena, with poems such as "Goody Blake and Harry Gill," "The Thorn," "The Last of the Flock," "The Mad Mother," "The Idiot Boy," and "The Complaint of a Forsaken Indian Woman" all being memorable chiefly for their presentation of, as Averill puts it, "persons at psychological extremes" (241). While Wordsworth's softened rhetoric toward the science of mind indicates that he viewed this branch of scientific knowledge as having the potential to enlarge humanity rather than diminish it, he suggests at the same time that it is a new and quintessentially *poetic* domain—one presently dark and unexplained and requiring the illumination of the poetic vision.

Appropriated Metaphors

Within his poetical works, particularly the various versions of *The Prelude*,[70] Wordsworth explores a number of schemes of resistance to the worldview advanced by natural science. As with Blake, this resistance often takes the form of images and

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[69] Wordsworth acknowledges this in the Advertisement of the 1798 edition of *Lyrical Ballads*: "The tale of Goody Blake and Harry Gill is founded on a well-authenticated fact which happened in Warwickshire" (8).
[70] The Two-Part *Prelude* of 1799, *The Prelude* of 1805 in Thirteen Books, and *The Prelude* of 1850 in Fourteen Books.

concepts appropriated from the scientific disciplines deemed most at fault and posing the most direct threat to the poetic enterprise. Wordsworth's recurrent references to objects geological (the domain of deep time/material eternity) and astronomical (the domain of deep space/material infinity)—the juxtaposition of hills, cliffs, mountains, ridges, valleys, cataracts, and caverns with sky, sun, moon, planets, and stars—are so numerous and so conspicuous that they almost certainly signal some larger poetic purpose. These two most disruptive sciences to the established view—the century's "terrible Muses" as Tennyson would later call them[71]—certainly provide Wordsworth with a rich source of visual metaphors throughout *The Prelude*. In that astronomy and geology, taken together, encompass both heaven and earth, it could be argued that Wordsworth employs these paired elements simply as extremes of contrast in his poetic description, and that by their use he merely intends to signal the expansiveness of his scope. If that is so, then there may be no deeper meaning to these compounds. On the other hand, an in-depth examination of these geological/astronomical conjunctions yields the intriguing possibility that these disconnected episodes and images, taken together, form a narrative of sorts, limning an arc in the poet's thinking in regard to the natural world as it functions in issues of human self-definition, perhaps even recording a rejection of the temporally and spatially expanded universe of the new science and a reassertion of the traditional terrestrial sublime.

[71] In "Parnassus" (1889).

To address just a few of these geological/astronomical compounds in the order that they appear: The "moon" and "hoary mountains" pairing of 1.383-84[72] occurs just as Wordsworth sets out on his famous illicit nocturnal boat trip, with "the huge cliff" and "the stars" of 1.409-10 arriving precisely at the moment the poet receives his first vision of the physical sublime. The "presences of Nature, in the sky / Or on the earth" referenced in 1.490-91 appear in the context of the formative "ministry of fear" passage.[73] Subsequent compounds appear in the depiction of the "Infant Prodigy" (the modern student of science), "[who] can read / The inside of the earth, and spell the stars"(5.332-33) but do little else, particularly when contrasted with the "Boy of Winander," who commenced his evening communes with nature "when the stars had just begun / To move along the edges of the hills" (5.391-92), both episodes occurring within Wordsworth's meditation on the two contrasting paths a developing mind may take. Finally, there is the description of the poet's ascent of mist-bound Mt. Snowdon at age twenty-one—with the spectacle of the "moon" and "hundred hills" visible above the cloud deck (13.41-45)—a moment that is profoundly revelatory in its vision of unity, but which is also attended by the hard realization that the scene before him—indeed, all of material nature—is not in itself transcendent.

Wordsworth's presentation of these thematically constructed geological/ astronomical compounds within *The Prelude* is at times ingenious, with the poet finding a way to integrate the two realms even when the immediate context does not seem

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[72] All line citations in this section are from *The Prelude* 1805. Some of these geological/astronomical compounds, such as this first one, have no equivalent in *The Prelude* 1850.
[73] The tenor of which is established earlier in the work: "Fair seed-time had my soul, and I grew up / Fostered alike by beauty and by fear" (1.305-06).

conducive, such as in his description of his own interior mental landscape from Book III: "*Caverns* there were within my mind which *sun* / Could never penetrate" (246-47; emphasis added). But it is in Book VIII of *The Prelude* that Wordsworth, drawing once again upon the domains of inner and outer space, happens upon perhaps his most intriguing expression of the Romantic poetic philosophy—the metaphor of imaginative vision experienced in material darkness:[74]

> [W]hen a traveller hath from open day
> With torches passed into some vault of earth,
> . . . . . .
> He looks and sees the cavern spread and grow,
> Widening itself on all sides, sees, or thinks
> He sees, erelong, the roof above his head,
> Which instantly unsettles and recedes—
> Substance and shadow, light and darkness, all
> Commingled, making up a canopy
> Of shapes, and forms, and tendencies to shape,
> That shift and vanish, change and interchange
> Like spectres—ferment quiet and sublime,
> Which, after a short space, works less and less
> Till, every effort, every motion gone,

[74] Wordsworth's employment of an (initially, at least) infinite-seeming material space—again, a cavern—evokes parallels to Blake's vision of a similar domain: the subterranean "infinite Abyss" of *The Marriage of Heaven and Hell*.

The scene before him lies in perfect view.

Exposed, and lifeless as a written book.

(*The Prelude* 1805 8.711-27)[75]

What this passage is describing, of course, is the process of *dark adaptation*, with Wordsworth using the instinctive empirical response of the eye at its most heightened level as an emblem of its limits as compared with the poetic imagination, the same faculty with which this sense competes, and even attempts to dominate.

But let him pause awhile and look again,

And a new quickening shall succeed, at first

Beginning timidly, then creeping fast

Through all which he beholds: the senseless mass,

In its projections, wrinkles, cavities,

Through all its surface, with all colours streaming,

Like a magician's airy pageant, parts,

Unites, embodying everywhere some pressure

Or image, recognised or new, some type

Or picture of the world . . .

. . . . . .

A spectacle to which there is no end. (8.728-41)[76]

Wordsworth's view here is clearly reassertive of the limits of matter, both in terms of its

[75] *The Prelude* 1850 8.560-75.

[76] *The Prelude* 1850 8.577-89. It is worthwhile to note that the original location of this passage was in Book VI during Wordsworth's alpine travels, between the sobering disappointment at Simplon Pass and the affirmation of the imaginative over the visual sense that follows that episode.

physical boundaries and its need for the animating actions of the human mind. Note how after the initial phase of sensory apprehension of the physical world, a second phase begins, one involving mental projection onto the neutral backdrop of nature by means of the active engagement of the imagination. To see beyond, Wordsworth argues, requires another kind of vision. Further reinforcing the connections between the geological and the astronomical in this passage is the fact that dark adaptation is the same mechanism by which one engages the night sky. And the same conclusion may be drawn: The dark-adapted eye may be able to discern the individual stars, but it is not sufficient to conceive the constellations.

Chapter Five

Conclusion: Romanticism and the Philosophy of Science

In the introduction to this study, I first made mention of Romanticism's role in conceptualizing, evaluating, and—in the case of Romantic poetry—resisting the effects of science on culture. Since this study has concerned itself primarily with the works of William Blake and William Wordsworth, the preceding chapters have taken as their focus this last point, with a in-depth discussion of the motives behind these poets' resistance and the forms this resistance eventually took. Here in the concluding chapter, however, I would like to take the opportunity to examine those first two points in more detail and deal with Romanticism's role in the long-term conceptualization and evaluation of science. Throughout this study, I have stressed the role of Romantic thought in revising the vision of science held at the turn of the nineteenth century, introducing elements which altered the paradigmatic landscape of the discipline. But in addition to its contributions to the entity of science itself, there are Romanticism's contributions to the *philosophy of science*—that branch of the humanities which provides vital critical and conceptual analysis of the discipline from outside the field. Of particular interest is the role that Romantic thought played in the formation of two of the key concepts within the contemporary philosophy of science debate: the institutional acceptance of limits to scientific knowledge, conclusively established by the work of Werner Heisenberg, and the acknowledgement of the inexorably compromised nature of objectivity, resident in

Karl Popper's view that all observation of the universe is "theory laden"—that is, colored by one's pre-existing theoretical and ideological allegiances.

Observation and Explanation

In the twentieth century, the institution of science was irrevocably transformed by challenges to a pair of long-held and interrelated assumptions—first, that such a thing as objective reality exists and, second, that there are virtually no limits on our ability to know that reality—two views inherited from early Enlightenment science and carried forward despite the inroads of nineteenth-century researchers. As Lorraine Daston notes, the Enlightenment view held that even though "facts" were fragile, they *were* possible:

> Experience we have always had with us, but facts as a way of parsing experience in natural history and natural philosophy are of seventeenth-century coinage. . . . What made [Enlightenment] facts granular was not only their specificity but also their alleged detachment from inference and conjecture. Ideally, at least, 'matters of fact' were nuggets of pure experience, strictly segregated from any interpretation or hypothesis that might enlist them as evidence. (Daston 116-17)

But the process of their acquisition did not come naturally or effortlessly. "Francis Bacon," Daston notes, "thought only the strict discipline of method could counteract the inborn tendency of the human understanding to suffuse observation with theory" (117). The objective thus became one of "[c]hiseling out 'matters of fact' from the matrix of

experience and conjecture in which human perception and understanding automatically [lodges them]" (Daston 117).[1]

The Romantics shared the Enlightenment view of the fragility of facts, but their view differed in two important regards. First, while Bacon had felt that facts could be gleaned if strict discipline were practiced, the Romantics (particularly Romantic poets such as Wordsworth and Blake) viewed the overlap of observation and explanation as inevitable, despite our best efforts. Second, they viewed this inevitable overlap as actually desirable—a projection of the individual vision over colorless uniformity.

Observation and Reality

Within the scientific establishment, meanwhile, the debate over what constituted objectively derived evidence had reached a crucial juncture over a century earlier with the philosophical split between Hobbes and Boyle on the subject of empiricism. The conservative position (represented by Hobbes) was inclined to accept the results of the passive observation of nature as objective truth but challenged the validity of artificially concocted experiments (championed by Boyle) as a source of untainted and generalizable knowledge:[2] an extremely early acknowledgement of the problem Kuhn identifies when he writes: "The man who is striving to solve a problem defined by existing knowledge

[1] In an aside addressing this dynamic at work in the sciences, Daston notes that "even sincere, well-trained naturalists could inadvertently adulterate observations with imaginings. . . . An errant imagination was . . . Georges Cuvier's diagnosis of how Jean-Baptiste Lamarck had gone astray in natural history: for all his scientific gifts, Lamarck was one of those minds which 'cannot prevent themselves from mixing true discoveries [*découverts véritables*] with fantastic conceptions . . . they laboriously construct vast edifices on imaginary bases, similar to the enchanted palaces in our old romances [*romans*] which disappear when the talisman upon which their existence depends is broken'" (120).

[2] "Hobbes noted that all experiments carry with them a set of theoretical assumptions embedded in the actual construction and functioning of the apparatus and that, both in principle and in practice, those assumptions could always be challenged" (Shapin and Schaffer 112).

and technique is not . . . just looking around. He knows what he wants to achieve, and he designs his instruments and directs his thoughts accordingly" (96). In other words, the questions we choose to ask determine the answers we are going to get. For this reason, one of the earliest charges that twentieth-century critics of science leveled against *positivism*—the scientific culture of empirical and experimental verification—was that, because of the nature of scientific empiricism as it exists, "one cannot draw the sharp distinction between observational and theoretical statements that [such a] view requires" (Eichner 22). The primary point of these analysts was to force the acknowledgement of the risks we entertain in denying that we habitually view the world through the lens of the same theories we use to understand it, a realization that led Karl Popper (1902-94), deeply skeptical of empiricist assumptions, to argue that it is not possible for human beings to make observations independent of theory—that all worldviews are, in fact, "theory-laden."[3]

Blake clearly was not one to separate observation from belief, his vision from his views. Overarching all other issues of its nature, Blake's model of the universe is essentially an egocentrically constructed one, in that each individual constitutes the center of his or her own universe. In Blake's subjective, self-created reality, everyone sees things differently: "A fool sees not the same tree that a wise man sees," he writes in *The Marriage of Heaven and Hell*,[4] or, as he expresses the same notion in a letter to the Rev. Dr. Trustler, "As a man is So he Sees."[5] However, Blake's rhetoric on this point is

[3] Outlined in *Objective Knowledge* (1966).
[4] Plate 7; E35.
[5] 23 August 1799; E702.

flexible, at times suggesting that the human mind half-creates the world it lives in, at others taking the hard-line stance that any notion of an external, physical reality is a delusion. In general, though, Blake's vision is able to escape the most damaging charges of Berkeleyan solipsism.[6] As Stuart Peterfreund observes, "Blake's article of faith [is] that the soul . . . operates recognizably and similarly in all human beings" (*Newtonian World* xv).[7]

Wordsworth expresses a view similar to Blake's in *The Excursion* when he states, through the persona of the sage Wanderer, that "We see, then, as we feel" (5.563). Unlike Blake, however, Wordsworth never completely denies the existence of the physical world, even rhetorically. He questions only whether any meaning can be derived from its unimaginative observation. For Wordsworth, the world is objectively real but can only be subjectively perceived, with nature serving as both a canvas and a sounding board for the participatory actions of the human mind, a position the poet affirms in "Tintern Abbey," where he writes:

> Therefore am I still
> A lover of the meadows and the woods,
> And mountains; and of all that we behold
> From this green earth; of all the mighty world
> Of eye and ear,—both what they half-create,
> And what [they] perceive. (102-07)

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[6] This purest expression of idealism, outlined within Berkeley's *A Treatise concerning the Principles of Knowledge* (1710), holds that physical objects exist only to the extent that they are perceived in the mind.
[7] Peterfreund holds that Blake identifies the soul with the "Poetic Genius," a communal, interconnected entity described in *All Religions Are One*: "[A]ll are alike in the Poetic Genius. . . . [A]n universal Poetic Genius exists" (E1).

Explicit in this passage is Wordsworth's view that not only is there an inescapably subjective element to what many think of as objective reality, but that this process is at all times active, engaged, and creative. While such an unbidden process can produce very desirable and beautiful poetic results, it should be noted that in "Expostulation and Reply" Wordsworth seems to consider the merits of a different approach. Indeed, an interesting consideration here is that Wordsworth's concept of "wise passiveness," introduced in this poem, might be construed as the consciously willed interruption of our own theories upon our observations and, instead, opening ourselves up to the subjective insights of something larger.[8]

Romantic Empiricism

It is in an 1802 letter to Thomas Butts that Blake famously expounds his views on the topic of vision, empirical and otherwise, outlining its multiple levels:[9]

> Now I a fourfold vision see
> And a fourfold vision is given to me
> Tis fourfold in my supreme delight
> And three fold in soft Beulahs night
> And twofold Always. May God us keep
> From Single vision & Newtons sleep.

[8] There are strong parallels here to Keats' negative capability, though Keats viewed such negation of the self as the opposite of Wordsworth's usual poetic approach—i.e., the "egotistical sublime."
[9] 22 November 1802; E722.

This last and lowest form of perception—"Single vision"—is interpreted by Damon as "seeing with the physical eye only the facts before it" (436). However, Blake's own views, expressed elsewhere, question whether such a level of vision can exist—at least, independently. For Blake, the four levels of vision outlined are interdependent, with single vision as the starting point and all higher levels elaborating upon and revising this basic perspective; hence, his characterization of the Enlightenment claim that the universe can be viewed objectively—if only we are disciplined in our temperament and methodology—as "Newtons sleep."[10] A further enhancement of Blake's position on this point is found in *A Vision of the Last Judgment*, wherein he writes: "I question not my Corporeal or Vegetative Eye any more than I would Question a Window concerning a Sight[.] I look thro it & not with it."[11] In other words, everything seen is interpreted, and that interpretation occurs in the mind, not in the eye.

In a similar reflection on the limits of empiricism—both scientific and artistic—Wordsworth, in another passage from *The Prelude* 1805, weighs in again on the "tyranny of the eye," relating an incident from the time when post-Revolutionary disillusionment had alienated him from "feeling" and had drawn him into the cold embrace of pure objective rationality:

> The state to which I now allude was one
> In which the eye was the master of the heart,
> When that which is in every stage of life
> The most despotic of our senses gained

[10] Though "Bacon's sleep" might be more fitting.
[11] N95; E566.

Such strength in me as often held my mind

In absolute dominion.

(*The Prelude* 1805 11.170-75)[12]

It is important to mark, however, that the scrutinizing and empirical view to which he was temporarily drawn was anything but genuinely objective in nature, but rather the self-deluding insight offered by calculating, sense-limited reason, what Blake in *There is No Natural Religion* calls "the Ratio."

As outlined in Chapter Two, empiricism was a method inherited and summarily incorporated by the more mainstream variant of Romantic scientific practice. And for the most part, this was a stabilizing and productive addition, one which spared this branch of the new science the damaging excesses experienced by other variants such as *Naturphilosophie*. Still, despite its operational independence from the Enlightenment scientific paradigm, empiricism could not be applied to the new paradigm without some adjustments. Empiricism, after all, presumed to be about the objective gathering of facts, but according to the philosophical fundaments of Romanticism—specifically, the view of humanity as being in subjective communication with a natural system of which it is a part—this was impossible—and, again, undesirable—in that facts are meaningless without interpretation. As Levere confirms, adherents of scientific Romanticism realized that "[m]ere observation"—even if possible—"was undiscriminating; the essence of scientific activity lay in the recognition and selection of significant phenomena" (88).

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[12] *The Prelude* 1850 12.127-31.

Paradigms and Vision

In this study, I have advanced the argument that Romantic science was that branch of scientific theorizing and practice which was informed to an important degree by the tenets of the new cultural paradigm that would come to be called Romanticism, not simply science that happened to be temporally concurrent with the new paradigm. Still, many of the groundbreaking discoveries supporting the new paradigm were made in that same turn-of-the-century timeframe, and this occurrence cannot be written off as purely coincidental. Indeed, a corollary argument could be made that it was the new way of thinking that enabled these discoveries. During much of the long eighteenth century, many poets, like society in general, had seen no reason not to take science at face value and by its own self-representation, viewing the enterprise, embodied in the work of Newton, as free of subjective coloring and bias.[13] By the Romantic era, however, a new generation of poets had become increasing aware of science's occasional lapses in objectivity. These poets were particularly attuned to the ways in which one's scientific orientation might affect one's worldview.[14] Blake particularly, as Peterfreund notes, grasped how an individual's "metaphysics might precede the physics as well as follow from it" ("Blake and Newton" 207)—yet another iteration of Blake's observation that

[13] There were, of course, notable exceptions. Jonathan Swift and the Scriblerians spring to mind. But even within that circle, which included Alexander Pope, John Gay, and Dr. John Arbuthnot, there were marked divisions regarding the level of cynicism toward science. As a case in point, in Book III of *The Dunciad*, Pope makes a strong case for the nobility of the scientific enterprise, though its achievements are scorned and rejected by the Dunces whom he addresses: "'Tis yours, a Bacon, or a Locke to blame, / A Newton's Genius, or a Seraph's flame" (213-14).

[14] And, depending on their level of self-awareness, how one's *anti*-scientific orientation might affect one's worldview.

"As a man is So he Sees." In short, paradigms affect vision.[15] Kuhn makes this same point in an anecdote from *The Structure of Scientific Revolutions*, wherein he examines the historical record and finds

> indirect and behavioral evidence that the scientist with a new paradigm sees differently from the way he had seen before. . . . [For example,] Sir William Herschel's discovery of Uranus. . . . A celestial body that had been observed off and on for almost a century was seen differently after 1781 because . . . it could no longer be fitted to the perceptual categories (star or comet) provided by the paradigm that had previously prevailed. . . . The shift of vision that enabled astronomers to see Uranus . . . helped to prepare astronomers for the rapid discovery, after 1801, of the numerous minor planets or asteroids. . . . The history of astronomy provides many other examples of paradigm-induced changes in scientific perception. . . . Can it conceivably be an accident, for example, that Western astronomers first saw change in the previously immutable heavens during the half-century after Copernicus' new paradigm was first proposed? The Chinese, whose cosmological beliefs did not preclude celestial change, had recorded the appearance of many new stars in the heavens at a much earlier date. (115-16)

[15] Blake, weighing in on the cost of the materialist ontology on perception in *An Island in the Moon*, writes, "But, my Good Sir, Voltaire was immersed in matter, & seems to have understood very little but what he saw before his eyes" (Ch. 4; E451).

The Limits of Knowledge

The second assumption inherited from Enlightenment science regarding the physical realm, that which proposed an ultimately knowable universe, encountered an intractable complication with the 1927 enunciation of the "uncertainty principle" by physicist Werner Heisenberg. As Timothy Ferris writes in *The Mind's Sky*,

> Heisenberg found that there is an intrinsic limitation to the amount of accurate information one can obtain about any subatomic phenomenon. This limitation arises from the fact that neither we nor anyone else in the universe can observe subatomic particles without interfering with them in one way or another. (204)

Heisenberg's uncertainty principle has subsequently been generalized to other areas of the sciences, and the limitations it imposes are now acknowledged to be "fundamental to every act of observation" (Ferris 204). The epistemological result, Ferris concludes, is that "[t]he *observed* universe . . . cannot rightly be regarded as having a wholly independent, verifiable existence, since its apprehension requires the intrusion of an observer" (205). The consequences such a precept holds for the acquisition of knowledge are obvious.

The notion that there might be limits to scientific knowledge has deep roots,[16] of course, but its most striking and relevant origins date back to the Romantic period. As Marilyn Gaull notes, while many scientists in the late 1700s

[16] Pope, for example, in his *Essay on Man* (1733-34) expresses an acceptance of limits to scientific knowledge, but, it is worth noting, he does so from the perspective of an Enlightenment poet, not a scientist.

> continued to argue that science and the machinery that made it possible enhanced the sense of human power over nature and natural forces, a few isolated but significant observers were discovering the limits of human knowledge. The universe began to unfold as vaster and more complex than anyone had previously conceived. . . . [These] scientists inadvertently discovered that the unknown may also be unknowable.[17] (*English Romanticism* 372)

The perception and acceptance of limits to human knowledge was one of the essential characteristics of all varieties of scientific Romanticism. This reassessment from the preceding paradigm took the form of an explicitly stated acceptance of the complexity of the physical universe informed by a realization of the limitations of our human technology to measure and our human minds to understand.

The period's philosophical acceptance of such limits to knowledge, it might be argued, arose from a shift in science's objects of inquiry: At the turn of the nineteenth century, as Gaull notes, "science was increasingly pre-occupied with invisibles, 'imponderables' as they were called, the boundless, the infinitely great, small, and numerous" ("Romantic Skies" 34). As revealed by the present concepts of relativity and uncertainty—by-products of the study of the cosmic and subatomic realms,

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[17] In 1819, William Lawrence, in the *Cyclopedia Universal Dictionary of Arts, Sciences, and Literature*, wrote: "So narrow are the limits of human understanding that the knowledge of first causes seem[s] placed forever beyond our reach. The thick veil which covers them envelopes in its innumerable folds whoever attempts to break through it" (qtd. in Gaull, *English Romanticism* 373). Lawrence's wording might well have influenced Wordsworth in a later poem: "Desire we past illusions to recall? / To reinstate wild Fancy, would we hide / Truths whose thick veil Science has drawn aside?" (*Poems: Composed or Suggested During a Tour in the Summer of 1833*. XIV, 1-3). It is important to note that after these surprising opening lines, Wordsworth's poem shifts into an attack on science's imaginative limits relative to religious faith.

respectively—it has become clear that limits to our human understanding almost invariably come into play when the discussion turns to considerations of the very large or the very small.[18]

It had been the predictability implied by the mechanical model that had originally fostered the idea of a universe with no insurmountable barriers to its knowability. The Enlightenment scientific model, as it was understood and publicly resisted by the first wave of English Romantic poets, advanced a view of the universe as orderly, unchanging, and finite in time and space. But as Shapin notes, even Newton himself, though he had established and endorsed much of what came to be thought of as the mechanist worldview, "professed contentment with the ultimate inscrutability of nature" on a number of topics (*Revolution* 157). This attitude of circumspection and caution in regard to explanations of the natural world extended to other figures as well. Though traditionally cast as an opponent to Romantic science because of his specific opposition to *Naturphilosophie*, the Swedish chemist Jöns Jacob Berzelius was an articulate representative of trends of thought just emerging at the turn of the nineteenth century. We have, for example, his documented opinions that a "theory should never go 'further than the need to explain the phenomena'" and that a theory can be "merely a 'way to conceptualize' objects and not a true description of them" and still be of value

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[18] On the scale of the cosmic and the microscopic, there is, Blake seems to argue, a great deal that science does not yet know:

> Thou knowest that the ancient trees seen by thine eyes have fruit;
> But knowest thou that trees and fruits flourish upon the earth
> To gratify senses unknown? trees beasts and birds unknown:
> Unknown, not unpercievd, spread in the infinite microscope,
> In places yet unvisited by the voyager. and in worlds
> Over another kind of seas, and in atmospheres unknown.
> (*Visions of the Daughters of Albion* 4.16; E48)

(Lindroth 21).[19] This pragmatic sense of humility in regard to explanations of material phenomena combined with—and, indeed, engendered by—a sublime appreciation of nature is conceptually characteristic of the science that emerged in the era of Romanticism.

The persistent inaccessibility of the "truth," as suggested by Romantic philosophy, required an eventual adjustment on the part of the scientific enterprise, a change that finally arrived in the twentieth century in the form of a re-evaluation of the relevance of such notions to the enterprise's endeavors.[20] As Thomas Kuhn notes, even within a revised view of science's history—from one positing the orderly and cumulative acquisition of knowledge to one accepting disruptive and discontinuous revolutions of paradigm[21]—

> We may . . . have to relinquish the notion, explicit or implicit, that changes of paradigm carry scientists and those who learn from them closer and closer to the truth. . . . Does it really help to imagine that there is some one full, objective, true account of nature and that the proper measure of scientific achievement is the extent to which it brings us closer to that ultimate goal? (170-71)

Many modern analysts of science would agree with Kuhn that it does not. After all, a scientific principle need not be universally applicable to be of value; it need only be a

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[19] The Berzelius works cited are "Untersuchung uber die Zusammensetzung der Phosphorsaure," *Annalen der Physik*, 1816, 54: 44ff. and *Larbok i kemien*, Vol. III (Stockholm, 1818), pp. 16-22, respectively.
[20] Though formally codified in the twentieth century, its roots clearly go back to the early nineteenth century, at least.
[21] In "All Religions are One," Blake presents his own challenge to the cumulative view of scientific knowledge: "As none by traveling over known lands can find out the unknown. So from already acquired knowledge Man could not acquire more" (E1).

useful, site-specific approximation. Again, though, this is the contemporary view, possible only after a century of lively debate among scientific historians and philosophers. It is interesting to consider Blake and Wordsworth's response to such a sense of instrumentalism, anticipated within Romantic science as a necessary response to the revealed complexity of nature. We might well intuit that as poets they would have condemned any cultural entity with an operational indifference to absolute truth. But we can by no means be certain of this, for within their works there is a wealth of support for the non-universal view, expressed within both poets' strong support of the individual imaginative vision.

The Limits of Imagination

Within the field of contemporary Blake studies, there are volumes of commentary regarding the poet's idiosyncratic approach. This approach also drew comment from Blake's poetic contemporaries. Wordsworth's famous reaction after reading the *Songs of Innocence and of Experience* is recorded in the *Diary* of Henry Crabb Robinson: "There is no doubt this poor man was mad, but there is something in the madness of this man which interests me more than the sanity of Lord Byron and Walter Scott!" (281). While Blake doubtless strove for accessibility, at the same time (most analysts agree) he did not intend for his work to be immediately understood by everyone. It is the simultaneous sense of *revelation* and *unknowability* that powers Blake's poetic work. But ironically, instead of finding a sympathetic echo within the operations of the new science, the poet found only another encroachment on poetry's domain and identity. It is the view of this

study that Blake likely felt it was poetry's purview alone to incorporate such illuminating human contradiction.

Blake and Wordsworth both founded their creative careers and poetic programs upon a rebellion against the crisis-ridden science of the Enlightenment era—an institution they indirectly perpetuated by continuing to take seriously, completely untroubled by its crises—viewing these crises, in fact, as strategic opportunities for artistic response. In the Preface to *Lyrical Ballads*, Wordsworth ostensibly argues for a noble role for the scientist in the social order that is to come. Implicit in this agenda, since the poet is largely enabling this new role, is an even higher priority: to preserve a valued role for the poet. If poetry were to survive, particularly *their* vision of poetry, then its articles of faith required affirmation—chief among these being the apotheosis of the human imagination that serves as the nucleus of the Romantic poetic ideology. The humanist notion that all was knowable, dating back to Bacon, had elevated the faculty of the human imagination during the Enlightenment, but it had had the opposite effect on the natural world the human mind sought to know, recasting it, as Peterfreund observes, "as something instrumental rather than sacramental" ("Ideology" 144). The arrival of Romantic science changed all that, reinvesting the natural world with a sense of awe-inspiring power and grandeur but in the process contracting the reach of the human imagination, indeed recasting the human mind as a tool perhaps inadequate for the work ahead of it—whether that be comprehending the natural universe or deciphering its own intricate functioning. The conclusions of Romantic science on this issue were thus at odds with the aims of Romantic poetry.

Romantic Idealism and the Issue of Unknowability

Before closing, I would like to take a moment to consider the role of Romantic idealism as it concerns the central issues of this chapter, since idealism must be factored into any discussion of Romantic philosophy, particularly as it relates to the limits of scientific knowledge and the overlap of observation with belief. Kant's distinction of the realms of phenomena and noumena[22] lies at the heart of the Romantic question of unknowability. If things-in-themselves constitute reality, and these things-in-themselves are forever inaccessible to us, then logic dictates that reality itself is forever unknowable.[23] In *The Romantic Conception of Life,* Robert Richards observes that

> the phenomenal world of our experience arose from. . . the reality standing beyond experience, the noumenal sphere (as Kant called it), of which nothing could be scientifically known. The proper object of scientific thought, according to Kant, is the phenomenal world. In our experience of this realm, we discover both unity and order, whose ultimate foundations could only be in the mind. (62)

Indeed, the order that we observe in nature constituted for Kant a proof of sorts for idealism. He was also confidently willing to extend this principle of projected order further, arguing that since cause and effect exist in the human mind, we can assume their

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[22] Experiential appearances versus the presumed underlying reality of "things-in-themselves." Kant, I would note, usually employs the singular *Ding an sich.*

[23] It is worth noting, as does Max I. Baym, that "[f]or Kant . . . there was no opposition between art and science; though they are different modes of intellection, they are both implicated in the contemplation of phenomena"; thus, they are united in this sense of unknowability (742).

existence in nature as well.[24] But despite the best efforts of science in investigating these perceived instances of order and cause-and-effect relationships, we can know nothing about reality in itself, but only about reality as it is experienced. Kant's limiting of science to knowledge about the world of appearances was one of the first Romantic limitations placed upon the ambitious Enlightenment scientific viewpoint. It would not be the last.

In articulating his philosophy, Kant managed to sidestep objections that his view produced a Berkeleyan form of solipsism; he did so by maintaining that, while the "mind did construct the features of the natural world of ordinary experience, . . . it did so jointly out of necessary categories of thought, common to all human beings, and raw qualities[25] delivered to sense from a real world beyond experience" (Richards 63). Thus, in Kant's words: "The existence of things, that which appears, is not destroyed as in real idealism."[26] The influence of this last aspect of Kantian idealism on the philosopher Johann Gottlieb Fichte and his disciple Friedrich Wilhelm Joseph Schelling (the father of *Naturphilosophie*) would be profound, and it counters the usual stereotypes of German Romantic science's stand on realism versus idealism. As Richards explains,

> Fichte began his analysis with what could not be doubted, the immediate representations of consciousness. Our immediate experience of the natural world, upon close inspection, shows itself to be a representation, which we

[24] This has been construed in some quarters as a refutation of Hume's global skepticism, an even earlier challenge to knowability.
[25] Presumably, unprocessed by the senses and perception.
[26] *Prolegomena zu einer jeden künftigen Metaphysik dies als Wissenschaft wird auttreten können*, in *Werke* (6:153) (qtd. in Richards 63).

> assume quite naturally has been forced upon us by things existing outside the mind. (72-73)

Schelling took this position a step further—some would say a step in the opposite direction—supporting a metaphysical stance that "accords with our native instincts . . . [which] regard objects of the natural world as completely real and not the shadow of hidden entities" (165). But despite the modifications that brought his idealism to the threshold of a realist metaphysics,[27] Schelling's interpretation, Richards notes, still represents "a persistent effort to live without the Kantian thing-in-itself . . . [and] if we are going to explain experience, especially knowledge in science, but must do so without the aid of the thing-in-itself, then we can have as the objects of our consciousness only the very structures of subjectivity" (164-65). Nature is thus objectively real but subjectively perceived—a view that anticipates, among others, that held by Wordsworth.

After the Revolution

In plate 18 of *The Marriage of Heaven and Hell*, the Angel, representative of Urizenic reason and restraint, shows Blake his "eternal lot":

> By degrees we beheld the infinite Abyss, fiery as the smoke
> of a burning city; beneath us at an immense distance was the sun,
> black but shining[;] round it were fiery tracks on which revolv'd
> vast spiders, crawling after their prey; which flew or rather
> swum in the infinite deep, in the most terrific shapes of animals

[27] This characterization might have been lost on Schelling, however, who, as S. R. Morgan notes, saw his idealism as starkly opposing French materialism (27).

sprung from corruption. & the air was full of them. . . .[28]

But now, from between the black & white spiders a cloud and fire burst and rolled thro the deep blackning all beneath, so that the nether deep grew black as a sea & rolled with a terrible noise. (E41)

As one of the central images of his defiant response to the view of the universe promoted by Enlightenment science, as well as his anxiety regarding the new view proposed by Romantic science, Blake's vision here is a radical nightmare rendered in astronomical terms, with the Enlightenment view overhauled and the cosmic set redressed. Like Wordsworth's depiction of the dark landscape of the psyche in "Home at Grasmere,"[29] it is a scene informed by the chaos that ensues in the aftermath of revolution—in this case, a necessary imaginative one. In the following plate of *The Marriage of Heaven and Hell*, the Angel leaves Blake and the scene changes, and the poet writes: "I found myself sitting on a pleasant bank beside a river by moon light hearing a harper who sung to the harp."[30] The tone of this scene is echoed in the closing lines of Book X of *The Prelude* 1805, which, having dealt with the turbulent events of the French Revolution, resolves with Wordsworth's presentation of his own version of Blake's riverbank idyll. In the aftermath of chaotic change, Wordsworth at long last finds a measure of peace:

Thus I soothe

The pensive moments by this calm fireside,

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[28] Again, this is usually construed as Blake's unflattering take on the constellations of conventional astronomy.
[29] Lines 788-94. In the Prospectus to *The Recluse*, lines 35-41.
[30] Plate 19; E41-42.

And find a thousand fancied images

That chear the thoughts of those I love, and mine.

(1027-30)[31]

It is now 1804, and the Revolution across the channel is over. The scientific revolution, however, is ongoing, and the partisans of Romantic poetry must pause to assess. They have succeeded in precipitating the fall of the familiar Enlightenment scientific regime they so strenuously assailed with their poetic rhetoric, but it is by no means certain that its direct overthrow was ever their real aim. Meanwhile, the alternative science that they also opposed (though far more subtly) is on the ascent. It is a mixed outcome for them.

"How is it," Blake asks in his conclusion to *The Four Zoas*, "[that] we have walkd thro fires & yet are not consumd? / How is it that all things are changd even as in ancient times?"[32] The placement of this couplet just ten lines before the climactic mention of "sweet Science" is provocative. The face of science, the adversarial culture, unquestionably changed during the poetic lifetimes of Blake and Wordsworth. From this, one might argue either causation or coincidence. At the very least, it seems likely that these poets' criticisms of science, joined with those of others, succeeded in giving voice to widely held cultural concerns and as a result played some role in the discipline's eventual redefinition—a redefinition, ironically, that was in the long-term interest of the discipline itself, in that it fostered a realistic and sustainable revisioning of science's mission. But despite the changes that transpired within science in Blake and Wordsworth's day, in a century's time the discipline would need to change again, this

[31] *The Prelude* 1850 11.448-51.
[32] 9.844-45.

time in regard to formal positions on the knowability of the natural world and our chances of ever observing that world with anything approaching clarity. Our present understanding is that there are some questions that may never be answered to our complete satisfaction. Indeed, science in the present age, and by its revised definition, requires a certain tolerance for ambiguity and uncertainty. This represents a radical change in the underlying philosophy of not only the natural sciences but of Western culture in general since the days of Blake and Wordsworth—a change to which these poets were witnesses, if not champions.

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VITA

Thomas Charles Call graduated with honors from Murray State University in May 1981 with a double major in English and Biology and a minor in Chemistry—the first step in a career trajectory that has traced a ricocheting path between the sciences and the humanities. During his undergraduate career at MSU, his activities included editor of the campus literary magazine *Notations*, as well as editorial assistant to the bulletin for the Kentucky Philological Association. In May 1987, he completed Kentucky State Teacher Certification in Science and English Communications. He capitalized on these credentials to become Director of the Golden Pond Planetarium at TVA's Land Between the Lakes National Recreation Area (now administered by the U.S. Forest Service), a post he held until beginning doctoral studies in English at the University of Tennessee, Knoxville, in the area of literature and science studies. While at UT, he taught courses in English composition and eighteenth-, nineteenth-, and twentieth-century British literature. Subsequent to his teaching duties, he worked as an academic advisor for the College of Arts and Sciences, with particular emphases in the areas of pre-law, pre-health, and honors advising. In August 2005, he was awarded the Doctor of Philosophy degree in English.

His accomplishments at UT include presentations at a number of professional conferences, including the MLA National Convention (2003) and the International Conference on Romanticism (2004). In the fall of 2005, he will present a paper based on his doctoral research at the annual meeting of the South Atlantic Modern Language

Association. Also forthcoming are his contributions to *The Biographical Dictionary of Enlightenment and Revolution, 1690-1815* (currently in press), which will feature his profiles of the scientific figures William Herschel and William Hyde Wollaston.

Of particular pride to Call and his family was his official acceptance in 2004 into the Muscogee (Creek) Nation of Oklahoma, along with his CDIB (Certificate of Degree of Indian Blood) from the Bureau of Indian Affairs in Washington, D.C.