Imagination and Science in Romanticism

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Published by Johns Hopkins University Press

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My aim here is to restore connections between Romantic literature and science through one of the period’s key terms: “imagination.” The popular account of Romanticism still maintains that hostility to science is a unifying attitude of the period (Heringman, *Romantic Science* 7). In recent years, work on Romantic science has become a virtual cottage industry, but we still lack an overall sense of how scientific ideas undergird the Romantic imagination and how that undergirding changes what we think we know about it.¹ Science and art were more compatible then, and this study shows why. Adding to the problem: within literary studies, the imagination itself has been discredited for its false idealism and its misleading promises of autonomy.² I show how this dismissal has been too hasty, in part by challenging both the traditional view of the imagination and the version of the Romantic imagination that historicism has left us with.

**THE ROMANTIC TURN TO PHENOMENALITY AND THE USES OF FORM**

In brief, the main claim of this book is that both Romantic artists and scientists seized upon the imagination to connect more fully with the experience of objects, not to leave them behind, and thus “transcendence” could not automatically separate art from science.³ Kant, of course, meant by “transcendental” all the necessary conditions of experience.⁴ Physician John Abercrombie, to cite only one of many hundred possible instances, wrote, “The power of invention, founded on exercise of the imagination, may also be applied to the investigations of science . . . [I]t may be employed, for example, in the contrivance of experiments, calculated to aid investigation, or to illustrate a doctrine; and in the construction of
those legitimate hypotheses, which have often led to the most important discoveries” (Inquires 162). Imagination operated, on the one hand, as hypothesis, to link literary creation with the creation within scientific discovery. Lorenz Oken in Die Zeugung (1805) imagines “the complex living organism as an association of simple living organisms” (Jacob 115), and this prepared the way for cell theory. On the other hand, imagination operated to bracket ontology as beyond what it is possible to know, since, after Kant, the thing-in-and-of-itself was considered widely to be outside epistemology. Joseph Priestley refers to experimental results as “appearances,” and he goes so far as to “imagine” a theory to account for the chemical process he thinks he has just witnessed (“Experiments” 301). Naturalist Charles Bonnet insists that “tout le Système matériel ne seroit qu’un Phénomène, une pure apparence” (Collection Complète 7: 7), and he believes there was no break in the continuity of existence.

Together, these modes of operation facilitated the rise of phenomenality over ontology, even within science, enabling both to seek the Kantian transcendental, or knowledge of what human faculties could know based upon rules to ensure knowing, while remaining either agnostic or modest about ontology. Claims bracketed by phenomenality and form—highlighting the observer’s sensibility—could claim a modesty that was befitting the work of science. Organic understandings of bodies rendered them into transitional states, heightening the importance of phenomenology. Since the representation of the thing was at issue, concepts could remain when they bespoke what was necessary for human experience writ large, enabling the reading of appearances as experiences that tell us something both about the world and about our cognitive powers. The Romantic method for dealing with subjectivity was to actively factor it into the equation and to face it squarely and, only after doing so, temper it with the absolute, whose totalizing scale dwarfed the self and potentially countered its narcissism.

The images and ideas of imagination became nearly impossible to dispense with. They could point to new ways of seeing previously unknown forms of what the Romantics considered matter, like electromagnetism; relate those forms of matter to natural laws of dynamism; and thus help explain how our senses could encounter them. Hazlitt thought the imagination itself worked like a “lodestone, . . . moulded into itself by elective affinity,” thus linking its creative combinations to science, magnetism, and the powers of attraction of chemical entities, thereby lending association the power of a natural law (“Table Talk” 6: 47). Kant stipulated that the imagination could make images that were not present, either through invention or through abstraction (Makkreel 13), and the power of abstraction could also help enable particularities to be apprehended as law. Indeed,
Romantic science unified heat, light, magnetism, and gravity under the “single fungible currency of energy” (Daston, “When Science” 1). Nonetheless, to do so, one had to imagine and define “energy” as the entity pulling it all together. In its strongest form, the imagination’s ability to see relationality among differences could become what William Whewell, author of two monumental works on the history and philosophy of science, would soon call “consilience,” the bringing together of previously separate streams of research to make something new.

To the extent that Romantic literature and science looked to imagination to embrace this turn to phenomenality, the feltness of experience, over ontology, both could share the aesthetic project of bracketing objects and materiality in terms of appearances and forms. Lecturing future physicians, John Gregory warned in 1772, “Many feeble attempts have been made to explain the phenomena of the animal body upon mechanical and chemical principles alone; but without success” (Lectures 189). The way forward was to try to study the laws of the nervous system because this would unlock “the mutual influence of mind and body” (189). Michael Faraday explicitly invoked “forms” over objects as he lectured his chemistry students: the goal “of our philosophy cannot truly be enclosed in or confined to one form and that of the form under which we lay it down: — it has relations running in a thousand different directions” (“Syllabus” J9, page 2). Such bracketing had several scientific and aesthetic advantages: objects acquired provisional status to be fodder for rational argument if not confirmed by experiment; objects thus had to be imagined as having some relationality to the subject as well as to other objects; and, indeed, in this view, there is no knowing outside of relationality. Faraday exploits this way of thinking to develop a series of experiments, and form, because it is metonymic of relationality, insists on research as process. Even phenomena that look dissimilar might when considered together provide insight into laws: here, form corrals difference and minimizes it as it moves from lower to higher apprehension. Coleridge, we recall, understood method to amount to the contemplation of “the relations of things,” especially the bringing of “things the most remote and diverse . . . into mental contiguity” (Friend 1: 451, 455).

Goethe even thought that he could develop a rigorous science of form (Gestaltbildung) with prolonged observation (Heitler 61). His transcendental anatomy stipulated an ideal, not actual, archetype that would regulate those observations of the “changing of one form into another” in plants (Goethe, Metamorphosis 6), and this led him to coin the term “morphology.” When he sees in winged seeds “the traces of such incompletely adapted leaf forms” (75), we witness just how much work imagination must do, as it must overcome traces, incompleteness, and partial adaptation. Like Goethe, Friedrich Schlegel thinks that art became
perfect to the extent it was a science and vice versa (Beiser, *Imperative* 15). Finally, Romantic art as formal illusion could add a reflective dimension to what it was possible for science and art to know, even as the idea of form provided a way for scientists and artists to negotiate difference as appearance.24

Hence, imagining through form was useful for both scientists and artists alike, who saw it as a means to apprehension, and as a kind of “plausible empiricism.” Kwame Appiah defines this term as a “disciplined connection between observation and occult properties, rather than a verificationalist confirmation of every occult property” (65). Because form can proffer visualizability yet is aware that it is only representation, its status as appearance provides visual plausibility while suspending questions of ontology.25 Form can respond meaningfully to these lowered stakes in Romanticism by offering discipline in terms of the multiple kinds of relationality stemming from both careful observation and imagined connections, but only so long as these have the potential to shed light on either the absolute or on natural laws. When Kant stipulated that our scientific accounts of objects must include our ability to experience them, he underscored the importance of considering plausibility. And, since living things were structured and simultaneously changing constantly, form stepped in to adjudicate between these solid and liquid poles. To the extent that “form” lacks a pre-given scale and, after epigenesis, given structure, it was an ideal placeholder for a dynamic unit of organization, what would become the cell.26

This simultaneous shift to both phenomenality and relationality was, moreover, assisted by the general turn in empiricism during Romanticism, moving from an Enlightenment focus on parts to Romanticism’s fascination with the relationships between parts that give the whole its meaning (Jacob 74). For Geoffroy Saint-Hilaire, thinking in terms of forms of animality encouraged him to make comparisons across species and to try to pin down the plan of organization itself, which, in turn, enabled his contribution of the term “homology” (Gil 194; Rehbock 149). These new tools of morphology and homology help make relationality into a science.27 For Alexander von Humboldt, whose lush descriptions of Latin America fueled Charles Darwin’s wanderlust, “Organic life is unceasingly occupied with connecting to new forms those elements liberated by death” (158).28 Humboldt’s emphasis on *Ansichten* meant that the project of recognizing connections within the web of life was just beginning, and he invites readers to activate their imaginations to move beyond natural history and toward geography, which attended to plants and their environment (Nicolson 170). He thus closes his “Ideas for a Physiognomy of Plants,” the central essay in the volume, by invoking “the power of our imagination [to] create a living picture of exotic Nature” (Humboldt 169), even
as he renders nature into a “global force with corresponding climate zones across continents” (Wulf 103). Because it remains a black box—the imagination is here papered over by the term “power,” whose workings require its own summons—phenomenality encourages an ethos of modesty surrounding its claims. More to the point, seeing aesthetically through the imagination provided the basis of what Kant called judgment: the ability to unify the particular with the universal through abstraction while at the same time allowing for the contingent to have shaped any current view of the universal. Form acquires such power because its lack of scale facilitates this slide between the particular and universal, one that becomes necessary because universality is infinite, and therefore beyond empiricism’s reach, and because laws exceed particularity.

Hence, the natural world and the literature about it become a sequence of reinterpretations and observations reconfiguring relationality that are not an obstacle to understanding but rather the precondition of it; and here the Romantics anticipate Heidegger’s rendering of Dasein, or the being of being, into a hermeneutic. De Quincey went so far as to define human nature as “some subtle nexus, some series of links, that we cannot perceive” (13: 178). And nature comes to be understood as an organism, and this overarching postulate allowed local differences to be subsumed by organic form even as phenomenality encourages the felt intensification of difference to heighten the quest for the absolute. Anna Barbauld in “A Summer Evening’s Meditation,” thus, figures deep space as “embryo systems and unkindled suns/sleep[ing] in the womb of chaos” (lines 97–98). If the world is an organism, hierarchy becomes logically absurd, since “every phenomenon is an indispensable part of the whole and equal to all the others” (Modiano 145). As a result, scientists were expected to have an account of the intelligibility of matter, how the subject encounters the object. Without such an account, the entity in view risked impossibility. This account, in turn, entailed a necessary modesty about claims of physicality beyond claims of relationality, which could contribute to the Romantic project of indicating a future ultimate order and unity.

Coleridge had these complexities in mind when he considered chemical elements as neither actual physical bodies nor principles or powers of nature: instead, he thought of them as “symbols of the operation and degree of dominance of given powers of nature” (Modiano 172). He thus aligns what we would consider the materiality of chemical elements with a symbolism that operationalizes them into natural law. In Romanticism, the concept of relative atomic weight ratio was analogous: John Dalton may have come up with the idea, but his calculation of it relied upon interpreting the chemical experiments of others and often guessing the atomic structure of the compound and then basing proportionality upon that
Dalton was careful to use the term “imagine” both when speculating upon the actual combinations in the production of compounds—as when he “should imagine” the oxidation that produces soda to be “one-to-one” (New System 2: 56)—and when speculating upon the reasons why certain combinations did not happen in nature (2: 101). Dalton thus turns to imagination because it allows him to bracket his claims as speculative and therefore needing the confirmation of either known analogies or systematic observations or calculations or experiments. Crucially, this ratio is now considered symbolically as not to have actual weight (De Bievre and Peiser).

At the same time, such speculations could leverage the quality of usefulness if they followed rules or were systematically and logically applied, or at very least opened themselves up to experimental contradiction, and, in a larger view, this meant that imagination did not function as the necessary antithesis to rules or logic. Romantic creativity without order cancelled itself: consider here Coleridge’s “Dejection” and the devastating loss of his “shaping spirit of Imagination” (366, line 86). Even wild Pindaric odes need shape. In his Logic, Coleridge argued that “‘science’ being taken in its highest sense, as any kind or quantum of knowledge that has been reduced to rules” (5). Indeed, the imagination raises the problem of judging how to produce rules that would discipline it, what Marc Redfield has called “judging judgment” (7), and Kant limited all a priori synthetic principles to “principles of possible experience” (PMN 314). As Kant voluminously showed, if anything required rules, it was the idea of possible experience. Without it, Kant thought that all the imagination could do would be to rave wildly. William Hazlitt argued that “logic should enlarge and invigorate its conceptions by the use of imagination: . . . neither is sufficient alone” (“Understanding and Imagination” 4). Coleridge spent most of his adult life working on a defense of logic, in part to undermine the idea that induction was the only path to scientific knowledge. Rather, he recognized, to make progress with strict induction would take several lifetimes. It was therefore pragmatic to begin scientific knowledge with a hypothesis, and this meant that imagination could have a substantial, if regulated, role within science (Merrison 174–75). That he understood logic to concern “not what we understand nor how much, but simply how we understand” (Coleridge, Logic 45), and defined it as “the art and science of discoursing conclusively” (22) indicated that neither had a monopoly over it.

The traditional view of the imagination as articulated by the likes of Frye, Bloom, and Engell assumes that imagination reached its developmental peak in Romantic literature, and it wrongly predicates this teleology on the assumption of a split between the two cultures of science and literature before any such split
solidified.\textsuperscript{40} Even today, Gerald Holton notes that many of the binaries associated with scientific innovation (reason/imagination, subjective/objective, logical/empirical) do not lend themselves to describing the human activity of scientific work (xiv), and neither do they capture Romantic art or science. George Rousseau pointed out decades ago that the Romantic imagination was a physiological imagination, and thus it could be medically described (NA 86–91),\textsuperscript{41} a view that should have put to bed these reifications of a split. Frye based his understanding of the educated imagination on what we know now to be a false dichotomy between literature and science: “Literature belongs to the world man constructs, not the world he sees” (27). Davy grouped both poetry and philosophy under “science”: the former was “the science of feeling”; the latter, the “science of ideas” (Notebook HD/21/b, page 10).\textsuperscript{42} He cultivated a reputation for genius by showing himself attuned to the sublime powers of nature and swanning around with his manipulations of the voltaic battery (Golinski, \textit{Experimental Self} 53).

Any binary opposition between feelings and ideas or art and science were undercut by the fact that feeling, as in Kant’s notion of beauty, could lead to ideas like purposiveness without purpose, central to both nineteenth-century biology and aesthetics.\textsuperscript{43} As Coleridge insisted in a letter to Thelwall, “I seldom feel without thinking or think without feeling” (\textit{CL} 1: 279). The scientific appreciation of nature required an aesthetic sensibility, and the study of metamorphosis in living things enabled “art and nature to lose their separate identities” (Wellmann 122). Dalia Nassar puts it thusly: “The experience of beauty expands our concept of nature insofar as it points to analogies between our creative capacities . . . and the natural world” (63). Kant, of course, suggests that constructs themselves enable meaningful seeing, and Blake insists that infinity was possible if only one cleansed one’s doors of perception. Frye goes on to emphasize, “The world of literature is human in shape . . . , where the primary realities are not atoms or electrons but bodies, and the primary forces not energy or gravitation but love and death and passion and pity” (28). Yet Percy Shelley hypothesizes that the forces of attraction and repulsion that hold matter together are love. Bloom falsely pits imagination against nature: “The mind, searching for what would suffice, encountered an icy remoteness, but dared to affirm the triumph of its imaginings over the solitude and vacancy of inadvertent nature” (\textit{Ringers} 90). However, organicism left little that could be considered inadvertent about Romantic living nature, and many scientists linked life with purposiveness, a way of looking at forms and appearances of nature as if they were designed. Purposiveness provided biologists with the idea of a plan without having to specify one (R. Richards, \textit{Conception} 71).\textsuperscript{44} Baldly put, the science of the time made it difficult to tar nature with the brush
of alienation, and the best scientists, like Goethe’s tender empiricists, felt nature’s manifold interconnections.

Romantic conceptions of embodied minds, moreover, refused anything like two cultures of art and science, emphasizing instead a relationality between mind and world that regarded such triumph as hollow. Kant thought consciousness needed objects. Hence, Percy Shelley, in his poem “The Triumph of Life,” depicts intellectual history as being inexorably chained both to the car of life and to the brain: “A vision on my brain was rolled.” And, hence, Coleridge’s primary imagination is tied to perception, and I will show how his physiological understanding of imagination made it difficult to separate the material from the idea, a point Coleridge underscored when he writes, “Thought is the participle past of Thing” (N 3587). His point is that they are not fundamentally different entities: what separates materiality and idea is the passage of time. An embodied mind, furthermore, learns from the body, as its emotions color our deliberations and enable us to make choices. Indeed, Kant in his 1786 “What Is Orientation in Thinking,” makes clear that the conscious mind is necessarily embodied, as he there begins his treatment of thought with the need to feel a difference between his right and left hands because the body provides thought the orientation it needs to get going.

In his magisterial *The Creative Imagination*, James Engell also tends to celebrate creativity as a necessary good and to locate its apotheosis within Romantic literature. And yet, because of the constant traffic between literature and science, the creative imagination would not be confined to the arts. So, for example, as Ursula Klein has documented, well into the nineteenth century the laboratory was both an artisanal and scientific space, either in the home or university, for implementing chemical operations. Novalis, trained in the Freiberg Mining Academy in mineralogy and geology, claimed the laboratory to be a site of creativity and wrote in his *Notebook of Medical-Natural Scientific Studies* that “natural genius belongs in experimenting, that is to say, that wondrous ability to capture the sense of nature—and to act in her spirit. The true observer is an artist—he divines the significant (Notes 219). Novalis shows that the fault lines between art and science were much more fluid than the scholarship tends to admit. Even artists had interest in laboratories. In 1801, Coleridge hoped to entice Wordsworth and William Calvert to study chemistry together, and this prompted Coleridge to write to Davy, asking him to send “directions for a convenient little Laboratory” to facilitate their study (CL 2: 378).

This fluid boundary between art and science was underscored by the fact that *Naturphilosophie*, the search for an overall theory of the self-organizing powers of
nature, was “normal science” (Beiser, “Kant and Naturphilosophie” 10), one that called upon the power of the imagination to animate what otherwise might remain particular and detached facts. This group included such diverse writers as Friedrich Schlegel, Johann Wolfgang von Goethe, Joseph Schelling, Georg Hegel, Immanuel Kant, Lorenz Oken, Karl von Baer, and Hans Christian Orsted. When critics of Naturphilosophie dismissed it as bogus because of what they saw as a metaphysical quest for unity, they not only underestimated its concern with observation and experiment, but they also neglected arguments about the solipsism of merely personal experience. These critics also underestimated the nature philosopher’s fascination with the formal power of paradox to gesture toward life, as in the idea of purposiveness without purpose. Nonetheless, as Modiano, Beiser, and Robert Richards have shown, this movement made key contributions to science—such as Orsted’s discovery of electromagnetism, Johann Wilhelm Ritter’s discovery of ultraviolet light, and von Baer’s making of embryology into a science—and its emphasis on the need for a methodology to explain nature as an organic unity made possible these contributions. For our purposes here, the dismissal of Naturphilosophie as a science not only makes it possible to overlook the force science has over Romanticism, but it also has made it more difficult to see why poetry and science did not have to be at odds. Both considered beauty to bespeak the intelligibility of the world. Jon Klancher has recently shown how much entanglement and intermediation there was between the arts and the sciences through institutions like the Royal Institution, which were devoted to both, and he illustrates how the one helped form the other. Davy, we recall, commented that “there is no absolute utility in poetry; but it gives pleasure, refines and exalts the mind. Philosophic pursuits [chief among them chemistry] have likewise a noble and independent use of this kind” (Consolations 9: 360). We should not forget that chemistry could be considered an art or skill.

Such Romantic traffic between the arts and sciences has been screened by the recounting of famous moments as when Blake urged that that “God us Keep / From Single Visions & Newton’s sleep” (E722) or when Keats accuses Newton of having unwoven with cold philosophy the poetry of the rainbow. Of course, Blake turned to Newton to better articulate what the triumph of imaginative vision would look like, and Newton was not necessarily the enemy (Ault, Visionary Physics). Not only does Lamia then go on to warn of the dangers of enchantment, but also Keats knows that science is not merely cold philosophy. Stuart Sperry has demonstrated how the poet’s two courses in chemistry helped make the world more enchanting and simultaneously more intelligible, while Richard Holmes has suggested how Romantic science enhances wonder rather than encouraging its demise.
when Humboldt argues that “the plant kingdom impresses our imagination through a constant immensity” (161), he at once insists that the sublime is what provides the scientific observer with her attachment to nature so it can be studied and then has to worry that such immensity does not devolve aesthetically into “tediousness”: “One should avoid the impression of tediousness that any enumeration of individual forms must invariably elicit” (163). When scientific discovery is caricatured as a slavish method that roteley follows rules, it might look like a stable, efficient, reproducible process, but it is also thereby emptied of creativity, denied the imagination, and demonized.60 In his important study of the scientific imagination, Gerald Holton argues that success requires the mobilizing of different kinds of resources: theoretical frameworks, experimental activity, gathering data, and interpretation through concepts (xxix). Friedrich Steinle adds, “Experiments aren’t simply found; they are made,” and “experimental results are not attained but negotiated” (Exploratory Experiments 302, 306).61 No rote method can capture these nuances, just as no rote method yields artistic creativity (our current blind faith in innovation notwithstanding). He also underscores the value of unintended interactions or applications, which of course must be recognized (xxxvii), and I submit such recognition begins as feeling.

To the traditional view of imagination, a group of historicist critics led by Jerome McGann responded that the Romantic imagination was ideologically evasive and escapist, but they too indirectly assume a split between poetry and science that was not firmly in place.62 Such a split was licensed by a fundamental misunderstanding of the relation between the immaterial and material, and the role of Romantic science in adjudicating the two.63 One reason why the line between the immaterial and material was so vexed was the fact that, in Romanticism, scientists had to come to terms with both what they thought were new forms of matter like electromagnetism along with an overwhelming sense of the diversity of the living world.64 For one, what does materiality mean when it includes “imponderable” matter, their category for matter without mass, which included entities like heat/caloric, light, and ether? For another, Dalton posited that the atoms of one element differ from the atoms of another element, thus linking it with difference. With regard to the diversity of living things, Buffon insists, “There are really only individuals in nature, and genera, orders and classes exist only in our imagination” (Oeuvres 1: 54). If taxonomic categories belong to imagination, then it is charged with finding the natural order in the living world.

Taken together, then, Romantic matter explodes with difference, and difference undermines any necessary opposition between materiality and figuration that would allow figuration empire over difference, an opposition already undercut by
Kant’s injunction to think of things as forms or appearances. I suggest here that logocentrism is predicated on a mattercentrism, which is false, and this means language has been given too much credit for its awareness of difference. Kant argues that, “whereas matter is a plurality of things that cannot itself supply a determinate unity for its combination, . . . an idea is an absolute unity of presentation” (CJ 377).

Another reason why Romantic matter and spirit won’t be conveniently sorted was the pervasive dissatisfaction with materialist and mechanistic accounts of living matter: even though Kant thought that mechanism was essential for something to be a science, he recognized that biology needed a concept of purposiveness if it were to try to account for the self-organizing powers of life. If conventional views assume the imagination to be immaterial, historicist views insist that the immaterial amounts to an ideological evasiveness, but this is to ignore both how difference made it more difficult to generalize about materiality and how Romantic science appropriated the idealizing logic of “as if.” Historicist critics thus err when they presume that to make the imagination material is to understand its transcendence ideologically, and thus true criticism is tasked with bankrupting the imagination by showing transcendence to be a lie. Such a split was further underwritten by an idea of objectivity that was also not, as Lorraine Daston and Peter Galison argue, in place even within science. “To be objective,” they write, “is to aspire to knowledge that bears no trace of the knower—knowledge unmarked by prejudice or skill, fantasy or judgment, wishing or striving” (17). But Romantic science was tied to the ability to feel.

I argue the imagination and its insistence upon phenomenality was an important precursor to scientific objectivity because it demanded recognition of the difference between an appearance, which was inseparable from subjectivity, and reality. Nonetheless, for scientific objectivity to become what Daston and Galison refer to as an “epistemic virtue,” a conflation of epistemology and ethics that enables the creation of a scientific self that seemingly does not have one (39–40), one first had to confront the degree to which it was possible to get outside the self and its ability to perceive. One also has to imagine an epistemology that does not rely upon the exile of subjectivity to sanitize itself. As I show, the imagination played a key role in this history. On the one hand, only a visionary imagination could abstract rules and laws out of empirical particularities, and to do that particularities had to be seen and felt in terms of meaningful patterns. On the other hand, one had to recognize that the creative freedom and sensibility of imagination were not absolute goods, and thus it was imperative to impose limits upon it. Hence, the Romantics oft deploy a disciplined, rational, feeling imagination.
against a wild, excessively feeling, spontaneous one, in the process operationalizing what discipline looks like as well as setting the benchmarks for the subject’s education or Bildung, so it could be measured.69 The stakes here were enormous. After insisting that “no one, certainly can regulate the imagination of another,” Thomas Beddoes prescribes anatomical, physiological, and natural historical knowledge as a prophylactic to the evils of masturbation because these are “incapable of raising improper emotions” (1: 49–53). Certainly, his injunction that boys should learn the difference between the oviparous and viviparous classes provided a much-needed cold shower, as did his insistence they be instructed in the history of diseases.70 Physician Thomas Arnold warned that, when the imagination was too active, it would be led by the “slightest associations,” even the most “dissimilar” and incongruous ones, and if unchecked would lead to insanity (2: 431).71

Romantic artists and scientists thereby not only put the Bildung in the Einbildungskraft (imagination)—we should pause over the fact that the wild imagination makes Bildung possible—but they also took advantage of the traffic between domains that can be so conducive to creativity. 72 Without first asking how any proposition was possible and without having rules for judging possibility, one could not have knowledge but only fantasy. Yet proving something to be impossible was also much more difficult than to prove an instance of it to be false. Objectivity itself is further in part about the feeling of asceticism, and, in this view, objectivity demands the exchange of one set of emotions—sympathy—for another—the pleasures of self-denial (P. White 825–26).73 The Romantic history of the imagination shows how and why this asceticism came to be, even as it, in closing the gaps between feeling and objectivity, allows Romanticism full participation in the history of science. Furthermore, by acknowledging a link between objectivity and feelings, we enlarge what the practices of science look and feel like. If the more emotional imagination worked by spontaneous associations that could not be controlled but were spontaneously generative, its more rational counter-spirit could evaluate those associations.74

What historicists dismiss as ideological transcendence could actually be far more complicated: it could take the form of a Kantian a priori, that which is before experience but necessary for knowledge like concepts of causality or even of time and space; or it could take the form of a postulate or hypothesis; or it could frame differences as local differences, ultimately subsumable under an absolute. Orsted’s ability to see the differences in the powers and kinds of matter in terms of related forms, for instance, was key to helping him to discover electromagnetism. Whewell, furthermore, stipulated that speculative theories “for any other purpose than that of comparison with observation are frivolous and useless exer-
The mathematician Poincaré later cautioned that although the mind’s laws are “imposed on our science, they are not imposed on nature” (xviii). Together, these examples show that what Kant called the transcendental could be very useful for both science and art.

**WHAT’S WRONG WITH HISTORICIST AND IDEOLOGICAL APPROACHES TO IMAGINATION?**

Proponents of ideological approaches to the imagination often insist that the imagination is tied to a certain kind of personage—the white bourgeois subject—and therefore smacks of elitism. Rather than bankrupting the imagination in advance in this way, I highlight both an epistemological imagination that has the potential to work democratically to discipline individuals so that reason and imagination can cooperate, and the need to examine what the Romantic imagination accomplishes, instead of rejecting it dogmatically.

There are three main problems with the historicist critique of imagination and the understanding of materiality that historicism relies upon. First, the science of the time offered many ways in which to think about the imagination in materialist terms, and so the Romantic imagination will stand in for neither transcendence nor ideological evasion. Historicism makes the options starker than they actually are when it understands materiality as a corrective. Despite its political charge of French radicalism and atheism, materiality gave the imagination necessary intelligibility: how it worked and had effects on the world was the concern of scientists and writers alike. When Wordsworth worries about the repair and restoration of his imagination in *The Prelude*, he has to figure out how that repair is to take place, which in turn demands an account of what the imagination is, how it works, and what caused it to break down. Simply put, one had to have a way of explaining how the imagination could encounter the things of this world and what that encounter meant. The fact that physiology took on epistemology made it absolutely central to the imagination’s intelligibility. That physiology and epistemology could be linked at all suggests how complicated the mind’s connection to the body could be, as well as how an embodied imagination could nonetheless provide transcendent rules for knowing.

Second, the opposition between the material and immaterial was neither as drastic as we take it to be, nor were its stakes such that materialism could be a corrective to idealism. Kantian modesty about knowledge of things made claims of materiality overtly speculative. Once one could take for granted that matter needed to be imagined, Kant recognized the need for two modes of reasoning: the constitutive, based on secure a priori concepts, and the regulative use of it, which
relies on an imaginative “as if” supposition because it is not secure. When historicist critics link imagination to ideology, they ignore the skepticism scientists had about both ontology and constitutive reasoning. A number of scientists recognized that very few phenomena could be constitutively grounded, but science as procedure could hold out the hope for such a future grounding. Kant insists, “The concept of a thing as in itself a natural purpose is not a constitutive concept either of understanding or of reason. But it can still be a regulative concept for reflective judgment, allowing us to use a remote analogy with our own causality in terms of purposes generally, to guide our investigation of organized objects and to meditate regarding their supreme basis” (CJ 376). Nonetheless, the regulative use of reason merely stipulated that if a concept were necessary for the science to exist, the concept could be used so long as it was not framed constitutively. Because living things required some notion of purposiveness in order to explain them, purposiveness could provide at least a regulative basis for biology. While “regulative” explanations recognized the limits of imagination, constitutive ones risked immodesty and error, not to mention dogmatism.

At a practical level, because scientists could not afford to preclude spiritual concerns even within science (they could not risk atheism) and because concepts like imponderable matter—a matter that was not measurable—helped to equivocate between new forms of matter like radiant or electromagnetic matter and known matter, the boundary between materiality and immateriality was porous. This was another reason why materiality could not immunize ideology. Kant, we recall, insisted that concepts allowed things to come into being. He would later in his Opus Postumum define physics as “a system of perceptions from the forces of matter which affect the senses, insofar as they modify the subject according to a principle of the possibility of experience (outer as well as inner)” (127). Insofar as the creative imagination was understood as that which allows us to have the judgment that comes with seeing the universal in the particular (Warnock 83), ideas will not easily be severed from things. That is Coleridge’s point when he insists that “not the Ground (material subjecta) but the relations constitute all individuality” (CN 4356). Within science, Kantian judgment helped foster the discovery of new natural laws and the interconnectedness of all life by encouraging the finding of the universal within the particular. Hence Cuvier argued that the essence of vitality would only be reached through the rigorous comparison of particular with general forms within comparative anatomy (1: xxii). With regard to the imagination, Cuvier stipulated that one first had to distinguish between what it was possible as a physiologist to know—he argued that the “effects of habit and attention” could be known only by the metaphysician (2: 115)—but the physiologist could attend to the “order
of corporeal motions which correspond exactly to those sensations and combination of ideas” (ibid.). In sum, he argued that “the imagination will produce physical effects on the body, which seem to be a repercussion of the influence which the physical changes of the body have on them” (2: 115–16). Crucially, the imagination can be studied through its physical effects, but any correspondence between those effects and imagination is bracketed by “seems.”

Together, then, science and literature shared an interest in phenomenology, in part because claims of ontology were beyond what it was possible to know, but also because thinking in terms of appearances helped to foster comparisons and a sense of felt interconnectedness, not to mention a sense of the difference between careful practiced observations and imperfect first notions. Perhaps the feeling of belonging opened the subject up to imaginative improvisation, which De Quincey referred to as being “forced into the consciousness of creative energies” (5: 307), and thus generativeness could temporarily compensate for the limits of what could be known to be known. Hence, Goethe warns against seeing experiments in terms of isolated facts, instead urging the systematic placement of phenomena next to another (“Experiment as Mediator” 21–22) along with the active finding of the patterns between them (the Urphänomen) while being careful not to be misled by the confirmation bias entailed in one’s own hypotheses. Seeing each stage of growth of the plant as one of its forms enabled him to observe fastidiously how leaves developed into other parts of the plant. The life sciences, too, were limited to appearances and forms, but could discipline those appearances under laws. Kant defined thinking itself as “uniting representations in consciousness” (PMN 305).

Representation—what Cuvier refers to as a “correspond[ence],” and not an identity—further insisted upon a gap between the object and its appearance, which was crucial for self-reflection and the ability to improve one’s powers of observation. Not only were feelings an indispensable part of experience, but also at least in French the word for “experience,” expérience, was also the word for “experiment.” In the Argument to All Religions Are One, Blake alludes to the slide between the two when he insists, “As the true method of knowledge is experiment the true faculty of knowing must be the faculty which experiences” (plate 3). He would go on to name “poetic genius” as the faculty of experience and knowing. Key to scientific explanation, then, was the ability to account for how the object could be encountered by human experience, and this meant that the narrative of the encounter, the feltness, acquired the power of a limited fact. If the object could be encountered by experience, moreover, one could conceive of either logical consequences ensuing from it or invent an experiment that might
reveal something about it. As Wordsworth and Coleridge put it in their 1802 “Preface to the Lyrical Ballads,” “We have no knowledge, that is, no general principles drawn from the contemplation of particular facts, but what has been built up by pleasure, and exists in us by pleasure alone. The Man of Science, the Chemist and Mathematician, whatever difficulties and disgusts they may have had to struggle with, know and feel this” (258).

Daston submits that “between about 1780 and 1820 facts hardened, the imagination ran riot, and art and science diverged in their aims” (“Fear” 81). Daston and Galison insist that a split took place in Romanticism in how the imagination was understood, as writers increasingly speak of the imagination as being “creative,” “inventive,” and “holistic,” while scientists move away from such ideas toward seeing science as exclusively concerned with the understanding of facts and with the avoidance of large-scale systematic claims (246). By contrast, I argue that such a split was more rhetorical (performative) than actual (constative), notwithstanding Wordsworth’s polemical antithesis between poetry and “matter of fact, or science” (“Preface,” 1800 ed., 254). Instead of fixing fields, my approach further asks that we consider the kinds of work that these declared border raids accomplish. The short answer is they evidence creativity. Goethe denies that facts can be separated from theory: “The highest is to understand that all fact is really theory” (cited in Seamon and Zajonc 4). Leigh Hunt further supports the idea that any such notion of a widening gap between art and science was performative, writing, “As feeling is the earliest teacher, and perception the only final proof of things most demonstrable by science, so the remotest imaginations of the poets may often be found to have the closest connexion with matter of fact” (4). And in 1833 William Whewell lamented that “it has of late been common to assert that facts alone are valuable in science,” consequently, a tension between theory and fact has made “men’s observations and speculations useless and fruitless” (xx). While his lament might be construed as evidence for Daston and Galison’s claims of a split, Whewell is resisting the elevation of facts and claiming that the value placed on them is an assertion. Dalton worried about numbers of “alleged” chemical facts (New System 2: appendix), which warns about the dangers of the stand-alone power of facts.

To the extent that Romantic scientific objects had to explain how they could be encountered, “fact” included how the object was experienced, and the value of including how it was experienced helped to surround this fact with modesty and contingency, which, in turn, made it continuously subject to scientific methods. John Tresch has shown the importance Romantic scientists gave to “feeling around in the invisible” as they discovered the properties of electromagnetism
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(40), and he conclusively shows feeling was often the road to fact, but facts then are still tied to the subjective experience of them. After noting that natural philosophy “does not consist in a sterile accumulation of facts,” Humboldt, despite his mounting footnotes, insisted that “it is the privilege of the curious and active mind of humanity to occasionally drift out of the present and into the darkness of prehistory” (257). Hazlitt insists that “without being grounded in facts & feelings, we shall end as we began in ignorance” (“Understanding and Imagination” 5), and feelings here are also a ground. He continues, speaking of the slave trade, “Those evils that inflame the imagination & make the heart sick, ought not to leave the head cool” (6–7). Hazlitt urges that feelings should prompt decisive action. In a larger view, because any border between science and art mobilizes other binaries, such as logic and creativity, method and spontaneity, fact and fiction, feeling and reason, its citation could energize.

Romantic facts would further not immunize the imagination from error because they were difficult to separate from how they were to be operationalized or understood, and this meant that they “conform[ed] neither to positivistic views nor towards the radical contingencies of postmodernism” (Holland, “Facts” 4). Instead, “the Romantic fact seems most comfortable poised on the threshold between theoretical system and event” (ibid.). Hence Cuvier lamented that physiology “possess[ed] no demonstrated principle, whence the particular facts might be deduced as consequences, the whole science consists as yet in the series of these facts only” (1: xxii). And Coleridge opined that nature “supplies” us with “a motley chaos of facts,” which “conscious choice will perfect into knowledge” (Logic 8). Faraday, moreover, commented that “he is the wisest philosopher who holds his theory with some doubt—who is able to proportion his judgment and confidence to the value of the evidence set before him before taking a fact for a fact & a supposition for a supposition” (“Speculations”), and he often noted his general suspicion of what others took as facts, insisting that “the general fact sought to be proved” (“Annotated Offprints” F/3/E, page 73). Orsted called “genius” the ability “to create a true theory from all the facts which they have found in nature by means of their profound understanding” (“Chemistry of the Nineteenth Century” 123). In this view, facts entail profound understanding that makes them coherent. He both thinks that facts have a kind of purposiveness and believes that experiment operationalizes fact, once again undermining their ability to ground. Because the event requires a system in which to make sense, the Romantic fact was inextricable from the contexts that called for its citation. Whewell put it best: “It is only through some view or other of the connexion or relation of facts, that we know what circumstances we ought to notice and record” (Address
His Kantian understanding of an idea as that which gave form to the sensations (Yeo 12) further vexed the relation of fact to objectivity.96 In fact, insofar as the experience of matter mattered more than its ontology, sensibility, or the ability to feel, took on a truth-bearing weight that Victorian objectivity has obscured.97 While things-in-and-of-themselves might be beyond our knowledge, the ability to experience things was not, and thus things had to be framed in such a way that our experience of them would be possible. Without this ability to experience the scientific object, it was at best difficult to instrumentalize it into an experiment because one had to suss out how to operationalize it. Thus, the possibility of experiencing objects became the fault line between an imagination that was disciplined and an imagination bent pathologically on fantasy. This is why atoms were dismissed as fantasy: they could not be experienced. Surprisingly, then, feeling and science thus were not necessarily enemies. Jessica Riskin has argued that science of the Enlightenment demanded sensibility, which in turn stipulated modesty. The way to know something to be true was to be in touch with it, not to coldly objectify it as being wholly separate from the perceiving subject.98 Wordsworth thus demanded that readers attend to the “passion [within] the forms of nature themselves” (Prelude, 1850 ed., book 13, page 347). Such feeling was especially sought after, given Romantic science’s interest in unity: the particular feeling had the potential to put one in contact with the universal. The necessary counterweight to such feeling was skepticism about the knowability of ontology that was signaled by a gap between the feeling and the thing. The gap between feeling and the thing meant that one could talk about forms and appearances of the material rather than materiality itself. Instead of materiality being able to rescue artists and scientists from idealism or transcendence, then, the transcendent was precisely the opposite of ideology: it was a way of thinking about the limits of one’s knowledge of the material. In their rush to ideology, historicist and deconstructive readings of the imagination have missed the mark. An added boon: this gap left space for the self to occupy.

My insistence upon the importance of phenomenology to Romanticism means that Romantic art could function neither as a mirror to the world (mimesis) nor as a lamp (pure expression), since only the appearance could be mirrored and because the expressions of form ran the danger of simply skipping over the thing. Art and science were furthermore united in their mutual insistence upon form and representation as potentially powerful means of knowing, but that power stemmed from the ability to correct one’s assumptions when necessary.99 Thinking of natural objects as representations not only invited such correction but also crucially provided a vantage point from which to see the possibility of error. Be-
cause there were effects that chemistry at the time could not clearly attribute either to matter or the powers governing it, for instance, Faraday refers to “heat, [and] electricity” as “phenomena” so that he can be careful not to attribute it to the one or the other (“Lectures on Chemistry” 111).

Hence, the third reason why a split between science and literature was not in place: a culture of sensibility that not only declared feelings to have a crucial relationship to even scientific knowledge but also insisted upon a modesty surrounding what it was possible to know. Imagination enabled an idea to become registered as a felt impression. As Mary Warnock puts it, “Imagination, then has two functions which go together; to shape by means of an inner power, and to allow us to feel” (78). For Ampère, _tatônnement_, or “tactile testing,” was crucial to his epistemic project. He thought that knowledge arose from “resistances between the will, the muscles, and external objects” (Tresch 39). Ampère was part of a larger cultural recognition of the importance of the viewer’s senses, habits, and memory in creating perception. In this view, poetic vision and scientific scrutiny need not be at odds. Goethe’s scientific writings therefore go hand in hand with his poetry about plants.

The Romantic fascination with phenomenality further helps explain Romanticism and its double consciousness, not to mention its faith in imagination once one understands its limits. In _Dark Interpreter_, Tilottama Rajan illustrates how Romanticism participates in contradictory aesthetic postures that seem dialectically to idealize and doubt the power of art. To the extent that phenomenality holds the world in suspension, it defers endorsement and imposes modesty upon claims even as it questions the given so that change becomes possible. This deferral of commitment need not be an evasiveness; moreover, it can be quite useful for science, especially when science can turn to a never-ending verificationalism that is always able to revise the given. If idealization meant that the absolute was eventually attainable, and perhaps most readily so within aesthetic intuition, then skepticism insisted on the gaps between nature and freedom. In the Romantic period, not only did feeling have some power to verify, but also, because skepticism and idealism were constant options, emotions necessarily fluctuated, shaping cognition. In Victorianism, objectivity would consolidate powers of verificationalism and, with the exception of physicist John Tyndall, largely leave the imagination behind. Objectivity’s rise entailed the imagination’s descent. Tyndall reminded his readers that Newton’s “passage from a falling apple to a falling moon” was in fact a leap of imagination (6).

Let me elaborate on what I mean by the ability of science always to revise the given, especially since this capacity for revision is indebted to imagination. Both
Romantic science and current science avail themselves of what I call “empirical futurity”: an empiricism that promises to negate itself based on future findings or technologies that would allow new theories and things to come into being, sometimes clustered around similar objects.¹⁰⁷ One way strict empiricism negates itself is through a scientific object that is more like a metaphor.¹⁰⁸ Science has little use for objects that do not adapt to changing technologies and the “advance” of knowledge, and Kantian modesty about things accepts changes of appearances without necessarily canceling out their status as the same objects. For example, Evelyn Fox Keller has written eloquently about the fact that “genes” function like a metaphor since, in the history of their scientific use, they refer to something that is an actor or something acted upon or some combination of both. Similarly, “plasticity” can refer to a necessary process of neural development, the modest capacity of the brain to repair itself, and the making and breaking of neural connections (Rose and Rose 90). The floating definition means the object in question, the nerves, can be adapted to changing ontological speculations. This imaginative work is screened by scientific objectivity, a verificationalism that stretches into the future, even as it claims a rigorous empiricism by conflating a commitment to empiricism with empiricism itself—even more so for sciences that claim insight into futurity, the ability to make predictions.¹⁰⁹ Within neuroscience, empirical futurity can manifest itself as a commitment to some future mechanism that will explain consciousness.

Far from ideology, then, the Romantic imagination thus becomes a way of either venturing or forestalling commitment: Davy writes, “May we not venture to imagine, that the visible and tangible world, with which we are acquainted by our sensations, bears the same relations to the divine and infinite Intelligence, that our organs bear to our mind” (Consolations 9: 380)—and “venture” here not only insists upon provisionality, but it also is limited to claims of relationality.¹¹⁰ Davy argues that mind might be to brain as divine intelligence is to tangibility. It also helps explain the double consciousness within Romantic science, which, on the one hand, sought to find unity in the world and which, on the other hand, recognized the obstreperousness of certain particularities to yield to larger patterns, along with the totalizing potential of those larger patterns to swallow up everything in their path.¹¹¹ Unity could unwittingly impose domination. Coleridge’s strategy for dealing with this problem is multeity in unity, whereas Blake’s is an endlessly proliferating series of allegories. To the extent that the Romantic imagination is the context through which these writers saw and felt the world, it is the vehicle through which their idealism and skepticism, not to mention apprehension of unity and difference, took root.
Insofar as science has an open commitment to a form of materiality that may be available only in the future, it must rely upon imagination, and the problem now becomes how to discipline imagination to make it a reliable tool of epistemology. Here, reliability eschews stability and instead becomes about including the possibility of self-correction. Seen thusly, the imagination allows science to become about a process of trial and error, even as science models itself on the organic processes of the human mind, and error itself is transformed into a tool that is a necessary step on the way to knowledge (Cowles 644). The problem of epistemology, then, in Romanticism is not often framed in terms of getting rid of imagination but rather how to get it to work with reason. Even when excoriated, the imagination functioned as a useful enemy. Although Kant labeled imagination “blind,” he made it central to the unifying of the manifold of presentations and to the unity of the self that enabled thought itself. It was therefore central to the apprehension of both the subject and object. And despite the fact that the phrenologist Spurzheim warned that the “faculty of imagining . . . is a power which gives a great exaltation to the feelings,” he insisted that “the feelings are under control of the judgment” (n.p.).

We witness the truth value of feeling and imagination within science in Humphry Davy’s 1802 “A Discourse Introductory to a Course of Lectures on Chemistry,” when he insists, “The food of the imagination is supplied by the sense, and all ideas existing in the human mind are representations of parts of nature accurately delineated by memory, or tinged with the glow of passion, and formed into new combinations by fancy. In this view researches concerning the phaenomena of corpuscular action may be said to be almost natural to the mind, and to arise out of its instinctive feelings” (2: 324–25). Davy argues that the food of imagination comes from the senses, and he thereby seeks to connect mental representations with nature. Yet note his turn to “phaenomena” when thinking about corpuscular action, which frames them as an appearance and not ontology. When he has them “tinged with the glow of passion,” he thus insists on how feelings enable attention to said phenomena in a way reminiscent of the German Gefühl, or inner tactile feel for ideas, that was central to knowledge in German Romanticism. He then insists that “the study of nature, therefore, in her various operations must be always more or less connected with the love of the beautiful and the sublime; and in consequence of the extent and indefiniteness of the views it presents to us, it is eminently calculated to gratify and keep alive the more powerful passions and ambitions of the soul” (2: 325). Because nature is bracketed by phenomenality, it is proximate to the aesthetic and therefore reveals the scientist’s powers of judgment. One outcome of this: experiment in the Romantic period was not neces-
sarily driven by a hypothesis but could be tasked with simply becoming familiar with all related phenomena and their extensions (Tresch 39), and this meant that, just in the same way materiality could not cure idealism, experiment could further imaginative speculation rather than put an end to it.

Davy concludes his chemical lecture, however, by noting that experiment “may destroy diseases of the imagination, owing to too deep a sensibility” (“Discourse Introductory” 2: 326). Experiment starts to function here as the counter to excessive sensibility, the cause of disease, and this suggests that knowledge has its roots in sensibility and its excesses or the limits of Gefühl. This, in turn, reminds us that experiment was about the testing of experience about the relation between experience and knowledge (Henderson 155). Since feelings were an inescapable part of that experience, the key was to understand how much attention one needed to give to them. Note, however, that not attending to them is not an option.

Mary Shelley had read Davy’s 1802 Royal Institution lecture in October 1816.114 Indeed, when she comments that “in a scientific pursuit there is continual food for discovery and wonder” (Frankenstein 33), she likely tips her hat to Davy. When she foregrounds the feelings that drive Victor Frankenstein—the variety of which “bore [him] onwards, like a hurricane, in the first enthusiasm of success” (36)—she reminds us of the legacy of sensibility upon science but argues that Victor has become so dangerously attuned to his own ego that his sensibility becomes a form of absolute selfishness, an irony Shelley underscores when Victor interprets the monster’s threat to be with him on his wedding night as a threat against himself, despite the growing pile of dead bodies surrounding him. When he refuses to attend to the “loathing from [his] occupation” (37), working as he does alongside the worms of death, and when he “tortures the living animal to animate the lifeless clay” (36), Shelley warns that Frankenstein’s sensibility has been perverted. Sensibility in fact gave electrical science an ethics: much work on electricity within medicine was driven by a search for new cures to such diseases as rheumatism. Victor, however, thinks about electricity only as a way of buttressing his own growing ego, how his creatures will worship him. Sensibility thus begins to require something like objectivity to guard against such extremes. When Victor declares himself the winner of his own pity party over Justine—“the tortures of the accused did not equal mine” (64)—Mary Shelley indirectly protests enough is enough.

Thomas Hankins provides another lens for thinking about the rise of phenomenal within the science of the time: “The materialist philosophers of the eighteenth century made matter active by giving it the properties of life. In essence, they distributed the soul throughout matter in order to get rid of it” (127). Hankins suggests a synthesis of materiality and idealism, and—I will show how—as con-
cepts of the material shifted under dynamism, they defied any easy opposition between idealism and materiality that underwrites many of the critical assumptions about imagination. Kant's argument about matter stipulates that we must grapple with what enables human beings to encounter it, and thus the forces of attraction and repulsion within matter are what enable us to sense it. With this growing recognition of the importance of phenomenality came a stress on the unifying powers of the imagination, which enabled seeing symbolically in terms of the universal within each particular. Coleridge mistakenly thought that the German for imagination, *Einbildungskraft*, began with the word “one,” and he liked the fact that it brought together different phenomena into one image (Warnock 92).

My argument, then, insists that the imagination mattered and was not merely delusion or a literary phenomenon, and that science helped explain why it mattered. Ever since Francis Bacon showed how the imagination helped to produce idols of the mind, there was scientific distrust about the imagination. Because he thought that the human understanding was too easily moved by things that strike it, he accused the imagination of not only being too easily filled but also of imputing a similarity to the objects it gathered that was not there (Bacon 1: 47).\textsuperscript{116} Romantic writers even within the sciences helped to overcome this distrust in two ways: first, by thinking through the ways in which one has to imagine an idea before one can prove it; therefore, imagination, despite its problems, becomes an unavoidable part of discovery. Second, they insisted, despite knowing that imagination sometimes worked unconsciously or subconsciously, that its fruits could be harnessed in concert with reason and not against it.\textsuperscript{117} Paradoxically, the imagination could help discover what was possible along with the limits to possibility.\textsuperscript{118} Coleridge defined “hypothesis” as “the placing of one known fact under others as their ground or foundation.” He went on to stipulate that “not the fact itself but only its position in a certain relation is imagined” (N 3587). In this view, imagination could conform to reason when it was restricted to considering possible relations between facts and observations. The fact that its workings were often below the level of consciousness—again Kant calls the imagination “blind”—meant that it was prudent to adopt an essential modesty toward its fruits. Nonetheless, Davy recalls that Bacon was able to find value in the errors of alchemy: in “searching for an imaginary treasure, [they] fertilized the soil” (Consolations 9: 356).

When William Blake pronounced, “What is now proved was once, only imagin’d” (E36), he insists both that one has to imagine an idea before proving it and that science is more than mere proving.\textsuperscript{119} Although science today underscores verification, how did the candidates for verification come into being?
Blake’s apprenticeship to James Basire, the official engraver of the Royal Society, helped him to recognize that. And although critics are fond of quoting Keats’s comparison of the imagination to Adam’s dream to show the seductive powers of imagination—“he awoke and found it true”—Keats’s pronoun is “he,” and he immediately qualifies this with “I have never yet been able to perceive how any thing can be known for truth by consequitive [sic] reasoning—and yet it must be—.” The poet’s “must” wagers a speculative truth of imagination that binds consecutives into a unity that Keats cannot perceive. Still rarer is quotation of this passage’s end, when Keats extolls a “complex Mind—one that is imaginative and at the same time careful of its fruits” (Letters 1: 185–86).120

Wordsworth in book 13 of The Prelude likewise comments:

I had been taught to reverence a Power
That is the visible quality and shape
And image of right reason; that matures
Her processes by steadfast laws; gives birth
To no impatient or fallacious hopes,
No heat of passion or excessive zeal,
No vain conceits; provokes to no quick turns
Of self-applauding intellect; but trains
To meekness, and exalts by humble faith;
Holds up before the mind intoxicate
With present objects, and the busy dance
Of things that pass away, a temperate show
Of objects that endure. (1850 ed., page 336, lines 20–32)

The poet insists upon objects as appearances, and he warns against the tendency to intoxicate our minds with “present objects.” Against those “present objects,” he foregrounds “a temperate show / Of objects that endure.” Whether the objects are present objects or enduring objects, Wordsworth insists upon “show,” or appearance, and thus the only way to make sense of objects is not only to understand what truly endures but also to question even physicality itself as a necessary form of endurance. If phenomenality brackets objects, it also brackets the perceiving imagination, and hence his metonymies for imagination—power, quality, shape, image, and reason—insist upon mediations. Since both the subject and the object are likewise mediated, the one can encounter the other. Instead of a knowledge that is contingent upon a power differential between subjects and objects, then, Wordsworth stipulates an imagination that is the inescapable source of the mind’s presentations, and he insists that the imagination is needed to help sort out
the enduring from the ephemeral. Although he here stipulates the many things that can go wrong with the imagination—fallacious hopes, excessive zeal, a “self-applauding” intellect—Wordsworth insists that so long as the imagination can be an image of right reason, it will lead us to “steadfast laws.” Awareness of the subject’s emotions enables them to be cancelled out if necessary.

As Wordsworth suggests, the ability to image things as not necessarily physically present was useful to both literature and science insofar as imagination could suggest both ways of improving the world and methods for testing things whose physical contours were unknown. Within Romantic science, one name for this was “hypothesis,” and I show how hypothesis and speculation became necessary but provisional ways for moving forward in physiology and neurology. Thomas Hankins puts it thusly: “Experimental physiology in the eighteenth century became phenomenalistic” (115). To the extent that experiment aligned with phenomenality, even it could promote an idealism that was not the antithesis of, but rather underwrote, materiality. The upshot here is that vitalism encouraged descriptions that were about appearances, not ontology, and thus the imagination could make important and necessary contributions to the framing of the phenomenality of matter itself insofar as the meaning of the appearance was open to debate. Baldly put, claims of vitalist ontology were beyond what was possible for science to know; nonetheless, as Denise Gigante remarks, “The hermeneutic field constituting Romantic life science addressed the complexity of the organism in a way that twenty-first century biologists have once more begun to do,” but that is because it acknowledged the role of interpretation (29). Molecular biology has had to come to terms with the fact that the appearance of life and the appearance of genetic information are not the same thing (Morange 16), and thus life has returned as a scientific goal. The idea of life in the deep sea as well as on other planets has challenged its deepest assumptions, such as the degree to which life must be carbon based.

The story I will tell about the Romantic imagination is one infused by science. The direct consequences of these connections are to redefine the imagination as an epistemological faculty that produces ideas and makes possible comparisons, scientific as well as poetic ones. The imagination generates hypotheses that in order to become scientific must somehow be confirmed. Alan Richardson has shown that the mind-brain problem in the Romantic period matters. But science demonstrated that regulating the imagination was as natural as indulging in it as a matter of escape. From a medical point of view, the regulation of diet and behavior was thought to help stem the excesses of imagination. And if physiology showed the imagination could exacerbate the symptoms of certain diseases, the
challenge was to show how it could aid in healing. Cuvier worried about how to weed out imposters like Mesmer, writing, “It must be confessed, that it is extremely difficult . . . to distinguish between the effect of the imagination of the person subjected to the experiment, from the physical effects produced by the operation, and the problem is frequently complicated” (2: 122), but the panel of scientists overcame this problem by inventing the blind experiment. Scientific ideas further underscored the difficulty of the separation of the imagination from the world, and understanding these contexts helps make it clear that the fears of the imagination’s delusions are more ours than theirs, especially since Romantic thinkers put protocols in place to insulate the imagination from delusion. Today, psychologists recognize that even children understand imaginary friends to be imaginary, and I therefore suggest Romantic critics have overestimated the imagination’s ability to foster delusion by neither paying enough attention to the role it played in bracketing claims within science nor to the protocols invented that enabled it to work with reason, and even if its spontaneity could not be controlled, judgment could be applied to its fruits.124

Simply put, in reminding us of the links between imagination and science, I restore the imagination’s role as an engine of epistemology, once its limits were understood, and also help explain why the period could not avoid imagination. Even when Kant and Faraday consider atomism as a symptom of an overactive imagination, they did not reject it. How is that possible? As I argue, they framed the problem in terms of the amount of freedom given to the imagination, and, as a result, they sought to come up with principles that would contain that freedom without destroying its generative, spontaneous, and creative powers. The Romantics understood that science advances neither by facts alone nor by brutal reductionism alone. Instead, scientific advancement occurs through disciplined uses of imagination that allow forms to suggest laws.

Permit me to offer a few words about what is not included here and why. In using the term “scientist,” I risk anachronism because I seek to remind readers of Coleridge’s role in shaping the term.125 At the 1833 meeting of the British Association for the Advancement of Science, William Whewell coined the term “scientist,” after Coleridge insisted that these “men” stop calling themselves “natural philosophers.”126 “There was [then] no clear distinction between philosophy and science, and no such thing as a pure empirical science limited only to observation and experiment” (Beiser, “Kant and Naturphilosophie” 10). In 1834, Whewell, in a review of Mary Somerville’s work, used the term “scientist” for the first time in print, perhaps because “man of science” would have been inappropriate. James Secord cautions that Whewell actually thought of her as better than a scientist: as a phi-
losopher (106). Although he considered “natural philosopher” to be “too wide and too lofty” (Yeo 110), “scientist” was to Coleridge, by contrast, also a bit of a demo-
tion, a turn to the empirical and away from the rationalism and “inner sense”
embraced by natural philosophy (BL 1: 250–52). My use of the term “scientist,”
then, highlights Romanticism’s recognition of the need for such a term, along with
its wariness of naming of a kind of self that negated certain forms of subjectivity
and eventually with them feelings, the very bases of our points of contact between
the self and the object. Furthermore, since “what constitutes a ‘science’ or a legit-
imate system of knowledge depends . . . on the criteria specific to each historical
period” (M. Kim 4), “Romantic scientist” captures the historical specificity of this
particular kind of practitioner. Despite Whewell’s ambivalence about the term
“scientist,” he does group her among “persons of real science, like Mrs. Somer-
ville” (Review 58). I also do not have much new to say about botany and geology,
and here books by Theresa Kelley, Alan Bewell, Noah Heringman, and Ralph
O’Connor fill this gap.127

**CHAPITERS AND SCOPE**

Chapters thus explore the ways in which Romantic writers and scientists argue for
the value of imagination in scientific practice, and the ways those arguments
should challenge assumptions about what the imagination can and cannot do.
Ranging widely across the work of such diverse Romantic scientists as Davy, Far-
aday, Boscovich, Priestley, Kant, Mary Somerville, Goethe, Haller, Humboldt,
Orsted, Swedenborg, Blumenbach, Buffon, Saumarez, Erasmus Darwin, Smellie,
and Von Baer, this book considers how these authors impacted ideas of imagina-
tion in such key Romantic works as *Prometheus Unbound*, *The Four Zoas*, *The
Biographia Literaria*, and *Frankenstein*. And, since the range of practices that fall
under the banner of Romantic science was wider than we tend to remember, it
was no wonder that imagination had such a charged role. Torn between a Natur-
philosophie that was drawn to metaphysics even when it was most experimental
and a Baconian experimental program that also recognized the value of concepts,
Romantic science struggled to find peace with a working method that could make
coherent these disparate practices, and this study concentrates on how the imagina-
tion helped to operationalize various methods. It often did so by bracketing
imaginative speculations as fodder for future confirmation, but the forms for that
confirmation were multiple and not just experiment.128

Because the Romantic imagination is bound up in debates about matter, I
begin with chemistry and physics and consider how scientists like Priestley, Davy,
Kant, and Faraday, among others, reject atomism as a delusion of imagination
and yet nonetheless turn to imagination in their considerations of dynamic matter. Indeed, Orsted credited Kant for having “liberated” physics “from the atomistic system, which, though of speculative origin, was made the basis of experimental physics” (“Introduction to General Physics” 305). Chapter 1 thus pursues the Kantian argument that human understanding cannot get to things-in-and-of-themselves, and, as a result, matter was necessarily imagined. In the process, I show how imagination was instrumentalized to perform the work of science, and Kant and others did so by considering what limits to the imagination’s freedoms were necessary. Percy Shelley not only thought about matter in terms of dynamic force, but he also considered love to be a force of attraction within the universe. As a key to a dynamic materiality, attractive force made it possible to unite imagination and matter. And as Davy had realized, Volta’s battery enabled the breaking of this attractive force by splitting compounds into their individual elements.

I turn in chapter 2 to think about why Blake in *The Four Zoas*, on the one hand, fervently believed in a visionary imagination and, at the same time, localized this imagination in the brain and nerves. How did Romantic neurology facilitate his insistent embodiment of imagination, and how could such reductionism not come at the cost of a meaningful self? I contrast physicalism, which usually eliminates autonomy and context, with Blake’s proliferating mythology and developing nervous system to address this question. And, given how often the word “delusion” appears in the poem, why does Blake risk tarring imagination with the delusions of dreams, and what are the circumstances under which the imagination can yield knowledge? I also consider the ways in which neurology of the time could foster an idea of an emergent self.

Chapter 3 considers how the science of physiology shapes Coleridge’s famous theory of imagination. While critics have shown how the *Biographia* was his attempt to prove his unlearned genius, I show how he claims both genius and science. Since genius and imagination worked unconsciously, they resisted being subject to rules. Because physiology had to correlate phenomena with natural laws even when the possibility of such correlations seemed doubtful, it provided models for how to substantiate laws and principles. Of crucial importance was the ability to determine the difference between speculations that had no possibility of actuality and speculations that did. Because physiology of the time tried to explain life in terms of vitalism, the theory that life was irreducible to chemical and physical principles, the imagination and vitalism could both profit from being explained in terms of models that either demanded the possibility of actuality for fear that imagination would usurp reason, or by models that bracketed such claims as appearances necessary for human experience. Physiologists took for granted that the
imagination was part of how minds work, and therefore they sought to construct systems that would allow imagination to work with reason. Because Coleridge considered mechanism to deny human agency, he turns to imagination to postulate a will, but only for the purposes of maintaining human morality. Once again method reigns in imagination. Through his famous definition of the imagination, he operationalizes cooperation between it and reason through the tools of physiology, a partnership that entailed a more modest and rational yet more creative imagination than has sometimes been offered.

Chapter 4 explores the place of imagination in obstetrics and embryology, and then considers how these debates shape Mary Shelley’s *Frankenstein*. I here begin with Erasmus Darwin’s emphasis on the imagination’s ability to produce analogies, which raises the problem of how one knows a useful analogy from a false one. With so much unknown in both fields, analogy was a crucial tactic. One strategy was to consider the difference between a surface similarity and a deeper one. Within obstetrics, men-midwives were trying to determine what practices should become standard, and this meant that the imagination functioned to stipulate possible methods so that one might evaluate them. Within embryology, scientists had to figure out how to prove or disprove theories of epigenesis or preformationism, which raised the frame problem. If the same empirical data could be used in service of either theory, how might one justify the theoretical frame one chose? If, under preformationism, God and mothers’ imaginations could be blamed for evil and monstrosity, what we now call birth defects, epigenesis stipulated the source of the problem to be the process of development. For Mary Shelley, the process responsible for monsters was not biological but rather cultural, and it was Victor Frankenstein’s fantasy that his imagination was fully autonomous that led development astray.

I close this introduction by commenting upon the irony that at the moment when science is giving serious attention to the imagination’s cognitive powers, Romantic critics are diminishing its influence by localizing it to particular figures. Philosopher Shaun Nichols highlights a robust scientific research program devoted to understanding the cognitive powers of the “propositional imagination,” which is important because it tells us what is possible and not possible. In *The Rational Imagination*, Ruth Byrne considers how logical our counterfactual imaginations truly are: when people imagine alternatives to reality, those alternatives it turns out are conditioned by reality. Psychologist Dan Gilbert credits imagination for our ability to anticipate our futures, and he warns that, because our imaginations work so quickly, we are not skeptical enough of its fruits. On the one hand, this current scientific optimism surrounding the imagination and
its capacity for enhancing knowledge does not take seriously enough what could go wrong with it. On the other hand, such optimism might usefully challenge the marginalization of the imagination within the humanities, including the localization of it within Romantic criticism, and even within some accounts of science, and it is in the spirit of this challenge that this book has been written. By neglecting the imagination’s role in epistemology of the time, Romanticists have done nothing less than give up the store.