CHAPTER 4

THE SCIENTIFIC AND PHILOSOPHICAL CRITICISMS OF *THE ORIGIN* IN CAMBRIDGE AND BOSTON, 1859-1860

While William Rogers debated Louis Agassiz at the Boston Society of Natural History, Asa Gray debated Francis Bowen, John A. Lowell, and Louis Agassiz, with occasional support from Theophilus Parsons, at three special meetings of the American Academy during the spring of 1860. Gray was frequently frustrated by their lack of understanding and determined to answer their weak criticisms. His frustration should not be surprising. After all, he was a professional botanist who for the past five years had been struggling with these complex issues in his own work and through correspondence with Darwin and Hooker. As subsequent debate has demonstrated, *The Origin* is a difficult book to understand, even for professional naturalists. The fact that laymen like Bowen, Lowell, and Parsons, grasped as much as they did is a testimony to their learning and the high regard with which the educated public held natural history.

Each of the participants in the Academy debates published full-length articles that took the issue public. These articles give us important insight into the depth of understanding these Cambridge laymen possessed of Darwin's arguments, the strategies they chose for their criticisms, and the merits of Gray's own critical

responses in his *Atlantic Monthly* articles.[1]

John A. Lowell's Critique

John A. Lowell, an amateur botanist and a friend of both Gray and Agassiz, elaborated on his criticisms of Darwin's theories in the Unitarian quarterly, *Christian Examiner*, in May 1860.[2] Although Agassiz and Bowen undoubtedly coached him, he showed a competent understanding of Darwin's basic theory and the kinds of objections that would occur to someone with his background in the current paradigm of natural history. Lowell made it clear that it was Darwin's logic, not his facts, that were in dispute. This meant that anyone, not just a naturalist, who was able "to reason from admitted premises, to conclusions" was qualified to assess the validity of his theory. Since Darwin also raised metaphysical and theological issues, Lowell felt further justified in passing judgment.

Lowell challenged the logical validity of Darwin's central analogy between human and natural modification of plants and animals on four grounds. Darwin's first weakness, Lowell noted, was that humans were continually guarding, selecting, and protecting just those qualities they wanted to perpetuate; nature had no such counterpart. Thus, crossing, interbreeding, swamping, and reversion to type would all work to frustrate natural selection. But Darwin simply assumed, without any evidence of "a variety having given birth to a new variety," that organisms gradually

[1]Their remarks are summarized in American Academy of Arts and Sciences. *Proceedings* 4 (1857-1860): 410-31.

[2][John A. Lowell], "Darwin's Origin of Species," *Christian Examiner* 6 (May 1860): 449-64.

diverged from their specie type. Since the assumption was unwarranted, the theory itself could not possibly stand.[3] Second, Lowell pointed out that human breeders developed or repressed certain tendencies already latent within the plant or animal. The changes they induced fell within the limits defined by the species itself; they never produced any generic changes. This is all that Darwin's pigeons showed, though Lowell even disputed whether all of his pigeons had the same common ancestor. "If, then, there is no sufficient reason to believe that man can do anything more than to foster and develop existing and apparent tendencies, it cannot be inferred, by analogy, that Nature possesses the powers here claimed for her." Perhaps, Lowell suggested, the differences between species and genera were "incommensurable with those that separate one species from another." Third, Lowell challenged the assumption, following Agassiz, that even Nature produced varieties. Darwin's alleged varieties, Lowell insisted, turn out upon closer examination to be hybrids.[4]

Finally, Lowell objected to Darwin characterizing anything in nature as "accidental" on the grounds that it assumed what had to be proven; namely, that the origin of species were not designed by God. Darwin had no right, Lowell contended, to decide this central question by using the term "accidental" to describe the origin of species. Neither could Darwin use "favorable" to imply that God had placed some organisms in "unfavorable" environments. That also had to be demonstrated, not

[3]"Darwin's Origin of Species," 450-51.

[4]"Darwin's Origin of Species," 451-53.

asserted. Whatever Darwin's merits as a naturalist, Lowell found major logical flaws in the way Darwin laid out his central analogy.[5]

Lowell noted several other logical weaknesses in Darwin's argument. Darwin seemed to be driven by an "inexorable logic" to stray from his announced intention of discussing how varieties gave rise to new species to the far grander vision of how "species became genera, genera orders, and so on, until at last the whole of organic life can be traced back to a single pair." Why did not Darwin heed his own warning that the farther he extended his theory of how species were modified, the less sure his arguments were? Lowell had many questions here. What enemies would the first progenitors have had? What did "indefinite" time for this process to have taken actually mean? How could Darwin so easily dismiss the lack of fossils to support his theory? Why stop at visible progenitors? Why not trace life all the way back to microscopic organisms? How did Darwin explain the transition from ape to human? How was it possible to comprehend the number of "accidents" that would have to happen to trace the lineage of man back to a mollusk? Surely, Lowell concluded, even if we grant Darwin all of these changes, he would need a more rational explanation than accident and chance. He would need a superior intelligent power.[6]

Lowell finally noted that *The Origin* had created such a stir because it "at least suggests, views on the modes of action of the Creator, and on the ways of

[5]"Darwin's Origin of Species," 452-56.

[6]"Darwin's Origin of Species," 457-63.

Providence, that are repugnant to the most cherished feelings and hopes of man."[7] While he admits a First Cause, Darwin drastically limits his intervention and denies any sustaining Providence. With a swipe at Gray, Lowell contended that it is no answer to argue that Darwin "merely attributes a different mode and time to the Divine agency." This response was a refuge only for those "devout minds" who felt driven by "irrefragable proof," which Darwin had not provided. He was further convinced that Darwin would not even accept this strategy. Lowell was not willing to charge Darwin with atheism or even skepticism, but he deeply mistrusted him as a guide to the Creator's working in nature. As for himself, Lowell concluded that miracles were no problem for him: "the Power that could enact and sustain, must, in our apprehension, of necessity be equally able to suspend, or alter, the laws of nature."[8] Whatever personal sparks may have flown between Gray and Lowell during their debate on these issues, there is no denying that Lowell had raised reasonable logical challenges to Darwin's theory.[9]

[7]"Darwin's Origin of Species," 449, 462.

[8]"Darwin's Origin of Species," 463-64.

[9]Dupree seems determined to create a "war" between Gray, the intrepid defender of Darwin, and Lowell, the embodiment of Boston wealth and power, with his talk of "defection," "formidable alliances," "scent of danger," and "condemnations." *Asa Gray*, 286-87. There was undoubtedly great drama at the Academy meetings and subsequent encounters. But we cannot allow the drama to detract us from the substantive issues that a well-read, albeit amateur, naturalist raised in his encounter with Darwin. Dupree fails to give us that sense. Technically, Lowell did not challenge the accuracy of Darwin's theory. He only challenged the *logical* grounds Darwin gave for its validity. Unless Gray believed that Darwin's theory was self-evident, which he surely did not, then Lowell was certainly warranted in stressing the logical weaknesses of Darwin's argument. Presumably, Darwin could have provided inferior grounds for maintaining an accurate theory, certainly not the first time that has been done in the history of science.

Louis Agassiz's Critique

By the time Louis Agassiz's review of *The Origin* appeared in the July issue of the *American Journal of Science*. he had already surveyed his principle criticisms of Darwin in his debates with Asa Gray, at the spring 1859 Academy meetings, and with William Rogers at the spring 1860 Boston Society of Natural History meetings. He took advantage of the forthcoming publication of the third volume of *Contributions to the Natural History of the United States* to summarize his criticisms of Darwin for a larger public.[10] Darwin's fundamental error, which he shared with so many other naturalists, Agassiz insisted, was that he confused the ontological reality of a class, i.e. "species," with the living members of that class, i.e., this individual organism. He was clearly frustrated, even irritated, that so many naturalists, even one as eminent as Charles Darwin, failed to grasp this elementary distinction he had spent a lifetime elaborating.

Agassiz built his entire philosophy of nature on the conviction that "the natural divisions (i.e. species, genera, families, orders, classes) in the animal kingdom were primarily distinct, founded upon different categories of characters, and that all exist in the same way, that is, as categories of thought, embodied in individual living forms. . . The community of characters among the beings belonging to these different categories arise from the intellectual connection which shows them to be categories of thought." These natural divisions--according to which God had structured the world

[10]Louis Agassiz, "Prof. Agassiz on the Origin of Species," *Am. Jour. Sci.* 30 (July 1860), 142-154.

and Cuvier had first clearly identified--bound together members who shared certain intellectual relationships. Species were *a priori* stable categories that never changed. Naturalists had the significant task of uncovering these categories and carefully fitting each individual organism into its proper class.[11]

Individual organisms, on the other hand, Agassiz insisted, were the only entities that had material reality and life. "Each individual, as a distinct being, has a definite course to run from the time of its first formation to the end of its existence, during which it never loses its identity nor changes its individuality, nor its relations to other individuals belonging to the same species, but preserves all the categories of relationship which constitute specific or generic or family affinity, or any other kind or degree of affinity."[12] Darwin had failed to offer any account of "features that constitute individuality. Surely, if individuals may vary within the limits as Darwin assumed, he was bound first to show that individuality does not consist of a sum of hereditary characteristics, combined with variable elements, not necessarily transmitted in their integrity, but only of variable elements."[13] Individuals may vary as widely as Darwin has shown, but the relationships that define their membership in a species never changes. Individuals pass along, from generation to generation, all that is

[11]"Prof. Agassiz," 142-44. Mary P. Winsor has a helpful discussion of this critical point in *Reading the Shape of Nature*, 19-27.

[12]"Prof. Agassiz," 144.

[13]"Prof. Agassiz," 151.

typical of their membership in a class, never their individual peculiarities.[14]

That is why Agassiz contended that only individuals vary, never the natural divisions in which naturalists grouped those individuals. Thus, from Agassiz's perspective, to maintain that species changed would wreck havoc in natural history. Darwin had erroneously believed that by showing the wide range of variations among members of a "species," or the many difficulties naturalists had in determining which individuals belonged to which "species," he had demonstrated that the category of "species" also changed. He had done nothing of kind, Agassiz exclaimed.[15]

Agassiz concluded that Darwin's book had done nothing to shake his confidence in his own belief in the permanence of the natural divisions and the transitoriness of individuals. The "transmutation theory [is] a scientific mistake, untrue in its facts, unscientific in its method, and mischievous in its tendency."[16] Agassiz was raising a perennial philosophical puzzle: what did individuality mean? What was the relationship between the one and the many, the individual organism and

[14]"Prof. Agassiz," 151.

[15]Perhaps an analogy with the changed meaning of "computer" could illustrate the point that Darwin wanted to make about the changes "species" have undergone. From Darwin's perspective, the class "computer," like the class "species," has not remained stable over the last century. It has gradually shifted its meaning from persons who performed the intellectual task of mathematical calculation to machines that carried out algorithmic functions electronically. The class "computer" gradually came to characterize a different population of "computers." Darwin, along with many other naturalists, was only groping for this distinction himself, as seen in his muddled arguments in his notebooks, letters, and *The Origin*. Agassiz, and many others, never understood the differences. It was no wonder that there was a serious clash of differing universes of discourse in the debates over *The Origin*.

[16]"Prof. Agassiz," 154.

the species to which it belonged?[17]

Theophilus Parsons' Critique

Theophilus Parsons, a Harvard law professor, thought that he had found a way to reconcile Darwin and Agassiz.[18] Darwin assumed that the "successive changes" that had produced new species "have always been minute and slow, and have only become sufficient to reach their consummation, by an indefinite accumulation of effects, through the indefinite periods of time which geology affords us." But this limited the rate and extent of variations. Parsons reasoned that we could just as well assume that the changes had been much greater. Great changes, which departed too sharply from the norm, had usually been labeled "monstrosities," but that was prejudicial. There could just as well be abnormal variations that led to new and improved species.[19] This would open up the way to satisfy Agassiz's claim that there were multiple creations of new organisms in successive geological periods. We could simply assume that these new creatures were "created by some influence of variation acting upon the ovum . . . of some animal nearest akin -- a wolf, a fox, a hyena, or a jackal; and the brood will come forth puppies and grow up dogs to produce dogs." This was after all, no more improbable than creatures springing into existence in a

[17]This question continues to fascinate philosophers of biology. Michael Ghiselin most recently commends his novel answer in *Metaphysics and the Origin of Species* (Albany: State University of New York Press, 1997) that species themselves should be considered as individuals.

[18]Theophilus Parsons, "On the Origin of Species," *Amer. Jour. Sci.* 30 (July 1860), 1-13.

[19]Darwin was pleased with Parsons' effort to make "favorable monstrosities" serve his purpose; however, he had found no evidence to support such a view. Darwin to Gray, 11 Aug. 1860, CCD 8: 317.

flash. Besides, we would all be well-served by combining the insights of these two great naturalists and stop fighting about the meaning and origin of "species."[20]

Having satisfied himself that he had made peace between Darwin and Agassiz, Parsons next tried his hand at harmonizing Darwin's theory and religious belief. The key here was to recognize that "natural science belongs . . . to the intelligence of man, and to his outer life, while religion belongs . . . to his affections, his motives, and his inner life. Hence, entirely different faculties and functions of our common nature are brought into exercise in reference to science, from those which are invoked by religion." No better statement of the post-Kantian understanding of "science" and "religion" could have been written. It was for these reasons that "science" could never be used to either prove or disprove "religion"; they dealt with totally different universes. At most, the person predisposed to deny the validity of religious beliefs would use every finding of "science" to support their unbelief, while the person who believed in God would find abundant evidence in science to support their beliefs. By the nature of the case, there could be no way to adjudicate their disputes about "science" since they held such differing "religious" beliefs. Yes, the inductive foundation of the design argument was demolished by this strategy, but so also was the denial of God. Parsons rather identified himself with the person who saw in Darwin's theory "new proof of the eternal working of the personal God in whom he believes."[21]

[20]"Prof. Parsons," 1-9.

[21]"The Origin of Species," 12-13.

Samuel Eliot's Critique

Samuel Eliot, although not a participant in the Academy debates, wrote an essay on the Parsons and Agassiz articles that enables us to glimpse how another member of the Harvard community responded to Darwin. A longtime enthusiastic supporter of Agassiz, Eliot was clearly out of his intellectual depth in struggling to comprehend Darwin's arguments.[22] He was relieved that Agassiz had stepped forward to expose the innumerable fallacies that littered Darwin's book. All he could manage was a string of rhetorical questions that exposed Darwin's unsubstantiated and shocking ideas. "Because numerous and great varieties of pigeons can be produced from one original stock, does it follow that hawks and pigeons were of one blood originally? Because a bear can swim, and pursue insects in the water, does it follow that he might become a whale?" Had Darwin provided even the remotest proof that man derived from a monkey? Had a duck ever emerged from a chicken's egg? "Is it philosophical to rely on a theory which requires an infinite length of time to produce a single one of the prodigious changes of structure which are the subject of investigation? . . . Who can overcome the obvious, the inherent incredibility of such a theory?" Eliot definitely could not; he was dismayed that this "startling theory" . . . could so turn men's eyes from broad facts, to dwell upon fanciful theories, as Mr.

[22][Samuel Eliot], "The Origin of Species," *North Am. Rev.* 91 (Oct. 1860): 528-38. Michael McGiffert identified Eliot as the author of this anonymous review. Eliot, as treasurer of the Harvard Corporation, played an instrumental role in the campaign to purchase Agassiz's substantial natural history collection, underwrite the publication of *Contributions to the Natural History of the United States*, and build the C.M.Z. for Agassiz. He was also the father of Charles Eliot, the future president of Harvard. Lurie, *Agassiz*, 165, 190-191.

Darwin has succeeded in doing."[23]

There is a remarkable range of responses to Darwin in these four essays, from Lowell's logical challenges and Parsons' determined harmonizing of Darwin and Agassiz, to Agassiz's scientific strictures and Eliot's incomprehension. No wonder that Gray felt frustrated that Darwin's message was not getting through to informed laymen and naturalists; ordinary citizens were mangling it beyond recognition. As if these four were not enough to impress Gray with the enormity of his challenge, Francis Bowen presented him with a stern philosophical challenge rooted in the Scottish philosophical tradition of Common Sense Realism.

Francis Bowen: The Scottish Philosophical Critique of Darwin

Francis Bowen's philosophical criticisms of Darwin have suffered serious neglect from scholars. When noted at all, they have been summarily lumped together with Agassiz's and dismissed as carping and irrelevant. Bowen's position deserves to be more fully considered.[24] Despite his often haughty delivery and forbidding

[23]"The Origin of Species," 531, 533, 534, 535, 537.

[24]Dupree, in his otherwise masterful study, *Asa Gray*, fails to provide much more than a bare-bones caricature of Bowen, 286; he relies exclusively on Gray's jaundiced evaluation of Bowen to carry his argument. Other historians of the reception of Darwinism in America have generally followed the same tack. As we have already shown and will elaborate below, Gray's assessment of Bowen's criticisms was as much a reflection of their personal history as it was of the presumed lack of merit in his arguments.

Historians of American philosophy have paid slightly more attention to Bowen's response to Darwin. Herbert Schneider, still an astute and reliable guide to the history of philosophy in America, comments that Bowen "raised some of the basic philosophical problems of Darwinism" and then provides an extensive set of quotations from his *North American Review* article to illustrate. Herbert W. Schneider, *A History of American Philosophy*, 2d. ed. (New York: Columbia University Press,

tendency to grind finely and mercilessly,[25] his critique raised important philosophical issues for evolutionary thought that still merit attention. More importantly for our discussion, they provide insights into the way one of the principal architects of antebellum academic philosophy responded to Darwin's theory. By tracing Bowen's argument in some depth, we will hopefully be in a better position to understand why Darwin's ideas so swiftly swamped Common Sense Philosophy, seemingly so firmly established in the nation's colleges and universities in the antebellum period.[26] Finally, we will be better able to evaluate Gray's response to both Bowen and

1963 [1946], 303-304. Flower and Murphey cover Bowen's texts on logic in *A History of American Philosophy*, 1: 382-387. Bruce Kuklick offers a brief overview of Bowen's thought and response to Darwinism in his now standard account of *The Rise of American Philosophy: Cambridge, Massachusetts, 1860-1930* (New Haven: Yale University Press, 1977), chapter 3, "Francis Bowen and Unitarian Orthodoxy." Kuklick contends that Bowen's writing was "penetrating, deft, and witty: his own constructive work demonstrated that he was a shrewd and able defender of the philosophic underpinnings of Unitarianism; and he left his mark on his students and associates--Chauncey Wright, Charles Peirce, and William James. The contempt shown him by posterity epitomizes the treatment accorded to theorizing that could not meet the challenge of Darwinism." 32. Whether Bowen's arguments "could not meet the challenge of Darwinism" or whether they were simply ignored is a question we will explore below.

[25]Bowen stressed that he was not putting forward any "invidious" or *ad hominem* arguments against Darwin. He succeeded, for the most part, though there were many rhetorical excesses that, while typical of Bowen's style, severely weakened his overall effectiveness, both then and now. My goal is neither to overlook them nor to expose them to more ridicule, but to emphasize his *strongest* scientific and philosophical arguments. These were, after all, the arguments Gray was compelled to answer, no matter how repulsive he may have found Bowen personally.

[26]Perry Miller declares that "It is a curious fact that one of the most radical revolutions in the history of the American mind took place in the two or three decades after the Civil War without exciting appreciable comment: the philosophy and the philosophers of Scottish Realism vanished from the American colleges, leaving not even a rack behind, and were swiftly replace by expounders of some form of Idealism." Perry Miller, ed., *American Thought: Civil War to World War I* (New York: Holt, Rinehart and Winston, 1954), ix. In fairness, it should be noted, Scottish Realism "vanished" only from the major new research universities, both private and public, during these years. It most certainly did *not* vanish from the hundreds of often small struggling denominational colleges scattered throughout the nation that continued to use Scottish texts to the end of the century. This important story still awaits its proper telling.

Darwin. Bowen's arguments compelled Gray to carve out a response that would at once placate Bowen on his right and satisfy Darwin on his left. Whether and how successful Gray was in this task is a question we will explore more fully below.

The Scottish Enlightment and Antebellum Moral Philosophy

The struggles within the Presbyterian state church in Scotland between the Moderates, the party more open to the Enlightenment, and the Popular party, the party of revivalism and orthodoxy, significantly shaped the character of the Scottish Enlightenment. The Moderates secured control of the Scottish universities in the mid-eighteenth century and made them an effective basis of influence throughout Scottish culture. The foundation of their control of the universities was a two-year required course in moral philosophy that served as the framework for specialized studies in the final two years. This course was *moral* because it dealt with human nature in its many facets, from its intellectual powers, sensibilities, and moral duties, to its relationship with others in society and to God. It was required, the philosophers argued, because every other course of study was related in some way to human nature. All of the other university professors agreed. The Scots believed that such a liberal, moral education would strengthen the society by impressing on students the depth and breadth of their intellectual powers and moral and religious duties to themselves and others. The liberality of the Enlightenment ethos would thereby be wedded to Presbyterian piety.

While this course was distinguished from *natural* philosophy in subject matter,

it was intimately aligned with it in method. The Scottish tradition, especially as it was definitively shaped by Thomas Reid and Dugald Stewart, enthusiastically applauded Francis Bacon and Isaac Newton for transforming natural philosophy into a *true science.* The Scots seized on the Newtonian method to provide the same certainty and stability for moral and religious belief that it had already established for natural philosophy, the epitome of science. To accomplish that purpose the Scots were determined to make moral philosophy as scrupulously empirical and inductive as natural philosophy. The first edition of the *Encyclopaedia Britannica* (1771), a Scottish response to Diderot's *Encyclopedie*, declared that

> Moral Philosophy has this in common with Natural Philosophy, that it appeals to nature or fact; depends on observations; and builds its reasonings on plain uncontroverted experiments, or upon the fullest induction of particulars of which the subject will admit. We must observe, in both these sciences, how nature is affected, and what her conduct is in such and such circumstances. Or, in other words, we must collect the appearances of nature in any given instance; trace these to some general principles, or laws of operation; and then apply these principles or laws to the explaining of other phenomena.[27]

Scottish moral philosophers employed this stringent scientific method of Bacon and Newton to defend against both skepticism and materialism, insure social stability, and construct a sophisticated philosophical analysis of human nature.[28]

Thomas Reid, a Presbyterian minister turned moral philosopher at Glasgow

[27]quoted in Roger L. Emerson, "Science and Moral Philosophy in the Scottish Enlightenment," in *Studies in the Philosophy of the Scottish Enlightenment*, ed. M. A. Stewart (Oxford: Clarendon Press, 1990), 26. The *Encyclopaedia Britannica* played a significant role in disseminating the Scottish philosophy throughout the young nation.

[28]Richard Olson, *Scottish Philosophy and British Physics*, 11-25; Roger L. Emerson, "Science and Moral Philosophy in the Scottish Enlightenment," in M. A. Stewart, ed., *Studies in the Scottish Enlightenment*, 11-36.

University, was stung into philosophical reflection by the skeptical epistemological consequences that David Hume drew from John Locke's *Essay on Human Understanding*. Hume argued in *An Inquiry Concerning Human Understanding* (1748) that since all of our ideas were only reflections on our sensations, we could not be certain that they made any contact with the real world; we could not make any truth claims for moral, religious, or even scientific statements. If unchallenged, Reid and his colleagues feared, Hume's skepticism would destroy the foundations of natural philosophy and moral philosophy that the Moderate Presbyterian party was laying in the nation's universities and pulpits.

Reid's response to Hume established the foundation of the Scottish philosophical tradition of moral philosophy. Reid contended that Locke, Hume, and Berkeley had been bewitched by the phantom of "ideas." There were no such entities that mediate between our minds and the external world; they were figments of their imagination that lacked empirical foundation. When we examine our own consciousness, Reid argued, we discover that there is an immediate, non-mediated, non-inferential connection between our minds and external objects. We simply *know* that external objects exist. This sort of knowledge, Reid concluded, could neither be denied nor proven; it was a constitutive feature of our minds. It was a *fact* of consciousness. It was, for that reason, *common* sense. At a minimum, Reid and his followers agreed that essential common sense beliefs included self-consciousness, contact with the external world, belief in cause and effect, and some type of moral

sense or faculty.[29]

Having established the *facts* of common sense through careful induction, Reid and his colleagues explored the contours of the mind in meticulous detail. Something of the scope of that search is given in Reid's course description on "Philosophy of the Mind":

> By the *Philosophy of the Mind*, is understood, An Account of the Constitution of the human Mind, and all of its Powers and Faculties, whether Sensitive, Intellectual, or Moral; the Improvements these are capable of, and the Means of their Improvement; of the mutual Influences of Body and Mind on each other: and of the Knowledge we may acquire of other Minds, and particularly of the Supreme Mind. And the *Sciences depending on the Philosophy of the Mind*, are understood to be Logic, Rhetoric, the Laws of Nature and Nations, Politicks, Oeconomicks, the fine Arts and natural Religion.[30]

This broad base of study enabled the Scottish tradition, which included such men as Francis Hutcheson, Lord Kames, Lord Monboddo, Adam Smith, Adam Ferguson, and Dugald Stewart, to make significant philosophical and empirical advances in areas ranging from anthropology and psychology to history and political economy.[31]

The Scottish "didactic" Enlightenment was tailor-made to provide philosophical direction to a young America, a dynamic and overwhelmingly Protestant nation.[32]

[29]S. A. Grave, *The Scottish Philosophy of Common Sense* (Oxford: Clarendon Press, 1960); Roger D. Gallie, *Thomas Reid and 'The Way of Ideas,'* (Boston: Kluwer Academic Publishers, 1989).

[30]quoted in *Thomas Reid, An Inquiry into the Human Mind; on the Principles of Common Sense: A Critical Edition*, ed. Derek Brookes (University Park, MD: The Pennsylvania State University Press, 1997), Explanatory Notes, 220.

[31]Louis Schneider, ed., *The Scottish Moralists on Human Nature and Society* (Chicago: University of Chicago Press, 1967).

[32]Henry May has characterized the American appropriation of the Scottish Enlightenment as the "didactic" phase of the Enlightenment in America. Henry F. May, *The Enlightenment in America* (New York: Oxford University Press, 1976), Chapter three, "The Didactic Enlightenment 1800-1815."

The Scottish philosophical tradition significantly shaped nineteenth-century American moral philosophy, from its arrival in 1768 with John Witherspoon, a conservative Scottish Presbyterian as president of Princeton, to the last great text of that tradition, Noah Porter's *Elements of Moral Science, Theoretical and Applied,* published in 1884. Its philosophical assumptions enabled antebellum Protestants to fend off the more radical implications of Enlightenment thought until the middle of the nineteenth century. For that reason it was the perfect philosophical medium for virtually every denominational college, from the Calvinist Presbyterians to the Arminian Methodists and Unitarians. Scottish publications were edited, abridged, bowdlerized, and published by the score in the antebellum period.

Americans, however, with few exceptions were more interested in the practical consequences of moral philosophy than they were in its philosophical foundations or directions for further study. They paraded rather than practiced their verbal commitment to the Newtonian method; they cited rather than studied the Scottish authorities on whom they relied. Clergymen, who were more interested in catechisms and apologetics than in philosophical inquiry, taught the moral philosophy courses. Thus, it was a dramatically attenuated Scottish philosophy that dominated courses on moral philosophy and influenced thousands of students throughout the nineteenth century. The consequence was that moral philosophy in America tended to be superficial, dull, and dogmatic, but, most important, it was morally and religiously

reassuring. Francis Bowen was firmly planted in this tradition.[33]

Defender of Unitarian Orthodoxy

Francis Bowen was a formidable philosophical and theological opponent, despite Gray's dismissal.[34] He had a long, distinguished career as a champion of Unitarian orthodoxy in Boston. As a young instructor at Harvard he took up the gauntlet thrust down by Ralph Waldo Emerson in his famous Divinity School Address

[33]Elizabeth Flower and Murray G. Murphey have countered the long-standing prejudice against the Scottish philosophical tradition in America with a full and just summary in their *A History of Philosophy in America* (New York: G. P. Putnam's Sons, 1977), vol. 1: 203-396. G. Stanley Hall's jaundiced overview of "Philosophy in America," *Mind* 1 (1880), 89-105 should be compared with Noah Porter's exhaustive "Philosophy in Great Britain and America," published as Appendix 1 in Friedrich Ueberweg, *History of Philosophy from Thales to the Present Time* (New York: Scribner, Armstrong & Co., 1877, vol. 2: 349-460. Daniel Walker Howe, *The Unitarian Conscience: Harvard Moral Philosophy, 1805-1861* (Cambridge, MA: Harvard University Press, 1970); Douglas Sloan, *The Scottish Enlightenment and the American College Ideal* (New York: Teachers College, 1971) and Donald H. Meyer, *The Instructed Conscience: The Shaping of the American National Ethic* (Philadelphia: University of Pennsylvania Press, 1972) are essential reading. There is no substitute for browsing the texts themselves. Three representative texts would be: Francis Wayland, *The Elements of Moral Science* (1835), a phenomenal publishing success, selling nearly 100,000 copies by 1900; Thomas Upham, *Elements of Mental Philosophy* (New York: Harper & Brothers, 1840), and Noah Porter, *The Elements of Moral Science* (New York: Charles Scribner's Sons, 1884). In fairness, Porter transformed Scottish philosophy with liberal doses of German idealism. If students actually read these texts, they had more sheer endurance than modern students, or even their professors. Their sheer dreariness is but one small reason for the breath of fresh air that the Pragmatists were determined to bring into these studies.

Sydney Ahlstrom's seminal article on "The Scottish Philosophy and American Theology" *Church History* 24 (1955): 257-272, first called attention to the theological significance of Common Sense Realism. George Marsden and Mark Noll, two prominent historians of American evangelicalism, have explored antebellum evangelicalism's apologetic uses of Scottish philosophy in various articles and books. Two representative articles are: George Marsden, "The Collapse of American Evangelical Academia," in *Faith and Rationality: Reason and Belief in God*, ed. Alvin Plantinga and Nicholas Wolterstorff (Notre Dame: University of Notre Dame Press, 1983), 219-264 and Mark Noll, "Common Sense Traditions and American Evangelical Theology," *American Quarterly* 37 (Summer 1985): 216-238.

[34]Bowen wrote two lengthy essays on *The Origin*. "Darwin on the Origin of Species" was published in the April issue of the *North American Review* 90 (April 1860), 474-506 and "Remarks on the Latest Form of the Development Theory," which elaborated on criticisms made at the Academy special meetings, was subsequently published in the *Memoirs of the American Academy of Arts and Sciences* 8 (1861), 97-122.

in 1838. In a series of articles for the *Christian Examiner* and *The North American Review* Bowen unleashed a withering attack on the Transcendentalist heresy then tempting New England.[35] These essays established Bowen's reputation as the architect of Unitarian orthodoxy within the philosophical framework of Common Sense Realism. While later serving as editor of the *North American Review*, he delivered a series of lectures on natural theology at the Lowell Institute during the winter of 1848-1849. These lectures secured his appointment in 1853 as the Alford Professor of Natural Religion, Moral Philosophy, and Civil Polity at Harvard.[36] The title was impressive; the work was crushing. By 1860 he was the only philosophy professor at Harvard, but his mission remained crucial to the college and to himself.[37] At the end of his life Bowen reflected that he had given the past forty years to defend Christianity against all of the variant forms of infidelity. The *Origin of Species* was high on his

[35]These essays were subsequently collected and published, along with several others on contemporary philosophical themes, as *Critical Essays on a Few Subjects Connected with the Present Condition of Speculative Philosophy* (Boston: J. Munroe, 1842).

[36]*Lowell Lectures, on the Application of Metaphysical and Ethical Science to the Evidences of Religion; Delivered before the Lowell Institution in Boston, in the Winter of 1848-49* (Boston: Little, Brown, 1849). These lectures were expanded into a popular text, *The Principles of Metaphysics and Ethical Science Applied to the Evidences of Religion* (Boston: Brewer and Tileston, 1855).

[37] At its January 1860 meeting the Harvard Board of Overseers considered a report which deplored the current state of instruction in "Intellectual and Moral Philosophy." There were no proper courses in metaphysics, logic, ethics, or either natural or revealed theology; they had all been "curtailed, cut down, and driven out step by step from . . . [their] proper place in the College course." A single faculty member [Bowen] was charged with teaching an expanding student and course load. He had, in addition, just been charged with working up a course on political economy. The lamentable result was that students were left destitute of proper training in moral philosophy and religion. Perhaps the report found special urgency in the lack of rigorous philosophical instruction because of the danger to young minds which it saw in *The Origin of Species*. Bowen would have been in complete sympathy with that perspective. Overseers' Report, 1860, Harvard University Archives; quoted in Bruce Kuklick, *The Rise of American Philosophy* (New Haven: Yale University Press, 1977), xv.

list of speculations that carried insidious consequences for the vitality of Christian civilization.[38] The Boston Unitarian establishment clearly looked to him to defend the principles of Unitarian natural theology against the threat posed by Darwin.

The Gray-Bowen confrontation at the Academy must be seen in the broader context of their strained personal and professional relationship. There was more going on in their debate than the rather impersonal question of the plausibility of Darwin's theory and whether an acceptable rapproachment could be effected with the doctrines of design and Final Causes. Gray and Bowen had a long history that was not altogether amiable and mutually respectful. There was first of all a marked clash of personalities: Bowen was irascible and combative, a man of decided religious and philosophical convictions; Gray was gentle and congenial, a man of broad and accommodating religious and philosophical opinions. Bowen was the defender of Boston gentility and harmonious social order; Gray was the child of pioneer stock in upstate New York and product of New Light revivalist social and religious upheaval.

As editor of the *North American Review*, Bowen in 1845 had rebuffed Gray's desire to write a review of *Vestiges* for the *North American Review*; he wanted the pleasure of skewering the anonymous author for his manifold preposterous notions.[39] Bowen gave Gray an opportunity to review *Explanations* the next year. But even in

[38]Bowen, *Gleanings from a Literary Life, 1838-1880* (New York: Charles Scribner's Sons, 1880), vii; Bowen, *Modern Philosophy, from Descartes to Schopenhauer and Hartman* (New York: Charles Scribner's Sons, 1877), vii.

[39]Dupree, *Gray*, 145-146; Bowen, "A Theory of Creation," *North American Review* 60 (April 1845): 426-78.

this, there is ample internal evidence that Bowen exercised rigorous editorial control over Gray's article. It has all of the marks of Bowen's rhetorical style, philosophical framework, and typical lines of argument, but very little of Gray's lucid exposition and scientific authority that he wore so lightly in all that he wrote.[40]

There may well have been significant political tensions that exacerbated the gulf between Gray and Bowen. The 1850s were a crucial decade in the nation's agony over slavery. Little of Gray's thinking is known about these issues, but he was a vigorous supporter of Lincoln and the Union during the Civil War in its fight to preserve the Union and hoped for a swift end to the scourge of slavery. Gray's growing political convictions about the evils of slavery undoubtedly differed from those of Bowen and other Unitarian moralists, who were unwilling to denounce slavery and embrace the abolitionist cause. Bowen adopted the Cotton Whig position of endorsing the Compromise of 1850, on the grounds that opponents of slavery had nothing to fear since the deserts of the Southwest would not support cotton plantations. He supported the Fugitive Slave Law on similarly dubious grounds.[41] Bowen, doubtless, abhorred John Brown's raid on Harper's Ferry the previous November and his elevation to sainthood among many New Englanders and Bostonians. Gray was sympathetic to Brown's cause, if not his tactics. Thus, when Gray and Bowen debated Darwin at the Academy in the spring of 1860 they did so in the larger context of a range of significant differences.

Scottish Natural Philosophy and Natural Theology

Francis Bowen was unique among antebellum professors of moral philosophy by making the Scottish tradition the philosophical framework for his entire thought. Only Noah Porter and James McCosh (after 1868) had a stronger philosophical

[40][Gray], "Explanations of the Vestiges," *North American Review* 62 (April 1846): 465-506. I believe there are very compelling grounds from the character of the article itself for believing that Gray should not even be considered the primary author of this article, though he has been cited as the author in all of the literature. As just one example, on p. 466, we have: "Our readers are doubtless familiar with it [*Vestiges*] from the perusal of his original work, and of *our former article upon it.*" [italics mine] As far as we know Bowen was the only one with a *former* article, not Gray. For these reasons I have not leaned on this article at all in determining the history of Gray's thinking on the issues that the *Origin of Species* raised.

[41]Daniel Walker Howe, *The Unitarian Conscience*, 280-284.

background in the Scottish tradition. Bowen used both the Scottish originals and his edited versions in his classroom, not his nor anyone else's second-hand textbook. By 1860 Bowen had secured a solid reputation as a writer of textbooks in various branches of philosophy, especially moral philosophy.[42] He had also become a disciple of William Hamilton, who was considered at the time to be the most erudite and articulate spokesman for the Scottish philosophy.[43] Bowen used the Scottish tradition to establish sound principles of philosophy, physical science, moral philosophy, and natural theology to act as "a barrier against the licentious and infidel speculations which are pouring in upon us from Europe like a flood."[44] He articulated these

[42]In addition to his earliest collection of essays on the Transcendentalist threat to Unitarianism, Bowen wrote popular textbooks in logic, political economy, metaphysics, logic, and classics. He translated and edited the first American edition of De Tocqueville's *Democracy in America*, which still serves as the basis for modern translations, and compiled a collection of the seminal documents of British and American constitutionalism. His history of *Modern Philosophy from Descartes to Schopenhauer and Hartmann* (1877) was a solid contribution, given sparkle by Bowen's often growling commentary on his philosophical opponents.

James Walker, Bowen's predecessor in the Alford chair and president of Harvard from 1853 to 1860, published immensely popular editions of Dugald Stewart's *The Philosophy of the Active and Moral Powers of Man.* (Cambridge, MA: J. Bartlett, 1849) and Thomas Reid's *Essays on the Intellectual Powers of Man* (Boston: Phillips, Sampson, and Co., 1850), which was an abridgement of Hamilton's edition and included his notes. Bowen edited an abridged and annotated edition of Stewart's *Elements of the Philosophy of the Human Mind* (Boston: William H. Dennet, 1864). These was only two of many editions of Stewart's writings in America.

[43]Bowen published textbooks on Hamilton's metaphysics and his logic. William Hamilton, *The Metaphysics of Sir William Hamilton, Collected, Arranged, and Abridged, for the Use of Colleges and Private Students, by Francis Bowen* (Cambridge, MA: Sever and Francis, 1861) and Bowen, *A Treatise on Logic; or, The Laws of Pure Thought; Comprising both the Aristotelic and Hamiltonian Analyses of Logical Forms, and Some Chapters of Applied Logic* (Cambridge, MA: Sever and Francis, 1864). Largely as a result of Hamilton's influence, Bowen gradually became more sympathetic to Kant.

[44]Bowen had in mind the revolutions that convulsed Europe in the late 1840s and early 1850s. He had stirred up bitter public outrage when he attacked the immensely popular Hungarian revolutionary, Louis Kossuth, on the grounds that Hungarian independence meant the oppression of

principles most fully in his lectures at the Lowell Institute during the winter of 1848-49. They provided the philosophical framework, and often the identical language, he employed in his critique of *The Origin of Species* in his debates with Gray and his reviews.[45]

Bowen followed the conventional Scottish pattern of dividing thought into two basic divisions -- metaphysics and physical science. Metaphysics (i.e. philosophy) dealt only with the products of pure thought, as typified most completely in logic, reason, and mathematics. These studies employed the deductive method in analyzing the meaning and proper relations of fundamental ideas, such as "cause, power, infinity, freewill, identity, substance, and the like." Physical science, on the other hand, studied actual physical things or *facts* with the inductive or Baconian method. Physical science comprehended all of the true sciences, from astronomy to zoology.[46] Natural theology and ethics were also *sciences* since they, too, were built on well-established laws that had been discovered inductively. Bowen considered it crucial that this rather rigid distinction between metaphysics and science be maintained, since those who confused these two realms and their respective methods committed innumerable errors.

Bowen's claim that natural theology belonged to the inductive sciences rather

Slavs, Slovaks, Rumanians, and Germans. Samuel Eliot Morison, *Three Centuries of Harvard, 1636-1936* (Cambridge: Harvard University Press, 1936), 291-292.

[45]My references will be to the textbook based on these lectures, *The Principles of Metaphysical and Ethical Science Applied to the Evidences of Religion* (Boston: Brewer and Tileston, 1855).

[46]Bowen, *Principles*, 1-47.

than metaphysics, while jarring the modern frame of mind, was central to Bowen's philosophical position, as well as that of the entire Scottish philosophical tradition. *Science* has always been an honorific term in Western culture. Christian theology has, for that reason, been determined to stay under the epistemic umbrella of *science*, however the contemporary culture understood it. Thus, whether *science* was understood as the contemplation of Plato's Ideas or Aristotle's First Principles in the ancient and medieval Church, or as applying Baconian inductive methods to the particulars of existence in the modern period, Christianity had always insisted that its claims were truly *scientific*. The explosion of books on *natural* theology in the eighteenth and early nineteenth centuries was theology's attempt to vindicate its truth-claims by parading, with often mind-numbing profusion, the many "evidences" found in the "natural" world to vindicate the veracity of its claims. Christianity dealt with the real world of contingent things and events that science studied; it was not the product of abstract ideas spun out of theologians' minds. The same *science* by which Newton had united heaven and earth could be used to authenticate Christianity.

Bowen's mission was to assure his audience that the truths of Christianity were as surely authenticated by *science* as were the truths of any other properly conducted study of nature. Theology was rooted in *science*; it used the same inductive analysis of the facts, was subject to the same logical rules, and provided the same level of certainty in its knowledge as the other sciences. Theology had nothing to do with the vain *metaphysical* speculations of those despised German romantics. As a philosopher and *natural* theologian Bowen, therefore, felt fully qualified to evaluate the claims

physical scientists made about the *natural* world.

A central feature of that world, Bowen noted, was the inescapable principle of causality. It was David Hume, following the epistemic trail of John Locke, who first challenged what seemed to be the common experience of knowing the "causes" of events and actions in the world. Hume claimed we could never *know*, either deductively or inductively, that A *caused* B. It was impossible for people to observe causal connections, Hume claimed. They only observed a regular succession or conjunction of events, A and B. After observing this succession or conjunction for a long time, they developed the habit of expecting that B wouldl follow A. Nothing more solid than habit or custom could support the alleged causes of things and events in experience. Thus, both the scientist and the natural theologian who contended that they could determine the *causes* of changes in the world were simply wrong. If sustained, Hume's claim would deal a death blow to both science and theology.[47]

It became the mission of Thomas Reid, and the Common Sense philosophical tradition he established to counter Hume's claim and preserve the epistemic foundations of both science and natural theology. Reid was concerned that the term "cause" had become so ambiguous, hackneyed, and misused, that its clear and only proper meaning was being lost. He determined that the only valid meaning of "cause" was what Aristotle identified as the "efficient" cause, that active power that produces a certain effect. Power and force constitute what even the ordinary people understood

[47]It is often overlooked that Hume's critique, while motivated by the desire to answer the often sloppy inductive arguments of natural theologians and deists, was equally devastating to all physical science arguments. It was this realization that woke up both Thomas Reid and Immanuel Kant.

by cause.[48]

If this, then, was the ordinary and proper understanding of cause, how did the Scots escape Hume's skepticism about our ability to know causes? Actually, they said, Hume did not deny the reality of causality; he only denied that Reason could know causality. They agreed. They countered that we come to know causality through our own experience of self-consciousness. When we reflect on our self-awareness we discover that its central meaning is that we have an *active power* to effect change in our environment. We can will to do something and it is done; we can will to move our arms and they move. Arms have no internal principle of movement; an external agent, as it were, must move them. That agent is the person who wills to move his arm and it moves. We have direct, unmediated consciousness that we can will to perform an act and carry it out, if only in a limited way. Our knowledge of causality is constitutive of our self-awareness; we know the one as soon as we know the other. Thus, Bowen and the Scots argued, personal volition is the ground of our knowing the reality and meaning of efficient cause.[49]

Once having this idea of causality, it is irresistible, Bowen claimed, to believe that every other change, motion, and coming into existence in the universe has taken place through the agency of an efficient cause. Matter is inert; it cannot move itself. If it moves, therefore, we believe that some external power must have caused it to

[48]Reid provides a succinct statement of his views on causation in *Essays on the Active Powers of Man*, Keith Lehrer and Ronald E. Beanblossom, eds. (Indianapolis: Bobbs-Merrill Co., 1975 [1788], 304-313.

[49]Bowen, *Principles*, 86-92.

move. There must be an efficient cause for all changes in the universe, whether we currently have knowledge of it or not. Nothing changes without an efficient cause to change it. We are compelled to believe in a universal law of causation.[50]

While we must believe that efficient causes exist in the universe, the Scots agreed with the verdict of virtually every philosopher that true causes could never be known in the world of matter. Even though we all believe that every event, every change, every coming into being, must have a cause, they maintained that it is impossible and vain to search for the true or efficient cause of any event in the external universe of matter. It was impossible to know if poison caused a person's death or if a match caused the house fire. All that could be known with any degree of certainty was that these events were somehow conjoined: death followed the draught of poison and the fire followed the lighting of the match.

One of the significant consequences of this belief for Bowen and the Scottish Philosophy was that science had to give up the pretense that it was discovering the *causes* for the phenomena it investigated. It had to adopt the humility of Newton who refused to frame any hypotheses about the *cause* of gravity and simply described the mathematics of its regularity and the objects in the universe that were subject to this law.

Bowen clarified the fundamental Reidian distinction between *laws* and *causes*. "Gravity is a law," he declared, "but not an efficient cause" of the planetary orbits.

[50]Bowen, *Principles*, 92-96.

Reid had said that the laws of navigation never powered a ship to port. Bowen insisted that

> A *law of nature* is nothing more than a *general fact,* or rather a *general statement, comprehending under it many similar individual facts.* A *law* is the result of a *classification*, and individual things are classed together on account of some similarity or uniformity that has been discovered between them. . . . A particular event, comprehended under the statement of a Law, is not properly said to *be caused by the Law*, but only to be a *case*, or instance, *happening under the Law.* . . . The Laws of Nature *do not account for,* or *explain,* the phenomena of nature; they only *describe* them. Description and classification are the sole employment of Physical science.[51]

This modest claim was most difficult to observe, Bowen noted, when scientists themselves frequently confused the laws they described with the causes of those events. The theories of physical science could never be taken as explanations, causes, or even origins of the phenomena they describe. This was as true of theories dealing with matter and the laws governing their changes as for living things and the laws governing their formation and growth. "The real object of the astronomer's calculations is to express the *law* that is, the *uniformity* of the motions of the heavenly bodies, with little regard to any theory as to the origin or cause of these motions. *The motion alone is measurable*; . . . *the cause of it cannot be measured*, for it cannot be perceived."[52] The theories of Pierre-Simon LaPlace and William Herschel violated this understanding of science when they were taken to describe the *cause* or *origin* of the solar system. These theories have assumed that *"gravitation* not only accounts for the present motions of the heavenly bodies, but that, on an easily conceivable theory,

[51]Bowen, *Principles*, 77, 79-80.

[52]Bowen, *Principles*, 152.

it may be made to explain *the origin of these motions*, and their several stages of progress, so to speak, to their present state or law." But this, Bowen contended, is to assume an imaginary universe in which "mathematical science is a very general organon of calculation, which enables us to compute, not only the actual motions and changes of the actual universe, but the imaginary states and changes of a great number of fictitious, but easily conceivable worlds." Those who believe that the Nebular Hypothesis explains the origin of the universe needed to recall Newton's stern warning that "*gravity must be caused by an agent acting according to certain laws.*" Astronomers, by virtue of the limited nature of knowledge available to science, can never *know* the efficient cause of the universe.

In the same way, Bowen argued, the phenomena of life display "the incessant motion, the countless changes, [and] the perpetual succession of birth, growth, decay, and dissolution." These processes could not be explained by appealing to the inert matter that made up the plant and animal. They must be accounted for by some power, some efficient cause, outside of the organism itself, in the same way that everyone's personal life must be attributed to some willful power external to itself. The movements of both life and matter required an efficient cause to explain them. But science could never find the true cause of these movements in any laws of nature. They must all be attributed to the Divine power and will. [53]

It is no surprise that Bowen identified the efficient cause of all the phenomena

[53]Bowen, *Principles*, 152-158, 162-165. Bowen frequently cited John Stuart Mill's similar claims in his *A System of Logic* in support.

in the universe with "the immediate agency of the Deity" since "all causation is an exertion of *mind*, and is applied only by metaphor to the *material* universe." Causation could never legitimately be equated with any inherent power, force, or principle in nature. There were, therefore, no such phenomena as "secondary causes." The "course of nature" was merely a figure of speech that identified the constant and uniform effect of God's will in the universe. God was immediately present to the universe through will and power.[54]

He had shown that the only valid notion of causation derived from our being aware that we can effect changes in our world through an act of will. However, our notion of cause was intuitively grasped once we became self-aware. We gained our understanding of cause neither by inducing it from a large class of facts or deducing it from a self-evident major premise. The laws of nature established by the physical sciences were powerless to effect any changes in the phenomena they studied. It could not, therefore, be the object of physical science. But, since it was absurd to believe that inert matter could move and change itself, Bowen claimed that we were compelled to believe that there exists an external power that originates these things and events.

Bowen's analysis of causality, rooted in personal will and power, laid the foundation for several distinct inductive arguments for the existence and character of God that were totally different from those of Paley. His first argument was built on

[54]Bowen's view of God as the immediate cause of all events in the universe is line with the similar teachings of the Occasionalists, particularly Nicolas Malebranche, and Jonathan Edwards.

the analogy between coming to know other people and coming to know God.

> We recognize the presence of God in nature in precisely the same manner in which we come to know that any intelligent, though finite, being exists besides ourselves. . . . I am conscious of power dependent on my will, and I perceive the effects produced on matter by the exertion of that will; I perceive, also, perfectly similar effects, which I can attribute only to my brother man, and I infer, therefore, that *he* exists, and that his will is equally active in producing those effects. . . . In like manner, then, I say, if *His* sun rolls over my head and warms me, if His wind cools and refreshes me, if His voice speaks to me, . . . and wherever I look in outward nature, I behold constant action, change, and joy, I do not suppose that brute and senseless matter causes all this by its inherent power whether original or derived, but that the spirit, the Person within, controls, vivifies, and produces all.[55]

Bowen developed a second argument based on the unique and mysterious phenomena of life. Life, quite simply, could not be explained by the laws of either chemistry or physics; it was a totally unique phenomena in the universe. In the first place, life, as everyone's experience had demonstrated, had always come from previous life. There was an impenetrable barrier between life and non-life. Life, unlike inert matter, was characterized by "incessant motion, . . . countless changes, . . . perpetual succession of birth, growth, decay and dissolution." How could this totally unique phenomena be explained on the basis of purely physical or chemical laws? No, life introduced a completely new novelty into the universe that could not be explained by any known physical or chemical phenomena. Furthermore, unlike the

[55]Bowen, *Principles*, 147-148. Bowen's argument is remarkably similar to that proposed by the prominent contemporary philosopher, Alvin Plantinga, who, in *God and Other Minds: A Study of the Rational Justification of Belief in God* (Ithaca, NY: Cornell University Press, 1967), concludes that "if my belief in other minds is rational, so is my belief in God. But obviously the former is rational; so, therefore, is the latter," 271. He has elaborated the argument that belief in God is properly basic in numerous articles. He has defended the epistemic foundations of this argument most recently in his Gifford Lectures for 1987 and published as *Warrant: The Current Debate* (New York: Oxford University Press, 1993) and *Warrant and Proper Justification* (New York: Oxford University Press, 1993). Plantinga has shown broad sympathy for the Reidian tradition throughout his work.

inanimate matter of the universe which is strictly uniform, the phenomena of nature show a remarkable diversity, variety, and innumerable differences that could not be accounted for by any general laws that described the uniform activities of matter. Living beings, from the smallest invisible germ to the largest organizations of humans, are absolutely unique. Their actions defy being either computed, foreseen, or reduced to physical laws. Fatalistic and deterministic views of life are continually frustrated, Bowen pointed out, by the idiosyncrasies of life, particularly human life. All of the actions of living things are analogous to those we have come to expect from the exercise of human intelligence and will. Bowen concluded that only a Divine will exerting continuing power in and through the universe could account for the deep mystery that surrounds the origin, sustaining, and activities of life.[56]

Bowen inferred the character as well as the existence of God from his understanding of causality in the world. Although he bowed to Paley's version of the design argument, Bowen developed his own distinctive form of the argument based on the centrality of free will in his theory. Just as we are personally aware of the several distinct features of intelligence in our own designs, so, too, we immediately recognize those distinct features of intelligence which we find scattered throughout our experience and the entire universe. We conclude, Bowen argued, that the Efficient Cause of the universe has, at least, all of the attributes we associate with the human intelligence. Just as he argued for God's *existence* with an analogy based on our

[56]*Principles*, 162-170, 174-183.

awareness of personal volition, so he argued for God's *intelligence* with an analogy based on our awareness of the marks of personal design and plan. These arguments need to be distinguished from the "design" arguments of Paley and the *Bridgewater Treatises*.[57]

Bowen's entire philosophy of science and natural theology was built on the Reidian notion that "efficient cause" was commonly understood as the power to act according to what one had willed. Personal agency was the root meaning of causality. Every other feature of his philosophy flowed from this fundamental claim. The philosophical position Bowen outlined in *The Principles of Metaphysical and Ethical Science Applied to Religion* provided the framework for his critique of *The Origin*. It is important to note that Bowen was part of a trans-Atlantic community of Scottish philosophical reflection on the fundamentals of natural philosophy. Richard Olson has traced the profound influence that Scottish philosophy had on prominent British natural scientists and philosophers from 1750 to 1880. There are remarkable parallels between Bowen's philosophical claims and those of John Herschel, Lord Kelvin, and James Clerk Maxwell, to mention only three of the most influential early nineteenth century British scientists. This is undoubtedly due to common sources rather than individual influences, since none of these men are mentioned in Bowen's writings. The Common Sense tradition, as any tradition, was marked by strong debates and

[57]Bowen, *Principles*, 173-222. The argument for God's existence based on the analogy of mind are rooted in the Scottish philosophy's deep interest in an inductive examination of mental phenomena. The Scots, and those Americans influenced by them, much preferred this as the strongest form of the design argument. They drew on Paley's utilitarian argument only as an auxiliary.

disputes among the principals. However, as Richard Olson makes clear, all of them were consciously working within the contours of Common Sense Realism and against the threat of the Positivists and German idealists. Bowen was clearly a member of this community of thought.[58]

Bowen's Philosophical Critique of *The Origin of Species*

Despite his stern rebukes, Bowen nonetheless sought and largely achieved an accurate understanding of the kernel of Darwin's theory. His challenges were due not so much to his failure to understand Darwin as they were to his refusal to grant Darwin certain assumptions needed to support his claims. Bowen accurately identified what he called the five essential steps or processes in Darwin's theory. These were: 1) the acknowledged fact of individual variation; 2) individual variations were perpetuated by inheritance; 3) the "superinduction" of these variations over vast stretches of time so that the initial slight divergence from the parent was magnified to bridge over the gulf between species; 4) the reality of struggle in nature between and among individuals for that which sustains their lives; and 5) natural selection as the means by which individuals, species, and their specialized organs are selected for their ability to adapt to their environment.[59] He proceeded to a thorough analysis of the

[58]Richard Olson, *Scottish Philosophy and British Physics, 1750-1880: A Study in the Foundations of the Victorian Scientific Style* (Princeton: Princeton University Press, 1975). cf. Bowen's blistering critique of both Mill and Comte in "J. S. Mill on the Theory of Causation," *North Am. Rev.* 78 (January 1854): 82-105 and "Martineau's Translation of Comte's Philosophy" *North Am. Rev.* 79 (July 1854): 200-229) that pointedly illustrate the philosophical divergence between the Scottish philosophy and Positivism.

[59]"Remarks," 98-100; "Darwin," 478-479.

philosophical errors Darwin had committed in each step of his theory.

Bowen protested, as many commentators did, Darwin's rather novel understanding of "varieties" and "variation." He understood what was meant by individual organism's "varying" from their parent stock, but these "variations" were better known as "peculiarities," "sports," or "abnormalities." Such "variations" did not affect the reproductive organs so were never passed on for more than three generations at most. The common experience of breeders had shown that such "variations," unless vigilantly supervised, would either revert to the original or degenerate in just a few generations. Nature had always "tended" to maintain Permanence of Type, contrary to Darwin's claim that they "tend" to depart from Type. As far back as we can trace, Bowen claimed, even "varieties" had bred true. [60]

Bowen understood that the key to Darwin's theory of the "origin" of species was that variations were inheritable and cumulative over vast stretches of time. Darwin seemed to have been beguiled into accepting this belief, Bowen suggested, by the well-known difficulties that breeders and naturalists had in distinguishing between "species" and "varieties." To Bowen these debates missed the point: everyone agreed that dogs and men, for example, belong to different species, whatever their difficulties in distinguishing "varieties" of either. He did not appeal to Agassiz's transcendental definition of "species" as eternal thoughts in God's mind or even a dogmatic belief in the fixity of species to make his point. He rather cited the common understanding of

[60]"Remarks," 101.

naturalists and farmers that "animals and plants belong to distinct Species when they cannot be crossed or made to interbreed." As far as Bowen knew these breeding barriers were impenetrable.[61]

Bowen claimed that Darwin's most egregious error was that he ignored the clear boundary separating metaphysics and physical science by drawing unwarranted metaphysical conclusions from unsubstantiated physical evidence. "We have a right, then," Bowen contended, "as students of the moral sciences, to examine the connection between his premises and his conclusions, to test his mode of reasoning, and to see whether he has legitimately applied the principles of inductive science to matters of fact, or has been only indulging in speculative and metaphysical dreams."[62] As Bowen understood his project, he was not invading Darwin's domain as a naturalist and criticizing him for failing to satisfy theologians and philosophers. He was, rather, criticizing Darwin's failure to adhere to the inductive method in his physical science and resisting his intrusion into the domain of metaphysics.

Bowen claimed that *The Origin* aptly illustrated the speculative "Development Theory" that stretched from Democritus through Lamarck to the anonymous author of *Vestiges*. They all contended that

> all the species, genera, orders, and classes of animal and vegetable life are

[61] "Remarks," 102.

[62] "Darwin," 476. Bowen was asserting the Scottish assumption that the "moral" sciences surveyed the entire range of mental phenomena. One important mental phenomenon, to which Bowen contributed, was logic. Thus, he had a legitimate right to critically examine the logical validity of Darwin's claims. Five years later Bowen elaborated on Darwin's logical fallacies in *A Treatise on Logic, or, the Laws of Pure Thought* (Cambridge: Sever and Francis, 1865).

> essentially of one blood and lineage, having been developed out of one another, without the intervention anywhere of any act of creative power; -- developed by the slow and progressive accumulation, through what is practically an infinite lapse of ages, of differences and variations which were at first, and for a long period of time, so slight as to be wholly imperceptible.[63]

Despite their surface differences in explaining the mechanism of "development," these proponents of the "Development Theory" were fundamentally alike in their insistent denial that "any act of creative power" had been responsible for the origin of life and its manifold diversity. Darwin only merited attention because he put forward these views with considerable "ability and candor."[64]

Like these previous authors, Darwin's book failed to meet the rigorous standards of inductive science, violated several basic philosophical principles, and breached the walls separating physical science and metaphysics. Bowen argued that while Darwin claimed that his was a work of physical science, he had in reality used his immense power of imagination and the weakest kinds of analogies to persuade his readers. He had not a single demonstrable *fact* to support his claims. Because he failed in his scientific and philosophical tasks, Darwin was led to deny the ever-active power of both Final Causes and the Efficient Cause in the natural world. Darwin was guilty of sloppy science, careless philosophy, and reckless metaphysical speculations.

Bowen found an intimate connection between the speculative bent of Darwin's theory and his great abuse of the concept of time. Darwin had borrowed vast stretches of time from the geologists to lend plausibility to his theory.

[63]"Darwin," 474; cf. "Remarks," 98.

[64]"Remarks," 98.

> [I]t seems a trifling matter for him to ask us to admit, that ages of equal or even greater length may have elapsed of which we have no record in the rocks; -- that besides the eternity of which we have some sort of geologic evidence, we should acknowledge the probable lapse of another eternity that has left no legible traces behind it, but which happens to be necessary for the purposes of his theory.[65]

This "ease" glossed over several significant difficulties for taking his theory seriously as a contribution to physical science. First of all, Bowen readily granted Darwin *time* for his theory to work. But, conceding him *Indefinite Time* was quite another, which Bowen refused to do. An *Indefinite Time* was only another name for *Eternity*. At this point Bowen believed that he had caught Darwin in a central contradiction. The fact is, Bowen charged, Darwin denied an "*absolute beginning*."[66] Darwin had simply renewed the dream of the ancient atomists who believed that an eternity would be sufficient time for the fortuitous movement of atoms to create all possible worlds. His theory "professes . . . to explain the beginning of things; and in order to do so, it is obliged to assume that the present or ordinary succession of phenomena, the common sequence of causes and effects which we every day witness, has continued from eternity; -- that is, that there never was any Creation, and the universe never began to be."[67] He cannot have it both ways: he cannot have a theory of beginnings which occurred an infinite time ago.

Of course, grant Darwin an indefinitely long period of time for his theory to work and he can show that anything is possible. Darwin had paraphrased

[65]"Darwin," 483.

[66]"Remarks," 109.

[67]"Remarks," 107.

Archimedes: give me enough time and I can create the world. Darwin realized that he could offer no direct evidence for his theory, and that it would be impossible in any case, given the limited human time scale compared to the vast time scale on which new species had been originated. All Darwin really offered, then, was infinity plus possibility. That assured that he would win the argument every time by staggering the imagination of the innocent and naive.[68] A more sober verdict would be that "the evidence which needs to be multiplied by infinity before it will produce conviction, is no evidence at all."[69]

Darwin may have thought that he was perfectly within his rights as a naturalist to introduce this concept of indefinite time into his theory, but he was absolutely wrong. His concept of time, Bowen contended, was pure metaphysics, according to both Kant and Hamilton. They had shown that the concept of the infinite or absolute lacks objective reality, conveys no knowledge, and involves the most insoluble contradictions.[70] Such a concept was completely immune to the rigors of inductive science. There was simply no way to prove or disprove it. By borrowing so much time to lend credibility to his theory, Darwin was trenching on the terrain of the metaphysicians and was, thereby, subject to whatever criticisms they leveled at his

[68]"Darwin," 485.

[69]"Remarks," 103.

[70]"Darwin," 487.

theory.[71]

While many other critics also objected to the vast amount of time Darwin's theory seemed to require, Bowen contended that this assumption actually created acute embarrassment for Darwin. In fact, Bowen suggested, Darwin could take as much time as he wanted; it still would not solve his problem. Darwin's problem was not that intermediate forms were absent from the geological record; the problem was that, with virtually an infinite amount of time, there should also have been "an infinite number of other varieties not intermediate, -- gross, rude, and purposeless, . . . the unmeaning creations of an unconscious cause, -- wholly out of line with such as succeeded in founding a permanent family."[72] Bowen wondered how it was possible for an infinite number of varieties and transitional forms that were not improvements to live and die during an infinite period of time without leaving any trace of

[71]Bowen was one of the first of many critics who scoffed at Darwin's supposition that it took perhaps 300 million years for the sea to denude the great Weald of England at a constant rate; "Darwin," 483-484. The critics were so insistent that this was a ridiculously long period of time that Darwin dropped this example from the third edition. But his troubles with the long stretch of time his theory needed did not end with that embarrassing calculation.

Darwin was further troubled by Lord Kelvin's claim that there was a fundamental incompatibility between the doctrine of uniformitarianism and the newly discovered second law of thermodynamics. Darwin, following Lyell, had appealed to the uniformitarian principle to justify his claim that the same biological and geological processes that we see operating now have always been in operation. He believed that this would give him the amount of time he needed for his processes to accomplish their tasks. Kelvin rejected these uniformitarian assumptions on the grounds that they violated clear physical principles, especially the second law of thermodynamics. Thus, the earth simply could not be as old as the uniformitarians wanted it to be. The sun must have been hotter in the past than it is now; the increased solar radiation must have led to more violent convulsions, erosion, evaporation, and volcanic activity in the past. The earth was continually dissipating energy; it was not the perpetual motion machine that Lyell and Darwin came close to making it. The earth's crust, on Kelvin's calculations, could be no older than 98 million years; at the very most, 400 million years. Joe D. Burchfield covers Darwin's wrestling with Kelvin's geochronology in *Lord Kelvin and the Age of the Earth* (Chicago: University of Chicago Press, 1975 [1990], especially chapter 3.

[72]"Darwin," 488-489.

themselves. His answer, of course, was that it was impossible, despite the admitted imperfections of the geological record.[73]

Bowen pressed on. Allowing an infinite amount of time for infinite gradations to be developed should be sufficient to overcome the fundamental and qualitative structural and psychological differences observed between animals and humans. If reason had great advantage over instinct, then those innumerable forms of Quadrumanna and Bimana that had some measure of reason surely had a definite advantage over their rivals in the struggle for existence. There surely should be some fossil evidence that these creatures existed who triumphed over their rivals, especially when we find the remains of other creatures by the cartload.[74]

For Bowen the Common Sense philosopher, reason was the distinguishing characteristic of humans; mind sets them apart from all other creatures. Instinct, on the other hand, was a prime characteristic of all other animals. Darwin's assumption that instinct could, through indefinite time and infinite gradations, bridge the gulf between instinct and reason was folly. Instinct and reason were not ranged on a continuum, Bowen asserted; they were fundamentally and qualitatively distinct.[75] This could be shown in several different ways. First, Darwin had confused the meaning of *variability* with *pliability* to make his assumption work. The instinct of bees and wasps, for example, was not *variable*, as Darwin used the term; it was only *pliable*.

[73]"Remarks," 116.

[74]"Remarks," 116.

[75]Bowen had already surveyed these same issues in *Principles*, 223-249.

It was quite obvious that bees and wasps made slight alterations in their hives and cells to accommodate the contingencies of location. This simply demonstrated that their hive-making instinct was *pliable*; it did not indicate that their instinct was infinitely *variable*, as Darwin supposed. All of our knowledge of bees and wasps, from as far back as Aristotle and covering innumerable generations, pointed to the constancy of their instinct. It neither improved nor deteriorated. Bowen concluded that instinct is "*invariably* pliable to the same, and that a very limited, extent" in successive generations.[76]

Second, naturalists seemed to agree that the most complex instincts were found in the lowest structural forms of life, such as bees, ants, and spiders, and the comparatively simplest instincts among the higher forms of life, including humans. There seemed to be an inverse relationship, rather than a continuum, between structure and instinct: the more complex the physical structure, the less complex the instinct. This was just the opposite of Darwin's assumptions. There was, thus, no basis for Darwin's belief that animal instinct had developed by inherited variations into human reason.[77]

Third, we should not confuse instinct with other "powers" that animals and humans have in common, such as "appetites, propensities, desires, affections, memory, simple imagination, or the power of reproducing the sensible past in mental

[76]"Darwin," 490.

[77]"Darwin," 492.

pictures, and even the judgment of the simple and intuitive kind."[78] Bowen granted that animals demonstrated all of these in some degree. The critical "power" that animals lacked was the ability to generalize, deduce a statement or plan of action from a general rule, judge through inference, or plan ahead; in short, they could not reason. Further, instinct was in many ways superior to reason. Animals often did by instinct what many humans failed to do by reason, e.g. escape from danger or build harmonious communities. For these reasons Bowen believed in a fundamental difference between instinct and reason that not even an eternity of variations could overcome.[79]

Bowen found it difficult to conceive how infinite, imperceptible gradations of external body form or internal organs could possibly be preserved and inherited, as Darwin explained it. Each gradation, according to Darwin, must have been important enough to give some increased chance of survival. But, Bowen wondered, how did Nature preserve these variations that were imperceptible? If the variations were as important as Darwin said they were, then it could not be one of countless "imperceptible steps."[80] Bowen contended that on Darwin's theory the peculiarity that enabled one seed or one animal to succeed against its competitors must not have

[78]"Remarks," 118.

[79]Bowen elaborated on this distinction again at the Academy meeting of 11 December 1860. The secretary reported that there was general agreement among the participants that "animals think, but that man thinks that he thinks." *Proc. Am. Acad. Arts Sci.* 5 (1860-1862), 82-89.

[80]"Darwin," 499.

been slight and imperceptible; it must have been a "jump."[81] "[T]here is all the difference in the world between *seeing*, however imperfectly, and *not seeing at all.*" If only those variations which were immediately useful were transmitted, how could the eye have been formed, even over millions of years?[82] Finally, Bowen pointed out, the successive development of new races must have gone through many, many steps before the resulting difference was great enough to allow one to drive out the other. But at the present we have many species of the same genus inhabiting the same territory without any sign of their driving the others out, e.g., South Africa has fifty species of antelope, all doing well--except at the hands of hunters.[83]

Darwin's desire to have vast stretches of time for his theory was intimately bound up with his professed goal to explain all physical phenomena in the universe, including how new species were introduced, as the result of the "continuous and uninterrupted action of what are called secondary causes or natural laws."[84] He simply could not allow for "any special creative act, or any exertion of intelligence and will." Thus, "even the primitive act of creation, by which the universe was first evolved out of nothingness or out of a chaotic mass, is either denied, or, what is the same thing, is removed to an infinite distance. An *absolute beginning*, either of the universe, or of any Species of animal or vegetable life in the universe, is, on this

[81]"Remarks," 105.

[82]"Darwin," 499.

[83]"Remarks," 105.

[84]"Remarks," 109.

Theory, an impossible or inadmissible conception."[85]

Darwin brought forward his theory of Natural Selection "to explain and account for all natural adaptations and adjustments, even the nicest and most complex, without any necessity of supposing that they were intentional or designed, and consequently without any need of referring them to the action of an all-wise Architect."[86] But Bowen wondered how capable Natural Selection was to fill this role. Was Natural Selection a suitable alternative to "an all-wise Architect"?

The expression "natural selection,"Bowen contended, was cluttered with crippling confusions. They began with the title. It was a "misnomer" for Darwin to title his book "the origin of species by means of natural selection" since "natural selection" did not "originate" any new species; it did not act or do anything.[87] A more accurate title would be "the origin of species by cumulative variation," since only if a variation improved an organism's ability to survive would it in fact survive and become the basis for successive, cumulative variations. "Natural selection," on the other hand, was powerless to create or exterminate any organism. Its only function, according to Darwin's theory, was to determine survivors and victims. It was famine and aggressive competitors--and humans, Bowen added -- that exterminated individuals, not "natural selection." Bowen answered Robert Young's

[85]"Remarks," 109.

[86]"Remarks," 110.

[87]"Remarks," 99.

question, "Does Nature Select?," in the bold affirmative: "absolutely not."[88]

Careless thinkers, Bowen observed, believed that they could simply transform Natural Selection into an agent to do the bidding of the Deity. Why not simply have the Deity allow Natural Selection to choose the variations and fashion the adaptations?[89] The problem with this attempted solution is that "Natural Selection is neither a created thing, nor a cause, nor a law dependent on the volition of a lawgiver; but it is an abstraction and a generalization."[90] The fact is, Bowen pointed out, that it is not "natural selection" that either kills or preserves, but the many conditions of life--climate, food, enemies, space. Natural Selection is nothing but a general expression for "the inevitable result of the relations of animals to their conditions of existence." Natural selection did not kill sheep; wolves did. Given

[88]See Robert M. Young, *Darwin's Metaphor: Nature's Place in Victorian Culture* (Cambridge: Cambridge University Press, 1985) for a collection of previously published essays that brilliantly explore the metaphorical shape of Darwin's central concept. His centerpiece essay is "Does Nature Select?"

Bowen was one of the first of a long line of critics to draw attention to this central ambiguity in Darwin's use of the expression. Darwin only muddied the waters even more when he tried to clarify what he meant by the term in the third edition: "It has been said that I speak of natural selection as an active power or Deity; but who objects to an author speaking of the attraction of gravity as ruling the movements of the planets? Every one knows what is meant and is implied by such metaphorical expressions; and they are almost necessary for brevity. So again it is difficult to avoid personifying the word Nature; but I mean by Nature, only the aggregate action and product of many natural laws, and by laws the sequence of events as ascertained by us. With a little familiarity such superficial objections will be forgotten."

The fact is that these were not "superficial objections" that would soon be "forgotten". Gray certainly did not think so, as he noted in his own correspondence with Darwin, in his marginal comments in his personal copy of *The Origin*, and in all of his reviews of pertinent literature bearing on natural selection.

[89]The "careless thinker" was Gray who proposed something very close to this in his debate with Bowen and, more fully, in his *Atlantic* articles, which we will examine more fully below.

[90]"Remarks," 110.

whatever conditions of life one chose for organisms, the results for those organisms inescapably followed. Thus, the Deity could no more "direct" these results, whether for extinction or preservation, than the Deity could circumvent the Binomial Theorem. Both were invariable laws.[91] Natural Selection was, indeed, a weak substitute for a guiding Intelligence that created new species.

Darwin had even excluded intelligence and will as explanations for the origin of individual variations, the foundation of his theory and on which selection operated. This was where he actually needed it most. These individual variations were, according to Darwin,

> the exceptions and monstrosities, -- the phenomena which least of all admit of being reduced to law, or referred to the action of any uniform cause. These aimless and exceptional *lusus naturae* , as they appear to most observers, form the chaos or rude matter of the Development Theory, on which the principle of Natural Selection, like the *deus ex machina*, is to operate, and evolve order out of confusion and complex adaptations out of accident. In fact, this principle would have nothing to do, -- it would not be *selection*, -- if the Individual Variations were not multiplied at random, and were not purposeless in character. The essence of the hypothesis is that, there is a power always intently watching each slight *accidental* alteration," (p. 169) and finding a use or fitness where none was intended," in the same way that a 'savage' , finding a stone, may use it as a chisel. D. speaks of Nat Sel "will pick out with unerring skill each improvement" (p.169) , and eliminating the useless. "*Mere chance*, as we may call it, might cause one variety to differ in some character from its parents. (p. 104) [92]

At the nub of Bowen's dispute with Darwin was his understanding of causality. As we demonstrated above, Bowen and the Scottish philosophy understood *efficient* cause as the only suitable meaning of cause. This meaning of cause was

[91]"Remarks," 110.

[92]"Remarks," 110-111. His quotation is actually found on p. 189 of the English first edition.

fundamentally derived from a personal intuitive awareness of the will as an active power to effect change. This was why Bowen was so critical of Darwin's sloppy understanding of Natural Selection. In reality, Natural Selection was merely a generalization that accounted for the invariable relationship between organisms and their conditions of life, nothing more, nothing less. Bowen was willing to grant Natural Selection that status. But he was not willing to grant that Natural Selection was a *cause*, that it was an agent endowed with will and intelligence to effect changes in the relationship among species and to originate new species.

The intolerable consequence of Darwin's theory "is the absolute universality of natural law, or the entire exclusion of the contingent, the variable, or the unprecedented from the scheme of creation. " Darwin's theory eliminated the numerous phenomena which "show no trace of mechanical repetition or adherence to a fixed pattern. . . ." Science would never be able to fully comprehend them under an invariable law because "the only *law* which they exhibit is that of boundless variety and unceasing change." Living things express their individuality through innumerable differences that are "wholly irregular, and so flatly refuse to submit themselves to order, system, or mechanism," but are equally part of the "Divine plan" as the regular laws. "Admitting . . . that law and order can be ascribed to the blind action of secondary or mechanical causes, these endless diversities still remain inexplicable except upon the supposition of the constant action of a free personal cause."[93]

[93]"Darwin," 505-506.

This meant that Darwin still needed a *cause* to account for the "new" organisms -- all those randomly produced variations -- upon which the law of Natural Selection would function. He did not have one. Neither *eternity* nor *Natural Selection* could fill the role of an actual *cause* of variation and the origin of new species. Bowen summed up Darwin's scheme: "Creation denied, or pushed back to an infinite distance, and a blind or fatalistic principle watching over a chaos of unmeaning and purposeless things, and slowly eliciting from them, during an eternity, all the order and fitness which now characterize the organized world."[94] Such speculation defied all the principles of inductive science and committed enormous philosophical blunders, Bowen concluded.

Bowen was quite familiar with those who had criticized naturalists in the past for denying the doctrine of Final Causes because it weakened the arguments for the existence of God. He agreed that Darwin's theory did that, but agreed that was not a legitimate criticism in this forum. He chose rather to challenge Darwin's denial of Final Causes as a path to scientific understanding on purely scientific and philosophical grounds.[95]

Final Causes have been crucial to the advancement of physical science in many different ways, Bowen argued. They had been most important to the sciences of morphology and physiology. The morphologist relied on the twin doctrines of homologies and Final Causes in the search for the underlying structures of animals.

[94]"Remarks," 111.

[95]"Remarks," 107.

The former guided his search for those parts in different animals that served the same function; the latter guided his search for the unknown function of an organ. Harvey discovered the circulation of blood by his conviction that the opposite opening of the valves in the heart must serve some purpose. Darwin had erroneously concluded "that because Final Causes cannot be *discovered everywhere*, therefore they do not *exist anywhere*." But who would deny that because we do not know what purpose the male mammae serves, we do not know that the purpose of the homologous female organ is for nursing? Such logic would be akin to declaring that these rain drops served no purpose in refreshing the earth because other rain drops fell into the ocean far from dry land. Bowen admitted that "chance" and "accident" often accompany human intentions, but no one had a right to declare with absolute finality, as Darwin seemed to do, that God's works could ever be without any purpose whatsoever. Bowen was confident that Final Causes would continue to serve the physical sciences in the future, Darwin's objection notwithstanding.[96]

The doctrine of Final Causes served a second important role in the physical sciences that Darwin failed to appreciate. It provided the basis for the fundamental analogy that Darwin, and all other geologists and paleontologists, required between fossilized animals and plants in the past and living animals and plants in the present. No direct evidence of their similarity was possible. In fact, Darwin's case was even more troublesome. If he followed the doctrine of the Greek atomists to its logical

[96]"Remarks," 111-113. Though he did not mention his name, Bowen drew on the work of the prominent British anatomist, Richard Owen, who sought a synthesis between the contrary systems of Geoffroy St. Hilaire, the morphologist, and Georges Cuvier, the teleologist, to make this point.

conclusion, there was no reason to believe that a "fortuitous concourse of atoms, in the lapse of an eternity" could not have as easily formed living plants and animals as fossilized plants and animals. Darwin could only make his case on the basis of an analogy between the past and the present that assumed the continuity of God's purpose, His Final Cause, in creating living organisms. If Darwin wanted to repudiate the analogy between the marks of Intelligence shown in the structure of the eagle's eye and in the structure of a telescope, then he must also be prepared to abandon the analogy between the structure of fossilized organisms in the past and the structure of living organisms in the present upon which his entire theory relied.[97]

Bowen finally charged that Darwin, and his Academy colleague Theophilus Parsons, had caricatured the meaning of the "origin of species by a direct act of creation" in order to dismiss it as inconceivable. No theist understood the "act of creation" to mean that organisms were suddenly "flashed out of nothingness, or out of a mass of inorganic elements which had been drawn together in due proportion for that purpose." On the contrary, theists, as much as Darwin and Parsons, were fully aware that the birth of new individuals through ordinary birth was continually happening all around them. However, what Darwin and Parsons both missed was that "whether we call it creation or ordinary generation, the process -- the mode in which inorganic particles are suddenly bound together into an organic whole -- is wholly inexplicable." The reality was that neither the scale of an event, frequency of

[97]"Remarks," 107-109. Since analogy played such an important role in Scottish philosophy of science, as well as in Darwin's own thought, Bowen should have taken the opportunity to explore Darwin's use of analogy in more depth.

occurrence, nor length of time to accomplish the purpose are relevant in distinguishing a direct act of creation from an ordinary birth.[98]

Bowen capped his argument with a quotation from one of the most lucid Scottish philosophers on this important point, Dugald Stewart:

> If an animal or a vegetable were brought into being before our eyes *in an instant of time*, the event would not be in itself more wonderful than their *slow growth* to maturity from an embryo or from a seed. But on the former supposition, there is no man who would not perceive and acknowledge the immediate agency of an intelligent cause; whereas, according to the actual order of things, the effect steals so insensibly on the observation, that it excites little or no curiosity, excepting in those who possess a sufficient degree of reflection to contrast the present state of the objects around them with their first origin, and with the progressive stages of existence.[99]

Bowen concluded by neatly turning Darwin's vigorous protest against a creative power as the efficient cause of new organisms and species into its bold affirmation.

> While seeking with so much zeal to disprove the necessity of any fresh exertion of creative power to explain the origin of a new species, he traces back that origin to countless 'variations,' departures from law, divergences from type, every one of which, on his own principles, is just as much an act of creation as the primary calling forth of light out of darkness. Variations of this sort, not mechanical, but contingent, -- not resulting necessarily from the old order of things, but arbitrarily engrafted upon it, -- not pointing backward in an endless cycle, but forward to an continued progress and improvement, -- have been taking place ever since the first appearance of life upon the earth, and are even now constantly occurring around us. Thus indeed, -- to adopt the doctrine propounded in another of the mottoes affixed to this book, though not, we fear, in the sense in which either its author or Mr. Darwin understood it, -- thus, indeed, 'we can perceive that events are brought about, not by *insulated* interpositions of Divine power,' but by exertions of it so frequent and beneficent, that we come to regard them as the ordinary

[98]"Remarks," 121.

[99]"Remarks," 121-122. Bowen had used this same quotation to make a similar point in *Principles*, 177-178.

> action of Him who laid the foundations of the earth, and without whom not a sparrow falleth to the ground.[100]

Try as he might Darwin could not escape the presence of the "Divine Power" as the Efficient Cause of even the ordinary operations of nature. If Darwin was going to cite Whewell, Bowen was determined to make him swallow the implications.

Francis Bowen was the first philosopher on either side of the Atlantic to conduct such a thorough survey of the major scientific and philosophical challenges to Darwin's theory. His eagle eyes missed nothing of consequence. This in itself was impressive, given his non-scientific background and how early his reviews were written. What makes the depth and breadth of his criticisms historically significant is that they epitomized the Scottish philosophical tradition's objections to the new currents of positivism, empiricism, and materialism that were slowly but aggressively emerging in mid-century Britain, often nourished in Scottish soil, and had subtly shaped Darwin's own theorizing.

Bowen, however, did not seem to comprehend that the philosophical landscape was undergoing such a profound seachange. He simply assumed that Scottish philosophy *was* philosophy; all of the major philosophical issues had been settled and beyond dispute. He could not fathom that Common Sense Realism had been reduced to a *paradigm* of philosophy that was now competing with new and aggressive

[100]"Darwin," 506. The other motto Bowen refers to is the one from William Whewell's *Bridgewater Treatise* that Darwin printed on the flyleaf of the first edition: "But with regard to the material world, we can at least go so far as this -- we can perceive that events are brought about not by insulated interpositions of Divine power, exerted in each particular case, but by the establishment of general laws."

paradigms, like Darwin's, that attacked the fundamental premises of the Scottish tradition or simply ignored them altogether. There was no need, as far as Bowen was concerned, to justify *his* philosophical first principles or to engage Darwin in a metatheoretical dispute on the foundations of science. Darwin was the heretic; he had abandoned the straight and the narrow road of *good* science. Bowen's failure to grapple with Darwin's own philosophical commitments as they were worked out in the *Origin* meant that the acuity of his criticisms were sadly neglected.

Bowen's criticisms put Gray in an uncomfortable situation. On the one hand, he deplored Bowen's total lack of sympathetic understanding of the genuine empirical dilemmas and theoretical cul-de-sacs that naturalists like himself were confronting. Bowen's neat and tidy world of discreet categories simply could not contain the tumbling diversity of the world that naturalists of all kinds had been uncovering for decades. It was precisely because Darwin offered some way out of these difficulties that Gray applauded his work as a reasonable scientific endeavor, whether or not it eventually proved to be "true." On the other hand, Gray himself was extremely uncomfortable with Darwin's easy moves outside of the received paradigm of science and the way he employed assumptions and drew conclusions that did not seem at all warranted. Gray had harbored several of Bowen's criticisms ever since Darwin first revealed his theory to him and had raised them in his correspondence with both Hooker and Darwin. How could he simultaneously support Darwin against Bowen while supporting several of Bowen's criticisms without seeming to undermine Darwin? How would he navigate between the competing philosophical paradigms of Bowen and

Darwin? That was the delicate task Gray set for himself in his own reviews for the *American Journal of Science* and the *Atlantic Monthly* series and in his private correspondence with Darwin.