

CHAPTER 1

INTRODUCTION

Asa Gray, the internationally renowned nineteenth-century botanist at Harvard, has become known primarily as the "friend of Darwin" who defended the scientific credibility of Darwin's theory and its harmony with the design argument of traditional natural theology. The main contours of their relationship are by now familiar. Darwin, then working on his "big book" on species, contacted Gray in the spring of 1855 with a number of key questions on the patterns of distribution of the North American flora that Gray knew so well. Over the next three years Gray provided Darwin with important statistical information on those patterns that supported his theory on the origin of species. Impressed by Gray's knowledge and interest, Darwin took Gray into his small circle of confidants and divulged the outlines of his theory in the fall of 1857.

By the time *The Origin of Species* appeared in November 1859 Gray was convinced that Darwin had made a significant contribution to solving the "species problem" and had built a convincing case against the idealistic views of Louis Agassiz, his influential Harvard colleague. At the same time, Gray was deeply aware that Darwin's bold thesis would not gain the hearing it deserved until its perceived threat to theism was effectively answered. It therefore became Gray's major mission between 1859 and 1861 to argue in various venues that Darwin's theory was

compatible with a theistic interpretation of the world, that natural selection could be harmonized with the traditional design argument.

Darwin was initially delighted with how well Gray articulated his views, immediately seeing how valuable they were in securing a fair hearing in America and shoring up his reputation as an orthodox naturalist and theist. He even encouraged Gray to reprint his three anonymous *Atlantic Monthly* essays as a pamphlet under the title *Natural Selection not Inconsistent with Natural Theology* (1861), which he then distributed to key naturalists and advertised in the third edition of *The Origin*.

In private correspondence, however, Darwin objected almost immediately to Gray's attempt to harmonize natural selection and design, contending that there was no evidence for design and that natural selection had replaced an "interfering" God in originating and adapting species. The stage was thus set for a vigorous private debate through extensive correspondence on the implications of Darwin's hypothesis for the traditional design argument.¹

¹Although it is most often referred to simply as "the design argument," there was (is) no single argument. Throughout the history of its use, differences developed concerning the *ground* of the argument, whether intuition, analogy, or inference; the nature of *design*, whether end, order, purpose, function, adaptation, or final cause; who or what was the "God" alleged to be concluded from the argument; what one was able to prove about this God's existence, attributes, and ethical requirements; whether the argument *proved, suggested, implied, or pointed to* "God"; whether the argument was best deployed as an *apologetic* to defend belief in God against its critics, as a *tool* of social and political control, as a *devotional aid* for the already committed, or as a *scientific* protocol to guide understanding of the natural world; and whether the best source of supporting evidence was astronomy, physics, the organic realm, society, or human consciousness. With this understanding in mind we will continue to refer to the "design argument" so as not to burden the text unnecessarily with qualifications. The ambiguity of "design" played a central role in the debate between Gray and Darwin. E. L. Hicks, *A Critique of Design Arguments: A Historical Review and Free Examination of the Methods of Reasoning in Natural Theology* (New York: Charles Scribner's Sons, 1883) remains unsurpassed for its concise summaries of leading advocates and critics of the design argument throughout history and insightful criticisms of the argument itself. His promotion of what he termed

Though less intense after Gray's pamphlet was published, Darwin and Gray continued to debate the relationship between descent and design down to 1868, the year that Darwin published *Variation of Plants and Animals Under Domestication*. In the concluding chapter Darwin introduced his stone-house analogy, with which he for the first time publicly repudiated Gray's view that God "guided" natural selection in ways that ultimately benefited individuals. Gray professed to have no answer.

Though their serious discussion on design thus ended, they continued their friendship and correspondence, mainly on their mutual interest in climbing and insectivorous plants, down to Darwin's death in 1882.

Once we probe beneath the surface of the obvious point that Darwin denied and Gray upheld design, we find considerably more complexity in their long debate than has been conventionally noted.² Over the past twenty years historians have the "eutaxiological" argument, based on the order evident in the universe, is much less successful.

²Asa Gray has surprisingly been overlooked in the past forty years, despite his pre-eminence as an American scientist in the late nineteenth century and close association with Darwin. The brief flurry of interest during the centennial celebration of the publication of the *Origin* produced three notable studies. A. Hunter Dupree produced a magisterial biography, *Asa Gray: 1810-1888* (Cambridge: Harvard University Press, 1959; reprinted as *Asa Gray: Friend of Darwin, American Botanist* by Johns Hopkins University Press, 1988) and Edward Lurie published a superb biography of *Louis Agassiz: A Life in Science* (Chicago: University of Chicago Press, 1960; reprinted under the same title by Johns Hopkins University Press, 1988) Michael McGiffert's dissertation on "Christian Darwinism: The Partnership of Asa Gray and George Frederick Wright, 1874-1881" (Yale University, 1958) concentrated on the brief period during which Wright, an accomplished geologist and pastor, encouraged Gray to draw together his miscellany of articles on Darwin. These were collected and published in 1876 as *Darwiniana*, together with an important new essay on "Evolutionary Teleology." McGiffert provided a sympathetic portrait of Gray, but little critical analysis of the Darwin-Gray debate on design, preferring to emphasize Gray's harmonizing role as a counter-example to the dominant image of ignorant theological opposition to Darwin. The irony of the Dupree and Lurie studies is that rather than stimulate new lines of inquiry into the history of American science at mid-century, the American reception of Darwin, or the history of American natural history it seemed to many that all that could be said on the topics had been said. There have been no major studies of the American scientific community's reception of Darwin since Dupree and Lurie. Michele Aldrich underscores these

developed a more nuanced understanding of the subtle historical interactions of science, philosophy, and theology than the traditional warfare of science vs religion imagery made possible.³ This development allows us to see the Gray-Darwin exchange on design in a new light. We can now see that their debate took place as the post-Newtonian synthesis of science, philosophy, and natural theology was slowly disintegrating, a process well underway by 1859. Shared meanings were being lost; familiar terms were being redefined; conventional assumptions were being challenged. This essay seeks to elucidate the roots and implications of the ambiguities, inconsistencies, and tensions in the long debate between Asa Gray and Charles Darwin on whether natural selection could be harmonized with the traditional design argument. Doing so will illuminate the deeper scientific, philosophical, and theological issues raised by the *Origin* that are still with us.

James Moore, a leading scholar of the thriving "Darwin industry," launched an interpretive revolution in 1979 in *The Post-Darwinian Controversies: A Study of the Protestant Struggle to Come to Terms with Darwin in Great Britain and America, 1870-1900*. Moore contended that, contrary to the prevailing image of obscurantism and hostility toward Darwinism, orthodox naturalists and theologians, especially those weaknesses in "United States: Bibliographical Essay," in *The Comparative Reception of Darwinism* (Chicago: University of Chicago Press, 1988 [1974]), ed. Thomas F. Glick, 207-226. Robert V. Bruce provides a thorough contextual study of *The Launching of Modern American Science, 1846-1876* (New York: Alfred A. Knopf, 1987).

³David C. Lindberg and Ronald L. Numbers have provided an excellent guide to this development in their introductory essay for *God & Nature: Historical Essays on the Encounter between Christianity and Science* (Berkeley: University of California Press, 1986), 1-18. This volume contains excellent essays by many of those challenging the adequacy of the "conflict" model for understanding the historical relationship between science and religion.

that were Calvinists, were able to accept and accommodate the broad outlines of Darwin's theory of descent.⁴ Asa Gray was one of Moore's prime proponents of the "Christian Darwinian" position that was able to harmonize descent and design. Moore inspired a number of corroborative studies. The most notable was David Livingstone's 1987 study of *Darwin's Forgotten Defenders: The Encounter between Evangelical Theology and Evolutionary Thought*.⁵ On the basis of his study of a large group of English, Scottish, and American naturalists and theologians, Livingstone found that, with generous variations, most of them were able to accommodate Darwin with a modified version of the design argument, one that stressed the transcendental structural patterns and harmonies of the world. Asa Gray became a prime example of the peaceful transition from Paleyan natural theology to Christian Darwinism.

Both Moore and Livingstone were primarily concerned with resurrecting and refurbishing the images of the many orthodox naturalists and theologians on both sides of the Atlantic who were able to harmonize Darwinian evolution with evangelical theology. Both assumed that the received tradition of natural theology had sufficient theological, philosophical, and scientific resources to accommodate Darwin; its proponents only needed the will and foresight to use them. Neither raised any questions about the internal weaknesses of the natural theology tradition within which these men interpreted and accommodated Darwin or their failure to confront Darwin's

⁴(Cambridge: Cambridge University Press). Herbert Schneider had made a similar claim about American Calvinists in his *A History of American Philosophy*, rev. ed. (New York: Columbia University Press, 1963), 321-336.

⁵(Grand Rapids, MI: William B. Eerdmans, 1987).

philosophical assumptions. Perhaps they should have.

The Moore-Livingstone interpretation overlooks the reality that all was not well in the house of post-Newtonian natural theology by the mid-nineteenth century.⁶ Historians across a broad front have exposed many of its most serious weaknesses. Richard Westfall has consistently argued for nearly four decades, most recently in "The Rise of Science and the Decline of Orthodox Christianity: A Study of Kepler, Descartes, and Newton," that seventeenth-century scientists and early eighteenth-century British theologians who zealously adopted the Newtonian universe as the rock solid foundation upon which to defend Christianity, unwittingly evacuated Christian

⁶Historians face a major dilemma in clearly identifying the sets of ideas they discuss in ways that capture the ambiguities and inconsistencies these ideas conveyed. This is especially acute in the present case where it is these very ambiguities and inconsistencies that are the focus of discussion. In many ways this dilemma is analogous to the frustration that Asa Gray, and a host of his contemporaries, faced in accurately distinguishing species from each other and from races and varieties. What single set of specific marks were essential to characterize a species? How different could two individuals be and still be considered members of a single species? How similar could two individuals appear to be and still be considered separate species? How well could the logical categories of genus and species capture the flowing continuity of organic life? Any single term that we assign to each of these frameworks can be faulted for conveying a false sense of a clean demarcation between distinctive systems of thought.

For example, it is particularly difficult to label the older set of assumptions as "natural theology" since, as John Brooke has been at pains to point out, "natural theology" covered such a broad range of understandings of its meaning, roles, and assumptions. Furthermore, in the American context "natural theology" included not only the more familiar amalgam of Common Sense Realism, Protestant piety, and Baconian science, which Herbert Hovenkamp terms "doxological science," but it also included the very different model inspired by German romanticism. Thus, to say that someone participated in the natural theology tradition without specifying the particular beliefs they actually held clouds rather than illumines understanding. We will use "natural theology" to cover all those attempts that discussed and disputed what could and could not be learned about the existence, attributes, and ethical requirements of "God," however understood, from the study of natural history without the guidance or support of the Bible. Viewed in these very broad terms "natural theology" contained a diverse assortment of theological positions and tensions. Gray and Darwin were engaged in a natural theological discussion about both the framework of natural theology and the meaning of design.

orthodoxy of several of its most significant theological claims.⁷ John C. Greene, in his classic study on *The Death of Adam: Evolution and Its Impact on Western Thought*, focused on how the powerful solvent of the Newtonian premise of "nature as matter in motion" as formulated in Darwin's theory gradually dissolved classic Christian claims and eventually all of natural theology.⁸

Two historians, one studying eighteenth-century European philosophy and theology and the other examining nineteenth-century America intellectual life, have more recently advanced the provocative thesis that the success of natural theology contained the seeds of its own destruction. This is a new version of Max Weber's famous claim that Christianity dug its own grave of modern irrelevance. Michael Buckley argues in *At the Origins of Modern Atheism* that the same philosophical tools that seventeenth-century Catholic philosophers so confidently forged to defeat atheism became the tools that eighteenth-century skepticism and atheism used to undermine the claims of Christianity.⁹ James Turner argues, in *Without God, Without Creed: The*

⁷This essay is in *God and Nature: Historical Essays on the Encounter between Christianity and Science*, 218-237. It deepens his classic study on *Science and Religion in Seventeenth-Century England* (New Haven: Yale University Press, 1958).

⁸(Ames, IA: Iowa State University Press, 1959). Greene has continued exploring the many ramifications of this claim in his numerous subsequent publications. His influence on Darwin studies can, in part, be measured by the *festschrift*, edited by James R. Moore, *History, Humanity and Evolution: Essays in Honor of John C. Greene* (Cambridge: Cambridge University Press, 1989), that brings together essays by many of the leading scholars in the field. Greene's "Afterword" is a luminous outline of his interpretation of the Darwinian revolution over three decades. He expands on this interpretation in his most recent book, *Debating Darwin: Adventures of a Scholar* (Claremont, CA: Regina Books, 1999).

⁹(New Haven: Yale University Press, 1987). Alan Charles Kors has advanced a similar argument in *Atheism in France, 1650-1729*, vol. 1, *The Orthodox Sources of Disbelief* (Princeton: Princeton University Press, 1990). Bernard Lightman has persuasively argued that Victorian unbelief was rooted

Origins of Unbelief in America, that unbelief became possible at mid-century only when those most eager to reconcile belief in God with the philosophical implications of the modern (i.e. Newtonian) view of the world succeeded in making their God, at best, a remote First Cause and, at worst, an embarrassing irrelevance.¹⁰

John Hedley Brooke in numerous ground-breaking studies of British natural theology has cogently summarized the ironies, unintended consequences, and embattled foundations of post-Newtonian natural theology in *Science and Religion: Some Historical Perspectives*.¹¹ Most recently Brooke and Geoffrey Cantor have published their Gifford Lectures, *Reconstructing Nature: The Engagement of Science and Religion*, which explore the ways that the history of science can illuminate our understanding of the science-religion dialogue by exploding many myths and stereotypes, including some that have grown up around Darwin and design.¹² Jon Roberts' *Darwinism and the Divine in America: Protestant Intellectuals and Organic Evolution, 1859-1900*, contends that when Protestants substituted immanent causal relationships for the transcendental ontic relationship between Creator and creature as the foundation of their apologetic for Christianity, they inadvertently led the way in

in the epistemological claims of post-Kantian theologians in *The Origins of Agnosticism: Victorian Unbelief and the Limits of Knowledge* (Baltimore: Johns Hopkins University Press, 1987).

¹⁰(Baltimore: Johns Hopkins University Press, 1985).

¹¹(New York: Cambridge University Press, 1991).

¹²(Edinburgh: T & T Clark, 1998).

transferring cultural authority from theology to the new paradigm of Positivism.¹³

While the natural theology tradition was showing grave signs of internal weakness by the mid-nineteenth century, it was challenged without by an aggressive alternative worldview, known to contemporaries as Positivism.¹⁴ Neil Gillespie argues in *Charles Darwin and the Problem of Creation*, a study overshadowed by Moore's book, that the struggle over the theory of evolution pitted two distinct philosophies of science against each other, the older creationist science and the newly emerging positivism.¹⁵ While many orthodox naturalists and scientists believed they had

¹³(Madison: University of Wisconsin Press, 1988). Edmund Ballantyne covers much the same ground in "After Darwin and the Reconciliation of Science and Religion in Nineteenth Century America," (Ph. D. diss., University of Chicago, 1989) without interacting with the recent explosion of secondary material that deals with his general topic.

¹⁴ "Positivism" connoted a broad range of often incompatible ideas to many people in the mid-nineteenth century and served very different ideological agendas. Framing an essentialist definition of "Positivism" will thus not serve our historical interests in this essay. Its ambiguous connotative meaning in the cultural dialogue of the day is rather an important clue that the post-Newtonian paradigm was fracturing along irreparable fault lines.

This being said, it was a rhetorical masterstroke for those seeking to overturn the received philosophical, scientific, and theological assumptions that they characterized themselves as favoring "positive" knowledge. Everyone agreed that all knowledge should be "positive." Who, after all, would support the quest for "negative" knowledge? The fundamental philosophical question was what should count as "positive" knowledge and how could it be achieved. Proponents of "Positivism" successfully hid their ideological answer to this question behind a universally appealing, seemingly benign, term.

Viewed in this way, we will adopt David Oldroyd's suggestion that Positivism, and all similar terms, should be understood "as a genus, order or class rather than a species, for [they are] very large, amorphous and ill-defined philosophical taxon[s]." *The Arch of Knowledge* (New York: Methuen, 1986), 168. It was often the inability of contemporaries to understand the new meanings being given to old terms and the grounds for rejecting traditional assumptions that created so many of the misunderstandings and confusions during this period. They played a central role in the Gray-Darwin relationship. In the last analysis, it was people, each holding a combination of fears, hunches, unconsciously held assumptions, and half-formed opinions, that debated each other, not wooden blocks of ideas, during this period.

¹⁵(Chicago: University of Chicago Press, 1979). Gillespie tends to adopt essentialist definitions of "Positivism" and "Creationism," neither of which do full justice to the far broader, richer, and more ambiguous connotative meanings of these terms in the debates surrounding *The Origin of Species*.

successfully accommodated their theology with evolution, Gillespie claims that they failed to comprehend that their accommodations simply did not make sense in the newer positivist framework. They continued to assume the traditional framework, the same framework which the newer Darwinism had done so much to undermine. In this light, it was no wonder, Gillespie maintains, that Darwin was so exasperated with those orthodox reconcilers, including Asa Gray, for failing¹⁶ to see that his theory was meant to supplant natural theology, not supplement it. Charles Cashdollar provides an exceptional analysis of Positivism in *The Transformation of Theology, 1830-1890: Positivism and Protestant Thought in Britain and America*.¹⁶ Paul Jerome Croce, in *Science and Religion in the Era of William James: Eclipse of Certainty, 1820-1880* provides a sensitive portrait of how William James and his circle of Cambridge friends negotiated the often traumatic transition from the certainties of the older natural theology framework to the uncertainties of a new paradigm.¹⁷

The consequence of the growing disintegration of a once unified natural theology tradition and the growth of a Positivist alternative was, in Robert Young's apt phrase, "the fragmentation of a common context" in America.¹⁸ Scottish Common Sense Realism was *the* philosophical, scientific, and theological medium of a shared

¹⁶(Princeton: Princeton University Press, 1989).

¹⁷(Chapel Hill: University of North Carolina Press, 1995).

¹⁸"Natural Theology, Victorian Periodicals, and the Fragmentation of a Common Context," in *Darwin's Metaphor: Nature's Place in Victorian Culture* (Cambridge: Cambridge University Press, 1981), 126-163.

community of discourse, especially at Harvard, Yale, and Princeton during the antebellum period. By mid-century the resonances of Christian orthodoxy that had once reverberated throughout intellectual life at all levels of discourse in the early nineteenth century had grown quieter. Shared assumptions about God, man, and nature and univocal meanings of such key terms as creation, origin, species, design, purpose, cause, law, uniformity, and science were breaking down under the weight of relentless attacks by critics, numerous qualifications by friends, and empirical studies by naturalists. Alternative philosophical, theological, and scientific assumptions were slowly and often silently making their way into American intellectual discourse. The newer set of Positivist assumptions were like an acid rain that dissolved traditional views and meanings so imperceptibly that even the most astute minds, like Gray and Darwin, failed to fully understand the contours of the new intellectual landscape.

The persuasive power of the design argument for the existence of God had historically depended on common perceptions, assumptions, evocations, and shared experiences that bound together a shared community of discourse. As those shared social and intellectual meanings dissolved, the bare bones of the argument no longer carried their former convictions; they were no longer considered credible or plausible. Ironically, the clearest signal that a common context was dissolving was that the harmony of science and religion was more vigorously affirmed just as it was being most seriously challenged in the decades after the *Origin*.

Asa Gray and Charles Darwin mirrored the larger cultural transformations in which they participated and helped shape. Their temperaments and life histories were

dramatically different. While Gray was robust, healthy, and energetic to the end of his life, Darwin was weak, in frequent incapacitating ill-health, melancholic, and often morose. While Gray could dash off articulate reviews and large technical pieces of work with aplomb, Darwin agonized over his stubborn English. Gray worked long hours in his laboratory, bent over his microscope, examining the structural affinities of plants; Darwin had energy enough for only short spurts of work, yet successfully worked on an astonishing range of projects. The most "radical" idea Gray embraced was the natural system of classification that supplanted the artificial system of Linnaeus; for all else he was pleasantly content with the reigning scientific, theological, and philosophical assumptions. Darwin, on the other hand, was forever probing at conventional explanations of the "species problem" and prodding correspondents to supply him with what must have seemed to be quirky tidbits of information. Gray had a brilliant, but unschooled, philosophical sense that often betrayed his accurate understanding of disputed points; Darwin had a plodding but tenacious mind that mulled ideas for long stretches of time. While Gray's marriage bore no children, he and his wife, Jane, gave ample evidence of being happy together, enjoying the many students who tramped through their busy home. Darwin delighted in his large family, yet endured the agony of losing an infant son and two young daughters.

Gray's loose-fitting Protestant piety stood in marked contrast to Darwin's brooding melancholia. He was raised in rustic upstate New York by sturdy and pious Scotch-Irish farming stock. When the Second Great Awakening swept across western

New York in 1835, he was converted and soon joined a New School Presbyterian Church. He assured a friend that, unlike the great majority of new converts, his was an orderly conversion for "the tone of my mind and the whole tendency of my education and habits of thinking does not incline me to credulity, or subject me to the influence of fanaticism." He recommended that his doubting friend avoid the tangle of theological speculation and "investigate the plain elementary truths . . . as you would those of any other science without prejudice or bias, carefully distinguishing between fact and opinion."¹⁹

When he moved to Cambridge in 1842, there being no Presbyterian church, Gray joined the smaller conservative Congregational church. The larger liberal Congregational church had long since been in the firm hands of the Unitarians. From the first Gray dropped what he considered to be the harsher Calvinist theological strains. In an early letter he commented that "In fact, I have no more fondness for high Calvinistic theology than for German neology. . . . But I have no penchant for melancholy, sober as I sometimes look, but turn always, like the leaves, my face to the sun."²⁰ Such views were not out of place in Cambridge where Unitarianism had become a code of Christian virtue shorn of an encumbering Trinity.

When Gray married Jane Loring at the age of 38, he married into the proper Bostonian family of the eminent lawyer and longtime member of the Harvard

¹⁹Gray to N. W. Folwell, 28 April 1838; quoted in Dupree, *Asa Gray*, 44-45.

²⁰Jane Loring Gray, ed., *Letters of Asa Gray*, 2 vols. (Boston: Houghton Mifflin, 1893; reprint, New York: Burt Franklin, 1973), 1:322; Dupree, *Asa Gray*, 136.

Corporation, Charles Greeley Loring. The Loring were conservative Unitarians. Jane never joined Gray's church, preferring to attend the parental church in Boston. In Cambridge she often attended the Unitarian services at Harvard chapel. These differences produced no evident strain between them. Jane commented that "[a]s the years went on he grew broader and sweeter, feeling wider sympathy with all true, devout religious belief."²¹ This was amply borne out by his friendship with several conservative Unitarians on the Harvard faculty, Rev. R. W. Church, a high-church Anglican in England, moderate Congregationalists at Yale, and various others with moderate to liberal religious beliefs. Gray's early New School Presbyterianism had been quietly and unobtrusively domesticated to live in the cosmopolitan company of broadly devout friends.

When his collection of essays on Darwinism was published in 1876, Gray declared that he was "scientifically, and in his own fashion, a Darwinian. philosophically a convinced theist, and religiously an acceptor of the 'creed commonly called the Nicene,' as the exponent of the Christian faith."²² While the Nicene Creed is one of the classic statements of orthodoxy, Gray's reason for choosing it over the more familiar Apostle's Creed, given at the end of his life, is revealing.

The latter and larger [Nicene Creed] is remarkable for its complete avoidance of conflict with physical science. The language in which its users "look for the resurrection of the dead" bears--and doubtless its adoption had in the minds of at least some of the council -- a worthier interpretation than that naturally suggested

²¹LAG, 1:321.

²²Asa Gray, *Darwiniana: Essays and Reviews Pertaining to Darwinism* (New York: D. Appleton's, 1876; reprint, Cambridge: Harvard University Press, 1963), 5.

by the shorter western creed [Apostle's], namely, the crude notion of the revivification of the human body, against which St. Paul earnestly protested.²³

This reasoning played a major role in allowing Gray to retain his faith as private and individual, defend the traditional harmony of science and religion, and approach his debates with Darwin in good spirits and little discomfort.

Darwin, in sharp contrast, was raised in a wealthy professional home with decided heterodox religious leanings. His grandfather, Erasmus Darwin, authored *Zoonomia* (1796), an evolutionary tale told in a German romantic idiom that aroused widespread dismay. His uncle Josiah Wedgwood was a prominent Unitarian. While his father, Robert, was strongly attracted to free thought, he kept silent and allowed his wife to take young Charles to Unitarian services. After his mother's death Darwin attended the local Church of England. Since clerical careers were then held in high esteem by Victorian society, it was not unusual that Charles' father should urge his son, whom he believed lacked both direction and talent, to pursue a ministerial career at Cambridge. Such a career would afford him a comfortable living while making few intellectual demands. Darwin disappointed his father once again, balking at subscribing to the Thirty-Nine Articles and showing not even a minimal interest in a quiet rural vicarage.

Paley's *Evidences* (1796), a required text at Cambridge, and *Natural Theology* (1802) did make a lasting impression on Darwin, ironically more as an aid in understanding natural history than as a solid defense of Christian orthodoxy. He

²³Asa Gray, *Natural Science and Religion* (New York: Charles Scribner's Sons, 1880), 119.

professed in *The Descent of Man* (1871) that "I was not able to annul the influence of my former belief, then almost universal, that each species had been purposely created; and this led to my tacit assumption that every detail of structure, excepting rudiments, was of some special, though unrecognized, service."²⁴ Paley's version of the design argument continued to fascinate, even haunt, Darwin for the rest of his life.

During the pivotal years following his *Beagle* voyage, in which Darwin formulated his theory of natural selection, he reflected that he was "led to think much about religion."²⁵ He soon cast off biblical revelation and belief in miracles.

I had gradually come by this time [i.e., between October 1836 and January 1839] to see that the Old Testament from its manifestly false history of the world, with the Tower of Babel, the rainbow as a sign, etc., etc., and from its attributing to God the feeling of a revengeful tyrant, was no more to be trusted than the sacred books of the Hindoos, or any barbarian. The question then continually rose before my mind and would not be banished, -- is it credible that if God were now to make a revelation to the Hindoos, would he permit it to be connected with the belief in Vishnu, Siva, &c., as Christianity is connected with the Old Testament. This appeared to me incredible.²⁶

It seemed to him that Christianity lacked "the clearest evidence" that would compel "a sane man [to] believe in the miracles by which Christianity is supported. . . . [T]he more we know of the fixed laws of nature the more incredible do miracles become." He was compelled to attribute the New Testament belief in miracles to the fact that "men at that time were ignorant and credulous to a degree almost incomprehensible by

²⁴*The Descent of Man and Selection in Relation to Sex*, 2 vols. (London: John Murray, 1871), 1: 153.

²⁵Charles Darwin, *The Autobiography of Charles Darwin, 1809-1882*. Edited by Nora Barlow. (New York: Harcourt, Brace, 1958), 91.

²⁶*Autobiography*, 85-86.

us." Furthermore, "the Gospels cannot be proved to have been written simultaneously with the events, -- that they differ in many important details, far too important as it seemed to me to be admitted as the usual inaccuracies of eye-witnesses." For these reasons he "gradually came to disbelieve in Christianity as a divine revelation." It defied understanding, Darwin remarked, that anyone would even want to affirm the truth of the "damnable doctrine" of eternal punishment. While abandoning Christianity, Darwin noted that it was not until much later in his life that he thought about the existence of a "personal God."²⁷

This private confession of disbelief marked the beginning of the dual existence Darwin began to live. In public he projected the image of a respected Victorian naturalist holding agreeable religious views and baptizing his children at the local parish church; in the private world of his transmutation notebooks he entertained the most unorthodox scientific and theological beliefs.²⁸ In those notebooks he had taken the full measure of Paley's design argument and soundly defeated it. Darwin was most solicitous of his pious Unitarian wife, Emma, who harbored continual doubts about her husband's orthodoxy. At the same time he enjoyed the stimulating company of his brother Erasmus's radical friends, including Harriet Martineau, the translator and champion of Auguste Comte. The death of his beloved eldest daughter Annie in 1851, the second of three children he would eventually lose, crushed any lingering

²⁷*Autobiography*, 86-87.

²⁸We will discuss the private world revealed in his transmutation notebooks much more fully in chapter 8.

remnants of Christian belief he continued to project in public. And yet he continued to ponder the relationship between belief in God, design, and his theory of natural selection throughout his life.

His agonizing challenge was how to bring those potentially explosive thoughts he had been shaping and honing in private on the origin of species into public view without undermining his carefully crafted public image of respectability. He was finally ready in 1854 to set to work on his "big species book" that would expose the scientific and theological weaknesses of the "ordinary" view of the origin of species and present a persuasive case for his theory of the descent of species through modification. He needed to confirm some suspected patterns of the geographical distribution of North American flora to strengthen his hypothesis. It was time to contact Asa Gray, the authority on North American botany.

Sitting comfortably in Cambridge among his devout Unitarian and Congregational friends in 1855, Gray had been sheltered from all of the heterodox scientific and theological ideas that had washed over Darwin in the preceding twenty years. His youthful flirtation with rationalism and materialism had long since given way to a commodious Protestant piety that emphasized the elementary truths shared by all religious people. He was remarkably free of the doubts that triggered Darwin's flight from scientific and theological orthodoxy. His lectures, textbooks, and reviews exuded his widely-shared confidence that the specimens he studied every day revealed an exquisite design, the true mark of a divine Intelligence. Gray's public and private selves were of a single cloth. Yes, it was true that his own taxonomic work was

raising questions about the origin, nature, and distribution of species, but he was confident that they could be solved within the confines of the orthodox scientific and theological framework. He had no reason to believe that Darwin believed otherwise when his first letter arrived.

We now know that Darwin gave considerable thought to the relationship between his theory of natural selection and the traditional design argument from his early transmutation notebooks to the last year of his life. Darwin stewed ideas for long periods of time, turning them over and over repeatedly, before divulging them. His challenges to the conventional understanding of design were thus brewing long before he took them up in his discussion with Gray. While he occasionally discussed the subject with others, Darwin's discussion with Gray on design and its relationship to his theory of descent was the longest and most intense, and raised a wealth of significant scientific, philosophical, and theological issues.

Darwin was, as he often professed to Gray and others, in a "muddle" about design. Yet his "muddle" was the product not of superficial attention but rather of driving the logic of the received understanding into logical cul-de-sacs. Darwin knew, perhaps better than even Gray, that trying to understand the relationship between descent and design was like trying to understand the relationship between free will and determinism: neither alternative could be consistently applied without creating unbearable consequences, yet there seemed to be no satisfactory escape. He could find no evidence of design in individual organisms yet he could not believe that the entire universe had arisen by chance.

Ironically, Darwin's inability to escape from these equally unbearable consequences was rooted in the many scientific and philosophical assumptions that he shared with natural theology. He inherited the post-Newtonian, mechanistic world picture that astronomy and physics had outlined with their dramatic successes, John Herschel had articulated, and Positivists had pushed to its logical limits. He struggled unsuccessfully to articulate his new discoveries about the organic realm with his inherited mechanistic vocabulary. How was it possible to transpose a deterministic understanding of law, cause, chance, accident, and uniformity into a key that conformed more appropriately to the unpredictable and, perhaps, even unknowable patterns of life he was discovering? How was God's foreknowledge of all future contingencies compatible with God not interfering in any of the natural processes that led to the emergence of new species? Darwin even struggled to free his central concept of natural selection from the *vera causa* tradition he inherited from the physicists. Try as he might he could not escape the weaknesses of the physicalist paradigm for understanding God's relationship to the world. These and many other intriguing philosophical and theological issues emerged in Darwin's debate with Gray.

This essay will follow Gray and Darwin through four phases of their debate on descent and design. It begins with the significant debates in the 1850s that Gray had with Joseph Dalton Hooker, the highly respected British botanist at the Royal Botanic Gardens in Kew, and Hooker's close friend Charles Darwin on the "species problem." Throughout the early nineteenth century a wide variety of naturalists, especially

botanists, were encountering a host of baffling questions on the origin, nature, and geographical distribution of species that challenged traditional scientific, philosophical, and theological assumptions. Despite accepting many of Hooker's and Darwin's criticisms of traditional views on species, Gray defended the wide variability of species in his ground-breaking studies of the statistical patterns of North American plant life and the relationship between the flora of Japan and the northeastern United States. Hooker was more bold. On the basis of his own extensive first-hand studies of the geographical distribution of botanical species in the southern hemisphere and his intimate knowledge of Darwin's theorizing, Hooker moved steadily toward the mutability of species. What became *The Origin of Species* was Darwin's answer to the many scientific, philosophical, and theological questions raised by the "species problem" during his pivotal discussions with Hooker and Gray in the 1850s.

The second phase of their discussion began with Gray's reviews of the *Origin* in 1860 and concluded at the end of 1861 when Gray published his pamphlet on *Natural Selection not Inconsistent with Natural Theology*. Gray's reviews have generally been praised for their articulate outline of Darwin's theory and persuasive appeal for a theistic reading of the *Origin*. Yet little attention has been devoted to its rhetorical strategy or the reasons why Darwin rejected Gray's proposal for harmonizing natural selection and design. That is where we catch a glimpse of the ambiguities that characterized the transition from the traditional natural theology framework to the emerging Positivist framework. As Gray informed Darwin, his most effective strategy would be to insure that Darwin was given a fair hearing rather

than defending the validity of his claims. Gray offered Darwin an effective way to present and defend his theory on the basis of the traditional natural theology framework he assumed Darwin still maintained.

It was in their animated private discussions during these years that Darwin challenged the fundamental assumptions of the traditional design argument, exposed many of its inherent weaknesses in light of his empirical studies, and struggled to adapt the mechanistic assumptions of his fundamental concepts to his understanding of the origin of species. While Darwin privately rejected Gray's natural theological assumptions, he nevertheless publicly benefited from the protective cover Gray's reconstruction of his views gave him.

Gray's brilliant rhetorical strategy in his reviews to save the appearance of Darwin's scientific and theological orthodoxy was filled with irony. On the one hand, Gray's reviews impressively articulated the contours and evidential foundations of Darwin's theory. On the other hand, Gray failed to understand the subtle, yet profoundly different, scientific and theological assumptions that Darwin was bringing to his work. He also failed to critique his own mechanistic assumptions about God's relationship to the world, as well the subtle shift in meaning of such key terms as cause, law, chance, uniformity, purpose, and design. The consequence was that Gray defended Darwin in terms of the traditional natural theology framework that Darwin had long discredited and now privately dismissed as a misunderstanding of his position.

Gray, following the Scottish tradition, confused God's relationship to the world

as articulated by classical orthodoxy with the efficient cause of the physicists. He was troubled throughout the remainder of his life by these antithetical meanings of efficient cause. How was it possible to reconcile the uniform operation of efficient causes in the origin of species, to which he was firmly committed as a scientist, with his belief that God was the Efficient Cause of all new species, to which he was equally committed as a Christian? How could he reconcile his conviction that design was an inescapable inference from the study of the natural world with Darwin, a person he praised as a sagacious investigator of nature, who claimed to find no evidence for design in nature? Gray felt trapped by his dual allegiances as Darwin continued to press him relentlessly on these same points throughout their debate. By 1868 Gray abandoned his earlier claim that design was an inescapable inference from the empirical evidence and fell back on the milder claim that believers were still warranted in believing in design as a personal conviction, whatever Darwin said.

The third phase of their discussion covers the neglected period between 1861 and 1868. It was during this period that Darwin mounted his "flank attack" on the design argument with his meticulous studies of numerous curious contrivances in plants, from those of the stunning orchid to the intriguing climbing and twining plants. While publicly praising Darwin for reintroducing teleology into botany, Gray continued to wrestle with the implications of Darwin's new strategy in undermining confidence in the design of so many odd adaptations. In these studies Darwin had differentiated physiological function from teleological end and dismissed the latter as

incapable of discovery and irrelevant to understanding the plant. It was this glimpse of Darwin's ability to isolate function from intention that gave Gray a "cold chill." The design argument thus ceased to serve its original apologetic goal of providing irrefutable proof of God's existence and became a private devotional aid to strengthen personal faith arrived at by other means.

Throughout this period Gray continued to argue for some form of a derivative hypothesis for the origin of species in which natural selection played an important, though not exclusive, role. As an editor of the influential *American Journal of Science* Gray reviewed and offered extensive commentary on the major botanical contributions of the period that bore on the "species problem" and the validity of Darwin's theory of natural selection. His widely influential botanical textbooks continued to assume a natural theology framework built on the morphological tradition for understanding plant life. In the end it was undoubtedly Gray's botanical textbooks, with its mix of natural theology, morphology, and a derivative hypothesis that enabled many students in the latter nineteenth century to cross the bridge to a genetic understanding of the origin of diversity of plants and their complex structures while still remaining skeptical of Darwin's mechanism of natural selection.

The final phase of their debate began when Darwin publicly repudiated Gray's harmonizing strategy in the concluding section of *Variation of Plants and Animals Under Domestication* in 1868. Darwin had been thinking about an effective way to combat Gray's notion that God had guided variations along beneficial lines for some time, since to admit that understanding would be to scuttle his entire enterprise. His

final response came in his extensive stone-house analogy where he likened an architect using stone fragments that had accidentally fallen from a cliff to build a house to natural selection using variations that had happened accidentally to fit an organism for successful living. Darwin contended that just as the stones were not designed or intended expressly for their subsequent use in the house, so neither were variations designed or intended exclusively for their subsequent use in an organism. They rather were found to be useful to the architect and the organism. Thus, it was neither necessary for God to interfere to adapt organisms to their conditions of life nor to infer prior design from their subsequent use. Gray professed to see the great weight of Darwin's argument, but had no answer. This exchange effectively closed Darwin's discussion with Gray on design. They continued their long friendship and correspondence filled with matters of mutual botanical interest until Darwin's death in 1882.

Close study of the debate between Gray and Darwin throws valuable light on the complexities of the wider scientific, philosophical, and theological context of Darwin's reception in America. Traditional surveys of the *Origin's* reception focus on the dramatic confrontation between Gray, Darwin's indomitable defender, and Louis Agassiz, the stern critic of Darwin's solution to the "species problem." As understandable as this focus is, it tends to wash out the complexities of Darwin's reception. Our study reveals that sympathy for Darwin extended far beyond Gray in Cambridge and Boston. William Barton Rogers, the well-known geologist and founder of the Massachusetts Institute of Technology, effectively dispatched Agassiz's

objections to Darwin on the basis of his own extensive geological surveys of eastern North America. Jeffries Wyman, a comparative anatomist at Harvard, also supported the scientific credibility of Darwin's theory, corresponding with Darwin on several matters of common interest.

In addition, there was a young contingent of mathematicians, philosophers, and physical scientists who had become disenchanted with the received natural theology tradition and enamored by the scientific and philosophical assumptions of the Positivist tradition then flourishing in England and on the continent. Chauncey Wright, Simon Newcomb, John Fiske, Charles Sanders Peirce, and later William James and Francis Ellingwood Abbot, eagerly welcomed Darwin as a critic of the received philosophical tradition and champion of the Positivist cause. While their story has most often been told as the founders of pragmatism, their involvement in the initial debates on Darwin sheds considerable light on the complexities of how Darwin was read in Cambridge. In particular, the relationship between Chauncey Wright, the staunchest proponent of Positivism, and Gray, his former teacher, mentor and friend, illuminates the subtle disintegration of the common intellectual context that Gray assumed and Wright rejected in their discussions on Darwin, design, and philosophy of science.

Louis Agassiz was not even Darwin's sharpest or most perceptive critic in Cambridge. That honor belonged to Francis Bowen, prominent philosophy professor at Harvard and well-known advocate of Scottish Common Sense Realism, the idiom of the natural theology tradition spoken among the philosophers and theologians of the Northeast. Our analysis of Bowen provides insight into the inability of the Scottish

philosophy in the mid-nineteenth century to critique its own flawed metaphysics and epistemology, appreciate the empirical foundations of Darwin's theory, comprehend the roots of Darwin's criticisms of the "ordinary" view of creation, and grasp Darwin's fundamentally different philosophical and scientific assumptions. Bowen's confident dismissal of Darwin's philosophical heresies met with Positivist bemusement rather than repentance, the worst possible fate for the Scottish philosophical tradition in America.

Our study of the Scottish philosophy throws new light on the early theological reviews of the *Origin*. Contrary to the lingering stereotype of ignorant theologians decrying Darwin for purveying atheistic science, these reviews were surprisingly calm, well-informed, and substantive. Their principle criticisms were directed against Darwin's failure to adhere to the fundamental principles of the inductive philosophy, echoing many of the similar criticisms made by Francis Bowen. Darwin's most egregious errors, the theologians underscored, flowed from his unwillingness to follow the prescribed canons of inductive science and philosophy. They, however, like Bowen, seemed completely oblivious to the mounting empirical conundrums of the "species problem" that Darwin addressed and were powerless to mount a substantive critique of Darwin's Positivist philosophical assumptions. The consequences were ominous. Following their response to Darwin, the theologians, accustomed to wide influence as cultural authorities, found themselves talking more and more to each other and intellectually marginalized in the wider scientific, philosophical, and even theological debates in the late nineteenth century. The Gray-Darwin exchange on

descent and design was thus a microcosm of a far more extensive and unsettling transformation of American intellectual life at mid-century.

Our study shows that the intense debate sparked by the *Origin* was not about the strength of the empirical evidence that Darwin had marshalled to support his theory of descent. Such debates rarely are. After all, what should have counted as "evidence" when the philosophical meaning of "evidence" was being challenged and redefined? *The Origin of Species* rather exemplified the fracture of the post-Newtonian paradigm of science, philosophy, and natural theology and magnified the confusions, ambiguities, and tensions over what would replace it. The broader metaphysical and epistemological commitments that shaped the disputed meaning of the key terms in the debate were so often invisible to the participants. This is seen most vividly in the long discussion between Darwin and Gray over the implications of Darwin's theory of descent for the traditional design argument. Darwin and Gray both sensed the larger shape of the issues lying underneath their debates at a visceral level, but were yet unable to articulate their deepest meaning. Darwin never resolved the many philosophical and theological questions his own research had raised; Gray yearned for someone to show him how to retain the comfort of traditional natural theology in the face of Darwin's threatening philosophical perspective.

The issues Gray and Darwin struggled so earnestly to resolve are still present in the modern debate on the implications of Darwin's theory of the origin of species for the design argument of traditional natural theology. Hopefully, an intensive study of their debate, with all of its insights, ambiguities, misunderstandings, and blind

alleys. will enable us to pick our way more carefully through the contemporary minefields in science, philosophy, and theology that await the unwary.