

CHAPTER 7

AN *APOLOGIA* FOR DARWIN

By the time the Academy debates ended in early May 1860, Gray had already decided on the next phase of his plan to give Darwin a fair hearing. Since Bowen and Lowell had already published critical reviews of Darwin that were read by the Boston and Cambridge intelligentsia, and many other unsound criticisms were also circulating, Gray believed that it was imperative that he answer them. His best strategy would be a series of anonymous semi-popular articles for the *Atlantic Monthly* that would put forward the very best scientific case for the plausibility of Darwin's theory, answer his critics, and defuse the charges of atheism. Such a series of articles could come none too soon, judging by the reports he was receiving from England and letters from scientific colleagues in America.

Gray had been receiving a steady stream of updates on the progress of the debates on the *Origin* from Darwin and J. D. Hooker in England. As frustrating as the debates at the Academy were for Gray, they were mild and restrained compared to the vitriol and scorn that were being heaped on Darwin in his homeland. Adam Sedgwick and Richard Owen were the worst. Darwin lamented that his old teacher, Sedgwick, "reviewed me savagely & unfairly in the *Spectator*. The notice includes

much abuse & is hardly fair in several respects." Hooker, ever direct, declared that "poor old Sedgwick has been vomiting letters to [Richard] Whately for publication in the *Spectator*, hot & strong, very intemperate, . . . but then we all know Sedgwick to be a hot-headed warm-hearted old gentleman, who knows no more Nat[ural] Hist[ory] than I do of Theology." Sedgwick continued his attack at the Cambridge Philosophical Society and dragged along Clarke and Phillips.¹

Richard Owen, the celebrated anatomist, was even more calculating in his attack on Darwin and snub of Hooker. After remaining silent for months, he finally "thrashed" Darwin in the *Edinburgh Review*. Hooker was outraged at his "falsification of Darwin's matter & meaning, the nasty petty allusions, detraction, meaning & duplicity of the articles are almost incredible." He was "Eaten up with Envy & jealousy" toward Darwin for putting forward a transmutation theory before he did. Not only did Owen attack Darwin, but after earlier complimenting Hooker on his "Introductory Essay on the Flora of Tasmania," he snubbed and sneered at him as a naive follower of Darwin.² Darwin, ever the Victorian gentleman, was only

¹Darwin to Gray, 3 April 1860, *CCD* 8: 140-141; Hooker to Gray, 23 April 1860, GHA; Darwin to Gray, 18 May 1860, *CCD* 8: 216-217. Sedgwick's review, "Objections to Mr. Darwin's Theory of the Origin of Species," appeared in the *Spectator* (24 March 1860), 285-286. See below for details of the Cambridge Philosophical Society meeting.

²Darwin to Gray, 8 March 1860, *CCD* 8: 124-125; Darwin to Gray, 25 April 1860, *CCD* 8: 166-167; Hooker to Gray, 23 April 1860, GHA. Owen's anonymous review of *The Origin*, along with Hooker's Essay and eight other works, including three of his own, was published in the *Edinburgh Review* 111 (April 1860), 487-532. It was common knowledge that Owen was the author. W. B. Turrill suggests that Owen's contempt for Joseph Hooker may well have been rooted in the institutional rivalry between the Natural History Departments of the British Museum, of which Owen was superintendent, and the Kew Herbarium, which rapidly outshone the herbarium at the British Museum after it gained governmental support in 1853. W. B. Turrill, *Joseph Dalton Hooker: Botanist, Explorer, and Administrator* (London: Scientific Book Club, 1963), 88-90.

"annoyed" that a friend for more than twenty-five years should be so spiteful in declaring that his book would be forgotten in ten years.

Darwin's health had always been fragile. Since the publication of *The Origin* he had been able to work for only a few hours each day on the third edition, taking relief at the water cure when possible. The reviews of his book only added to his discomfort. He kept a meticulous record of nearly all the reviews and kept up a running commentary on them for Gray.³ He thought that "surely you will get sick unto death of me & my Reviewers." By early June the weight of the personal abuse, misrepresentations, and attacks on his book were becoming almost unbearable. The attacks were "more incessant & very bitter." He had, he confessed, had many "more kicks than half-pence." So many people had misunderstood him that he was convinced that he was "an extremely bad explainer." Yet, the efforts of Huxley, Hooker, Carpenter, Gray, and even Lyell gave him the courage to "buckle on my armour & fight my best . . . for a long fight."⁴

Just as his first *Atlantic* article was published, Gray received Hooker's account of his and Huxley's dramatic confrontation with Bishop Wilberforce at the Oxford British Association meeting.

We . . . had an awful fight at the Brit. Assn. about [the *Origin*] -- into which I

³CCD 8, Appendix VII, "Reviews of *Origin*, 1859-60," 598-603, lists the reviews mentioned in the Darwin correspondence. Darwin annotated and kept many of the them. They are included in the Darwin Pamphlet Collection.

⁴Darwin to Gray, 8 March 1860, CCD 8: 124-125; Darwin to Gray, 3 April 1860, CCD 8: 140-141; Darwin to Gray, 25 April 1860, CCD 8: 166-167; Darwin to Gray, 18 May 1860, 18 May 1860, CCD 8: 216-217; Darwin to Gray, 22 May 1860, CCD 8: 223-226; Darwin to Gray, 8 June 1860, CCD 8: 247-248.

was driven wholly against my avowed intentions -- but the Bishop of Oxford, crammed by Owen, thought to pooh-pooh all Naturalists by a stunning display of Oratory, & Huxley & I gave him the most tremendous thrashing he ever got in his life -- in the presence of nearly 1000 people. I spoke only once, the last of all, showed that he could never have read Darwin's book & exposed ignorance of the rudiments of Science. -- I shut him up completely, he had not a word of reply, & the discussion was hence closed amid rounds of applause for my side.⁵

Darwin, whose shyness and ill health kept him from the Association meetings, assured Gray that he was certain that "if I had not stirred up the mud some one else would very soon; so that the sooner the battle is fought the sooner it will be settled. -- not that the subject will be settled in our lives' time."⁶ To aggravate the situation even more, Wilberforce published a review of the *Origin*, no doubt with Owen's collusion, in the *Quarterly Review* which displayed his "audacity, intemperance & utter incomprehension of Darwin's views & facts." The attitudes toward Darwin typified by Wilberforce and Owen had given Hooker "a very very low opinion of my fellow Naturalists." No wonder Huxley felt so much contempt for them.⁷

While Darwin and Hooker were keeping Gray abreast of the unfolding debate in England, criticisms of Darwin were flowing in from several other English correspondents. Francis Boott, an amateur botanist and native Bostonian then living in London, believed that Darwin "would have much less opposition if he would not

⁵Hooker to Gray, 5 July 1860, GHA. Hooker provided even more detail and drama in his recounting of the affair to Darwin, Hooker to Darwin, 2 July 1860, *CCD* 8: 270-272. *CCD* 8, Appendix VI, "Report of the British Association Meeting in Oxford, 26 June - 3 July 1860," 590-597, reconstructs the news account of the meeting.

⁶Darwin to Gray, 3 July 1860, *CCD* 8: 273-275.

⁷Hooker to Gray, 5 July 1860, GHA; Hooker to Gray, 23 July 1860, GHA; Hooker to Gray, 9 August 1860, GHA. Wilberforce's review was published in the *Quarterly Review* 108 (July 1860), 225-264.

have extended his law to man and said nothing of primitive forms." By the fall Boott pronounced that "the old notions have been unsettled, & when men's minds have become more composed, I have no doubt Darwin's views will be pleasantly admitted to take their place in the efforts to explain the mystery of creation -- We can never fully comprehend it."⁸

William Harvey, the prominent Irish botanist at Trinity College, Dublin, was alternately shaken, angered, and puzzled by the *Origin*. He had initially fired off an intemperate attack on the book while only half-read; Hooker had persuaded him to revoke it.⁹ He apologized to Gray for having written the "squib." He, however, believed that Darwin had

overlooked a 'force in nature' that acts at right angles to what he calls 'natural selection,' and so controls variation within bounds. Throughout all nature physical nature -- order is brought about by force & counterforce -- without exception -- as I think." He was fully prepared to "admit 'Nat. Sel.' as a 'vera causa' of much change -- but not as 'the' vera cause of Species. I fully admit the impossibility of defining the limits of species -- or genera -- or order -- or any thing. But this does not shake my belief in the existence of limits -- unseen by our eyes, undefineable by our philosophy. But how many 'natural species' were created -- & what they were like I know not."¹⁰

Whatever difficulties Darwin may have raised, Harvey wanted to defend "the Theistic aspect of Creation," though he was not quite sure what that meant or how to

⁸Boott to Gray, 20 April 1860, GHA; Boott to Gray, 23 November 1860, GHA. Boott sent Darwin a long letter praising him as "The High Priest of nature" whose book he read with as much reverence as he did the "precepts of Christ & the parable of the prodigal son." Darwin, although appreciative, was quite taken aback by the excessive adulation. Boott to Darwin, 29 February 1860, CCD 8: 113-115; Darwin to Gray, 8 March 1860, CCD 8: 124-125.

⁹Hooker to Gray, 16 March 1860, GHA.

¹⁰William Harvey to Gray, 9 Feb. 1860, GHA.

carry it through. The more he thought about it, "the more transcendental it seems" in taking the discussion far beyond the available evidence. By November he was prepared to admit that perhaps Darwin's theory was at least a "plausible foreshadowing" of the Truth.¹¹

Richard W. Church, a respected Anglican churchman whom Gray had met on his last trip to England, wrote a temperate and respectful early review of the *Origin* for the Anglican newspaper, *The Guardian*. Though readers would undoubtedly not be convinced by Darwin's arguments, Church believed that they would be "certainly supplied with many new thoughts, and strengthened and expanded by the sensation of contact with a powerful, philosophical, and richly stored mind." He provided a competent summary of Darwin's theory of variation, struggle for existence, and Natural Selection, but allowed that there remained "great difficulties" which Darwin himself surveyed at great length. "All these formidable difficulties are fairly stated, and most ingeniously explained by Mr. Darwin; though he is obliged, in many cases, to take shelter . . . under the wide-covering protection of human ignorance. . . . Time alone and the discussion of the learned will set the seal of value upon his speculations."¹² From his perspective (a country parish outside Oxford) the book had not stirred nearly as much controversy as *Vestiges* had. Perhaps this meant, he hoped,

¹¹Harvey to Gray, 20 May 1860, GHA; Harvey to Gray, 3 November 1860, GHA.

¹²[R.W. Church], Review of *On the Origin of Species by means of Natural Selection; or, the Preservation of Favoured Races in the Struggle for Life*, by Charles Darwin in *The Guardian* 15 (8 February 1860), 134-135.

that Darwin's book would not frighten people so much and allow them to discuss its merits as philosophers rather than "old ladies." He applauded Gray's earlier deft handling of the strengths and "formidable difficulties" of Darwin's book; he especially approved his clear statement of the theological issues it raised. As for the charges of atheism, Church believed that it was a "wonderful 'shortness of thought' to treat the theory as incompatible with the ideas of a higher and spiritual being." Gray took those words to heart in preparing his articles.¹³

Closer to home Gray's friend and neighbor, Charles Eliot Norton, had several pertinent criticisms of Darwin. He feared that "some expressions in the last chapter of the book . . . [would be] likely to excite prejudice, and as utterly unsupported by any present knowledge." Darwin also seemed to overlook the fact that "an argument from analogy cannot be stretched indefinitely. . . . In reasoning from the known to the unknown its conclusions become more & more uncertain with each further step. until it becomes in the highest degree improbable that they can be correct."¹⁴ Norton struggled to understand what new insights Darwin's theory may provide that would not undermine the role of the Divine in creation.

It does not seem impossible that Darwin's theory, which at first sight appears to do away with a specific creation, may lead to an understanding of the laws of organization as well as of those of development. I do not mean of course to an understanding of their divine or supernatural, or miraculous causation, but of their occasion, their exhibitions, their secondary rules, all that lies this side of their

¹³R. W. Church to Gray, 12 March 1860, Mary C. Church, ed., *Life and Letters of Dean Church* (New York: Macmillan, 1894), 183-185.

¹⁴Norton to Gray, 21 February 1860, GHA.

ultimate principle.

There is danger lest with the tendency of modern science to simplicities of generalization, this very essential principle of the Divine work, this principle of simplicity should be carried so far as . . . to cause the fact to be lost sight of, that a single great harmony may include many apparent discords, many diverse modes of operation.¹⁵

Perhaps there was some way, after all, to harmonize Darwin's theory with theism.

Norton was not yet prepared to follow the English Unitarians in their hearty endorsement of Darwin's theory.

By June Norton had discovered an appropriate passage from Lord's Bacon's "Confession of Faith" that he felt provided a helpful way to understand Darwin's theory. He thought that Gray could use it in his upcoming *Atlantic* articles.

That notwithstanding God hath rested and ceased from creating since the first Sabbath, yet nevertheless he doth accomplish & fulfill his divine will in all things great & small, singular and general, as fully and exactly by providence, as he could by miracle and new creation, though his working be not immediate & direct, but by compass; not violating Nature, which is his own law upon the creature.

Gray was delighted with this quotation. He used it in his October essay on the theological and philosophical difficulties surrounding the conventional understanding of creation and Darwin's theory.¹⁶

As Gray reflected on the Academy debates, letters from colleagues, and the many reviews he had read, he settled on his strategy. He later informed Church that his aim was

¹⁵Norton to Gray, 23 June 1860, GHA.

¹⁶Norton to Gray, 8 June 1860, GHA; Gray to Norton, 9 June 1860, Houghton Library, Norton Papers. Norton quoted from the Spedding edition of Bacon's works, vol. 8: 221.

to warn the reckless and inconsiderate to state the case as it is; to protest against the follies of those who would, it would seem, go on to fire away the very ramparts of the citadel, in the defense of needless outposts; and . . . to clear the way for a fair discussion of the new theory on its merits and evidence. We must use the theory a while in botany and zoology, and see how it will work; in this way a few years will test it thoroughly.¹⁷

This would be a delicate balance to maintain: resist the scientists' tendency to transform secondary causes into the means of originating new organisms while persuading the theists to abandon irrelevant arguments against Darwin. Personally, he believed that Darwin's principles would be adopted, though natural selection would be found insufficient to accomplish all that Darwin required of it.¹⁸

At the same time, he informed Hooker, that his main targets were the intemperate duo of Bowen and Agassiz, as well as his other careless neighbors. He was determined to "not only wash them but to *iron* them out as well as I could in a good natured way, -- though they really deserved a savage treatment." His strategy was best designed to expose their "foolish arguments," which unfortunately characterized too many of the reviews, rather than champion Darwin's cause. "It is just because I hold fast to the uncommitted ground that I can make my blows against the critics tell." He was anxious to complete this project. After all, he really did not want to "meddle with this matter at all" and wanted to heed Hooker's stern admonition to finish his *Flora*. If any American scientist could succeed at this

¹⁷Gray to Church, 7 May 1861, *LAG* 2: 464-465; cf. Gray to Norton, 9 June 1860, Norton Papers, Houghton Library.

¹⁸Gray to Church, 7 May 1861, *LAG* 2: 464-465.

daunting task, it would be Asa Gray.¹⁹

"Saving the Appearances" of Darwin's Orthodoxy

Gray's reviews of the *Origin* have been recognized from their initial publication down to the present as providing one of the most deft and persuasive interpretations of Darwin's theory that was written in the latter half of the nineteenth century. Darwin certainly thought so. At the same time modern interpreters have been baffled, and even embarrassed, that Gray went to such great lengths to harmonize Darwin's theory of descent with modification with the design argument, which they assume Darwin had undermined. In recent years James Moore and David Livingstone, among others, have stepped forward to rescue Gray's reputation by showing that he was one of numerous evangelical naturalists and theologians on both sides of the Atlantic who effectively harmonized design and descent in the late nineteenth century. Contrary to the prevalent view that orthodox Christians held a decidedly hostile and uninformed view of Darwinism, the Moore interpretation argues that these "Christian Darwinians" demonstrated that orthodox naturalists and theologians, especially those in the Calvinist tradition, had ample theological resources to modify its natural theology to accommodate Darwinism. This thesis has been very influential in undermining the warfare of science and religion, which has characterized traditional historiography, and in championing Gray's harmonizing strategy as an

¹⁹Gray to Hooker, 21 August 1860, Kew, APS.

appropriate paradigm for contemporary harmonizing efforts.²⁰

As important as the Moore-Livingstone thesis is in recovering a host of prominent nineteenth-century orthodox naturalists and theologians who tried to harmonize Darwinism and design, it overlooks one crucial point: Darwin flatly rejected Gray's attempt to harmonize descent and design. The design argument had been wielded in the post-Newtonian era as orthodoxy's central apologetic strategy in its battle with unbelievers. Proponents claimed that it was an unanswerable argument in defense of God's existence. By the time the *Origin* was published, however, the design argument had already lost its power to persuade unbelievers that God's existence was an inescapable inference from the observed design of the world. The result was that the design argument, whether based on perfect adaptations or transcendental order, had failed as an *apologetic* strategy. Darwin and the Positivists were thus not waiting with baited breath to see how successful the orthodox community was in harmonizing descent and design. The result was that the various harmonizing strategies the orthodox constructed illustrated how the design argument had been significantly transformed from an *apologetic* tool to persuade the unbeliever into a *devotional* aid to convince the faithful that design could still be salvaged in the midst of Darwin's attacks. Ultimately, it made little difference how many schemes

²⁰James R. Moore, *The Post-Darwinian Controversies: A Study of the Protestant Struggle to Come to Terms with Darwin in Great Britain and America* (New York: Cambridge University Press, 1979) and David N. Livingstone, *Darwin's Forgotten Defenders: The Encounter between Evangelical Theology and Evolutionary Thought* (Grand Rapids: Eerdmans, 1987); Richard Aulie, "Evolution and Special Creation: Historical Aspects of the Controversy," *American Philosophical Quarterly. Proceedings* 127 (1983), 418-462, and William E. Phipps, "Asa Gray's Theology of Nature," *American Presbyterian* 66 (1988), 167-175, have advanced similar interpretations.

the orthodox could devise to convince themselves that Darwinism could be harmonized with design: the apologetic battle with Positivism had already been lost.

One of the primary reasons that the design argument failed as an apologetic strategy was that the orthodox community failed to comprehend fully the subtle, yet profound way that Positivism had transformed the terms of debate. James Ward Smith argued over thirty years ago that American Protestants have always had an enthusiastic, though profoundly naive, understanding of the scientific revolution and its theological implications. He contended that from the Puritan's response to Newton to the evangelicals' response to Darwin, Protestants accommodated only the *corpus* of the new science, its isolated bits of information and laws, without understanding the deeper driving *spirit*, the philosophical assumptions and worldview, of that science. The consequence was a superficial, merely terminological, accommodation which inevitably collapsed when confronted by Positivist scientific and philosophical systems which had absorbed the spirit of the new science into its very bloodstream. The evangelical community lost its formative cultural role precisely because it was unable to "discern the spirits" that were shaping the new philosophy of science, one intentionally at loggerheads with the received natural theology tradition.²¹

Gray's *apologia* for Darwin poignantly illustrates his failure to understand how Positivist assumptions had shaped Darwin's theory of descent and weakened the design

²¹James Ward Smith, "Religion and Science in American Philosophy," in *The Shaping of American Religion*, ed. James Ward Smith and A. Leland Jamison (Princeton: Princeton University Press, 1961), 402-442.

argument. This chapter explores this intriguing theme through a close analysis of Gray's rhetorical strategy in his reviews; the following chapter examines Darwin's subsequent rejection of Gray's harmonizing strategy during 1860 and 1861. We hope thereby to come to a clearer understanding of the fundamentally differing philosophical premises that both Gray and Darwin brought to their understanding of the issues Darwin raised in *The Origin of Species*. Such lack of understanding typified evangelical natural theology's failure in the late nineteenth century to realize the enormity of the philosophical challenge posed by the newer positivist philosophy of science represented by Darwin. The irreconcilable differences of their two positions portended ominous consequences for the continued vitality of a natural theological foundation for natural science that had been considered so crucial in western science since the end of the seventeenth century.

Gray's reviews of the *Origin* reflected a very subtle and sophisticated rhetorical strategy.²² It is not strictly true that Gray *defended* Darwin's position. As he told Darwin, he wished to give Darwin a fair hearing within the scientific and theological communities, whether or not Darwin was able to persuade them of his claims. Gray's goal was to legitimate the *scientific* status of Darwin's claims, not advocate their validity. To accomplish that purpose Gray pursued three closely related objectives.

²²Gray published his first review of the *Origin* in the *American Journal of Science* 29 (March 1860), 153-184, hereafter ROS. His first two anonymous articles appeared in the July and August numbers of the *Atlantic Monthly* under the title "Darwin on the Origin of Species," 109-116, 229-239, hereafter DOS. His third anonymous article appeared in the October issue of the *Atlantic Monthly* under the title "Darwin and His Reviewers," 406-425, hereafter DR. Gray also published an anonymous article entitled "Discussion between Two Readers of Darwin's Treatise on the Origin of Species, upon its Natural Theology," in the *American Journal of Science* 30 (Sept. 1860), 226-239, hereafter TRD.

First, he had to persuade his audience that Darwin's theories were the plausible results of numerous accepted developments in natural history. Second, he had to vindicate the scientific character of *The Origin*. He was compelled to demonstrate that Darwin had faithfully followed the canons of the current understanding of scientific method, whether or not his hypothesis would eventually be confirmed.²³ Darwin's hypotheses had fruitfully explored genuine biological problems, which was so unlike the shallow solutions offered by so many of his critics. Finally, he had to provide a way to interpret Darwin's hypothesis so that it would at least not be inconsistent with the prevailing school of natural theology.

In the great tradition of the medieval commentators who glossed Plato and then Aristotle to conform to Christian theology, Gray glossed Darwin to conform to current understandings of the relation between natural science and natural theology. In this sense, Gray's gloss on Darwin was not unlike Osiander's (unauthorized) introduction to Copernicus's *On the Revolution of the Heavenly Spheres* (1543). Both were designed to blunt potential theological criticism by showing how the works *could be* interpreted within the prevailing theological and philosophical framework as acceptable hypotheses, not demonstrable theories. Gray offered a way in his essays to save the appearances of Darwin's scientific and theological orthodoxy. As he told Darwin somewhat later, he was determined to "baptize" his views, despite Darwin's protest,

²³Since Gray, in accord with the then current understanding of scientific method, identified Darwin's position as a "hypothesis" rather than a "theory," I will use "hypothesis" throughout to refer to Darwin's long argument. This technical distinction between "hypothesis" and "theory," so important in understanding the debate between Gray and Darwin, differs in important ways from contemporary usage.

to save them from being theologically discredited. The critical test would be whether Darwin would be any more willing to accept the baptism than was Copernicus willing to accept Osiander's.²⁴

The Plausibility of Darwin's Theories

Gray, not surprisingly, assumed that his audience would be initially hostile to Darwin. His first challenge was thus to persuade his readers that, even though the *Origin* seemed to make a radical break with their traditional understanding of natural history, there were in fact many independent lines of developments in natural history that seemed to converge on someone proposing a theory of the origin and distribution of species very much like Darwin's. Whatever one thought of the validity of Darwin's notions, they were at least plausible inferences from current scientific trends. "Investigations about the succession of species in time, and their actual geographical distribution over the earth's surface, were leading up from all sides and in various ways to the question of their origin." All investigations into the origin of species pointed to "the notion that one species of plant or animal is somehow derived from another, that the different sorts which now flourish are lineal . . . descendents of other and earlier sorts."²⁵ Gray established that Darwin's theory, regardless of the final verdict, was what anyone the least familiar with natural history should have expected. No one should have been the least bit startled by it.

²⁴Gray to Darwin, 31 March 1862, *CCD* 10: 140-141.

²⁵*DOS*, 110, 113.

Without seeming to marshal evidence to support Darwin's answer to the riddle of origins, Gray was nevertheless able to explain to his non-naturalist readers what "the admitted facts" (presumably by all competent naturalists) of natural history were that "suggest hypotheses of derivation, in some shape or other." He cited five major "admitted facts" that suggested the *prima facie* case for the lineal descent of species. Gray did not tell his readers that it was actually Darwin who had marshalled disparate pieces of information from numerous sources for the past twenty years and presented them in his book to create these "admitted facts." That would have undermined his strategy to persuade his audience to at least listen to Darwin.

First, it was a "patent fact" that all species vary. Domesticated species of plants and animals often vary widely. The varieties thus produced have frequently become fixed so that they breed true in successive generations. Naturalists are fully acquainted with varieties in the wild. They are frequently so perplexed by the profusion of varieties and the differences between them that they have great difficulty in determining which are species and which are varieties. Second, species of the same genus differ from each other in unequal ways. In large genera all of the species seem to be "clustered" around a central species, "like satellites around their respective planets." Once aware of this "fact," Gray reasoned that someone was sure to suggest that the clustered species were lineal descendents of older forms in the genus.

Third, "as a general thing, all or most of the species of a peculiar genus or other type are grouped in the same country, or occupy continuous, proximate or

accessible areas." This fact is so prominent that even naturalists with no sympathy for transmutation suppose former geographical connections to explain disjoined species. Because the evidence for the geographical continuity of species is so strong, all scientific explanations for this fact have postulated some form of common origin. Fourth, the suggestion that current species were lineal descendents of former species had been made credible by the vastly extended age of the earth and human habitation that geologists and archeologists have uncovered. Even Agassiz admitted that the same species of polyps had been building coral reefs around the Florida peninsula "for many thousand centuries." Finally, the fossil record showed that present and extinct species have actually overlapped in time rather than being completely insulated from each other. Humans undoubtedly hunted mammoths and Irish elk, for example. If these ancient humans are considered to be the ancestors of modern humans, it is certainly natural to infer that Irish elk were the ancestors of the modern elk in the West. "In all candor," Gray argued, "we must at least concede" the possibility of genetic descent of contemporary species from extinct ones. Gray concluded that all five of these "admitted facts" point to some hypothesis about the lineal descent of species. Whatever the particular shape such hypotheses take they would all build "a common foundation on the general facts and the obvious suggestions of modern science." Darwin's theory certainly met these conditions. It was plausible.²⁶

²⁶DOS, 113-115.

The Scientific Status of *The Origin*

Gray's second crucial task was to vindicate the scientific status of the *Origin*. His goal at this stage was to establish that it fell within the domain and met the criteria of "inductive science." He was more concerned at this point to legitimate the *structure* of Darwin's claims than to validate their *content*. This was particularly important in light of the criticisms, particularly from Agassiz, that Darwin's views were speculative, not properly empirical, and different from the extravagant statements of *Vestiges*. Francis Bowen had similarly accused Darwin of being too metaphysical. The irony of Gray's defense was that it vindicated the scientific status of Darwin's work in terms of the older Baconian paradigm that Darwin had long since rejected -- and would soon privately remind him.²⁷

As he promised Boott, he would turn Agassiz' words against himself. He would show that it was Agassiz, not Darwin, whose claims were outside the boundary of inductive science. For the past five years Gray had become increasingly disenchanted with Agassiz's idealist framework, which connected both the origin and distribution of species directly to the Divine Will. He had underscored the

²⁷We are becoming much more aware that "science" is, and must always be, rooted in meta-scientific philosophical and even religious assumptions. Many of the most bitter intellectual struggles in the history of thought have been over the right to prescribe the criteria for "good science." We see this in the attack on Aristotle's understanding of "science" in the sixteenth and seventeenth centuries and the emergence of a revolutionary understanding of "science" in the Newtonian paradigm. The Newtonian paradigm, in turn, gave birth to several new, often antagonistic, understandings of "science" by the mid-nineteenth century that led to many ambiguities and misunderstandings. In particular, the Positivists were challenging the traditional natural theological understanding of "science." This tension becomes manifest in Gray's effort to salvage the scientific orthodoxy of Darwin. We need to keep the disputed character of "science" in mind throughout our discussion even though I will not continue to use quotations marks to always call this to attention.

deficiencies of Agassiz's view on species in his Japan essay and their Academy debates during the spring of 1859. Now he had the opportunity to undermine Agassiz's credibility in the eyes of his large and adoring public.

Gray astutely contrasted the views of Agassiz and Darwin on the origin and distribution of species with the traditional Linnean view to show that Agassiz, not Darwin, had departed the farthest from the common view. The traditional view assumed the supernatural and independent origin of each kind of plant and animal in a primitive stock. These original kinds reproduced themselves, from generation to generation, and so perpetuated the species. The ordinary view recognized that all species vary more or less, due partly to changing circumstances and to many unknown causes, but always as "oscillations from a normal state." Nature continues to preserve the differences between species through the sterility of progeny born of two different species. While the traditional view assumed a supernatural origin of species, it assumed that various natural agencies distributed the species geographically and perpetuated them unchanged over time.²⁸

Gray concluded that Agassiz's views on the origin and distribution of species differed markedly from the received understanding. He drove home the point that Agassiz's views were *unscientific* since they traced both the origin and distribution of species "directly to the Divine Will" and thereby removed them from "the domain of inductive science." This understanding was "theistic to excess." Authentic inductive

²⁸ROS, 155-56.

science traced the "efficient cause" to the Divine Will as its final, not its first, step of inquiry. The obvious point Gray wanted his readers to draw was: how *scientific* was it to attribute all phenomena relating to the origin and distribution of species immediately to the Divine Will, as Agassiz did? Was it not possible to be both *pious* and *scientific*?²⁹

In sharp contrast to Agassiz, Gray stressed, Darwin was both closer to the orthodox view of the origin and distribution of species and the practice of inductive science. Darwin agreed that all individuals of a species descended from a single ancestor or pair in a specific location. He further believed that "each species has extended and established itself, through natural agencies." Thus, the present geographical distribution of species are the result of natural causes, which inductive science studied, not primordial arrangement, as Agassiz maintained. Darwin simply "goes farther . . . to prove that the species we recognize have not been independently created, as such, but have descended, like varieties, from other species. Varieties, on this view, are incipient or possible species; . . . the difference is one of degree, not of kind." This was a clever move on Gray's part. How could believers in the traditional view possibly object to Darwin's goal? He was simply extending, not overturning, the traditional view, as had Agassiz.

Darwin's orthodox views on the origin and distribution of species were matched

²⁹ROS, 156. We want to pay close attention to Gray's use of the phrase "efficient cause" since its meaning was undergoing a significant change during this period. Recall Reid's and Bowen's understanding. In this use Gray did not capitalize the term; later on he did. Even Gray was not clear exactly what it should mean.

by his "strictly scientific" methods. He had studied the "facts and phenomena in reference to proximate causes, and endeavors to trace back the series of cause and effect as far as possible." Such an effort, "whether successful or futile, must be regarded as a legitimate attempt to extend the domain of natural or physical science." Gray was careful to add that this did not necessarily mean that all phenomena actually had immanent causal connections; it only meant that we could attribute their source to non-immanent Causes (i.e. Divine Will) only after we had been permanently frustrated in trying to find physical causes. "Inductive science" required a *prima facie* case for material connections. However plants and animals originated, Darwin had graphically demonstrated that they are "subject from their birth to physical influences, to which they have to accommodate themselves as they can." These influences must have "gravely affected the range and the association of individuals and species on the earth's surface." Granting Darwin's assumption that plants and animals have "an inherent disposition to vary," it is possible to conceive that species have been modified over time by a range of physical influences to produce the present diversity. It was certainly possible, in principle, to secure physical evidence for derivation. Gray's readers were compelled to conclude that Darwin was, to their surprise, more orthodox than Agassiz. He could thus be trusted as their guide through this complex line of study.³⁰

Gray failed, however, to alert his audience to the fact that Darwin's "long

³⁰ROS, 156-57; DR, 420-21.

argument" was directed precisely against what he took to be the traditional or orthodox view of the "special creation" of species. Readers could not fail to note that Darwin repeatedly criticized the "ordinary" understanding of the origin and distribution of species for its failure to explain a host of complexities, from classification to rudimentary organs. What was Gray's strategy in stressing the continuity of Darwin's views with the traditional Linnean understanding while knowing that Darwin utterly rejected the "ordinary" view? There is little question that Darwin caricatured the "ordinary" view of creation since there were several viable alternative understandings of "creation" that did not hold that species were created in a flash, as he tended to assume. At the same time he made it abundantly clear that his theory, as he reminded Gray numerous times, explained the diverse phenomena better than did the "ordinary" view of special creation.³¹ Perhaps Gray's goal in stressing the continuity of Darwin and the Linnean view was to further isolate Agassiz from the "orthodox" view. In any event, Gray's rhetorical strategy in saving the appearance of Darwin's orthodox view of origins flew directly in the face of Darwin's strategy in the

³¹Neal Gillespie contends that Darwin's sustained attack on the "ordinary" view of creation was designed to undermine the ethos of creationism which he believed inhibited the scientific, i.e. positivist, study of the complexities surrounding the origin and distribution of species. He identifies four distinct meanings of "creation" in mid-nineteenth century England and America. Neal C. Gillespie, *Charles Darwin and the Problem of Creation* (Chicago: University of Chicago Press, 1979), chapter 2, "Special Creation Among British and American Naturalists, 1830-59" and chap. 4, "Special Creation in the *Origin*: The Scientific Attack." Darwin actually introduced the modern scientific understanding of "creation" that completely stripped the term of its historical theological overtones. He confessed to J. D. Hooker in 1863 that "I have long regretted that I truckled to public opinion, and used the Pentateuchal term of creation, by which I meant 'appeared' by some wholly unknown process." Darwin to Hooker, 29 March 1863, Francis Darwin, ed., *The Life and Letters of Charles Darwin, Including an Autobiographical Chapter* (New York: Basic Books, 1959), 1: 202-203. The ambiguity of "creation" played a central role in Darwin's attack on the "ordinary" view and in Gray's reconstruction of Darwin's meaning. Recall Bowen's attack on Parsons' caricature of "creation" and citation of Dugald Stewart's answer.

Origin. Differing rhetorical strategies exposed deeper philosophical differences between Gray and Darwin.

To further isolate Agassiz, Gray pointed out that both Agassiz and Darwin undermined the traditional understanding that species had an objective existence in nature, but from opposing starting points. Agassiz believed that numerous individuals were supernaturally created over broad expanses of territory. These individuals possessed no specific, natural characteristic that defined them as a particular species; they were not even naturally connected by common descent. This meant that naturalists had no objective, natural standard for determining the species of an organism. In Agassiz's view, species were purely intellectual constructs whose determination depended on the subjective judgment of the naturalist. This was very far from the traditional view.³²

On the other hand, Darwin also undermined the objective character of species. He believed that species as well as individuals were descended from a common parent. "Affinity, relationship, all the terms which naturalists use figuratively to express an underived, unexplained resemblance among species, have a literal meaning upon Darwin's system, . . . namely, that of inheritance." Varieties, species, genera, and all the higher orders were related to each other by common descent, much like a genealogical tree. Thus, species for Darwin were not primordially fixed and

³²ROS, 157-58.

objective."

The fundamental differences between Agassiz and Darwin, Gray contended, finally resolved themselves into a conflict between a "theological" and a "scientific" framework of interpretation. Agassiz too quickly assumed that all the currently unexplained physical relationships between and among animals and plants were in principle inexplicable and referred them to the Divine Will. It was intrinsically impossible to find physical evidence to support Agassiz's view of species. Darwin, on the other hand, "endeavors to explain [all natural phenomena] as far as he can (and perhaps farther) through natural causes."³⁴

As far apart as their two views were, Gray believed that they were not mutually exclusive. There was no intrinsic reason why "the investigation of physical causes [should] stand opposed to the theological view and the study of the harmonies between mind and Nature." Gray argued that Agassiz should at least concede that there was a presumption that an "intellectual conception . . . in nature would be realized through natural agencies." There were all sorts of undisputed material connections in nature, e.g., grub, pupa, and butterfly; Agassiz should at least be willing to entertain the possibility of others. At least he should wait to announce that the connections were purely intellectual until all physical possibilities had been

³³ROS, 158.

³⁴ROS, 160; DR, 421. What did Gray mean that perhaps Darwin tried to explain natural phenomena "perhaps farther" through natural causes? Had he gone "too far"? Where could/should/ought he put up a barrier to natural causes? These questions kept nagging at Gray throughout his reviews and correspondence with Darwin. Many of Darwin's reviewers raised the same question. Once having brought all phenomena under the iron rule of natural law, what phenomena could be exempted?

exhausted. When Agassiz referred all natural phenomena directly to the Divine Intellect, no one should suppose, Gray pointed out, that he was offering a scientific explanation. He "is considering only the ultimate *why*, not the proximate *why* or *how*."³⁵

Gray offered an intriguing analogy to explain how the views of Agassiz and Darwin on the nature of species could be reconciled. Suppose, he suggested, that we took *chair* as a genus comprising the *species* of common, rocking, easy, and many other kinds of chairs. Some of these chairs had even *sported* (gardening expression) into many varieties. Because this analogy anticipated important modern philosophical discussions of the nature of "species," it deserves to be quoted in full.

But now, as the *genus* and the *species* have no material existence, how can they vary? If individuals alone exist, how can the differences which may be observed among them prove the variability of species? To which we reply by asking, *Which does the question refer to, the category of thought, or the individual embodiment? If the former, then we would remark that our categories of thought vary from time to time in the readiest manner.* [italics added] And, although the Divine thoughts are eternal, yet they are manifested to us in time and succession, and by their manifestation only can we know them, how imperfectly! Allowing that what has no material existence can have no material connection or variation, we should yet infer that what has intellectual existence and connection might have intellectual variation; and, turning to the individuals, which represent the species, we do not see how all this shows that they may not vary. Observation shows us that they do. Wherefore, taught by fact that successive individuals do vary, we safely infer that the idea must have varied, and that this variation of the individual representatives proved the variability of the species, whether objectively or subjectively regarded.³⁶

³⁵ROS, 159-161.

³⁶DR, 421. He introduced a further analogy between architectural styles and speciation. Ernst Mayr has given extended thought to the philosophical issues surrounding the meaning of species throughout his professional career. See his collection of previously published essays on the topic in *Towards a New Philosophy of Biology* (Harvard: Harvard University Press, 1989), 313-358. Michael Ghiselin's *Metaphysics*

Gray was determined to show that "species" were neither purely subjective intellectual constructs, as Agassiz definitely believed and Darwin seemed to believe, nor permanently fixed from all time, as the vast majority of naturalists believed. He was too much the seasoned taxonomist and botanical geographer to believe either alternative. There is no hint that Darwin or any other contemporary explored the heuristic possibilities that Gray's analogy opened up through the dilemma of *species*.

Though Darwin was primarily concerned with investigating the physical relationships between species, the *how* of their connection, Gray supposed that

he does not deny their intellectual connection, as related to a Supreme Intelligence. Certainly we see no reason why he should, and many reasons why he should not. Indeed, as we contemplate the actual direction of investigation and speculation in the physical and natural sciences, we dimly apprehend a probable synthesis of these divergent theories, and in it the ground for a strong stand against mere naturalism.

Gray was here signaling Darwin and his readers that it was possible with enough imagination to "dimly apprehend" how his theory could be made compatible with "a strictly theistic view of the universe." He would soon find out whether Darwin shared his "apprehension."³⁷

Having established that Darwin had presented a legitimate *scientific* argument, Gray next determined that his argument was a *hypothesis*, not a *theory*. Gray believed, with some justification, that he would have the best chance of gaining a

and the Origin of Species is the most recent discussion of the topic. Neither Mayr nor Ghiselin refer to Gray's anticipation.

³⁷ROS, 161.

hearing for Darwin and reducing some hysterical criticisms if he could convince readers (and Darwin) that the *Origin* presented only a *hypothesis*, not a *theory*. Gray followed the standard usage of the time in distinguishing between a *theory* and a *hypothesis*. A *theory* was a statement that offered true physical causes, *vera causae*, for the phenomena it explained and was able to provide demonstrative proof of its validity. Newton offered a *theory* of universal gravitation. A *hypothesis* strove to harmonize all of the known facts of a problem into a consistent whole without being able to assign actual material or physical causes for the phenomena. It was a "supposition of what there is no proof of from experience, assumed in order to account for the observed phenomena, and supported by such indirect evidence as can be had."³⁸

According to these criteria, Gray pointed out that both the doctrine of special creation and that of derivation were hypotheses. They shared the same status as the theory of gravity and the nebular hypothesis. This was true despite the efforts of the advocates of special creation to "mix up revelation with scientific discussion" by offering the biblical account of creation in physical science as *demonstrative proof* that the world was created miraculously by Divine Intelligence. The only *vera causa* recognized in physical science were material, physical causes. Revelation offered nothing like these. It was perfectly acceptable, however, for Creationists to put forward their views on origins as a hypothesis.

³⁸DR, 406; DOS, 230.

Gray contended that the derivative hypothesis held the same scientific rank as the nebular hypothesis. Both were "allowable, as not unlikely to prove tenable in spite of strong objections, but as not therefore demonstrably true." There were no grounds to prematurely declare such a hypothesis either patently false or demonstrably true.

Those, if any there be, who regard the derivative hypothesis as satisfactorily proved, must have loose notions as to what proof is. Those who imagine it can be easily refuted and cast aside must, we think, have imperfect or very prejudiced conceptions of the facts concerned and of the questions at issue.³⁹

Physicists provided, Gray urged, the appropriate understanding and use of hypotheses in physical science. The undulatory theory of light is now generally accepted by most physicists. Once adopted over the rival emission theory it was soon extended to the phenomena of heat. This, in turn, strongly suggested "the hypothesis of a correlation, material connection, and transmutability of heat, light, electricity, magnetism, etc." This hypothesis promised to be adopted very shortly as the prevailing system.⁴⁰

Gray suggested that Darwin should be content with having offered a "tentative hypothesis" of the origin of species, even though he believed he had offered a *vera causa* for his claims. Everything that naturalists knew about species strongly suggested Darwin's inference of derivation of one species from an earlier species.

Since species are only congeries of individuals, since every individual came into

³⁹DR, 408.

⁴⁰ROS, 162; DOS, 88; DR, 406.

existence in consequence of pre-existing individuals of the same sort, so leading up to the individuals with which the species began, and since the only material sequence we know of among plants and animals is that from parent to progeny, the presumption becomes exceedingly strong that the connection of the incoming with the pre-existing species is a genealogical one.⁴¹

Darwin clearly had not offered any demonstrative proof of derivation, but it nevertheless was a fruitful hypothesis. Claiming to have presented a hypothesis would also negate any criticism that he had not offered direct, physically demonstrable proof of his claims. Critics had no more right to expect such proof from Darwin than they did from Newton or LaPlace. No one criticized these two acclaimed men for their lack of physical proof. In fact, if Darwin adopted his hypothesis, Gray, urged, his cause of variation could remain as mysterious as the reason tadpoles become frogs.⁴²

Gray pointed out that there were significant grounds to support Darwin's hypothesis of derivation. It was able to explain grand classes of facts that on any other assumption were inexplicable.

It goes far towards explaining both the physiological and the structural gradations and relations between the two kingdoms, and the arrangement of all their forms in groups subordinate to groups, all within a few great types; that it reads the riddle of abortive organs and of morphological conformity, of which no other theory has ever offered a scientific explanation, and supplies a ground for harmonizing the two fundamental ideas which naturalists and philosophers conceive to have ruled the organic world, though they could not reconcile them; namely, Adaptation to Purpose and to the Conditions of Existence, and Unity of Type. To reconcile these two undeniable principles is the capital problem in the philosophy of natural history; and the hypothesis which consistently does so thereby secures a great advantage.⁴³

⁴¹DOS, 235.

⁴²DOS, 230; ROS, 162.

⁴³DOS, 236.

Whatever the final scientific verdict would be, Gray had no doubt that "the facts well accord with that hypothesis." These were weighty commendations, indeed.⁴⁴

Throughout the *Origin* Darwin frequently appealed to "fine gradations" everywhere in the natural world as a fact supporting his derivative claims. Gray elaborated on the axiom derived from Leibnitz, *Natura non agit saltatim*. (Nature makes no leaps) to lend additional *prima facie* support to Darwin.⁴⁵ He recognized that Leibnitz applied his principle only to physics and that it was not suitable as a test for all theories or laws of nature. Nevertheless, "naturalists of enlarged views will not fail to infer . . . that Nature in the organic world makes no distinct steps, but only short and serial steps, -- not infinitely fine gradations [contra Darwin], but no long leaps, or few of them." There were myriad examples. The two organic kingdoms of plants and animals "seem" to be firmly distinguished in all respects. However, "these broad differences vanish one by one as we approach the lower confines of the two kingdoms, and that no *absolute* distinction whatever is now known between them."

⁴⁴DOS, 234-36; ROS, 168-70.

⁴⁵Gray presented a "Discourse from the Axiom *Natura non agit saltatim*" to the Cambridge Philosophical Club on 8 March 1860 to support Darwin's claims. After an extensive survey of the numerous gradations in the plant kingdom, Gray concluded that it was "impossible to dispose the mass of species under a definite number of grades of affinity (genera, families, orders) subordinate one to another, and makes these groups of the same name of equal rank. i.e. -- one genus equivalent to another genus -- one family to another, etc. We can make certain approximations -- or rather uncertain approximations."

"We get manifest indications of system and order in respect to the relationships of plants -- in respect to the mysterious ties that bind all the manifold species into a systematic whole. -- We can collocate them into groups on the whole pretty definite as to genera, etc. -- perhaps more so as to orders -- certainly more so as to classes -- But to the whole system the axiom applies *Natura non agit saltatim*." "Discourse," 14a-14b, GHA.

His July *Atlantic* article summarized that presentation. The phrase was taken to mean that "nature makes no leaps (or jumps)." A "saltation" referred to the spontaneous origin of a new organism. Darwin rejected them out of hand on the principle that "nature makes no leaps."

whether we examine the gradation of sensibilities, manner of movement, mode of propagation, or even individuality. "Everywhere we may perceive that Nature secures her ends, and makes her distinctions on the whole manifest and real, but everywhere without abrupt breaks." Knowing this reality, Gray was hardly surprised that there should be gradations between species and varieties.⁴⁶

Gray was acutely aware that Darwin's hypothesis of natural selection faced "formidable difficulties." Minor problems included, for example, the absence of fossilized intermediate forms and the sterility of mongrel crosses. The three major problems were the origin of man, the formation, structure, and function of specialized organs, and variation. Gray was unaware of any fossil evidence showing that man was a lineal descendent of an animal. Darwin had honestly admitted as much. Gray concluded that there was a wide gulf, "anatomically and physiologically . . . between the highest quadrumana and man." The genealogy of man is completely independent from the lower animals. Gray concluded that "we must needs believe in the separate and special creation of man."⁴⁷

It was no surprise that Gray found a weak spot in Darwin's explanation of the

⁴⁶DOS, 237-238. Gray made some very suggestive comments about individuality that also anticipated modern discussions about species considered as "individuals." He suggested that "in the ascending gradation of the vegetable kingdom individuality is, so to say, striven after, but never attained; in the lower animals it is striven after with greater, though incomplete success; it is realized only in animals of so high a rank that vegetative multiplication of offshoots are out of the question, where all parts are strictly members and nothing else, and all subordinated to a common nervous centre, -- fully realized, perhaps, only in a conscious person." DOS, 238. It is also suggestive to compare Gray's comments on the gradations of individuality with very similar comments Frederick Lange made in his chapter on "Darwin and Teleology" in his masterful study of *The History of Materialism*, first published in 1865.

⁴⁷ROS, 178; DOS, 111.

formation of the eye through natural selection. The eye had been a venerable example of exquisite design in the tradition of natural theology. "It requires no small strength of nerve steadily to conceive, not only of the diversification, but of the formation of the organs of an animal through cumulative variation and natural selection." In a veiled reference to a "friend" (actually Darwin himself), Gray commented that while his friend had gotten over the fever stage of his "cold shudder" when considering the formation of the eye, he still "dread[s] the chill, and [has] some misgivings about the consequences of the reaction."⁴⁸

Natural selection, Gray contended, was simply unable to explain variation. "We no more know the reason why progeny occasionally deviates from the parent than we do why it usually resembles it. Though the laws and conditions governing variation are known to a certain extent, while those governing inheritance are apparently inscrutable." [*sic*] Darwin believed that the unknown cause acted on the reproductive system, but "the great primary law of inheritance remains a mysterious fact." Even if the cause of variation were discovered, Gray observed, it would only carry the sequence of secondary causes back a bit farther. The mystery would remain the same. Neither natural nor artificial selection can originate variation. This power of origination is ultimately "a question about efficient cause" and lies outside the bounds of physical science. Gray believed that the cause of variation "may be limited by something . . . inherent in the constitution of organic beings." It was this internal

⁴⁸DOS, 238-39; ROS, 178.

"something else" that Gray would exploit in his theistic interpretation of variation.⁴⁹

Despite its broad explanatory power Gray concluded that Darwin's hypothesis of descent of species through modification was yet unable to bear the full weight Darwin had placed on it. "To command assent we naturally require decreasing probability to be overbalanced by an increased weight of evidence. An opponent might plausibly, and perhaps quite fairly, urge that the links in the chain of argument are weakest just where the greatest stress falls upon them." As such it remained an undemonstrated theory, though a very persuasive hypothesis.⁵⁰

***The Origin* not Inconsistent with Theism**

Gray's third important objective in his reviews was to meet the charge that the *Origin* was atheistic by showing that it was not inconsistent with theism. Many early critics, notably Agassiz and Bowen, charged that the *Origin* was atheistic since it had substituted chance and natural selection for final causes and design. Gray, therefore, assumed the crucial task of blunting this charge, even though he was dimly aware of a possible collision between his commitment to an empirical approach to natural history and his commitment to the Creator's knowable role in that same natural history.

Gray faced the charge head-on: If Darwin understands the natural derivation of species to mean "a series of events which succeed each other irrespective of a

⁴⁹ROS, 165; DR, 408, 417. Being unable to establish the cause of variation was a major challenge for Darwin. His later theory of pangenesis was never taken seriously. The cause of variation was not known until Mendel's famous work on genetics was discovered.

⁵⁰ROS, 176; DOS, 231, 239.

continued directing intelligence . . . then he has not established that doctrine, nor advanced toward its establishment, but has accumulated improbabilities beyond belief." It surely took "no argument . . . to show that such belief is atheism."⁵¹ He prepared three lines of counter-attack against the charge of Darwin's atheism: first, it was not unlikely that Darwin believed in a First Cause; second, even if his views were eventually substantiated, it would have no bearing on the question of theism vs. atheism; third, the derivation hypothesis is best supported on theistic grounds as further evidence of grand design.

Gray pleaded with his readers to give Darwin the benefit of the doubt on the question of his theism. While Darwin had not explicitly stated how he "harmonizes his scientific theory with his philosophy or theology," Gray was prepared to supply such a harmony. His reviews are studded with conjectures and suppositions-- "maybe," "no doubt," "infer," "possibly," "trust," "suppose"--about Darwin's religious beliefs and their relation to his views on derivation. We have no right to infer atheism from his silence on the topic, he argued. After all, his book dealt with secondary causes, not efficient or final causes. It may very well be the case, Gray offered, that Darwin refrained from making any definite comments on this point until he had more time to deliberate on it. Of course, Gray was completely in the dark about the significant changes Darwin's theistic beliefs had already undergone.

We have no reason to doubt, Gray opined, that Darwin believed that all of the

⁵¹ROS, 183; DR, 409, 413, 416.

phenomena he has studied has been "done wisely, in the largest sense designedly, and by an intelligent first cause."⁵² Didn't he close his book with an eloquent passage that spoke of the Creator breathing power into one or many forms? Furthermore, the quotations which Darwin used from Whewell, Bacon, and, for the second edition, from Butler (at Gray's suggestion), on the fly leaf seemed ample grounds to confirm his theistic sympathies.⁵³ The most that Gray could allow is that Darwin did not express his theism as clearly as some would prefer. Therefore, it was certainly possible, therefore, Gray offered, to construe Darwin's statements and hints in such a way that he had not abandoned a theistic understanding of Efficient Cause.

⁵²ROS, 180.

⁵³DR, 412.

In the first edition of the Origin Darwin included the following two quotations.

The first one is by William Whewell, a prominent English physicist, philosopher and historian of science, and author of one of the most influential Bridgewater treatises, *Astronomy and General Physics Considered with Reference to Natural Theology* (1833), from which the following quotation comes: "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."

The second quotation comes from Francis Bacon, prominent English politician and polymath at the turn of the seventeenth-century who became a prominent publicist for the "new science" who wrote the influential *Advancement of Learning* (1605). "To conclude, therefore, let no man out of a weak conceit or sobriety, or an ill-applied moderation, think or maintain, that a man can search too far or be too well studied in the book of God's word, or in the book of God's works; divinity or philosophy; but rather let men endeavour an endless progress or proficiency in both."

The third quotation, which Darwin added to the second edition, comes from Joseph Butler who was, next to William Paley, the most influential natural theologian in England. The quotation comes from *The Analogy of Religion* (1736): "The only distinct meaning of the word 'natural' is stated, fixed, or settled; since what is natural as much requires and presupposes an intelligent agent to render it so, i.e., to effect it continually or at stated times, as what is supernatural or miraculous does to effect it for once."

Gray was most pleased with this addition. He told Darwin that it "tells just right." Gray to Darwin, 23 January 1860, CCD 8: 46-48.

Gray adroitly stepped into the breach of Darwin's silence on his theism to show Darwin and his readers how it was possible to harmonize theism and the derivative hypothesis. There is a remarkable shift in Gray's harmonizing strategies between his *American Journal of Science* review in March and his *Atlantic Monthly* review in October. In March he allowed that Darwin had not explicitly spelled out how he "harmonizes his scientific theory with his philosophy and theology," though

from certain incidental expressions at the close of the volume, taken in connection with the motto adopted from Whewell, we judge it probable that our author regards the whole system of nature as one which had received at its first formation the impress of the will of its Author, forseeing the varied yet necessary laws of its action throughout the whole of its existence, ordaining when and how each particular of the stupendous plan should be realized in effect, and -- with Him to whom to will is to do -- in ordaining doing it.⁵⁴

Such a view was perfectly consistent with the theism professed by Charles Babbage, Benjamin Jowett, and even Agassiz. In fact, even the celebrated William Paley had declared that the argument from design would be greatly strengthened if a watch were found that reproduced other watches. "What is to hinder Mr. Darwin from giving Paley's argument a further *a-fortiori* extension to the supposed case of a watch which sometimes produces better watches, and contrivances adapted to successive conditions, and so at length turns out a chronometer, a townclock, or a series of organisms of the same type?"⁵⁵ Even though Darwin himself seemed to sanction this interpretation, as

⁵⁴ROS, 182.

⁵⁵ROS, 182. Shortly after receiving his presentation copy of the *Origin*, Charles Kingsley, prominent churchman, amateur botanist, and popular novelist, revealed to Darwin that "I have gradually learnt to see that it is just as noble a conception of Deity, to believe that he created primal forms capable of self-development into all forms needful pro tempore & pro loco, as to believe that He required a fresh act of intervention to supply

(continued...)

seen in adding Kingsley's remark to the second edition, this analogy with natural selection is strained at best.

At this point Gray believed that a "philosophical theist" had two possible ways to conceive the relationship between Divine Power and the world: "the Creator" having "done from all time" or "doing through all time." Both positions harbored nontheistic tendencies. The first could become atheism by its notion of "an eternal sequence of cause and effect" which no rational person could consistently believe; the second could become pantheism. Gray stopped short of explaining the problem, though these were exactly the options he feared that Hooker's position entailed. The only escape from the problem, he argued, was the "profound conviction" that the universe was designed by Intelligence. "Thus guarded, we much prefer the second of the two conceptions of causation, as the more philosophical as well as Christian view - a view which leaves us with the same difficulties and the same mysteries in Nature as in Providence, and no other. Natural law, upon this view, is the human conception

⁵⁵(...continued)

the lacunas w[hich] he himself had made. I question whether the former is not the loftier thought." Kingsley to Darwin, 18 November 1859, *CCD* 7: 379-380. Darwin thanked him "sincerely for allowing me to insert your admirable sentence." Darwin to Kingsley, 30 November 1859, *CCD* 7: 407-408. Darwin modified this statement slightly and included it in the second edition, *Origin*, 481 (American 2d edition, 417). He sent this correction for the new edition to Gray, 1 February 1860, *CCD* 8: 61-63.

Kingsley may well have adapted this image from Paley who introduced it at the beginning of chapter 2 of *Natural Theology*: "Suppose . . . that the person, who found the watch, should, after some time, discover, that, in addition to all the properties which he had hitherto observed in it, it possessed the unexpected property of producing, in the course of its movement, another watch like itself; (the thing is conceivable;) that it contained within it a mechanism, a system of parts, a mould for instance, or a complex adjustment of laths, files, and other tools, evidently and separately calculated for this purpose." Such a discovery, Paley argued, would only deepen the person's "admiration of the contrivance, and his conviction of the consummate skill of the contriver."

of continued and orderly Divine action."⁵⁶ Gray defied "profounder minds" than his to establish "a rational distinction in kind between His working in nature carrying on operations, and in initiating those operations."⁵⁷

In October Gray resolved the tensions in the polarity of these two conceptions of Divine "intervention" with a serene continuum of gradations of how the Efficient Cause exerted power in the universe. He outlined three possible theistic modes for understanding how the Efficient Cause exerted power in the physical universe. First, matter, living and inert, was "endowed" with power to bring into existence everything in the universe. Second, the first view modified to allow for "insulated interpositions" where "now and then, and only now and then, the Deity puts his hand directly to the work." For the remainder, the original forces perform the necessary labor. Third, "[t]he theory of the immediate, orderly, and constant, however infinitely diversified, action of the intelligent efficient Cause." Each of these could be reconciled with

⁵⁶ROS, 182-83. James Moore interprets this passage to show that "Gray was careful to distinguish the semi-deism of [Charles] Hodge and [J. W.] Dawson from his own belief in a concursive providence." He passes over the difficulties Gray pointed out with these two positions to a quotation from Gray's review of Darwin's *Life and Letters* written in 1887 where Gray spoke of the need for a "fuller recognition of Divine immanence." Conflating these two positions gives an inaccurate understanding of the significant tension that Gray experienced in moving from the first to the second. This can be seen in comparing the very different positions he took in his March and October reviews as we have done. James Moore, *The Post-Darwinian Controversies* (Cambridge: Cambridge University Press, 1979), 339-340. There are several additional problems with Moore's interpretation. It is anachronistic to refer to Hodge and Dawson since the quotation comes from Gray's *Am. Jour. Sci.* review of March 1860; he did not change this section when it was reprinted in 1876. Characterizing Hodge and Dawson as "semi-deists" is novel, only because it excludes Gray and many others who held a similarly confused understanding of the relationship between God and the world. Finally, there are no grounds, that I can find, for believing that Gray was philosophically and theologically astute enough to understand the sophisticated medieval understanding of "concuris." The amnesia of the natural theology tradition on this important theme is a significant thread in the response of Gray and others to Darwin.

⁵⁷ROS, 183.

design, though the third was clearly the most Christian conception.⁵⁸

Most people, Gray surmised, had unstable views on these matters that wavered between all three positions, now choosing one, now another, depending on the occasion. Darwin was really no different from most people in this regard, Gray suggested. Darwin seemed to "prefer" the first view, but "might" argue that his view could even be reconciled with any of the three. He rejected spontaneous generation, allowed for original creation, and could even in some instances adopt the second view. Gray also acknowledged that while Darwin's hypothesis could be "compatible with an atheistic or pantheistic conception of the universe," this was also true of many other positions in physical science and ethical systems, so it was not peculiar to Darwin's position.⁵⁹

As far as Gray was concerned, it made no difference, in principle, how many interventions were allowed: "one interposition admits the principle as well as more." When it came right down to it, there was hardly any appreciable difference between Darwin's "natural" event and his critics' "miraculous" event.

[Darwin] merely inquires into the form of the miracle, may remind us that all recorded miracles (except the primal creation of matter) were transformations or actions in and upon natural things, and will ask how many times and how frequently may the origination of successive species be repeated before the *supernatural merges into the natural*. [italics added]

Darwin and Bowen actually agreed, after all: Darwin believed that both individuals

⁵⁸DR, 418; cf. *Proc. Am. Academy* 4 (1857-1860): 425-26.

⁵⁹DR, 418.

and species originated in natural acts; Bowen believed that both individuals and species originated through Divine power. The dichotomy had become a continuum.⁶⁰

Gray's proposed harmonizing strategy was a skillful rhetorical device, but hardly an accurate understanding of either Darwin's objection to the "ordinary" view of creation or Bowen's understanding of Efficient Cause and his criticisms of Darwin's refusal to concede the necessity of an Efficient Cause in the origin of species. Gray was floundering in the tangled philosophical and theological thicket of properly conceiving God's relationship to the world that had been bequeathed to him by post-Newtonian natural theology.

The Ambiguity of Efficient Cause

The meaning of "efficient cause" had become hopelessly confused in the eighteenth and early nineteenth centuries as it had gradually drifted away from its Aristotelian and medieval moorings. The Scottish philosophy, so well articulated by Bowen, argued that the only legitimate meaning of "cause" was that of Aristotle's "efficient cause," that exertion of power by which an action was achieved. This was the "true" cause, or *vera causa*, that post-Newtonian physics sought and formalized in its laws. Because of its association with physics, this "efficient cause" came also be known as a "physical cause." It was this understanding of causality that gained John

⁶⁰DR, 418-19. Gray may well have had in mind Chauncey Wright's quip, mentioned in chapter 5, that if all the pious required was a miracle, he was willing to give them an infinite number of them to gain a natural continuity of life. Ironically, what Wright meant as a dig at such a superficial understanding of miracle Gray meant as a serious proposal.

Herschel's imprimatur in *A Preliminary Discourse on the Study of Natural Philosophy* (1830), though even Herschel strayed from this strict understand. Further confusion was assured by equating "physical causes" with "secondary causes."

Scottish philosophy then took a bold step beyond Aristotle in asserting that the only meaningful understanding of "efficient cause" came from our intuitive sense that our will mysteriously "caused" our bodies to act. Thus, wherever we see movement and change in the external world, we can assume by analogy with our own wills and subsequent action, that there must be a corresponding Divine Will as the "efficient cause" in the entire universe. This Will, the Scots argued, in ironic agreement with the Positivists, was no more accessible to human inquiry in the physical world than it was in the human world.

The cruel irony was that the Scots, along with virtually all other post-Newtonian natural theologians, in their pious attempt to protect and elevate God as the Efficient, First, or Final Cause in the world, had actually reduced God to the level of all other imminent efficient causes. They accepted the physicists' understanding of causality as the only normative and acceptable meaning, without considering the many other ways that "cause" was legitimately used to convey meaning in other areas of life. Their dilemma then became how to convey God's relationship to the world with this mechanistic understanding of causality. Confessing that God was the "cause" of the world, they were compelled to make God part of the imminent causal process, though elevated slightly as the First Cause. But, the more science discovered the

regularities and continuities of this causal chain in the universe, the more difficult it became to find "room" or "space" for God's role or activity.

By adopting a profoundly reductionistic understanding of "cause" natural theology was confronted with the inescapable dilemma of simultaneously maintaining God's active role in the creation and the continuity of all causal relationships in the creation. Once God's relationship to the world was reduced to an analogy with human actions, it became inevitable that there would be a debate on whether, if, or how much God "intervened" in the world to "cause" events, e.g. like the origin of new species. After all, the Scots believed, it would be laughable to believe that humans could initiate action without "intervening" and willing to do so.

To compound this problem, God was considered "closer" to the world and more intimately involved with it the more occasions there were for his interventions. Conversely, God was feared "more distant" from the world, the more natural events and processes were understood as acting and operating regularly and continuously. Those intent on preserving God's "close" relationship to the creation of life believed they could do this only by protecting some break, however small, in the immanent chain of causality that was being constructed in all of the sciences. The mystery of the origin of variation was the small break that both Bowen and Gray held out as the "place" where God's causality was experienced.

The classical theological understanding, which had been forgotten by so many at mid-century, was that to call God the Creator and Sustainer of the universe could

never be understood in terms appropriate only for understanding events and processes in the creation itself. Categories appropriate for understanding creation are wholly inadequate for fully understanding the God of orthodox theology. Transcendence and immanence, when applied to God, are neither polar opposites nor spatial properties of God's relationship to the world. To even call God the *First* cause ought not to be understood as making God the first in a series, as the first batter in the lineup; it is rather to say that God is first in the order of authority and eminence, as the first lady. God is the transcendent ground of all orders of causality in the world; God can never be identified with that order.

Thus, to fear that God became more distant as the processes of immanent causality were better understood, was to misconceive God's relationship to the world in terms of physical and spatial relationships. Even a child soon understands that to be "away" from mom and dad at school does not mean that they are "away" from their love. Unfortunately, adopting Newtonian physics as the appropriate framework for understanding God's relationship to the world seriously compromised the efforts of both Darwin and Gray, as well as most versions of natural theology, to come to terms with the causal relationships Darwin had discovered.⁶¹ It was this flawed

⁶¹Properly conceiving God's relationship to the world has been a major foci of Christian theology, both past and present. Among the works that have been most helpful to my understanding have been Herman Dooyeweerd, *A New Critique of Theoretical Thought* (Nutley, NJ: Presbyterian and Reformed Publishing Co., 1969 [1953]), 4 vols.; William Placher, *The Domestication of Transcendence* (Louisville, KY: Westminster John Knox Press, 1996), 111-145; Paul K. Jewett, *God, Creation, & Revelation* (Grand Rapids, MI: Wm. B. Eerdmans, 1991), 438-501; Jarislov Pelikan, *Christianity and Classical Culture: The Metamorphosis of Natural Theology in the Christian Encounter with Hellenism* (New Haven: Yale University Press, 1993); and Diogenes Allen, *Christian Belief in a Postmodern World* (Louisville, KY: Westminster John Knox Press, 1989).

understanding of God as the "efficient cause" of events in the world that was the context for Gray's valiant, but grievously flawed, attempt to rescue God's role in the creation of new species with his move toward a "finely graded" continuum between miraculous intervention and natural generation.

A vivid illustration of this confused understanding of "efficient cause" came in Joseph Hooker's attempt to persuade William Harvey that Darwin's theory was not fatal to theism. Harvey, as so many others, had criticized Darwin for eliminating God's role and stressing natural selection as the efficient cause of the origin of species. Hooker had himself warned Darwin several times that his title was a mistake on the grounds that many would object to Natural Selection being *the* efficient cause of the origin of species.⁶² Hooker counseled Harvey that

I think . . . that you mistake his expressions and give an unfair interpretation of his expression '*efficient cause*.' Most people would say that moisture was the *efficient cause* of luxuriant foliage, without atheism being suspected, and in the present condition of English thought and language I see no objection whatever to the statement; at the same time, in another higher and the only true sense, moisture is not the efficient cause, nor is even the property imparted to the plant of being affected that way by moisture, but the will, or law, or call it what you will, of the supreme Governor of the universe of mind and matter.

Hooker believed that Harvey's misunderstanding of Darwin's use of "efficient cause" was peculiar to him alone; all other naturalists understood perfectly well what Darwin meant by the expression. "Every real naturalist," Hooker assured him, "owns N.S. to

⁶²cf. Hooker to Darwin, 8 June 1860, *CCD* 8: 248-249. On Harvey's charge that Darwin personified Natural Selection, Hooker wrote that "As to the question of *personality* it is simply ridiculous – I agree with him & you too that the *real* primary agency is as great a mystery as ever, call it *mystery* or *theistic element* or *God* or *nature* or what he will, *unseen Power* if he likes."

be a *vera causa*, though few admit the *plenary* power that Darwin gives it." Furthermore, Hooker saw no way out of this. "Throughout A. De Candolle's *Geog. Bot.*, Physical causes are treated as efficient causes in the same sense; and I have always been taught to regard them as such, *but limited in their action to varieties!* a view which, if logically carried out, always seemed to me irreligious and nonsensical *in the abstract*."⁶³ Hooker was at least aware of the confusion. It is not clear that he ever made Darwin or Gray see it. Perhaps because the distinction between "efficient cause" and "Efficient Cause" was so clear to him, he shrugged off Gray's agony in the fall of 1859 over pressing the doctrine of "efficient cause" so far as to eliminate the "Efficient Cause."

Derivation Consistent with Design

Even if Darwin were an atheist and his derivation hypothesis were proved to be true, Gray claimed, it would have no bearing on the questions of theism, final cause, or design. This was a critical point for Gray to establish; it touched the nerve of his haunting question to Hooker the past summer and fall. Physical science, Gray cautioned, dealt only with secondary or proximate causes; it did not touch the questions of final or efficient cause. Therefore, the conclusions of physical science must be the same for the theist or atheist. Newton's theory of gravity and LaPlace's nebular hypothesis were held equally by theists and atheists alike; the same would be

⁶³Hooker to Harvey, 26 May 1860, *LLJDH* 1: 517-19; Hooker to Harvey, June 1860, *LLJDH*, 1: 519-

true of Darwin's theory. To be sure, Darwin's perspective was *compatible* with atheism, but it did not *entail* atheism. In sum, the *Origin* did not introduce any new theological or philosophical difficulties for theism. The issue boiled down to our conception of the relationship between this world and the Efficient Cause. Indeed, it did.

It was very critical for Gray's understanding of the relation between science and religion that physical science not break its connection with a Final or Efficient Cause. This connection was the critical linchpin securing empirical analysis of the natural world to the Creator in the natural theology tradition. To give it up would be to give up the entire enterprise. Gray criticized Louis Agassiz, prominent Harvard zoologist and Darwin critic, not for appealing to an Efficient Cause in explaining the origin of species, but for substituting Divine Intelligence for material causality as an initial explanation of physical phenomena. Final Cause came last in an explanation, to be sure, but it must actually be there. Gray bent every effort and used all of his considerable rhetorical skills to show that Darwin had not broken this connection.

If this much were admitted, Gray argued, Darwin's perspective would have no bearing on the question of design. Could anyone consistently maintain a distinction between originating and sustaining power? Was not Divine Intelligence equally manifest in mediate as well as immediate creation? Do Darwin's critics deny that design is any more evident in the original creation than it is in the natural generation of their children? Design was just as valid for the reproduction of one dog as it was

for the descent of a variety of dogs from a common ancestor. Furthermore, the argument from design dealt with the structure and adaptations of living things regardless of their origin. If it were valid to infer design from the wonderful structures in the world before Darwin, it was as equally valid after Darwin. He had done nothing to change the basis of the inference. Besides, Gray cautioned, most people "fall into a hopeless maze whenever they undertake to define their position." Darwin was certainly no exception. Darwin's critics (i.e., Lowell and Bowen) should be a bit more reluctant to chastize his views on theism and design. After all, their position is not all that sharply defined either.⁶⁴

This was a critical juncture in his argument. The venerable design argument, honed in repeated elaborations since the seventeenth century, assumed that a person was epistemically compelled to conclude the existence of, and more or less, the attributes of a Deity from the presence of manifest evidences of design in the universe, whether astronomical, as they tended to be in the seventeenth-century in the glow of Newton, or organic, as they were in the tradition of John Ray and William Paley.

It was an *a posteriori*, or inductive, argument based on an analogy between human and Divine artifacts: just as the existence of a watchmaker was infallibly concluded from the presence of a watch so, too, must the existence of a Divine Maker be concluded from the presence of its marvelous handiwork. Either the universe was

⁶⁴DR, 409-410; ROS, 183.

the product of chance or of design, Gray claimed; there was no alternative. Since chance was irrational and provided no foundation for knowledge of any kind, the only alternative was design. And design presumed a Designer.

The validity of this succinct argument turned on the validity of the analogy between artifacts in the world and the world as a whole and the necessity of the inescapable inference of design from empirical study. David Hume delivered a devastating critique of both these claims in *The Natural History of Religion* (1757) and *Dialogues Concerning Natural Religion* (1779). They made little immediate impact on the proponents of the argument; Paley mistakenly believed that he had answered Hume's criticisms. But they were a time bomb waiting to go off in the nineteenth-century debate on origins. The bomb was ticking in Gray's response to Darwin.

Gray, following the standard line of argument, contended that there was no third alternative between chance and design; natural selection certainly was not a viable one. How do we choose between these stark alternatives, Gray wondered. The only way that is open to us, Gray held, was inference since we can appeal neither to direct testimony nor revelation. The only proof of design is "adaptation to purpose." When we survey the world around us we discover that "Organic Nature abounds with *unmistakable* and *irresistible* indications of design." These adaptations "*compel* belief with a force not appreciably short of demonstration." [emphasis added] On the other hand, chance "heaps up improbabilities at every step beyond computation." In sum there really is no choice since "To us a fortuitous Cosmos is simply inconceivable.

The alternative is a designed Cosmos." That some people are unconvinced and that many difficulties attend this view, Gray did not deny; however, Darwin had introduced no new difficulties.⁶⁵ We shall see.

Gray's Dialogue with Daniel Treadwell on Design

Gray's difficulty in understanding that Darwin had offered an alternative to chance and design was further revealed in a dialogue he had with Daniel Treadwell, a friend, noted scientist and inventor, and member of the Cambridge Scientific Club. He had it reprinted anonymously in the September *American Journal of Science*. Gray rather self-confidently assured Hooker that the dialogue

is a bona fide discussion with a sceptical neighbor of mine, a man who hangs doubtfully on the skirts of atheism, and thinks Darwin's book will give him a firmer hold. I have confined myself strictly to answering his points -- which is easy enough. He might set me a vastly harder task if he knew how. But he is old-fashioned, has no doubt that design proves personality, and does not appreciate the subtle objections which may be raised and which are so difficult to answer to the satisfaction of all minds.⁶⁶

Gray failed to appreciate that Treadwell had given him "a vastly harder task" than he realized. The debate between Gray and Treadwell concisely captured the ambiguities of the broader cultural debate on the implications of the *Origin* for the traditional design argument.

Treadwell took the position of the skeptic who, being unable to believe in the existence of God on the basis of revelation, faith, or intuition, had adopted the design

⁶⁵DR, 415-417; ROS, 182-183.

⁶⁶Gray to Hooker, 21 August 1860, Kew, APS.

argument as the most rational basis for his belief in God. He had been persuaded by Paley and host of the Bridgewater treatises that the "wonderful adaptations of the different organs and parts of the animal body" could only be explained by design or chance. Since chance was clearly irrational, he was compelled to infer the existence of a God who had designed these adaptations.⁶⁷

Now, Treadwell asked, what would be the impact on this skeptic's belief in design upon reading Darwin's book? It would be devastating. He had formerly believed that design and chance were the only alternative explanations for the formation of the eye and other exquisite adaptations in the organic world. Darwin, however, "brings up another power, namely, natural selection, in place of this impossible chance. This not only may, but, according to Darwin, must of necessity produce an eye." The eye was the inevitable result of the invariable operation of Darwin's three great laws -- "natural variation, the struggle for life, and natural selection." Given the operation of these laws, the result was certain in the very same way that Newton's laws determined the path that a billiard ball hit by a white ball would take. A player did not *design* the ball to take that path; it took that path *necessarily*. In the same way, these three laws *necessarily* produce the adaptations we see. The results were not *intended*; they were the inevitable results of the operations of these laws. To be sure, such necessity may coexist with design, but the results would be the same even without design. The results *appeared* to be designed,

⁶⁷TRD, 227, 229.

but, in reality, resulted from the necessary operation of natural selection.⁶⁸

Would the skeptic, Treadwell asked, after reading how natural selection formed the eye, "infer the existence of the designer -- God -- when he can, at the same time, satisfactorily account for the thing produced, by the operation of this natural selection?" The answer was obvious: of course not. He was no longer compelled to choose between design and irrational chance; he had a plausible alternative to both. "It seems to me, therefore, perfectly evident that the substitution of natural selection, by necessity, for design in the formation of the organic world, is a step decidedly atheistical."⁶⁹

Treadwell cut off any escape from this conclusion by declaring that it was "vain to say that Darwin takes the creation of organic life, in its simplest forms, to have been the work of the Deity" since it had always been the "most complex forms of organization" that had served "as the crowning proof of the existence of an intelligent Creator." Once having abandoned the highest forms of organization, belief in design was doomed. "Some future Darwin will show how the simple forms came *necessarily* from inorganic matter." Case closed: natural selection spelled the death of the design argument as an air-tight proof for the existence of a Creator.⁷⁰

Gray's response fully revealed his own inability to comprehend Treadwell's

⁶⁸TRD, 228-29.

⁶⁹TRD, 229.

⁷⁰TRD, 229-30.

point. Treadwell had made it clear that *from the viewpoint of the skeptic* natural selection seemed to be a plausible alternative to both design and chance. He did no doubt that those who believed in the existence of a Creator *on grounds other than design* would easily be able to explain natural selection as the mode of the Creator's operation in the world. His point was rather that the *skeptic* was no longer epistemically compelled to infer a Designer from the wonderful adaptations in the organic world, as the design argument insisted. Natural selection was a plausible alternative to design.

Gray missed this entirely. He could not understand why the skeptic would give up design after reading Darwin's book. "All the facts about the eye, which convinced him that the organ was designed, remain just as they were. His conviction was not produced through testimony or eye-witness, but design was irresistably inferred from the evidence of contrivance in the eye itself. Now, if the eye as it is, so convincingly argued design, why not each particular step or part of the result?"⁷¹ He argued that natural selection merely altered the *mode* of design from *immediate* design to *mediate* design. Pushing the original impulse further and further back in time did not invalidate the argument that the entire process or sequence is itself designed, he pleaded.

Gray reminded Treadwell (and the skeptic) of the foundation of the design argument. He agreed that appeals to revelation, faith, intuition, or testimony could

⁷¹TRD, 238.

not be used as the epistemic basis for belief in design. It stands to reason that design can never be demonstrated or proved.

The only way left . . . is to infer the design from the result, or from arrangements which strike us as *adapted* or *intended* to produce a certain result, which affords presumption of design. . . . The probability of design will increase with the particularity of the act, the speciality of the arrangement or machinery, and with the number of identical or yet more of similar and analogous instances, until it rises to moral certainty, -- i.e., to a conviction which practically we are as unable to resist as we are to deny the cogency of a mathematical demonstration.⁷²

But this was the very point disputed by Treadwell's skeptic and Darwin. The eye no longer "struck" them as *intended* but only the result of necessary laws; the probability of design did not rise to the level of moral certainty.

Gray further challenged Treadwell's characterization of the necessary operation of natural selection. Natural selection, he pointed out, only operated on variations. Those variations were not produced by necessary laws; they were original impulses that could not be predicted on the basis of past experience. Those original impulses were "equally mysterious or unaccountable, except on the supposition of an ordaining will."⁷³ It is "gratuitous and unscientific" to claim necessity in these original impulses of organisms to vary only because your argument needs it there. Discovering more physical causes of the original variation will only take us "one step nearer to the

⁷²TRD, 230.

⁷³TRD, 233.

efficient cause."⁷⁴

But this move changed the form of the original argument and missed Treadwell's point completely. The original argument was based on an inescapable inference from adaptations to the existence of a Creator or efficient cause.

Gray now introduced an "ordaining will" as a supposition to explain the "mysterious" origin of the variations on which natural selection worked. No longer was the "ordaining will" the conclusion of an inductive argument, it was a major premise. Where had he derived this major premise since he had already refused to accept it on the basis of revelation, intuition, or faith?

Treadwell pinpointed Gray's failure to understand his argument and restated it with greater elaboration. He explained that he had tried to show how "*design and necessity*, as different and independent sources from which results, it might indeed be identical results, may be derived." His skeptic did not believe in design before he considered the eye. He rather found the evidence for design more persuasive in the case of the eye than for other organs. But when he read Darwin, he discovered that the eye

is no more than a vital aggregation or growth, directed, not by design nor chance, but moulded by natural variation and natural selection, through which it must, necessarily, have been developed and formed. Particles or atoms been aggregated by the blind powers of life, must become under the given conditions, by natural variation and natural selection, eyes, without design.⁷⁵

⁷⁴TRD, 234.

⁷⁵TRD, 237.

He realized that "the membrane [of the eye] was not thickened and rounded to the end that the image should be more distinct and colorless; but, being thickened and rounded by the operation of natural variation, *inherent* in generation, natural selection of *necessity* produced the result that we have seen."⁷⁶ This was Treadwell's argument in a nutshell. The same result could now be shown to have two equally plausible explanations, design and natural selection. While the skeptic may continue to believe that the eye was designed, he would not have the same confidence as before reading Darwin, which is all that Treadwell claimed.

Gray was already discovering, through his private correspondence with Darwin, that this was exactly Darwin's position. He had already learned that Hooker believed that Darwin's hypothesis compromised his views on creation and design far more than he was willing to admit. Natural selection, it turned out on Treadwell's reading, *had* introduced a new difficulty for the design argument, one that Gray, along with many others, failed to see.

Harmonizing Analogies

In light of his construction of Darwin's views, Gray offered Darwin several apt analogies on how natural selection could be harmonized with design. His first analogy compared the formation of the eye to the successive improvements in the telescope (Darwin's own example) and the steam engine. The critical element in the analogy, for Gray, was that Intelligence was essential for the formation of all three. It

⁷⁶TRD, 238.

mattered little, Gray argued, whether the "successive developments" in the steam engine were composed of small steps or led to completely new machines. Intelligence was required for both.

Though if machines could engender, the adaptive method would be most economical; and economy is said to a paramount law in nature.⁷⁷ The origination of the improvements, and the successive adaptations to meet new conditions or subserve other ends, are what answer to the supernatural, and therefore remain inexplicable. As to bringing them into use, though wisdom foresees the result, the circumstances and the natural competition will take care of that, in the long run. The old ones will go out of use fast enough, except where an old and simple machine remains still best adapted to a particular purpose or condition. . . . If there's a Divinity that shapes these ends, the whole is intelligible and reasonable: otherwise not.⁷⁸

In March Gray introduced the outline of his well-known streams analogy. In explaining how new species developed in domestic breeding, Gray argued that in "watching opportunities, and breeding from those individuals which vary most in a desirable direction, man leads the course of variation as he leads a streamlet, -- *apparently at will*, but never against the force of gravitation, -- to a long distance from its source, and makes it more subservient to his use or fancy. He *unconsciously* strengthens those variations which he prizes" by planting a favorite fruit, breeding the strongest animals, and even drowning the ugliest kittens. [italics added] This analogy was surprisingly close to the one Darwin himself introduced in his *Essays* of 1842 and

⁷⁷Gray is referring to Maupertuis's law of least action: "it is inconsistent with our idea of Divine Wisdom to suppose that God would use more power than was necessary to accomplish a given end." He first referred to this law in his Academy debate of 22 February 1860. Quoted in *Proc. Am. Academy* 4 (1857-1860), 177. Bentley Glass discusses "Maupertuis, Pioneer of Genetics and Evolution" in *Forerunners of Darwin: 1745-1859*, ed. Bentley Glass, Owsei Temkin, William Strauss, Jr. (Baltimore: The Johns Hopkins Press, 1959), 51-83.

⁷⁸ROS, 183-84.

1844. Gray was trying mightily to even introduce the *appearance* of design and final cause in human breeding efforts. It may have *appeared* in retrospect that the new species was foreseen by the breeder when the process was first begun. In reality, this was only *apparent* and *unconscious* since natural selection, like gravity, was an inviolable law. The new species resulted not from the foresight of the breeder, but from the operation of natural selection on the choices the breeder made at each step of the process. If Gray would have stuck with this analogy, he would have come very close to Darwin's meaning.⁷⁹

By October he had refined, elaborated, and changed the meaning of this metaphor. He advised Darwin

to assume, in the philosophy of his hypothesis, that variation has been led along certain beneficial lines. Streams flowing over a sloping plain by gravitation (here the counterpart of natural selection) may have worn their actual channels as they flowed; yet their particular courses may have been assigned; and where we see them forming definite and useful lines of irrigation, after a manner unaccountable on the laws of gravitation and dynamics, we should believe that their distribution was designed.

Darwin's "true line should be that his hypothesis concerns the *order* and not the *cause*, the *how* and not the *why* of the phenomena, and so leaves the question of design just where it was before." Gray shifted the focus of the analogy significantly. Now it was not the apparent leading of the human breeder that was the focus of the analogy, but the useful channels of irrigation which the streams produced that could be explained only on the basis of design. The emphasis in the March analogy was on the *appearance* of design that was

⁷⁹ROS, 166. Darwin told Gray that he was "charmed with your metaphor of the streamlet never running against the force of gravity." Darwin to Gray, 18 February 1860, CCD 8: 91-92. Darwin's "charm" would soon give way to outright rejection.

actually not designed; the emphasis in the October analogy was on prior design being the only rational explanation for the *appearance* of design. Gray's confusion on what could legitimately be inferred from *appearances* spoke directly to one of the central questions that Darwin's theory raised.⁸⁰

Gray offered numerous other illustrations to demonstrate that the evidence of design in nature was unaffected by the *mode* of its production, the *extent* of the causal links from the effects back to the Efficient Cause, or the differing *clarity* of design in various contrivances. It is true that "some arrangements in nature appear to be contrivances but may leave us in doubt. Many others, of which the eye and the hand are notable examples, compel belief with a force not appreciably short of demonstration. Clearly to settle that such of these must have been designed goes far towards proving that . . . less explicit adaptations in Nature must also have been designed, and clinches our belief, from manifold considerations, that all Nature is a preconcerted arrangement, a manifested design."⁸¹

Since Darwin had not provided a *vera causa* for variation, Gray had the perfect response from his theistic perspective: the Creator's will was the "something else" that guided variation, keeping it safe from the shoals of fortuity and "ominous" retrogression. This beguiling metaphor would figure prominently in his subsequent private correspondence with Darwin on design.

⁸⁰DR, 413-14.

⁸¹DR, 415.

Gray remained convinced that "the argument from design always appeared conclusive of the being and continued operation of an intelligent First Cause, the Ordainer of Nature." He was not, of course, "blind to the philosophical difficulties" such belief must confront, but he was certain that Darwin's hypothesis did not introduce any "new or peculiar difficulties."⁸²

In the opinion of many of his contemporaries and subsequent historians, Gray had provided a brilliant defense of the harmony between natural selection and design. But would Darwin and, by implication, all those others who believed that natural selection had sounded the death knell of the design argument, accept it? What form of theism had Gray succeeded in salvaging in his harmonizing proposals?

Shrinking from the Philosophical Brink

As confident as Gray at times seemed to be in having vindicated a theistic interpretation of Darwin's theory, there were definite signs of deep foreboding about the thrust of the philosophical implications of Darwin's derivation hypothesis. His questions to Hooker the previous summer and fall kept coming back in his analysis, particularly in his *Atlantic Monthly* articles, mounting to a crescendo of "whys." Why this persistent compulsion, "these anxious endeavors," "this continual striving" to pull back the veil shrouding our origins? Why are we unable to be content with the traditional view in which we "intuitively referred" the incomprehensible to the supernatural? What can be gained from such searches since the origin of things necessarily lies in obscurity?

⁸²DR, 415.

Gray initially answered that the triumph of physical science in the inorganic realm emboldened the human mind to "unveil" the laws of the organic realm in the same way. Supernatural explanations only spurred deeper and deeper penetration of the alleged mystery. We cannot stop the questions; we can only adjust to them.⁸³

This initial answer became much more anxious when he considered the "inexorable" implications of Darwin's position. There did seem to be some grounds for hope in the future with natural selection always working for the betterment of life. Yet, on Darwin's own account, the slightest deviations could have "ominous" consequences. As we gaze into the past we are unsettled by the "inevitable" convergence of the lines of descent. ". . . . [It] is hard, if not impossible, to find a stopping-place. Some of the facts . . . impel the theory onward with accumulated force So the Darwinian theory, once getting a foothold, marches boldly on, follows the supposed near ancestry of our present species farther and yet farther back into the dim past, and ends with an analogical inference which 'makes the whole world kin.'" How can we account for this? How should we respond? Nagging questions all.⁸⁴

Darwin did little to quell Gray's anxiety. Indeed, he added to it. He followed this "inexorable leading" by moving from the modest claim that species were mutable to the radical claim that all plants and animals were lineal descendants from at most four or five progenitors. Darwin tapped in "the thin end of the wedge" in the beginning of his book only

⁸³DOS, 112.

⁸⁴DOS, 110-111, 116.

to drive it home at the end. Gray wondered why Darwin must "press his theory to these extreme conclusions?" "Why should a theory which may plausibly enough account for the diversification of species . . . be expanded into a general system for the origination of successive diversification of all species?" How could Darwin possibly believe that "psychology will be based on a new foundation, that of the necessary acquirement of each mental power and capacity by gradation?" The only conclusion that Gray could draw was that the promise of a unified explanation for heretofore unexplainable phenomena had such a "strong hold upon the speculative mind" that it ignored how "cumbered prima facia [it was] with cumulative improbabilities ."⁸⁵

Pondering the "menacing" prospect of Darwin's view, Gray turned expectantly to the views of Francois Jules Pictet, the Swiss paleontologist, who was one of the few people whose criticisms Darwin respected. Pictet accepted much of what Darwin had said, but rejected the final conclusion. Gray asked the key question: how was it possible, having once accepted Darwin's premises, to reject his conclusions? Pictet seemed to believe that he could "draw a clear line between sound inferences . . . and the unsound . . . theoretical deductions, which he rejects. We hope he can."⁸⁶ Gray's fear was that he could not.

Gray's questions were more than rhetorical; they represented a longing for answers that would satisfy his own deepest questions about the implications of Darwin's hypothesis. He feared the consequences of following his hypothesis: but he could find no satisfying way

⁸⁵DOS, 116; DR, 229-230; DR, 423-24.

⁸⁶DOS, 230.

to avoid them. He felt compelled by the logic of Leibnitz's *lex continua*, the "fine gradations" in Nature, to bring all events and processes in the natural world under the reign of natural law, yet he resisted the implications this harbored for God's knowable role in Nature. The logic of physical science seemed to pursue the chain of physical causes as far as possible, yet he felt uneasy with the remoteness of the Efficient Cause. The uniformity of nature held as much attraction for Gray as it did for Darwin, yet Gray was uncomfortable with extending its logic *ad infinitum*. He was *personally* still confident that design was compatible with Darwin's hypothesis, but many of his most respected colleagues, and even Darwin himself, were not convinced. His broad survey of Darwin's critics was a search for someone, especially a philosopher or theologian, whose criticisms could penetrate to the core of his troubling questions about Darwin. He found none. The weak arguments thrown up against Darwin which he so easily dismissed, disillusioned more than delighted him.⁸⁷ Gray intuitively sensed that absolutizing the immanent causal chain held uncomfortable implications for theology, yet he was unable to penetrate to the core of this discomfort.

Gray had offered a sophisticated gloss of the *Origin* to show that, at the very least, it was a plausible scientific hypothesis based on many facts and was compatible with some version of theism and the design argument. He had wished for more, but this was all he could legitimately hope to establish. His analysis of the *Origin* was by all accounts the most penetrating to have appeared. Gray did not have to wait very long to learn how Darwin

⁸⁷DR, 408-409.

would respond to his eloquent efforts to save the appearance of Darwin's scientific and theological orthodoxy.