Natural Selection, Teleology, and the Logos

From Darwin to the Oxford Neo-Darwinists, 1859–1909

By Richard England*

TODAY DARWINISM is popularly considered atheistic. Its best-selling modern proponents, Richard Dawkins and Daniel Dennett, claim that it has rendered the deity superfluous, that it is a “universal acid” that has eaten through religious belief and demoted religion’s outward forms to cultural curiosities.¹ Historians have offered little comfort to the orthodox. While they note that Darwinism, like any “ism,” has had many different meanings and manifestations, the tale they tell emphasizes the shift from natural theology to the triumph of “the philosophy of naturalism inherent in the Darwinian approach to nature. . . .”² The theory of evolution by natural selection is identified with naturalism. The counterexamples presented in this essay reveal that this has not invariably been the case. To begin the discussion I briefly trace the path from the religious sources of some of Darwin’s own early theories to the religious reinterpretation of natural selection by some of his late nineteenth-century followers.

It is well known that Darwin was influenced by religious sources, especially the natural theology of the late eighteenth century. His attention to adaptation was directed by his reading of a famous book by William Paley (1743–1805), *Natural Theology* (1802), and his conception of natural law owed a debt to the tradition of liberal natural theology that followed Paley. Darwin chose the words of the philosopher of science William Whewell (1794–1866) as an epigraph for the *Origin of Species* (1859). God acts, Whewell wrote, “not by insulated interpositions of Divine power . . . but by the establishment of general laws.” In his approach to adaptation and to natural law, Darwin drew on natural theology. Despite such directly religious sources, however, Darwin’s theory developed into a way of explaining natural purpose without reference to a supernatural creator. As David Kohn argued in his essay

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2. Peter Bowler, *The Eclipse of Darwinism* (Baltimore: Johns Hopkins Univ. Press, 1983), p. 44. (Naturalism is the idea that everything that is belongs to the realm of nature.)

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*Osiris*, 2001, 16:00–00 270
“Darwin’s Ambiguity: The Secularization of Biological Meaning” (1989), Darwin “secularized” biology.³

Religious elements operated in producing the theory of natural selection, only to be explicitly disowned in the completed theory. Adaptation is a phenomenon that can be described in religious or scientific language. Words used to describe this phenomenon in one of these languages (e.g., “perfect,” “universal”) can be translated into the other and may survive a further process of retranslation back into the first language. Meanings may, of course, change with the context. Some late Victorian neo-Darwinists in Britain recaptured and reworked Darwin’s emphasis on universal adaptation to prove the supremacy of natural selection as an evolutionary mechanism and to demonstrate its compatibility with Christian belief. While they accepted that natural law could be interpreted in a wholly naturalistic light, they drew on the vestigial religious elements that remained in Darwin’s theory to reenvisage adaptation in a new religious light.

In his Post-Darwinian Controversies (1979), the historian James Moore argued that nineteenth-century orthodox Christians who accepted Darwin’s theory were able to do so because it was founded on Paleyan teleology and Malthusian theology.⁴ Darwinism was built on the assumptions of an orthodox theology of nature. James Moore has now moved away from this position, which, he notes, depends on ahistorical categories of “orthodoxy” and a metaphysically neutral “Darwinism.”⁵ Until recently, most other scholars held that religious beliefs interfered with the acceptance of natural selection as an evolutionary mechanism. In this essay I argue that, on the contrary, Darwin’s revision of Paley’s teleology emphasized aspects of adaptation that were seen by a few Oxford neo-Darwinists to confirm their Christian belief, in effect reinforcing rather than undermining their scientific commitment to the theory of natural selection. Their view of natural selection was partly shaped by the religious ideas that had had a role in Darwin’s early theorizing.

At Oxford, the entomologists Edward Poulton (1856–1943) and Frederick Dixey (1855–1935) defended natural selection through the long “eclipse of Darwinism” in the decades around 1900. At the same university, Aubrey Moore (1848–1890), a liberal High Church Anglican canon, recognized that Darwin had described the universal, natural laws that produced the phenomenon of universal adaptation observed in living nature. Moore saw this as a “wider teleology,” which Christians could use to confirm, though not to prove, their belief that God acted constantly throughout nature. Natural selection, like all natural laws, was evidence of the action of the indwelling Logos, the second person of the Trinity: the facts of nature were the acts of God. Poulton and Dixey were both Anglicans, and they accepted Moore’s view of the religious significance of the theory they championed. Of course, in an age when the study of science was becoming a professional discipline, its students self-consciously censored its earlier connections with religion.⁶ Any scientific expression of

⁴ James Moore, The Post-Darwinian Controversies (Cambridge: Cambridge Univ. Press, 1979), pp. 332–3, 344–5. James Moore is not to be confused with the neo-Darwinist Aubrey Moore (1848–1890), whom I also discuss in this chapter.
⁵ Personal communication, 12 Oct. 1999.
the compatibility of natural selection with a Christian view of divine immanence was muted. The claims made were modest and were kept out of scientific papers. However, in addresses and book reviews, the religious ideas Darwin had built upon were brought to the fore in these neo-Darwinists’ reading of teleology.

**RELIGIOUS ELEMENTS IN THE DEVELOPMENT OF DARWIN’S THEORY**

In studying the role of Darwin's religious opinions in the development of his science, most commentators have explored the question of how the late eighteenth-century British varieties of natural theology affected his thought. Phillip R. Sloan, however, in his contribution to the present volume, makes a powerful case for the additional influence of the German naturalist Alexander Humboldt’s Romantic, pantheistic conception of nature. During the early period of his life, Sloan asserts, Darwin’s belief in a “creative power” in nature “carried many associations that he would later in life recall as ‘intimately connected with a belief in God.’” The fact that Darwin located creative force within nature may have helped later neo-Darwinists to reconcile his theory with an immanentist theology. In this section I focus on two common findings in Darwin scholarship that are directly relevant to late Victorian neo-Darwinism. The first is that Darwin’s early view of the “perfection” of adaptation was shaped by his understanding of William Paley’s natural theology; the second is that his view of the efficacy and action of natural selection was framed, in his early work, by the belief that there was a divine source for natural law.

In 1838 Darwin sought the source of the “perfect” adaptation of organisms to their environment: the idea of perfection arose from the tradition of natural theology, which saw all creatures as specially created and designed by God. Every structure was supposed to have a function to which it was perfectly adapted. Scholars differ over the importance of this tradition to Darwin. Dov Ospovat, in *The Development if Darwin's Theory* (1981), claims that Darwin completely abandoned the conception of “perfect adaptation” for that of adaptation only as perfect as required by an organism’s particular situation. John Cornell, in “Newton of the Grassblade: Darwin and the Problem of Organic Teleology” (1986), suggests that theistic metaphysics of perfection are still present in the *Origin of Species*.

As Stephen Jay Gould argues in his essay “On Transmuting Boyle’s Law to Darwin’s Revolution” (1998), Darwin’s theory is an evolutionary subversion of the adaptationist arguments of natural theology. Both natural theology and natural selection focus on the apparent adaptation of structure to function, and both derive their power to convince from their explanation of this phenomenon. Gould draws parallels between Darwin’s evolutionary focus on adaptation and Robert Boyle’s (1627–1691) theological focus on the same phenome-

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8 See Sloan's chapter “The Sense of Sublimity: Darwin on Nature and Divinity.”

non and suggests that the continuity reflects an “anglophonic preference for adaptationism.”

Gould is correct in pointing out that the idea of perfect adaptation is not an inherently religious idea. This is evident from the fact that Georges Cuvier (1769–1832) thought animals perfectly adapted. Jean-Baptiste Lamarck (1744–1829) also tried to explain adaptations. Darwin, however, encountered the idea of perfect adaptation in the specifically religious context of natural theology, and so continued to emphasize the universality of adaptation.

This focus on perfect adaptation made Darwin limit the scope of natural selection in the early versions of the theory of evolution. In 1837 Darwin held that natural selection acted only when changes in the environment necessitated changes in the perfect adaptations that organisms had previously evolved. As John Brooke puts it, in “The Relations between Darwin's Science and His Religion” (1985), “Nature was . . . regarded as a harmonious system for the preservation of adaptation.”

Ospovat finds traces of this view in Darwin’s writings up to and including his “1844 Draft.” After this time, however, Darwin developed a “relative” view of adaptation, which he described in the sixth chapter of the Origin: “Natural Selection tends only to make each organic being as perfect as, or slightly more perfect than, the other inhabitants of the same country with which it has to struggle for existence.” In the Origin, then, it seems that perfection is relative to an organism’s competitors and environment. However, Darwin did not wholly abandon the emphasis on the perfection of adaptations.

He wrote that natural selection could explain “organs of extreme perfection” such as the human eye. In such explanations, every stage of the eye’s development could be shown to have conferred some adaptive advantage on its possessor. Throughout the Origin Darwin emphasizes the adaptation of structure to function. To some of his later readers, Darwin appeared to argue for the utility and purpose of almost all organic structures. He would later regret his emphasis on the universality of utility, which he ascribed to his former allegiance to natural theology:

I was not able to annul the influence of my former belief, then almost universal, that each species had been purposely created; and this led to my tacit assumption that every detail of structure, excepting rudiments, was of some special, though unrecognized, service.

Although Darwin came to believe that adaptations were only more or less perfect relative to an organism’s environment, he shared Paley’s focus on the marvelous fitness of all structures to particular functions. Darwin’s ongoing emphasis on the universality of adaptation is a vestige of the natural theology that informed his idea of perfect adaptation in 1837. In addition, as Ospovat has noted, when Darwin uses

11 Ospovat, Development (cit. n. 7), pp. 44–5.
the word “perfect,” he often uses it to point out the admirableness of some adaptation, without implying that its perfection is in any way absolute. That said, such a use of “perfect” implies a nature worth admiring and marveling at: Darwin shared Paley’s humility before nature, and as a result it is no wonder that some passages of the *Origin* read like the Psalms on the glories of the Creation. Some of Darwin’s disciples of the late nineteenth century continued to focus on the marvelous utility of all organic structures: such “perfection” they claimed, could only be explained by natural selection. Just as Paley had emphasized the ubiquity, marvelousness, and perfection of adaptations, so did the neo-Darwinians, who read the same kind of descriptions of adaptation in the *Origin*. Even though they, like Darwin, abandoned the idea of absolute and unchanging perfection in organisms, some found it possible to admire universal adaptations as the work of the Christian God.

Recent studies have also emphasized the religious quality of Darwin’s view of natural law. John Cornell locates Darwin in the “Newtonian metaphysical tradition,” which saw the natural world as the product of a “divine arrangement of universal laws.” Similarly, Kohn has noted that although Darwin secularized biological meaning, he still held that “the laws of nature were impressed on matter by a Creator.” These views were not new, of course, with Darwin: natural theologians had long insisted that God accomplished his purposes through the ordering and arrangement of natural laws. The astronomer John Herschel (1792–1871) had called the law by which the Creator brought new species into being the “mystery of mysteries” and may have encouraged Darwin to seek it out. It is true that Darwin was also influenced by the positivist philosophy of Auguste Comte (1798–1857); however, as Neal Gillespie has suggested, Darwin’s take on positivism only committed him to a naturalistic and lawful science, not to atheism: at this time Darwin could still “deal with the idea of God or . . . see him as the Creator of the laws of nature.” While such views about the relationship between the Creator and the Creation were more deistic than theistic, they were, as Kohn has said, still a part of the religious map of early nineteenth-century England. Some liberal Anglican theologians (including the Oxford mathematician Baden Powell [1796–1860]) thought that this conception of natural law was compatible with Christianity. As sources of divine action, natural laws were more than described regularities: they were divinely prescribed universalities: natural law was designed to accomplish divine purpose by its universal and undeviating action.

Darwin at first considered natural selection to be a natural law, but he came to hold rather different views by the time the *Origin* was published in 1859. He wrote to his American follower Asa Gray (1810–1888) in 1860, “I cannot think that the

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Dov Ospovat, “God and Natural Selection: The Darwinian Idea of Design,” *J. Hist. Biol.* 13 (1980):169–94, p. 190, n. 69. Ospovat notes that this laudatory use of the term “perfection” is quite different from Paley’s idea of perfection as the absolute result of an omnipotent God’s design. In practice, however, the various senses of the word slip into one another. This also occurs with the word “perfect”: even a “relatively perfect” adaptation can be admired as a marvel of nature or of divine creation.


Ibid., pp. 222–3.


Cornell, “God’s Magnificent Law” (cit. n. 7).
world, as we see it, is the result of chance; and yet I cannot look at each separate thing as the result of Design.” Darwin wrestled with the idea that natural laws were designed by God, but that the details of particular events and contingencies were simply the working out of those general laws, and so not designed. He recognized that there were inconsistencies in this view (How could an omniscient God be kept out of the details?) and never came to a firm conclusion on this matter. In the last year of his life, Darwin thanked the philosopher William Graham (1839–1911) for his Creed of Science but could not agree with him

that the existence of so-called natural laws implies purpose. . . . Would there be purpose if the lowest organisms alone, destitute of consciousness, existed on the moon? But I have had no practice in abstract reasoning, and I may be all astray. Nevertheless you have expressed my inward conviction . . . that the Universe is not the result of chance. But then the horrid doubt always arises whether the convictions of man's mind, which has been developed from the mind of the lower animals, are of any value or at all trustworthy.23

Darwin's “horrid doubt” kept him from believing that God could have any role in nature, although he had an “inward conviction” that nature was not the result of chance. Even in his late agnosticism Darwin sometimes felt the power of the argument that natural laws, including those behind natural selection, were ordained by God. In 1885 the duke of Argyll (1823–1900) recalled a conversation with Darwin on this matter. Argyll insisted that adaptations must be the expression of a divine mind. Darwin replied, “Well, that often comes over me with overwhelming force; but at other times . . . it seems to go away.”24 If the agnostic Darwin appreciated this argument to a limited extent, his Christian neo-Darwinist followers were, as we shall see, more enthusiastic. As with the emphasis on perfect adaptation, a natural theological argument survived its translation into a naturalistic evolutionary theory to be resurrected in a religious reading of natural selection at the end of the nineteenth century.

Although Darwin had used religious ideas in developing his theory, he had no substantive place for a traditional God in the process of natural selection. Certainly the development of Darwin's own agnosticism owed something to the fact that he came to believe that natural law alone was sufficient to explain all natural phenomena. In Darwin's opinion it was impossible for human beings to know the source of that natural law. However, a few religious neo-Darwinian commentators reintroduced the Christian God to natural selection.

TELEOLOGY REVISED

Darwin described adaptation as an entirely natural phenomenon. As James Lennox has noted, before 1859 there had been two alternative views of purpose in nature: a

Platonic, external teleology and an Aristotelian, internal one. An external teleology supposes an agent outside of nature that arranges material within nature for its own purposes. The Demiurge of Plato’s *Timaeus* is an agent of this sort, as is the “Nature” of the Stoics and the God of the British natural theologians. Those who attempted to introduce a transcendent God who directed evolution also used an external teleology. An internal teleology describes an inherent tendency to achieve a certain goal, without reference to the intentions of an external agent. Aristotle’s view of purpose in nature is restricted to organic structures and explains the existence of such structures as due to their contribution to the organism’s life. This mode of immanent teleology was continued by nineteenth-century German *Naturphilosophen* and some of their successors.

Darwin explains the existence of organic parts and processes neither in terms of God nor in terms of inherent tendencies but as the result of the contingent interaction of organisms and their circumstances. As Lennox puts it, natural selection is teleological “in the sense that a value consequence (Darwin most often uses the term ‘advantage’) of a trait explains its increase, or presence, in a population.” This might be called a “natural,” or “Darwinian,” teleology. It is, of course, an explanation of the appearance of design without any reference to a Designer. Natural purpose was the result of a natural process, so there could be no external teleology. Darwinian teleology resembles internal teleology more than external teleology (although there remain fundamental differences). Both Darwin and Aristotle seek the source of organic adaptation in nature itself, not in some superintending external agent.

Darwin discomfited many who had believed that science and religion could be brought together through a Paleyan natural theology, and he delighted those who had believed that Christianity was false. In 1859 the positivist Harriet Martineau (1802–1876) described the *Origin* as “overthrowing . . . revealed Religion on the one hand, & Natural (as far as Final Causes & design are concerned) on the other.” At the opposite end of the religious spectrum, theologians such as the Presbyterian Charles Hodge (1797–1878) recognized that Darwinism did away with the external teleology of the design argument, and so Hodge identified Darwinism with atheism. Religious reactions to Darwinism were as diverse as opinions on many other issues. However, many historians assume that those theologians who “accepted” Darwinism were somehow ducking its naturalistic implications. David Kohn, for


example, in his article “Darwin's Ambiguity,” groups Protestant reactions to Darwin under the title The Varieties of Religious Ambiguity.31 Frederick Gregory, surveying the same reactions in “The Impact of Darwinian Evolution on Protestant Theology in the Nineteenth Century” (1986), concludes, “Unquestionably the attempt to reconcile evolution and Christianity depended on a rejection of natural selection as the mechanism of evolution.”32 James Moore’s thesis, in Post-Darwinian Controversies (1979), that “orthodox” Protestants could accept evolution by natural selection is no longer defended. The way seems clear for those who would assert that the Darwinian theory of natural selection, properly understood, is incompatible with religious belief.

Darwin indeed translated some religious readings of nature into an entirely secular theory, but some of his followers retranslated natural selection into a revised theology of nature. James Moore called such thinkers “Christian Darwinians” and claimed that they could accept Darwinian evolution. Referring to their work, James Lennox, in his essay “Teleology” (1992), notes that “Darwin’s Calvinist followers insisted on interpreting teleology along Platonic, natural theological lines. The idea of a natural teleology of a more Aristotelian variety was not what they had in mind.”33 Lennox rightly identifies a common flaw in Christian interpretations of Darwinian teleology: these Christians often attempted to maintain an external teleology rather than coming to terms with Darwin’s fundamental reworking of adaptation as the result of a wholly natural process. Other Christians, like Aubrey Moore and his neo-Darwinist friends in Oxford, did accept a “natural teleology of a more Aristotelian variety.” As Moore put it, “Modern science seems . . . to be moving in the Aristotelian direction, which is so far Christian.”34 Moore did not try to interpret Darwin in terms of Aristotelian internal tendencies, but he did recognize that a non-external view of teleology was necessary. The distinctiveness of this approach is best seen in contrast with one of the better-known attempts by a Christian to reconcile natural selection with an external teleology.

The American botanist Asa Gray, Darwin’s friend and popularizer, believed that natural selection and natural theology were not inconsistent. God’s design might still be seen in the nature of individual variations. In the early 1860s Gray claimed that variations might be “directed” along certain beneficial lines. Natural selection would then act as a kind of secondary sifting mechanism in evolution, separating the beneficial from the nonbeneficial variations in nature. While admitting evolutionary change and a role for natural selection, Gray’s view ultimately attributes evolution and adaptation to the direction of an external power: God.

Darwin, though at first enthusiastic about Gray’s views, came to reject this religious recasting of natural selection. His objections are most clearly stated in his famous “stone house argument,” which he advanced in 1868. The relationship between natural selection and variation was analogous to that between an architect and the stones found at the bottom of a cliff. Certainly natural laws (of geology, erosion, etc.) determined the shape of the stones that fell from a cliff, but to the architect

selecting stones for the walls of a house, the stones’ shapes were essentially random. The source of design was not variations directed by God, but the “architect” natural selection, which necessarily made the best of whatever natural variations were available. Natural selection, granted the phenomenon of “omnifarious,” undirected variation, could explain teleology without reference to a supernatural agent. Gray and Darwin never agreed on this matter. Indeed, in 1883, a year after Darwin’s death, Gray repeated his argument in the pages of Nature. However, Darwin’s disciple, George Romanes (1848–1894), defended his master’s view of design, citing Darwin’s stone house argument at length. There was no evidence that variations were directed by an external agent. Any claim that God did drive evolutionary change must be supported by proof that variation was driven in beneficial directions. Until that proof was forthcoming, Romanes argued, the scientific position must be to assume that no external agent was involved: variations simply happened, without any reference to the needs of organisms. Romanes’ verdict foreshadows a dominant paradigm in our own time, the view that faith and science stand at variance.

Romanes was a biologist who had lost his faith because Darwinism seemed to make Christian belief logically indefensible. However, in 1889, six years after his controversy with Gray, he claimed that there was a reasonable way in which theistic belief and Darwinism could be considered compatible. His change of heart sprang from his encounter with a new way of reading Darwin’s naturalizing of the origins of teleology.

**THE WIDER TELEOLOGY: AN ALTERNATIVE TO EXTERNAL TELEOLOGY**

Romanes was inspired by the work of Aubrey Moore, honorary canon of Christ Church, Oxford, and a contributor to *Lux mundi*, a landmark work at Anglican apologetics (1889). Moore was a historian of the Reformation, a tutor at Keble College, a lecturer on Aristotle’s *Ethics*, as well as an accomplished amateur botanist. Moore’s place as a reconciler of diverse traditions is symbolized by his friendships with both Romanes, Darwin’s disciple, and Henry Parry Liddon (1829–1890), confidant of the Oxford Movement leader Edward Pusey (1800–1882). Moore, as a member of the Anglo-Catholic branch of the Church of England, had no use for Paleyan natural theology: for him the source of religious belief and authority was not to be found in such evidence. He held that the true faith came from the universal, apostolic church, not from arguments from nature. Natural theology had long been viewed by High Church Anglicans as more supportive of deism than of Christian orthodoxy, and therefore as one more argument that was the property of heterodox theists.

Moore’s philosophical position was another factor that made him unsympathetic

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38 Romanes, “Natural Selection and Natural Theology” (cit. n. 37); see also Moore, *Post-Darwinian Controversies* (cit. n. 4), pp. 271–80.
to Paleyan natural theology. As a student at Oxford of the philosopher Thomas Hill Green (1836–1882), Moore had been inspired by an idealist epistemology. Green argued that John Stuart Mill (1806–1873) and the empiricists implicitly assumed an organizing principle that made possible a connection between human thought and the real world but were unaware of their own assumption. According to Green, nature and human understanding of nature shared in a common organizing, spiritual principle. 41 The epistemology he developed allowed him to replace the idea of a transcendent and historically localized God with an “immanent spirit” that bound together all knowledge and all human society. Moore and his fellow Anglo-Catholics seized on Green’s criticism of Mill and saw in Green’s “immanent spirit” the constant presence and action of the Logos, the second person of the Trinity, in the world. With this kind of immanentalist philosophical position, it is little wonder that Moore dismissed any natural theology that removed God from nature and looked more closely at how contemporary scientists were describing natural processes.

As an observer of science and an apologist for his faith, Moore knew that Darwinism was commonly associated with unbelief. He thought that a fearless, wholly Christian interpretation of Darwinism was needed to show that evolution by natural selection, like all true scientific theories, could be assimilated into a wider, fundamentally religious vision of nature. Moore undertook this project in a series of essays written in the 1880s in the Guardian, a weekly High Church religious newspaper.

He was impressed by an observation by Thomas Henry Huxley (1825–1895), who wrote that although Darwinism had certainly struck down Paley’s view of teleology it had revealed “a wider teleology which was not touched by evolution, but which is actually based upon the fundamental proposition of evolution.” 42 This “wider teleology,” as Aubrey Moore described it, consisted of the facts that natural law ruled everywhere in nature, and that, according to the theory of natural selection, natural purpose, or adaptation, was the invariable result of natural selection in living beings. Moore believed that the strictly natural phenomenon of Darwinian teleology suggested a more Christian theology of nature than had Paley’s somewhat deistic claim that nature was designed by an external Creator:

Science had pushed the deist’s God further and further away, and at the moment when it seemed as if He would be thrust out altogether, Darwinism appeared, and, under the guise of a foe, did the work of a friend. It has conferred upon philosophy and religion an inestimable benefit, by showing us that we must choose between two alternatives. Either God is everywhere present in nature, or He is nowhere... In nature everything must be his work, or nothing. We must frankly return to the Christian doctrine of direct Divine agency, the immanence of Divine power in nature from end to end, the belief in a God in whom not only we, but all things have their being, or we must banish him altogether. 43


Darwinism banished the near deism of Paleyan natural theology and opened the way to an immanentist theology of nature more compatible with Trinitarian Christian doctrine. Darwin had shown that there were no exceptions to natural law in biology. Many Christian apologists felt that a defense of orthodoxy involved the indications of gaps in the natural order where divine intervention must be invoked. However, Moore felt that this quest for a God of the gaps was deistic rather than Christian. With Saint Athanasius, Moore held that “the facts of nature are the acts of God.” Natural law itself could be interpreted as a manifestation of direct divine action. Moore here was treading in the footsteps of the architect of modern science, Isaac Newton (1642–1727), but, unlike Newton, the Anglican Moore translated law-like divine action into a Trinitarian idiom. The uniformity of nature could be seen as the result of the ongoing action and presence of God in His Creation. Darwin, by proving that all organic structures developed by the natural law of natural selection, had in effect, extended human understanding of divine action.44

Moore did not claim that this was the only way of interpreting natural law. He felt that those who already believed in the immanence of God could see the universality of natural law as a confirmation of their preexisting belief.45 In a letter written in 1888 Moore wrote, “We really bring to Nature much that we afterwards find verified in Nature, and I don’t feel sure that Paley knew this.”46 Others, who did not share Christian belief, would see only natural law. Agnostics and Christians alike could accept the universality of natural selection. The “wider teleology” of Darwinism was open to both theistic and atheistic readings, unlike the explicitly religious external teleology of natural theology.

The idea of a “wider teleology” was drawn from those parts of the theory of natural selection in which the young Darwin himself had been guided by religious sources: adaptations appeared to be universal throughout nature, and God acted by natural law alone. To Moore it did not matter that adaptations were not “absolutely” perfect. As long as natural selection was fitting structures to functions, or organisms to changing circumstances, natural laws were working out natural purposes. Laws of cause and effect were universal throughout nature. Everywhere the neo-Darwinist looked in nature, he could see marvelous adaptations and explain them in terms of a natural process. These points, which seemed to Darwin to justify at most an extreme deism, Moore translated in an immanentist light. It has been suggested that Moore somehow avoided the force of Darwinism by adopting this immanentist argument, but the best evidence that he had appreciated religious ideas inherent in Darwinism comes from the positive reactions of Darwinian scientists of his day and from their subsequent use of these religious ideas in their science.47

Romanes, who, with Darwin, had attacked theistic evolutionists such as Asa Gray, praised Moore during an 1889 Aristotelian Society symposium on the evidence of

design in nature. Moore, he said, unlike Gray, had not attempted to read an external teleology into Darwinian evolutionary theory but had shown the theory nonetheless compatible with Christian belief. Romanes rejected two extreme positions: that Paley's natural theology was untouched by Darwin's theory of evolution, and that Darwin's theory had destroyed all evidence of design in nature. He cited Moore's view that "the counterpart of the theological belief in the unity and omnipresence of God is the scientific belief in the unity of nature and the reign of law" and noted with approval that this view could only be held by those who already had faith. Romanes concluded,

Hence the one man [a believer] is as logically justified in seeing the evidence as the other man [a nonbeliever] is in not seeing it. . . . The question, "Is there Design in Nature?" has been referred from the lower courts of objective fact to the supreme courts of subjective personality; and there it stands to be decided by each man for himself at the tribunal of his own judgement.

Romanes, who remained a wavering agnostic until the last few weeks of his life, accepted that his interpretation of the religious significance of natural law was as rational as Moore's. Moore's view of teleology recognized the sufficiency of natural selection as an evolutionary mechanism and abandoned natural theology as a source of any independent evidence for religion. The apologetic value of his work lay in the fact that it described a reasonable religious interpretation of natural selection. Its status as a natural process was in no way threatened by the belief that natural laws were the direct result of divine action. Moore died in January 1890, little more than a month after Romanes had so wholeheartedly echoed Moore's view of the "wider teleology" at the Aristotelian Society symposium. Romanes, who had just moved to Oxford, called Moore's early death a "loss to Darwinism on its popular side" and lamented that he himself had not only lost a friend but "one whose rich stores of knowledge and thought had just begun to open such possibilities in the way of adding to my own." Romanes returned to a form of theistic belief on his deathbed in 1894, a fact suggestive of Moore's success in bringing out the religious resonances of the theory that had driven Romanes from his childhood faith.

RELIGIOUS ELEMENTS IN NEO-DARWINISM, 1890–1910

The zoologist E. Ray Lankester (1847–1929), perhaps the most important turn-of-the-century neo-Darwinist in Britain, was a Marxist and an atheist, yet he too appreciated Moore's approach. He rejected Christianity for a variety of reasons, but he considered Moore's essays "excellent" and in 1888 commended them in a brief

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50 Romanes et al., “Evidence of Design” (cit. n. 48), p. 76.
51 Romanes to Sir James Paget, 18 Jan. 1890, Romanes Collection, American Philosophical Society, Philadelphia.
review in *Nature.*52 Moore's religious approach to Darwinian teleology was admired still more by those neo-Darwinian scientists who shared his Anglican faith.

Oxford was home to a school of neo-Darwinism during the widespread "eclipse" of Darwinism around the turn of the century. Many scientists supposed natural selection incapable of explaining evolution and promoted alternative mechanisms such as the neo-Lamarckian inheritance of acquired characteristics, or mutations that resulted in large evolutionary leaps from one form to another.53 This school viewed natural selection as the only mechanism that could explain adaptation. These neo-Darwinists' adherence to natural selection and their rejection of all other evolutionary mechanisms arose from an unwavering focus on adaptation as the natural phenomenon that any evolutionary theory must explain. Mechanisms such as the neo-Lamarckian theory of the inheritance of acquired characteristics or the mutationist view of radical genetic leaps between generations were unacceptable because they could not explain the nearly perfect adaptations that occurred everywhere in the living world. Given this scientific focus, it is not surprising that two members of this school, Edward Poulton and Frederick Dixey, both Oxford University entomologists, Anglicans, and both friends of Moore, welcomed his religious rereading of Darwinian teleology.

Poulton had been a science tutor at Keble College at the same time as Moore (1880–1888) and in 1882 had converted from the Quaker faith of his parents to Anglicanism. He wrote many articles on insect mimicry, fiercely defending natural selection against rival evolutionary mechanisms. A colleague recalled "friendly swordplay" in the common room between Poulton and Moore as they discussed the relationship between science and theology.54 Poulton was of a much later generation than the scientific warriors of the X-Club, like Huxley and John Tyndall (1820–1893), whose fencing with theologians had been more deadly in intent. He never wrote on the relationship between teleology and Darwinism directly, but he did publicly maintain that Moore's view was the right one. He praised Moore on numerous occasions. As late as 1937, as president of the British Association for the Advancement of Science, Poulton praised Moore's work as evidence that the Anglican Church had accepted Darwinian evolution in the 1880s.55

Poulton's friend and fellow entomologist, Dixey, wrote more directly on the relationship between Darwinian science and the Christian faith. Like Poulton, Dixey was an entomologist interested in phenomena of protective coloration: this research subject in itself of course suggested the importance of explaining the marvelous adaptations of nature. However, this scientific view was likely reinforced by the fact that Moore had shown that Darwinism need not be a source of religious difficulties. At a time when neo-Darwinists were in the minority and alternative evolutionary mechanisms were gaining empirical support from an increasing number of laboratory-based studies, this religious factor at least suggested to them that Darwin-
ism could be held, and defended, by Christians. In The Eclipse of Darwinism (1983) Peter Bowler has drawn attention to survivals of natural theology in neo-Lamarckism and orthogenesis but has not noted that some neo-Darwinists gave evolution a religious reading. Dixey followed Moore in thinking Darwin's theory of natural selection more theologically orthodox than deistic creationism. The religious description of adaptation that Darwin had "naturalized" in his mature theory of natural selection was reinterpreted and reconsecrated by a few of his neo-Darwinist followers. Ironically, Darwin's religious sources indirectly contributed to Dixey's fervent advocacy of natural selection.

Dixey was the author of numerous neo-Darwinian studies on the evolution of butterflies. He was also a member of the English Church Union (a High Church Anglican layman's organization) and a loyal parishioner and chorister at the Anglo-Catholic parish of St. Barnabas. From 1901 through 1909 he reviewed for Nature several books that attacked Darwin's theory of natural selection or commented on its religious significance. In these reviews, and in his letters, Dixey declared his belief in the prevalence of adaptation and his belief that God works through the laws of nature.

Dixey was mystified by biologists who dispensed "with the Darwinian key to the puzzle of adaptation." He believed that natural selection, unlike other mechanisms, "actually showed how the adaptation everywhere manifest in nature might have come about." He noted that there is in living nature a "perfection of adaptation which seems to require 'directed variation' as an explanation, but which is perfectly explicable by natural selection." Here Dixey used the same kind of emphasis on universal adaptation that Darwin had inherited from Paley's natural theology. The importance Paley attached to marvelous adaptations in nature survived its Darwinian translation to influence early twentieth-century neo-Darwinism.

In 1919 Dixey declared before the British Association that his defense of the "Darwinian doctrine of natural selection . . . carried with it a belief in the existence and general prevalence of adaptation." This belief in the prevalence and importance of adaptation was not shared by mutationists, and Dixey had to admit that at times Darwinists had gone too far in attempting to find purpose in organic structures: "[T]oo much exuberance may have been shown in the pursuit of what Aubrey Moore called 'the new teleology.'" Nonetheless, Dixey believed that the quest to find and explain adaptation was the only way to advance knowledge of evolution. This assumption that adaptation was the fundamental problem to be addressed by evolutionary theorists may have been recommended by the tactical demands of scientific controversy with mutationists, but it also had, for Dixey, a definite religious significance. While directly theological articles were forbidden by the editors of Nature.

61 Ibid.
in reviewing religious commentators on evolution Dixey managed to indicate his religious preference for the theory of natural selection and to point out the heterodoxy (scientific and religious) of the alternatives.

For instance, the mutationist view could not explain adaptation without going beyond the realm of natural law. If organisms indeed evolved by leaps, Dixey asked, “[H]ow did it happen that they sprang into being in such exact harmony with their surroundings? Would Mr. Lock [a mutationist] have us fall back on the theory of ‘directed variation’ or, what comes to the same thing, Paley’s view of ‘contrivance’ by special creation?”62 Dixey, as a Christian, had no objection to considering God as the Creator, but for both scientific and religious reasons, he could have nothing to do with the external teleology that would have to be reintroduced into evolution to allow mutationists to explain adaptation.

Like Moore, Dixey felt that the position of Paley, and all those who supposed God to interfere with the course of evolution, was more deistic than Christian. Dixey reviewed a volume entitled Doubts about Darwinism (1903) whose author claimed to seek natural explanations for all organic structures. However, Dixey complained,

[w]hensoever he meets with a problem in evolution which appears to him inexplicable on the lines of natural selection . . . he resorts at once to the intervention, by a direct creative act, of a “Being possessing intelligence, intention, and power.” This is bad science, and we much doubt whether it is good theology. . . . To fly at once to the hypothesis of direct “intervention” by a “higher intelligence” is as much as to say that a science of life is impossible. It is not our province to enter into the theological aspects of the matter: we would only remark that the author’s language on this head appears to us to be a curious instance of survival from a bygone epoch. When, as in the eighteenth century, deistic conceptions of nature were rife, the idea of “interference” or “intervention” rose easily enough in the minds of devout persons. The only alternative seemed to be the complete banishment of the Deity from his universe. But in so far as deism is discredited by evolution, its correlative notion of “interference” must share in its discredit; and it is, to say the least of it, somewhat surprising to find the idea revived in the supposed interests of religion.63

Dixey saw such proposals of an external teleology, with God “interfering” with nature from without, as dangerous to both Darwinian and Christian orthodoxy.

With Moore, Dixey felt that Darwinian evolution was an aid to Christianity: “More indeed, is gained under the conception of organic growth than is lost by the sacrifice of the older teleology; for Paley’s statement of the case savours of deism, whereas under the more recent view there are distinct indications in the universe of a purpose which may be called moral.”64 Dixey interpreted natural law as the action of an immanent God. In this way, he could view adaptation in a religious light. Adaptation was the result of the law of natural selection, and as such, the universality of adaptation could be seen as indicative of the universal immanence of God in nature. Dixey’s neo-Darwinism, then, was more than a strictly scientific enterprise: in discovering adaptation in nature he uncovered the working of natural selection, which he could interpret as the presence of God. The religious elements in Darwin’s theory may have coincided with Dixey’s particular theological views to strengthen his personal conviction of the fundamental truth of natural selection.

Frederick Dixey, “Intelligence as the Soul of the Universe,” Nature 64 (1901):422.
In a private letter written in 1908 Dixey said that it was indeed the “wider teleology” that allowed him as a Christian to hold to Darwinism:

What Aubrey Moore called “the new teleology” wants driving into people’s heads. Ignorant talkers like Vernon, who speak of “the idea of progressive evolution embracing the error (!) of teleology” are hardly worth powder and shot. Of course it embraces that “error,” as even Aristotle knew, and it is precisely the fact that it does so that gives it its justification and ensures for it our acceptance as Christians.65

It seems, then, that the religious descriptions of adaptation that had been translated in Darwin’s naturalistic theory could be reinterpreted by some neo-Darwinists at the turn of the century. Religious elements not only acted to help Darwin produce scientific knowledge; they also contributed to the popularity and strength of the neo-Darwinist position by interacting with the religious views of later biologists.

CONCLUSION

Christianity could be and was reconciled with natural selection, in at least one historical case. Aubrey Moore’s identification of natural law and divine action raises theological questions: Is it possible to interpret natural law as the action of the immanent Logos? What theodicy is available to a Christian who accepts Darwin’s theory of evolution by natural selection? What place is there for miracles when divine action is manifested as natural law? There were and are many answers to such questions, but the success or failure of Moore’s position cannot be judged without reference to its historical context. As far as Romanes, Poulton, and Dixey were concerned, it was a success. Even a neo-Darwinian atheist such as Lankester praised Moore’s work. Their treatment of the phenomenon of adaptation shows how Darwin’s original natural theological sources could be reworked to inform later neo-Darwinian theory.

Moore had little direct influence on the Anglican Church, and his views were not widely accepted by men of science. However, he did show, on the eve of the eclipse of Darwinism, one way in which Darwinism could be read in a Christian light, and he thereby reinforced the neo-Darwinism of some Oxford biologists who shared his faith. In addition to revealing Moore’s minor role in the history of evolutionary theory, this case suggests that Darwinism does not invariably require naturalism as its metaphysical framework. Moore and his neo-Darwinist friends show us the porosity of the boundary between religion and science.

Darwin did secularize biological meaning, although he continued to focus on the ubiquity and apparent perfection of adaptations. Some of his followers subtly reconsecrated biological meaning by reading divine action in the laws that made adaptation so marvelous and universal. At the same time they recognized that nothing like Paleyan, external teleology was possible or desirable in their science or religion. What does this say about how religious elements work once they are absorbed into a scientific theory? I do not wish to imply that religious influences are limited to explicitly teleistic formulations of theories—or to deny that naturalism might function as a source of religious influence in a science. What I have described is the mutual engagement of thoughts about evolution and about God’s action in the world in Darwin and some neo-Darwinians.

65 F. A. Dixey to C. W. Formby, 2 Jan. 1908, Dixey Papers, Hope Library, Oxford University Museum. Vernon is likely H. M. Vernon, a contemporary who wrote on reproductive physiology.
The idea of adaptation was at first shaped by adjectives drawn from the religious language of Paley’s natural theology. The fact that organic structures were adapted to functions had been attributed to God, and so adaptation had taken on the “perfect” and “universal” qualities that might well be expected of the handiwork of the Creator. The idea of perfect and universal adaptation was assimilated into Darwin’s “purely” naturalistic description of adaptation. The mature Darwin did not believe that adaptations were absolutely perfect or universal, but he focused nonetheless, as Paley had, on these qualities of adaptation. Some of Darwin’s later readers read this particular view of adaptation in a new kind of religious light. Darwin showed that adaptations, the result of a law-like process, were everywhere in organic nature. This wider or Darwinian teleology could be seen as a confirmation, though not a proof, of a preexisting Christian belief in the immanence of God in nature. Moore’s view of divine action pointed up philosophical sympathies between late Victorian Darwinism and an Anglo-Catholic theology tinged with T. H. Green’s idealism. Moore did not rule out alternative interpretations of the same phenomena but suggested that natural selection could be interpreted as the result of God’s constant presence in the world. It was no surprise, then, to Moore and his fellow neo-Darwinists that adaptations effected by natural selection were universal in living nature.

Although the perfection and universality of adaptation were in some sense constant through the process described here, there were significant changes. Darwin described even “perfect” organs as the result of relative adaptation, and so “perfection” too was “relative.” Moore dealt with Darwin’s fundamental reworking of teleology and recognized that Darwin’s theory of natural selection destroyed the evidential power of Paley’s natural theology. The universality of adaptation could no longer be considered a proof of God’s existence but only a confirmation of a preexisting belief. Darwin radically changed possible structures of teleological arguments for the existence of God.

A HISTORIOGRAPHICAL NOTE

The theory of natural selection is not inevitably linked with naturalism. In at least one historical case, religious meaning was read in the implications of Darwinism. Neo-Darwinists such as Poulton and Dixey emphasized the universality of adaptation because it highlighted the strength of natural selection and the weaknesses of alternative mechanisms. Moore’s religious interpretation of adaptation may also have reassured them that their controversial scientific commitments were compatible with their religious faith and, indeed, that the non-Darwinian evolutionary theories of their scientific rivals were distinctly heterodox. The scientific and theological circumstances that shaped this little-known synthesis are now history, but the moral remains.

The boundary that separates our categories of science and religion is porous. Cultural, intellectual, and contextual chemistry may force phenomena or ideas across that boundary. To speak of “religious elements” affecting science, or “languages” of science and religion, implies that the categories of science and religion are more neatly separable than is justified by the available evidence. Rather than discuss the contribution of theistic sources to scientific theories, I might have drawn on the image of science presented by Robert Young, in his article “Darwinism is social” (1985) and simply described the close correlations between arguments given by
actors in religious and scientific texts. The claim that religion informs science risks assuming the present distinction between the two, even as it examines the historical process of their separation.\textsuperscript{66} The words and metaphors we choose are both products of, and productive of, our historiography.\textsuperscript{67}

Whatever the shortcomings of the idea of religious and scientific “elements,” the notion does have heuristic value. Ideas come together and drift apart. Their affinities and antipathies are constructed from logical, psychological, and political circumstances, in an array of possibilities that seems almost infinitely plastic. It is important to recall this when we think about the popular identification of Darwinism with philosophical naturalism. This view seems to describe a connection that transcends historical circumstance and so can be used to judge the ultimate legitimacy of past connections of ideas. However, any view of the relationship between the phenomenon of adaptation and the belief in a God is built of connections among many historical elements, connections not limited to logical implications of narratives about nature but also involving historically local contingencies of context and circumstance.\textsuperscript{68}

