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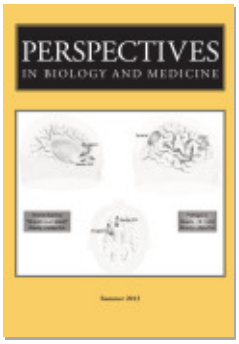
Perspectives in Biology and Medicine, Volume 56, Number 1, Winter 2013, pp. 78-98 (Article)

Published by The Johns Hopkins University Press
DOI: 10.1353/pbm.2013.0000



Darwin's Perplexing Paradox

intelligent design in nature

Steinar Thorvaldsen* and Peter Øhrstrøm†

ABSTRACT Today, many would assume that Charles Darwin absolutely rejected any claim of intelligent design in nature. However, review of his initial writings reveals that Darwin accepted some aspects of this view. His conceptualization of design was founded on both the cosmological and the teleological ideas from classical natural theology. When Darwin discovered the dynamic process of natural selection, he rejected the old teleological argument as formulated by William Paley. However, he was never able to ignore the powerful experience of the beauty and complexity of an intelligently designed universe, as a whole. He corresponded with Asa Gray on religious themes, particularly touching the problem of pain and intelligent design in nature. The term "intelligent design" was probably introduced by William Whewell. Principally for theological and philosophical reasons, Darwin could only accept the concept for the universe as a whole, not with respect to individual elements of the living world.

MUCH HAS BEEN WRITTEN through the years of the clash between Darwinism and natural theology, and the basic tenants of this debate are well understood (Gillispie 1959; Bowler 1977; Ruse 2003; McGrath 2011). However, the literature is still growing, and one may wonder if anything new may yet be added. Of these new literary sources, one of the richest is the online Darwin Correspondence Project, which makes it possible to search and read the full texts

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Perspectives in Biology and Medicine, volume 56, number 1 (winter 2013):78–98

of all correspondence either sent or received by Darwin, up to the year 1868. (This project is ongoing and letters are still being recovered and added.) The purpose of this article is to outline the role of the intelligent design argument, as espoused by its principal proponents in both the pre- and post-Darwinian world.

The term "intelligent design" is not new. It was used and discussed by Charles Darwin (1809–1882) in the years immediately after the publication of his *On the Origin of Species by Means of Natural Selection* (1859). He applied the term in an 1861 letter to Sir John F. W. Herschel (1792–1871). We shall address the import of this letter, together with Darwin's extensive correspondence with Asa Gray (1810–1888), Professor of Biology at Harvard University. We shall also argue that that Darwin and Herschel are likely to have got the term "intelligent design" from Professor William Whewell of Trinity College, Cambridge (1794–1866), who seems to have been the first to use it.

Unfortunately, few participants in the modern debate on intelligent design are aware of its historic background. Although some of the fundamental ideas propelling contemporary debate about intelligent design can be found in early discussions between Darwin and his contemporaries, the conversations regarding "design in nature" are much older, dating back to the Greeks. Some of the positions in the modern debate about intelligent design may be understood best when they are seen from a longer, historical perspective, and thus both sides of the modern debate can benefit significantly by investigating the arguments and views formulated in the intelligent design debate of the 1860s and 1870s.

The notion of intelligent design does not lend itself easily to expression in a precise or definitive manner, and the term may actually reference distinct but divergent views. (This seems to be the case in the debate in the 1860s and 1870s, as well as in the modern debate.) We argue that Darwin made a distinction between at least two kinds of intelligent design, one general (or cosmological) and one specific (related to the individual species). While he accepted the former kind of intelligent design as the basis of a correct understanding of the existence of natural laws, he rejected the latter idea as realized in the biological world.

Paley's Natural Theology

The arguments regarding intelligent design in the 1860s debate were formulated with the works of William Paley (1743–1805) as the main philosophical background. Paley's several books on philosophy and theology were widely influential, and they were required reading at Cambridge University for several decades. A thorough study of Paley's work formed a vital part of young Darwin's education. For Paley, Nature itself provided evidence for the existence of God. According to Lamoureux (2004), Paley's argument in favor of intelligent design can be organized into three major classifications: (1) beneficence, (2) perfect adaptation, and (3) intelligent design. In his famous book *Natural Theology* (1802), Paley mainly used the term "design." But he also used terms like "creative design," "in-

telligent mind," "intelligent, designing mind," "intelligent and designing Creator," "intelligent, designing author," "supreme intelligent Author," or "intelligent, free, and most potent agent." However, he never seems to have used the exact term "intelligent design."

In the comments to his famous watchmaker metaphor, Paley writes:

> There cannot be design without a designer; contrivance without a contriver; order without choice; arrangement, without any thing capable of arranging; subserviency and relation to a purpose, without that which could intend a purpose; means suitable to an end, and executing their office, in accomplishing that end, without the end ever having been contemplated, or the means accommodated to it. Arrangement, disposition of parts, subserviency of means to an end, relation of instruments to a use, implies the presence of intelligence and mind. . . .
>
> The machine which we are inspecting, demonstrates, by its construction, contrivance and design. Contrivance must have had a contriver; design, a designer; whether the machine immediately proceeded from another machine or not. That circumstance alters not the case. (Paley 1802, pp. 11, 13)

For Paley, the watch analogy was best applied to the biological domain, which he regarded as being more valuable apologetically than that of cosmology (McGrath 2011). Paley summed up his overall conclusion like this:

> we conclude that the works of nature proceed from intelligence and design, because, in the properties of relation to a purpose, subserviency to a use, they resemble what intelligence and design are constantly producing, and what nothing except intelligence and design ever produce at all. (Paley 1802, p. 414)

As noted by McGrath (2011), Paley's approach to nature is optimistic and positive, holding that nature displays evidence of divine wisdom at every point. Paley (1802) also discusses the classical problem of evil and suffering in nature, but openly admits that "no universal solution has been discovered" (p. 492).

The famed astronomer Sir John Herschel was one of the contemporary scientists whom Darwin most admired. As a young student, Darwin read Herschel's book *A Preliminary Discourse on the Study of Natural Philosophy* (1830) with great attention. In the book, Herschel operates within the tradition of natural theology and acknowledges "that Intelligence which he [the scientist] traces throughout creation":

> Nothing, then, can be more unfounded than the objection which has been taken, in *limine* [Latin: at the threshold], by persons, well meaning perhaps, certainly narrow-minded, against the study of natural philosophy, and indeed against all science,—that it fosters in its cultivators an undue and overweening self-conceit, leads them to doubt the immortality of the soul, and to scoff at revealed religion. Its natural effect, we may confidently assert, on every well constituted mind is and must be the direct contrary. (Herschel 1830, p. 7)

William Whewell was another important philosopher of science in that period (McGrath 2011; Ruse 1975; Yeo 1979). He covered a multiple of academic disciplines at Trinity College, Cambridge. Herschel and Whewell knew each other well, even if they came to differ over some of the metaphysical aspects of science. Herschel was inclining more to empiricism, whereas Whewell was much influenced by Kant (Ruse 1975). Darwin had known Whewell since his undergraduate days at Cambridge, and he later wrote about Whewell that "Next to Sir J. Mackintosh he was the best converser on grave subjects to whom I ever listened" (Darwin 1887, p. 66). Between 1838 and 1840, Darwin read both Whewell's *Astronomy and General Physics, Considered with Reference to Natural Theology* (1833) and his *History of the Inductive Sciences* (1837)—the first one he even read twice (Darwin 1887; Ruse 1975). According to Darwin's notebook *"Books Read" and "Books to be Read"* (1852–60), he also read Whewell's *The Plurality of Worlds* (1853) the year after it was published. This book has a separate chapter entitled "The Argument from Design." We know that some of Darwin's own conception of science was influenced by Whewell, even though there appears to be no consensus as to the extent of that influence (Hodge 1991; Ruse 1975).

In various writings in the 1830s, Whewell managed to demonstrate his support for many of the important tenets in Herschel's philosophy. One of Whewell's greatest gifts to science was his wordsmithing, and he is well known for coining the term "scientist" for what was, previously, known as "natural philosopher." Moreover, Whewell may have been the first to use the term "intelligent design." At least he clearly did so in Part II: Cosmical Arrangements of his book on natural theology (Whewell 1833), and we know of no earlier use of the term:[1]

> The next circumstance which we shall notice as indicative of design in the arrangement of the material portions of the solar system. . . .
>
> The machine will move of itself, we may grant: but who constructed the machine, so that its movements might answer the purposes of life? How was the candle placed upon the candlestick? How was the fire deposited on the hearth, so that the comfort and well-being of the family might be secured? Did these too fall into their places by the casual operation of gravity? And, if not, is there not here a clear evidence of intelligent design, of arrangement with a benevolent end? (pp. 169, 171–72)

Whewell also added that this argument was urged, with great force, by Newton. Whewell uses the term "design" all through the book, in expressions such as "wise and benevolent design," "most foreseeing and benevolent design in the Creator of man and of the world," "selected with a beneficial design," "most refined and skilful adaptation, applied with a most comprehensive design," "the intervention of intelligence and design," "evidences of design and adaptation," "the

[1]The term is used in a similar manner in an August 1847 article in *Scientific American* (2:381).

thought of superintending intelligence," and "design and intention exercised in the formation of the world." However, Whewell also argued that final causes were to be excluded from physical enquiry, since we are not to assume that we know the objects of the Creator's design; and he put this assumed purpose in the place of a physical cause. In Part III of his book, he states:

> We conceive, for example, that a person labours under gross error, who believes the phenomena of the world to be altogether produced by mechanical causes, and who excludes from his view all reference to an intelligent First Cause and Governor. But we conceive that reasons may be shown which make it more probable that error of such a kind should find a place in the mind of a person of deductive, than of inductive habits;—of a mere mathematician or logician, than of one who studies the facts of the natural world and detects their laws. (pp. 330–31)

In his *History of the Inductive Sciences* (1837), Whewell referred to his previous work, his *Astronomy and General Physics* (1933):

> in another work . . . I endeavoured to show that those who have been discoverers in science have generally had minds, the disposition of which was to believe in an intelligent Maker of the universe; and that the scientific speculations which produced an opposite tendency, where generally those which, though they might deal familiarly with known physical truths, and conjecture boldly with regard to the unknown, did not add to the number of solid generalisations. (3:472)

CORRESPONDENCE AFTER THE PUBLICATION OF "THE ORIGIN OF SPECIES"

Darwin prefaced the first edition of *Origin* with a quotation from William Whewell to demonstrate that his new ideas were consistent with natural theology: "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" (Whewell 1833, p. 356). Darwin sent Whewell a copy of the first edition of *Origin*, but Whewell was skeptical, without being horrified:

> I have to thank you for a copy of your book on the "Origin of Species." You will easily believe that it has interested me very much, and probably you will not be surprized to be told that I cannot, yet at least, become a convert to your doctrines. But there is so much of thought and of fact in what you have written that it is not to be contradicted without careful selection of the ground and manner of the dissent, which I have not now time for. I must therefore content myself with thanking you for your kindness. (Darwin Correspondence Project, letter 2634, Jan. 2, 1860; subsequent correspondence is from the same source)

Eventually, Whewell opposed the theories of "organic transmutation," including Darwin's theory (Ruse 1991). No further correspondence between the two has been preserved or has yet come to light.

Professor Asa Gray is considered the most important American botanist of his time. He is one of those who did most to spread Darwin's ideas in America. Gray and Darwin met briefly in January 1839, when Gray was on one of his visits to England. During the 1850s, Darwin wrote to Gray on several occasions, requesting information for his work. Darwin very much appreciated Gray's cooperation. In a letter to Jeffries Wyman, Professor of Anatomy at Harvard College, Darwin wrote: "No one other person understands me so thoroughly as Asa Gray. If ever I doubt what I mean myself, I think I shall ask him! His generosity in getting my views a fair hearing, & not caring himself for unpopularity has been most unselfish,—I would say noble" (letter 2936, Oct. 3, 1860). Some of their early correspondence has been lost, but after 1855, their correspondence is nearly complete. When Darwin published *Origin*, Gray wrote a clear, positive, yet none-the-less critical review in the *American Journal of Science* (Gray 1860). Gray also wrote several essays in the *Atlantic Monthly* Journal, in which he reviewed and commented on Darwin's book. In response to these articles, Darwin wrote several letters to his American friend. These letters offer an interesting picture of Darwin's beliefs, right after the publication of the *Origin*.

Gray suggested an interpretation of the *Origin* wherein natural selection includes God's intelligent choices. Were one to imagine the whole history of life without any directing intelligence behind it, it would, according to Gray, mean operating with probabilities that are infinitesimal and, therefore, beyond credibility. Instead, Gray pointed to God, who before the world appeared saw all the physical possibilities of every detail; and on that fundament and in his wisdom, decided to actualize the possible sequences, which we now see before us. Gray stressed that Darwin's theory, in this sense, is logically compatible with the idea of a divine design in nature. Darwin very well understood Gray's interpretation of his theory and was immediately attracted by it—but only to a certain degree. One of Darwin's clearest delineations of his views, specifically as touching the role of design, are set forth in a letter of May 1860. After writing on the indisputable brutality in nature, and on the apparent design in the universe, he stated:

> With respect to the theological view of the question; this is always painful to me.—I am bewildered.—I had no intention to write atheistically. But I own that I cannot see, as plainly as others do, & as I shd wish to do, evidence of design & beneficence on all sides of us. There seems to me too much misery in the world. I cannot persuade myself that a beneficent & omnipotent God would have designedly created the Ichneumonidæ [an insect family] with the express intention of their feeding within the living bodies of caterpillars, or that a cat should play with mice. Not believing this, I see no necessity in the belief that the eye was expressly designed. On the other hand I cannot anyhow be contented to

> view this wonderful universe & especially the nature of man, & to conclude that everything is the result of brute force. I am inclined to look at everything as resulting from designed laws, with the details, whether good or bad, left to the working out of what we may call chance. Not that this notion at all satisfies me. I feel most deeply that the whole subject is too profound for the human intellect. (letter 2814, May 22, 1860)

Darwin was unwilling to accept atheism due to the intuitive strength of the general grand design argument ("this wonderful universe & especially the nature of man"), yet he emphasized that he could not "look at each separate thing as the result of Design" as Paley had done. However, in the closing pages of the *Origin*, Darwin explicitly wrote: "There is grandeur in this view of life, with its several powers, having been originally breathed into a few forms or into one" suggesting a supernatural origins of life (Cosans 2005). Finally, he settled into an agnostic funk and characterized himself as being "in thick mud" (letter 3342, Dec. 11, 1861). In the letter to Gray, written July 3, 1860, he compared the question of design in nature with a famous Kantian paradox: "I have just reread your letter: in truth I am myself quite conscious that my mind is in a simple muddle about "designed laws" & "undesigned consequences."—Does not Kant say that there are several subjects on which directly opposite conclusions can be proved true?!" (letter 2855, July 3, 1860). This letter refers to Kant's (1781) "antinomies of pure reason," or pairs of contradictory metaphysical ideas, for which relatively strong arguments could equally be given. By using this reference, was Darwin admitting having arrived at his own cognitive dissonance and suggesting that the question of design in nature is just too daunting for the human mind? One may easily come up with strong arguments in favor of design. There are equally powerful arguments against it.

Later, in the same letter, he returns to the question, and challenges Gray by referring to an innocent man struck dead by lightening, and asks: "Do you believe . . . that God designedly killed this man?" He asks the same about a gnat being consumed by a swallow and sums up this way: "If the death of neither man or [sic] gnat are designed, I see no good reason to believe the *first* birth or production should be necessarily designed. Yet, as I said before I cannot persuade myself that electricity acts, that the tree grows, that man aspires to loftiest conceptions all from blind, brute force" (letter 2855, July 3, 1860). This echoes the classical problem of evil, also discussed by Paley. The old problem was given a new intensity, as previously articulated in a letter to botanist Joseph Dalton Hooker (1817–1911): "What a book a Devil's chaplain might write on the clumsy, wasteful, blundering low & horridly cruel works of nature!" (letter 1924, July 13, 1856). Darwin wanted design without pain, and purpose without suffering, and the presence of natural suffering accorded well with his theory of natural selection, rather than with design.

The issue of design also becomes the focus of discussion following a series of

three articles that Gray published in the *Atlantic Monthly* in July, August, and October of 1860: "We should advise Mr. Darwin to assume, in the philosophy of his hypothesis, that variation has been led along certain beneficial lines" (Gray 1876, p. 148). In a reply to Gray, Darwin suggested that the world in its entirety should be seen as a result of design, whereas the single events generally should be seen as outcomes of random processes: "I am conscious that I am in an utterly hopeless muddle. I cannot think that the world, as we see it, is the result of chance; & yet I cannot look at each separate thing as the result of Design" (letter 2998, Nov. 26, 1860). Then, after declaring that the articles were "admirable," Darwin goes on in his response to Gray:

> But I grieve to say that I cannot honestly go as far as you do about Design. . . . To take a crucial example, you lead me to infer (p. 414) that you believe "that variation has been led along certain beneficial lines."—I cannot believe this; & I think you would have to believe, that the tail of the Fan-tail was led to vary in the number & direction of its feathers in order to gratify the caprice of a few men. Yet if the fan-tail had been a wild bird & had used its abnormal tail for some special end, as to sail before the wind, unlike other birds, everyone would have said what beautiful & designed adaptation. Again I say I am, & shall ever remain, in a hopeless muddle.

When Darwin published his *Origin*, he sent a copy to Herschel, one of the contemporary scientists who Darwin admired most highly, and wrote in the accompanying letter:

> I have taken the liberty of directing Murray [the publisher] to send you a copy of my book on the Origin of species, with the hope that you may still retain some interest on this question.—I know that I ought to apologise for troubling you with the volume & with this note (which requires no acknowledgment) but I cannot resist the temptation of showing in this feeble manner my respect, & the deep obligation, which I owe to your Introduction to Natural Philosophy. Scarcely anything in my life made so deep an impression on me: it made me wish to try to add my mite to the accumulated store of natural knowledge. (letter 2517, Nov. 11, 1859)

Darwin had to wait for more than a year for an answer. In the meantime, he obviously heard some rumors: "I have heard by round about channel that Herschel says my Book 'is the law of higgledy-piggledy.'—What this exactly means I do not know, but it is evidently very contemptuous.—If true this is great blow & discouragement" (letter 2575 to C. Lyell, Dec. 10, 1859).

Finally, Herschel responded by sending Darwin a copy of his book, *Physical Geography* (1861), which had just been published. This was an anthology of articles Herschel originally composed for the eighth edition of the *Encyclopædia Britannica* (1853–60), here compiled, revised, and published in a single volume. Herschel promulgates a view similar to Gray's, and promotes the notion that

change in nature is guided by intelligent actions that have a purpose. He holds that species change "by a series of overlappings, leaving the last portion of each in co-existence with the earlier members of the newer series." To this discussion he appended the following note addressing Darwin:

> This was written previous to the publication of Mr. Darwin's work on the Origin of Species, a work which, whatever its merit or ingenuity, we cannot, however, consider as having *disproved* the view taken in the text. We can no more accept the principle of arbitrary and casual variation and natural selection as a sufficient account, per se, of the past and present organic world, than we can receive the Laputan method of composing books (pushed a *l'outrance*) as a sufficient one of Shakespeare and the Principia. Equally in either case, an intelligence, guided by a purpose, must be continually in action to bias the directions of the steps of change—to regulate their amount—to limit their divergence—and to continue them in a definite course. We do not believe that Mr. Darwin means to deny the necessity of such intelligent direction. But it does not, so far as we can see, enter into the formula of his law; and without it we are unable to conceive how the law can have led to the results. On the other hand, we do not mean to deny that such intelligence may act according to a law (that is to say, on a preconceived and definite plan). Such law, stated in words, would be no other than the actual observed law of organic succession; or one more general, taking that form when applied to our own planet, and including all the links of the chain which have disappeared. But the one law is a necessary supplement to the other, and ought, in all logical propriety, to form a part of its enunciation. Granting this, and with some demur as to the genesis of man, we are far from disposed to repudiate the view taken of this mysterious subject in Mr. Darwin's work. (Note added Jan. 1861.)[2]

In his reply to Herschel, Darwin wrote:

> The point which you raise on intelligent Design has perplexed me beyond measure; & has been ably discussed by Prof. Asa Gray, with whom I have had much correspondence on the subject. I am in a complete jumble on the point. One cannot look at this Universe with all living productions & man without believing that all has been intelligently designed; yet when I look to each individual organism, I can see no evidence of this. For, I am not prepared to admit that God designed the feathers in the tail of the rock-pigeon to vary in a highly peculiar manner in order that man might select such variations & make a Fantail; & if this be not admitted (I know it would be admitted by many persons), then I cannot see design in the variations of structure in animals in a state of nature,—those variations which were useful to the animal being preserved &

[2]Laputa is an imaginary flying island described in Jonathan Swift's *Gulliver's Travels* (1726), on which a mechanical engine has been invented by which "the most ignorant person, at a reasonable charge, and with a little bodily labour, might write books in philosophy, poetry, politics, laws, mathematics, and theology, without the least assistance from genius or study" (chap. 5).

> those useless or injurious being destroyed. But I ought to apologise for thus troubling you. (Letter 3154, May 23, 1861)

It should be noted that Darwin uses the term "intelligent design" in this letter, and he appears to have been one of the first to use it, after Whewell, from whom he may have mirrored it. However, it is also important to point out that, although Darwin accepted that the universe, as a whole, is intelligently designed, he did not believe that the same was true for the specific details. In particular, he denied that the various species in the living world were intelligently designed.

Further, in a letter to Gray, Darwin described his reaction to Herschel's opinion, stating that "acceptance of God's total predestination" would, in Darwin's opinion, preclude natural selection. It was, therefore, crucial to him that nature provide "an enormous field of un-designed variability" (letter 3176, June 5, 1861). This variability is essential to Darwin's theory—the theory of natural selection depends upon it.

On the other hand, Darwin was profoundly aware that his position inevitably engendered conflict with the theological and philosophical mind-set in which he was raised. In a letter to geologist Sir Charles Lyell (1797–1875), he described the problem as follows:

> I do not wish to say that God did not foresee everything which would ensue; but here comes very nearly the same sort of wretched embroglio as between freewill & preordained necessity.—I doubt whether I have made what I think clear; but certainly A. Gray's notion of the course of variation having been led, like a stream of water by Gravity, seems to me to smash the whole affair. (letter 3223, Aug. 1, 1861)

It is interesting that Darwin saw a close relationship between the debate regarding intelligent design and the classical problem concerning divine foreknowledge, human freedom, and predestination. It can be taken for granted that Gray, a strong Christian and a dedicated member of the Presbyterian Church, had seen the same similarities, and that it played an important role as a conceptual framework for his interpretation of Darwinian evolution. His statement, mentioned above, that "the variation has been led along certain beneficial lines," should be understood in this context.

The notion of intelligent design, which Gray defended, is obviously based on the idea that there is a divine, master plan, involving every detail in the temporal development of the world. This great plan takes into account the variations that will occur, without denying that they are variations. Clearly, the omniscient God can use the variations, which are going to occur, to obtain his purposes in the world. He acts like a master architect rather than as a miracle worker, which favored a law of evolution over special creation. In this way, we may consistently hold that God has chosen the best of all possible worlds, given his foreknowledge of which of the variations would be picked in every possible situation.

The Book on Orchids

In May 1862, Darwin published the book *On the Various Contrivances by which British and Foreign Orchids Are Fertilized by Insects, and the Good Effects of Intercrossing*. It received ample recommendations from Gray in letters and reviews, and in a July 1862 letter to Darwin, Gray made the following comment on the design question: "If you grant an intelligent designer anywhere in Nature, you may be confident that he has had something to do with the 'contrivances' in your Orchids" (letter 3637, July 2, 1862). The word *contrivance*, which Darwin used in the title of this work, stresses the thorough integration of "chance" and "design" that Darwin is describing in this passage:

> Although an organ may not have been originally formed for some special purpose, if it now serves for this end we are justified in saying that it is specially contrived for it. On the same principle, if a man were to make a machine for some special purpose, but were to use old wheels, springs, and pulleys, only slightly altered, the whole machine, with all its parts, might be said to be specially contrived for that purpose. Thus throughout nature almost every part of each living being has probably served, in a slightly modified condition, for diverse purposes, and has acted in the living machinery of many ancient and distinct specific forms. (Darwin 1862, p. 348)

But Darwin is amazed that Gray has not reacted more directly to the views expressed near the end of the volume, and in July/August, he submits a letter to Gray with the following request: "I shd like to hear what you think about what I say in last Ch. of Orchid Book on the meaning & cause of the endless diversity of means for same general purpose.—It bears on design—that endless question" (letter 3662, July 23, 1862).

In his reply, Gray states that the final chapter poses "a knotty sort of question about accident or design," one he is not yet ready to address. Gray discovered in the orchid book something he had not seen before. In the literature about orchids, this new thing is referred to as the use of a "teleological language" (Ghiselin 1994; Hoquet 2010; Lennox 1993). There is a long tradition of dealing with reality in terms of teleology, going back to the original Greek idea of a final cause or a purpose (*telos*) of a thing. According to the teleological interpretation of reality, final causes exist in nature. Traditionally, this means that the things in question have been designed and made by someone with a purpose (*telos*) in mind.

This is not controversial, as long as we are speaking of things made by humans. The question is, however, whether something similar may be the case in nature. Could a thing in nature have come into existence because there was a purpose which the thing-that-was-to-be should fulfill? If this question is answered affirmatively, we have made a claim that sounds not only teleological, but also theological, since that would mean that the thing in question has been

made because of its purpose, which is then supposed to have existed as a mental entity before the thing came into existence.

This was, of course, not a problem within the conceptual and theological framework suggested by Paley, who believed that things in nature were designed and created by God, as they were meant to serve certain purposes. However, Darwin pointed out that we may not need to assume that the purpose was decided before the thing came into existence. When the thing comes into existence, and it turns out that it has a certain function—that it serves a certain purpose—we may just as well say that it has a purpose (a *telos*).

Recently, Bruce H. Weber (2011) discussed the notion of "teleology without teleology," an idea originally suggested by Paul Davies (1998). Another way of expressing this is a "proto-purpose," or "purposiveness without purpose," an expression coined by Philip Clayton (2004, 2006). As argued by Weber (2011), crucial aspects of emergent complexity may be described in terms of these ideas. He explains that, according to this kind of teleology, "purpose is expressed via an open-ended process of emergence and novelty" (p. 285). This kind of teleology certainly does not imply any kind of design.

There has been considerable discussion in the literature of the meaning of teleology in the context of Darwin's framework, and the concept may be unclear (Ghiselin 1994; Hoquet 2010; Lennox 1993, 1994). A key question is, what is the conceptual relationship between teleology and design? As argued above, we may have a certain kind of teleology (teleology without teleology) without assuming any kind of design, any kind of preexisting plan for things that come into existence.

In principle, we may also imagine things that have been designed without any specific purpose, from which we may reasonably infer that the general relation between design and teleology is rather complex. Perhaps it would be useful to make a distinction between "teleology without teleology" and "teleology with teleology," where the former is the idea discussed by Weber and others, and the latter is the classical notion of teleology, suggested by Paley and others. In the *Orchids*, Darwin describes the structure of these flowers in terms of teleology, and many of its readers have underlined the presence of design in the Darwinian conception of nature, calling Darwin a "teleologist" (Hoquet 2010; Lennox 1993). It may be doubted, however, whether the kind of teleology Darwin accepted was more than "teleology without teleology." On the other hand, Darwin's thoughts gave rise to a new, natural kind of theology, according to which, the selection of useful structures was understood to be a "law of progress." And after all, Gray insisted that Darwin's botanical work displayed a thoroughly teleological perspective on adaptation: "A propos Darwin's botanical papers, which furnish excellent illustrations of it, let us recognize Darwin's great service to natural science in bringing back to it Teleology; so that, instead of Morphology vs. Teleology, we have Morphology wedded to Teleology" (Gray 1876, p. 80).

Darwin underscored their agreement on that point: "What you say about teleology pleases me especially, & I do not think anyone else has ever noticed the point. I have always said you were the man to hit the nail on the head" (letter 9483 to Asa Gray, June 5, 1874).

In his recent paper on the *Orchids* book, Thierry Hoquet (2010) challenges the standard interpretation, that Darwin's system was a "deathblow" to teleology. *Orchids* certainly focuses on empirical data and on teleological structures, and departs from the theories of transmutation and the "imaginary examples" of the *Origin*. Although Darwin refers to natural selection, he also presents his fascination with delicate morphological contrivances and co-adaptations. Hoquet argues that *Orchids* reveals ''another," quite unexpected and heterodox Darwin, freed from the hypothetical fancies of the *Origin*, and even suggesting a new kind of "physico-theology." It can be read as containing several indications of a Designer, and many of Darwin's contemporaries were more satisfied with *Orchids* than with the *Origin*, both because of *Orchids*' richness of empirical data and its compatibility with the traditional concepts of the ends of Nature. Teleology pervades every description in the text. However, at the same time, the contrivances in *Orchids* can be interpreted as the product of nature's "tinkering."

Final Positions

Darwin continued publishing new books, but the correspondence with Gray slowly came to an end on this point. Darwin claims that in Gray's view of designed variation—the forces producing selection in nature, plus harmful variation and damaging overpopulation—would be superfluous. In an 1868 review in the *Nation*, Gray responded, "not superfluous, surely, if 'survival of the fittest,' 'excellent co-ordination,' and all the harmonious adaptation and diversity we behold are to result from the operation of those very laws" (p. 236).

In contrast, Darwin appeared to suggest that if an omniscient Creator were to design each variation to be beneficial, and each species to breed at just the speed to match its environment's capacity, the basic mechanisms leading to "survival of the fittest" would be superfluous: it would not be natural selection generating the excellent adaptations. His book *The Variation in Animals and Plants under Domestication* (1868) ends in the following way:

> If we assume that each particular variation was from the beginning of all time preordained, the plasticity of organisation, which leads to many injurious deviations of structure, as well as that redundant power of reproduction which inevitably leads to a struggle for existence, and, as a consequence, to the natural selection or survival of the fittest, must appear to us superfluous laws of nature. On the other hand, an omnipotent and omniscient Creator ordains everything and foresees everything. Thus we are brought face to face with a difficulty as insoluble as is that of free will and predestination. (2:432)

As Lennox (2010) has remarked, Darwin here set up a dilemma for all those who want to absorb natural selection into the framework of natural theology: "So there is the choice Darwin is forcing on Asa Gray: accept variation led along beneficial lines, and give up natural selection; or accept natural selection, and try to reconcile your belief in a benevolent God with all the death and destruction, hidden beneath the pastoral surface of the tangled bank, that goes along with it" (p. 475).

It is worth pointing out that this dilemma is based on the assumption that what is foreknown by God will also be preordained by God. If this implication is rejected, one may consistently hold that God, based on his foreknowledge and by his actions, chose the best of all possible world histories, without destroying the process of natural selection. However, the distinction between what is foreknown by God and what is preordained by God would not have been very common in 19th-century Presbyterian circles. It is an open question whether Gray would have been ready to consider a distinction of this kind or not.

In a letter to Darwin in May 1868, Gray admits that "the notion of design must, after all, rest mostly on faith, and on accumulation of adaptations, etc." And furthermore: "So all I could do was to find a vulnerable spot in the shaping of it, fire my little shot, and run away in the smoke. Of course I understand your argument perfectly, and felt the might of it" (letter 6206, May 25, 1868). Gray's point seems to be that he is unable to demonstrate, empirically, that Darwin is wrong, but also, that it would be impossible to categorically reject his own idea of intelligent design, according to which the variation has been led along certain beneficial lines. In fact, the two positions are empirically equivalent, which means that the choice between Gray's intelligent design and Darwin's theory must be made on the basis of conceptual considerations and one's worldview.

In 1876, Gray published the essay "Evolutionary Teleology" in his collection of writings entitled *Darwiniana: Essays and Reviews Pertaining to Darwinism*. This publication contains his mature reflections and distilled views on design in their full scope, and it presents Gray's most systematic thought on teleology. Gray saw Darwin's explanation of adaptation as restoring notions of function and purpose to biology, and it was in this sense that he used the word *teleology*. Gray also pointed out that design need not be specific, but rather it can be the result of more universal principles. He stated clearly that Darwin did not discard purpose, and that Darwin's use of teleology per se did not argue for, or against, a deity:

> Darwinian evolution . . . is neither theistical nor non-theistical. Its relations to the question of design belong to the natural theologian, or, in the larger sense, to the philosopher. So long as the world lasts it will probably be open to any one to hold consistently, in the last resort, either of the two hypotheses, that of a divine mind, or that of no divine mind. (Gray 1876, p. 379).

Clearly, Gray's ideas of intelligent design should be understood in the context of his natural theology. He believed that there is a great master plan, covering every detail of life, worked out by divine omniscience and put into reality by the omnipotent God in order to fulfill His purposes. In his science, Gray found evidence supporting this belief, but no strong evidence refuting it.

However, he also understood that these observations could be interpreted in other ways. The question of whether the world should be understood in terms of a theistic or a non-theistic view would, in principle, have to remain open. This obviously did not exclude the issue from being discussed in scientific circles. And neither Darwin nor any of his contemporaries found it unscientific when Gray stated that "variation has been led along certain beneficial lines" (in other words, that the world develops according to a great master plan). In fact, as we have already seen, Darwin found elements of this idea very attractive, even though he found that it had to be rejected for other reasons.

Gray arrived at what has been called a third way to approach the issue of design (Sollereder 2010). He rejected Darwin's idea that natural selection makes the concept of design redundant, but he also rejected Paley's idea that design is only present if God supernaturally intervenes in the natural world. Where Paley thought of a merely static creation, Gray argued that creation should be seen as a dynamic and, basically, teleological process, directed by divine providence. Gray held that God is at work, precisely in the natural processes of evolution, and not in spite of them. He accepted natural selection as the cause of new species, but he did not believe it to be the only cause of variation, which he considered to be initiated by some inherent power, imparted in the beginning by divine design. Gray builds this argument with a sort of "natural predestination," in which the interventions of God are understood as done from all time, or doing through all time. This is an ingenious transmission of the well-known Calvinist predestination doctrine. By expanding Paley's design categories while, likewise, approving design through processes, Gray was able to embrace natural theology and evolution.

Darwin's views on intelligent design may have varied somewhat over time, especially in his later years. But he never embraced an atheistic worldview, and he struggled with the concept of intelligent design until the last years of his life, as he wrote in the 1876 manuscript of his autobiography:

> The old argument of design in nature, as given by Paley, which formerly seemed to me so conclusive, fails, now that the law of natural selection has been discovered. We can no longer argue that, for instance, the beautiful hinge of a bivalve shell must have been made by an intelligent being, like the hinge of a door by man. There seems to be no more design in the variability of organic beings and in the action of natural selection, than in the course which the wind blows. (Darwin 1887, p. 87)

Whereas Darwin could not be persuaded of the existence of God through argument based upon biological design, he found arguments that took man and the universe into account more compelling to that end:

> Another source of conviction in the existence of God, connected with the reason and not with the feelings, impresses me as having much more weight. This follows from the extreme difficulty or rather impossibility of conceiving this immense and wondrous universe, including man with his capacity of looking backwards and far into futurity, as a result of blind chance or necessity. *When thus reflecting I feel* compelled to look to a First Cause having an intelligent mind in some degree analogous to that of man; and I deserve to be called a Theist. (pp. 92–93)

Actually, a paradoxical state of mind, with the concept of brute variations in biology and the eminence of man in the universe, had perplexed Darwin beyond measure (letter 3154, May 23, 1861).

DISCUSSION

The possible evidence of intelligent design in nature has historically provided a kind of argument for the existence of God. With Darwin's publication of the theory of evolution, the argument from design met a truly hard reliability challenge. To discuss this further, it will be useful to distinguish between the *teleological* argument (the argument from design) and its close relative, the *cosmological* argument.

Both arguments have their backgrounds in classical philosophy. In the cosmological argument, the existence of the universe as a whole and some highly general facts about the world, serves as an argument on the grounds that something exists, while the teleological argument works from meaningfulness and the functions of what exists. Teleological order necessitates that structures, or processes, are fitted to bring about certain results, and in that sense, are designed.

As we have seen above, Darwin had great problems accepting particular divine inventions in living nature, but, in a broader sense, he accepted the divine design. When it came to the universe as a whole, he accepted design (cosmological design), but when he focused on the individual species in biology, he had discovered the principle of natural selection, and contrary to Gray, he found that this principle ruled out teleological design in the living nature. Thus, it is evident that Darwin made a distinction between two kinds of intelligent design, one general (or cosmological), and one specific (related to the individual species). He accepted the former as a basis for a reasonable understanding of the origin of the universe, whereas he rejected the latter as relevant for a proper understanding of the living world.

For Darwin, a major challenge to intelligent design in biology was the problem of evil. The harmony of the Enlightenment, in which he grew up, was

severely devastated by his observations from the biological world where evil (and cruelty) was proven to be widespread. He had to rethink the meaning of design in the face of evil and cruelty in nature.

It is important to make a distinction between the claims of design and teleology within nature. Teleology is a broader concept than design, and it is possible to hold that a certain element in nature has a purpose, even though it would be impossible to specify this purpose before the element in question came into being. This means that the existence of a purpose has no necessary bearing on the existence of a divine intent. On the contrary, the acceptance of the claim of design certainly implies that there is a Designer.

The main question that Darwin proposes to Gray during their correspondence reduces to this: is it plausible that the processes which govern the production of biological variations are the products of divine design (Lennox 2010)? In his theory, Darwin needed the concept of random variation, where no divine designer is involved. Without such variation, the theory would simply not make sense for him. Still, Darwin did consider final causes, and he continued to characterize the work of natural selection in teleological terms and to refer to the adaptive results of selection as "ends," "final ends," "final causes," "purpose," and so forth. This language appears prominently in his botanical writings in the period from 1862 to 1880, and it was highlighted by Gray. However, although Darwin employed a rich teleological vocabulary, he carefully avoided the word *design* in his publications. Darwin could not recognize specific design in biology because he was irrevocably tethered to Paley's ideas of how design would be manifested in the physical realm—through beneficent and perfect adaptations (Sollereder 2010). By exclusively accepting Paley's standards of how design is perceived in nature, Darwin was unable to see design at work in the parts of the evolutionary scheme. However, he recognized the grand, intelligent design of man in the universe.

The categories of teleology, over which Darwin and Gray debated, only play a minor role in contemporary mainstream neo-Darwinian biology, although it may be observed in the ideas of convergent evolution, quantum evolution, biosemiotics, and intelligent design discussions (Hoffmeyer 2008). What is missing, however, in Darwin's discussion with Gray is another question of chance encapsulated in the theory, namely the idea that natural selection does not necessitate that certain advantageous variations are transmitted, but merely increases the probability that they are. This is the conceptualization of "chance" that has been the main concern in the 20th century, since natural selection's integration with population genetics.

However, some of the discussion between Darwin and Gray on intelligent design in nature is similar to certain aspects of the modern debate on design, and both sides may benefit from looking into the Darwin–Gray debate. In fact, both sides may find it clarifying to refer to Darwin's distinction between the two kinds of intelligent design. The critics of intelligent design should take into con-

sideration that the other side actually has an interesting argument when they appeal to teleology, conceived as "teleology with teleology" (Brenner 2012), and modern advocates of intelligent design should understand why their view is considered provocative. The assumption underlying intelligent design—that nonhuman intelligence could play, or has played, an important role in nature—may be seen as controversial in a modern, secular context, because the methodology of modern empirical science is based on the systematic use of testable hypotheses in combination with the notion of falsifiability (Popper 1959). The use of notion of intelligent design is seen as violating this approach. In particular, it is seen as a violation of the principle of methodological naturalism, which "requires that science be practiced as if it is without a priori metaphysical assumptions" (Weber 2011, p. 285).

For Darwin himself, the idea of a divine designer was not the problem. In fact, he had nothing against the view that universe as a whole was intelligently designed, a notion that was part of the common worldview. However, the idea of a detailed, intelligent design was in conflict with his theory of natural selection. As we have seen, he found that an acceptance of Gray's view "would smash the whole affair" (letter 3223, Aug. 1, 1861). Clearly, Darwin seems to have assumed that the idea of "designed variation" would be conceptually inconsistent, since an assumption of design according to a divine master plan would rule out that there are alternative variations on which the natural selection can act. On the other hand, Gray might respond: "We can still hold that the natural selection acts, even if we also assume that God knows in advance which of the variations will occur and which will be naturally selected; and that God, taking this foreknowledge into account in His wisdom, has chosen the best of all possible futures; and thereby, intelligently designed the species in the living world."

Conclusion

In his preface to his *Logic of Scientific Discovery* (1959), Karl Popper writes: "There is at least one philosophical problem in which all thinking men are interested. It is the problem of cosmology: the problem of understanding the world—including ourselves, and our knowledge, as part of the world."

Darwin provided an account of the primeval life forms based on supernaturalistic presuppositions. But he did not accept Gray's idea of intelligent design in the parts of the evolutionary framework (teleological design), even though he spoke extensively on this issue. The theory was based on the concept of random variation, where no divine designer is involved. Without such variation the theory would simply not make sense for him. Hence, Darwin excluded specific biological designs in his publications. On the other hand, he acknowledged the grand intelligent design of the universe (cosmological design). And he admitted that this combination gives rise to a paradox that is just as difficult as that of free will and predestination. For Darwin this stood out as a *perplexing paradox*, which

he clearly expressed to both Gray and Herschel. This observation may explain why Darwin ended up an agnostic—neither an atheist nor a theist, although he fluctuated, to some extent, in this matter.

Both Herschel and Whewell reacted unfavorably to the theory of the *Origin*, although Herschel thought Darwin's theory might be retrieved and shown to be of value, if only he would make place for design: "But it [intelligent direction] does not, so far as we can see, enter into the formula of his law; and without it we are unable to conceive how the law can have led to the results. On the other hand, we do not mean to deny that such intelligence may act according to a law" (Herschel 1861, p. 12).

The modern intelligent design promoters, as well as those opposed to the modern version of the intelligent design approach, have much to learn from the history of natural theology and design. Darwin's and Gray's willingness to understand the other side of the argument, and the manner in which they debated on such a fundamental issue, show how we might refine the arguments and understand the limitations of the two positions.

In his modern bestsellers *The Blind Watchmaker* (1986) and *The God Delusion* (2006), Richard Dawkins suggests that Darwin was the foremost promoter of modern atheism. He further claims that a supernatural creator almost certainly does not exist and may qualify as a delusion. However, this is more of a popular cultural myth than it is based on Darwin's own writings. Instead, Darwin's work, like Gray's, is characterized by respect, curiosity, and humbleness, as well as a willingness to acknowledge strengths and shore up weak points in his reasoning. This attitude possibly arose from Darwin's familiarity with history. Clear differences of opinion did not twist or disrupt his communication with Gray, and the two men continued to interact cordially with one another on a topic that has yet to be generally settled.

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