DESIGN

The apparent evidence of intelligent design in the universe has historically provided a kind of argument for the existence of God. The argument from design has evolved over time and in relation to changing scientific and philosophical perspectives. Interestingly, it has been formulated and reformulated in ways that show responsiveness to the discoveries and challenges it has encountered from science. This history of interaction reflects both the tensions and support at play between science and religion. Whatever tensions lie between science and religion, however, are in many instances eclipsed by tensions within them. Scientists, for example, disagree with one another as to whether there is, in fact, evidence of intelligent design in the universe. Theologians, conversely, differ as to whether and to what extent such evidence should have bearing upon the question of the existence of God.

The argument from design (the teleological argument) should first be distinguished from its close relative, the cosmological argument. In the cosmological argument, existence of the cosmos as a whole, because it is contingent and is not self-explanatory, serves as a kind of argument for the existence of God. God becomes the answer to the question "Why is there something and not nothing?" The cosmological argument for the existence of God is put forward on the ground *that* something exists, whereas the argument from design works from *what* exists. The world evidences order, adaptation, directionality—design, therefore an intelligent designer must have brought it into being.

This argument gets the name *teleological* from the Greek word *telos,* which means "end" or "goal." Teleological order entails the notion that processes or structures are fitted to bring about certain results, and in that sense are "designed." The concept of teleological ordering is not simple causal ordering. To say that the wind is fitted to circulate dust in the air is an example of causal ordering, but to say the eye is fitted for sight is an example of teleological ordering, pertaining to the adjustment of means to ends.

Greek philosophy and the early church

Accounting the history of the argument from design presents something of a challenge because the argument has followed a long and winding road with many interesting turns and occasional dead ends along the way. Historian Norma Emerton gives a fuller accounting of this history in "The Argument from Design in Early Modern Theology" (1989), but this brief treatment can only present an aerial survey of the landscape the argument has traversed. Forms of the argument in Western classical tradition go back at least as far as the early Greeks. The pre-Christian Stoics believed that the order and harmony of the cosmos demanded explanation. In 45 B.C.E. the Roman lawyer Cicero in his book *The Nature of the Gods* presented both pro and con arguments. Speaking for the Stoics, who favored a teleological view, Cicero posed the question, "When we see a mechanism such as a planetary model or a clock, do we doubt that it is the work of a conscious intelligence? So how can we doubt that the world is the work of the divine intelligence?" Cicero also presented the contrary view of the Atomists (Epicureans) that "The world is made by a natural process, without any need of a creator. . . . Atoms come together and are held by mutual attraction" (2.97). No intelligent designer need be postulated. If there were an intelligent designer, the atomist Lucretius argued, the world in some respects is really badly designed.

The early Christian church eagerly took up the idea of nature as a witness to God. In *Against Marcion* (1.18) Tertullian even spoke in terms of a double revelation in "God's two books": the book of nature (God's work) and the Bible (God's Word). Nature's design, as seen in the order and beauty of the heavens, the anatomy and physiology of living creatures, and the suitability of the environment to support life, became and has continued to be for Christian theology a pointer to God.

The Middle Ages: classic formulation

After the fall of the Roman Empire in the fifth century C.E., interest in the natural world dwindled and with it the pursuit of both science and natural theology. It was not until the thirteenth century that long lost classical philosophy and science were rediscovered. With this turn the argument from design reemerged and received its classic formulation.

Aristotelian physics with its emphasis on causality became widely influential. Purely physical processes were frequently explained in terms of "ends." For Aristotle there were four distinguishable types of cause: *final cause* (the maker of an object), *formal cause* (the design or blueprint

according to which it is made), *material cause* (the raw material from which it is made) and *efficient cause* (the effort applied in actually making the object). At this time, the debate turned upon whether there is a formal cause (a design) and, having established that, proceeded to make theological claims of a final cause (a designer); if there is a design there must be a designer.

Christian theologian Thomas Aquinas was conversant with the science and philosophy of his day, and Aristotelian physics shaped his theology. The assumptions that an effect cannot be greater than its cause and that something can be *known* of the cause by observing the effect became building blocks of his particular formulation of the argument from design. Aquinas's arguments for the existence of God work *a posteriori* from observed facts of existence (effects) to what must be the case in the way of a *cause* to bring about such an effect. The most famous of his arguments are the "five ways."

Aquinas's "fifth way"(*Summa Theologica,* Part I, Question 2, Article 3) is perhaps the closest to the present concern. It starts from the orderly character of mundane events. Things meet their goals, even things that lack consciousness. Yet nothing that lacks awareness can tend toward a goal without direction from something that has awareness. As an arrow requires an archer to reach its goal, so also universal order points to the existence of an intelligent *orderer* of all things. For Thomas all causes acting in the physical universe are instrumental and have to be "used," as it were, by a primary agent. To assume that all this causation is self-explanatory is like expecting that a bed will be constructed if only one puts the tools and materials together "without a carpenter to use them." Aquinas then images God on the model of an artisan (in the mode of final cause).

Also relevant is the first of the "five ways." In thirteenth-century physics and astronomy, the four basic elements were thought to be under the dynamic influence of the stars, and lower celestial bodies were considered to be moved about by those at greater distance from the Earth. Everything that moved did so because it was moved by something else. God was the *Unmoved Mover* behind all the motion.

The section in the *Summa Theologica* where the "five ways" are presented is a response to the question, "Is there a God?" It begins with the objections that there must not be a God because there is evil in the world and because natural effects can be explained by natural causes. Interesting, these same objections still play an important part in contemporary discussions.

The scientific revolution: challenges and new forms

When Isaac Newton began working out the physical laws of nature during the late seventeenth century, he demolished one form of Aquinas's argument from design when he explained the motion of bodies according to fundamental mechanical physical laws. There was no longer need to appeal to direct divine intervention to move things around in space. However, in another sense, Newton only reformulated the argument, for he assumed God was the architect of the physical laws he had discovered. Science could explain matter and motion without recourse to supernatural forces, but these mechanical secondary forces were simply the working out of structural conditions given by God at the creation.

As many new discoveries were made during the scientific revolution, there came to be greater ambivalence about the place of natural theology. Some theologians were concerned that natural theology might usurp revelation. Conversely, some scientists were concerned that appeal to final causes might usurp attention to physical causes. Science needed to preserve its integrity and avoid becoming a "quarry" that was mined for theological arguments. Nevertheless most theologians, philosophers, and scientists (people like Francis Bacon, Robert Boyle, René Descartes, and Newton) assumed the legitimacy of natural theology.

Eighteenth and nineteenth centuries: new form and challenges

In the eighteenth century philosopher William Paley in *Natural Theology: Or, Evidences of the Existence and Attributes of the Deity, Collected from the Appearances of Nature* (1802) reformulated the argument from design by attending to specific instances of design. He took the eye as a case in point and the ways in which the parts of the eye cooperate to produce sight. To explain this adaptation of means to ends, he claimed, one needs to postulate an intelligent designer, much as one

would if one found a watch while crossing a heath; rather than assume the watch had come together by chance, one would assume an intelligent designer put it together.

David Hume in *Dialogues Concerning Natural Religion* (1779) attacked Paley's position for privileging the model of human design of artifacts. This approach, he claimed, skews the argument. Why not use another model, for instance the model of biological generation, which does not require intentional design? One could as easily say the universe is like an organism, therefore there must be a cosmic womb.

Paley had his defenders, those who preferred his analogy to Hume's. They observed that in biological generation creatures reproduce themselves rather than producing new and various things. When one asks why a rabbit has organs that are so well adapted to meet its needs, one is not helped by the answer that this is because it springs from other rabbits that were similarly adapted. Hume countered that if the best answer to such a problem is that there is an intelligent designer, then one still has to give an account for why the designer has a mind that is so well-fitted for designing. If the design comes from the designer, where does the designer come from? With either option, one ends up with an infinite regress.

Immanuel Kant in his *Critique of Practical Reason* (1788) also put forward objections to the argument from design. He thought that science and religion should be completely separate, and natural theology was for him a contradiction in terms. Nevertheless, he said in the conclusion to the *Critique,* "Two things fill my mind with wonder and awe . . . the starry sky above and the moral law within" (p. 166). Still, it was the latter—the moral law within—and not the former that he took to be the clearer pointer to God and God's goodness.

With the publication of Charles Darwin's *Origin of the Species* in 1859, the argument from design met a truly formidable challenge to its credibility. In the theory of evolution there came to the fore a genuine alternative explanation for apparent design in organisms. One was not left with mere chance on the one hand, or intelligent design on the other. Organic structures come to be what they are by development from simpler forms through purely natural processes of mutation and natural selection over an extended period of time. No intelligent designer is needed to design the eye for sight.

Twentieth century: new forms and new challenges

One might think that Darwin had dealt arguments from design the decisive blow, but the argument arose with new vitality in the twentieth century. The shape was, however, no longer examination of the particular instances of design but the general principles behind apparent design. In a manner parallel to what happened with Newton's discovery of physical laws, with Darwin's discovery of principles of natural selection the theological interest shifted from particular divine interventions to the wider divine design. What makes mutation and natural selection work in the way that it does? How did material existence come to be self-organizing in the way that it is?

This approach began taking shape in the 1920s with the work of Frederick R. Tennant in *Philosophical Theology* (1928–1930). He presents a fresh discussion of the teleological argument pointing to six kinds of adaptation that seem to evidence design and, when taken together, to point toward a theistic interpretation:

(1) The intelligibility of the world.

(2) The adaptation of living organisms to their environment.

(3) The ways in which inorganic life is conducive to the emergence and maintenance of life.

(4) The way in which the natural environment nurtures moral development in human beings through coping with hardships.

(5) The overall progressiveness of the evolutionary process.

(6) The aesthetic value of nature.

Here, in rudimentary form, are the elements of what became the argument from design in the contemporary discussion—the intelligibility of the universe and its suitability for life. Interestingly, these newly emerging forms of the argument arise from science, while some of the direct challenges to grounding intelligent design thinking in observations of the natural world come from of theology.

Theologian Karl Barth, for example, exemplifies a twentieth-century theological disillusionment with natural theology—the idea that there is a point

of contact whereby one may easily perceive who God is by studying the natural world. Barth's context, Germany during the rise of the Third Reich, shaped his theological critique. The risk of natural theology is that what one discovers will not be God, but one's own reflection, which one then names as God. It is too easy to find God in one's race, culture, and interests. Barth observed the failure of Protestant liberalism to issue a prophetic challenge. He insisted on the prophetic distance of revelation over against the "culture Christianity" of his day. So the early Barth said no (*Nein!*) to natural theology and cautioned that God is "wholly other."

A second theological challenge to intelligent design thinking arose in twentieth-century experience with the problem of evil. This is not a new challenge, but one to which any form of the argument from design (in any age) has to give a thoughtful response. But during the twentieth century, the challenge of the problem of evil was sharpened in new ways. The optimism of the Enlightenment and the nineteenth century was severely chastened. With two world wars, the Holocaust, and ethnic cleansing, evil has proven too pervasive and too heinous to be dismissed as a brief passage on the way to God's good ends, the necessary dark shades in God's beautiful painting.

Theological responses to this challenge have been mixed. In response to the problem of evil, for example, some maintain design, by which they mean a kind of divine blueprint is working itself out inexorably and in all its detail. If one could but see world processes from God's perspective, all evil would be only *apparently* evil, a matter of one's limited perspective or a necessary means to some greater good. Other theologians, especially process theologians, are willing to rethink the meaning of design in the face of evil. If absolutely everything that happens comes about by God's design, then what does one make of all the blind alleys, waste, suffering, and evil that have attended this process so carefully designed and closely controlled by God?

Design in the early twenty-first century

In the early twenty-first century, the discussion of design is being engaged with renewed vigor. Discussion centers on the somewhat negative evaluations emerging from chaos theory and evolutionary biology, and around more positive evaluations based upon the intelligibility of the universe and the suitability of the universe for the emergence of life. In these discussions, there are differences of viewpoint within the fields of theology and science that are every bit as great as some of the differences between these fields. It is not uniformly the case that theology affirms design while science denies it; the discussions are much more nuanced than that.

The reintroduction of the role of chance and contingency in the way the world works has, for many, challenged notions of design. Ian Stewart in *Does God Play Dice? The Mathematics of Chaos* (1989) has noted that with the advent of quantum mechanics the clockwork universe of Newton's day has become a cosmic lottery. "The very distinction . . . between the randomness of chance and the determinism of law, is called into question. Perhaps God can play dice, and create a universe of complete law and order, in the same breath." As one learns more about chaos theory, the question becomes "not so much *whether* God plays dice but *how* God plays dice" (p. 1–2).

Biologist Jacques Monod in *Chance and Necessity* (1972) expressed the conclusion of some: "The ancient convenant is in pieces: Man at last knows that he is alone in the unfeeling immensity of the universe, out of which he has emerged only by chance. Neither his destiny nor his duty have been written down" (p. 167).

Theologians who wish to uphold design are responding variously to chaos theory and the observations of science that much of what occurs in the universe is random activity, pure chance. A great deal depends upon their differing understandings of what one must mean by God's "design" as presented above. Those who mean "a detailed preexisting blueprint in the mind of God" hold a view that is antithetical to chance. These theologians tend to argue that what appears to be random is only apparently so. They point out that even Albert Einstein held the position that what appears to be a random occurrence would prove not to be random if only the causal activity behind it could be seen.

Other theologians do not understand design in such a constraining mode. They would allow that it might be part of the "design" that some things happen by necessity, others by chance, and others in open interplay of relative freedom. The design might include contingency as well as regularity,

chaos as well as order, novelty as well as continuity. Design might simply mean setting the systemic conditions that make life and consciousness possible, and then allowing it all to unfold. This view has the capacity to incorporate elements of chance as well as necessity into "design." This shift has profound implications for the way in which God and God's relation to the world are viewed. As John Polkinghorne expressed it, this view is "consistent with the will of a patient and subtle Creator, content to achieve his purposes through the unfolding of process and accepting thereby a measure of the vulnerability and precariousness which always characterize the gift of freedom by love" (1987, p. 69).

Process theology takes this general approach but allows for a more interactive role for God. God's purposes are expressed not only in setting the unchanging structural conditions and then letting things be, but also in the novel possibilities introduced. Divine creativity works within order and chaos, persuading toward good ends. It works with and does not coerce the self-creating activity of creatures.

Evolutionary biology, generally speaking, excludes appeal to the notion of intelligent design in organisms. The explanation of life in all its diversity, according to neo-Darwinist Francisco Ayala, lies in the blind, unguided, and mechanical process of natural selection. There are teleological processes internal to organisms; the heart, for example, has the purpose of pumping blood. However, these are not to be accounted for by divine design but through the process of natural selection and the development over time of features that prove reproductively successful. This process needs no external teleology directing it from outside. If there is anything like a "goal" or "end" to which things tend, it is reproductive efficiency.

To these assumptions, most contemporary theologians (except for creationists who reject evolutionary theory altogether) would accede. The question may still be posed as to why all things are oriented toward reproductive success. Can one infer, for example, that ultimate reality is in some sense fecund and biophilic? Why does natural selection work in the way that it does? How did material existence come to be self-organizing in the way that it is? Moreover, the mode of operation of evolution is a source of wonder that seems to point beyond itself. Differentiation, self-organization, and interrelation seem to characterize the evolutionary process. As Paul Davies points out, life forms have emerged from primeval chaos in a sequence of self-organizing processes that have progressively enriched and complexified the evolving universe in a more or less unidirectional manner. All this diversity, as John Haught has noted, comes from the informational sequencing of only four DNA acid bases. It is a remarkable state of affairs.

Nature seems to operate with a kind of "optimization principle" whereby the universe evolves to create maximum richness and diversity. Davies observes "that this rich and complex variety emerges from the featureless inferno of the Big Bang, and does so as a consequence of laws of stunning simplicity and generality, indicates some sort of matching of means to ends that has a distinct teleological flavor to it" (1994, p. 46).

As Paul Davies observed, "Human beings have always been struck by the complex harmony and intricate organization of the physical world. The movement of the heavenly bodies across the sky, the rhythms of the seasons, the pattern of a snowflake, at the myriads of living creatures so well adapted to their environment—all these things seem too well arranged to be a mindless accident. It was only natural that our ancestors attributed the elaborate order of the universe to the purposeful workings of a deity" (1994, p. 44). However, with the increased understanding that science has brought, one no longer needs explicit theological explanations for these phenomena. The questions that remain concern why the universe is lawful, coherent, and unified in this way. Why is it intelligible? Scientists themselves normally take for granted that people live in a rational, ordered cosmos subject to precise laws that can be uncovered by human reasoning. Yet why this is so remains a "tantalizing mystery" (Davies 1992, p. 20). Ian Barbour quotes Einstein as saying, "the only thing that is incomprehensible about the world is that it is comprehensible" (1990, p. 141).

Not all scientists agree here, however. Theoretical physicist Steven Weinberg at the end of his book, *The First Three Minutes* (1977), makes the statement, "the more the universe seems comprehensible, the more it also seems pointless" (p. 149). Analysis of cosmos does not, for him, yield clear and evident purpose. Advocates of the anthropic principle, John Barrow and Frank Tipler

(also theoretical physicists), make a different interpretation. The very laws that Weinberg takes to be indifferent to human beings seem to them to suggest the presence of an intelligence that "wanted" human beings to evolve.

Biological systems do have some very particular requirements and these requirements are in fact met by nature. There are cosmic coincidences of striking proportions. For example, if the expansion rate of the universe after the Big Bang were greater by an infinitesimally small proportion, stars and planets would not have formed. If it were any smaller, the universe would have collapsed upon itself. Similarly, the inverse square laws that apply to gravitational, electric, and magnetic forces are essential to the stability of the atoms and solar systems. Even a small change in the force-distance relation would jeopardize life as we know it. There are countless other instances of what Barbour has called "remarkable coincidences" (p. 136)

The odds against this special set of physical conditions and natural laws that make our lives possible are astronomical. The theoretical physicist Stephen Hawking has said, "The odds against a universe like ours emerging out of something like the Big Bang are enormous. I think there are clearly religious implications" (p. 121).

Detractors will say that one could only observe a universe that is consistent with one's existence (the weak form of the anthropic principle). Moreover, there is a possibility that there are an infinite number of universes. It is also possible that other, vastly different, forms of life have emerged elsewhere under different initial conditions and physical laws, although, as of 2002, none are known and this remains an open question.

If it is the case that the existence of life requires finely tuned conditions and these do in fact exist, then the suggestion of intelligent design does not seem an extravagant metaphysical claim. It is not more extravagant than the claim for infinite random universes. Some would apply the criterion of Ockham's Razor and argue that the hypothesis that there exists an intelligent designer serves as a simpler and therefore better explanation (applying Ockham's Razor criterion).

Theological responses to the argument from design emerging from some scientific accounts of the intelligibility of the universe and its suitability for life are mixed. From this scientific picture of the universe, many theologians are willing to make the interpretive leap to the existence of an intelligent designer—a creator with an investment in life, and even, apparently, intelligent life. If one does see design, it is hard not to make the leap to thoughts of an intelligent designer. While one may imagine a designer without a design, a design without a designer would be a surprising thing indeed.

Nevertheless, many theologians do not want to invest too much import in the argument from design. This is, in part, because the evidence is ambiguous. Scientists do not all agree, for example, that evolution manifests the directionality that is often appealed to as evidence of design. Paleontologist Stephen Jay Gould holds that while early evolution might be said to *complexify* (there was no other direction to go), as things steadied out life randomly got simpler as often as it got more complex. Complex life forms are actually disadvantageous; they are easy prey to mass extinctions that periodically plague the planet.

Even if the weight of scientific opinion were clearly in the side of design in the universe, the leap to an intelligent designer is still a large interpretive leap, and not one that all impartial observers would make. And even if this be granted as a reasonable inference from the evidence, a "designer" is not yet "God" in the sense of the creator of all things visible and invisible, infinite in goodness, wisdom, and power.

Theologically speaking, the argument from design is somewhat limited in its efficacy. At best, it is a pointer toward God; it cannot offer a convincing proof for God's existence. For the believer, evidence of design in the universe seems a kind of confirmation that there is reason to believe that it is not *unreasonable* to believe. Whether one believes or does not believe is a question of interpretation, as some would have it, "a leap of faith." One that is inevitably "underdetermined by the data."

The current state of the discussion between theologians and scientists is one of active engagement and mutual illumination. There are exciting new directions and many diverse perspectives represented. Old assumptions that theologians will uniformly support arguments from design while scientists will uniformly oppose them, simply do not hold. Scientists, for example, disagree with one another as to whether there is in fact evidence of intelligent design in the universe. Theologians,

conversely, differ as to whether and to what extent such evidence would have bearing upon the question of the existence of God. The questions remain open and interesting.

See also ANTHROPIC PRINCIPLE; ARISTOTLE; CHAOS THEORY; CONTINGENCY; COSMOLOGICAL ARGUMENT; CREATION; CREATIONISM; CREATION SCIENCE; DESCARTES, RENÉ; DESIGN ARGUMENT; DIVINE ACTION; EINSTEIN, ALBERT; EMERGENCE; EVIL AND SUFFERING; EVOLUTION; EVOLUTION, BIOLOGICAL; GOD; INTELLIGENT DESIGN; MUTATION; NATURAL THEOLOGY; NEWTON, ISAAC; PROCESS THOUGHT; REVELATION; SUPERNATURALISM; TELEOLOGICAL ARGUMENT; THOMAS AQUINAS; TWO BOOKS

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DESIGN ARGUMENT

The argument from design argues from the order, adaptation, and directionality evident in the cosmos that an intelligent designer (whom theologians call God) must have brought it into being. In religion and science discussions this argument has held a prominent place historically and is continually reformulated in response to discoveries and challenges from science. There is an ongoing discussion among scientists as to whether the cosmos in fact manifests sufficient order, adaptation, and directionality to indicate design. Discussion continues among theologians as well concerning the effectiveness and limitations of an argument from design for establishing the existence of God.