



Dialogue: Article

Interpreting the Book of Nature

Interpreting the Book of Nature

Angus J. L. Menuge



The idea of nature as a book provides one of the richest and most often appropriated metaphors for the natural world. Plato, Aristotle, the Stoics, and Christians have all seen the work of the scientist as tracing out the telos or logos inscribed in nature by some demiurge or god. Critics of design, from Francis Bacon¹ to Daniel Dennett, also see science as a kind of reading. Bacon urged that nature was a text which, to be rightly understood, must not be anticipated but humbly interpreted.² Dennett concludes evolutionary biology must employ “artifact hermeneutics”³ to discern what biological structures are adaptations for. Nonetheless, for Dennett, the text is written by the blind process of natural selection, not via the agency of an author. The metaphor of nature as text is congenial to both proponents and critics of Intelligent Design.

In this essay, I will trace the history of the idea that nature is a book from early Greek science, through the Middle Ages and Reformation, and culminating in the rise and critique of natural theology. First we will try to understand how science ever got started: What prompted some people to stand back from their busy lives to open the book of nature in the first place? Next we will draw on the recent work of Peter Harrison, in which he argues persuasively that the Reformation provided the crucial hermeneutical change that overcame scholasticism and made modern science possible. Then we move to the great controversy between natural theology and its critics. This we will consider as fundamentally a drama about rival hermeneutics and the proper limits of theological and scientific interpretation. We will attempt to show that sound hermeneutics are vital to understanding the interplay between science and religion.

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Opening the Book

Before science can get started, humans must have the idea that nature is congenial to systematic study. Not all ways of understanding nature support this assumption.⁴ Animism and polytheism suggest that nature itself is sacred, so that it would be a sacrilege to dissect it, and also that nature is governed by a multiplicity of local deities and is thus too heterogeneous and capricious to support universal laws. Excessive spiritualism or exclusive concern for eternal truth may disparage nature as the realm of

transience, *maya* (illusion) or corruption, making its systematic study a pointless or even sinful diversion.⁵

Even Plato had tendencies in the latter direction, but overcame them by proposing a more fruitful connection between the eternal and the temporal. If the eternal realm is fundamentally orderly and rational, and the temporal universe is a copy, then if the copy preserves enough of the original qualities, it should be intelligible to human reason. Speaking for Plato, Timaeus says that “the world has been framed in the likeness of that which is apprehended by reason and mind,”⁶ that is, in the (imperfect) likeness of the Forms. The cosmos was understood as an organism, “a living creature truly endowed with soul and intelligence by the providence of God.”⁷ While moderns will find this picture anthropomorphic, the assumption that the cosmos is an intelligent organism rather like us at least guarantees

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that nature's order is intelligible to humans, making the project of science possible.

Despite this nudge forward for science, Plato's philosophy inhibited its full potential. For one thing, he distinguished a corrupt sublunary realm from the superlunary region, where alone entities truly fulfilled their *telos*: "The sublunary part was ... a partial failure." Due to this distinction in Plato's vitalistic universe, he "deprived it of a thorough, universally valid orderliness."⁸ Although Plato had the genius to suggest that much of physics could be reduced to geometry, thereby anticipating Descartes, Kepler, and other giants of the scientific revolution,⁹ he did not think that geometry was valid for the corruptible Earth, a view hardly congenial to terrestrial physics. The major problem was that Plato divorced essences or forms from *concreta* so that universal truths were found only in the eternal realm. Thus science was viewed as speculating about the eternal mind on the basis of its temporal image, an activity that could at best yield approximations.

A decisive move away from this picture was made by Plato's great student Aristotle, who suggested that essences were actually contained in substances. If this is true, then scientific analysis of substance can hope to rival mathematics in its ability to discern forms. Aristotelian metaphysics made it possible to think that science could discover necessary connections (laws) by examining the essences of particulars. Since the Platonic realm was rational, when Aristotle imported it into particulars, these were predicted to conform to rational principles. Science became the project of discerning what a substance's nature was, which would tell us what it was inclined to do, and thus predict its characteristic behavior. The mentalism of Plato's approach to the universe was thus displaced, but not eliminated.¹⁰

In addition to the material and efficient causes still recognized throughout contemporary science, Aristotle also emphasized the formal and final causes. Looking at the development of embryos into chickens, Aristotle observed a programmed series of changes, which he supposed derived from the characteristic form of chickens contained in the embryo. Although contemporary science has challenged the claim that DNA is the exclusive determinant of development, it is not absurd to suggest that the discovery of DNA partially confirmed Aristotle's insight about embryogenesis, and this holds regardless of whether the properties of DNA are understood from the perspectives of Darwinism, theistic evolution, self-organization, or design.¹¹ Outside biology, however, modern science sees much less use for formal causes because typical physical objects are taken to be passively obedient to external laws rather than enacting active principles within themselves. Even less popular is Aristotle's idea that each substance had some final end, which provides a teleological explanation of its current behavior. Teleology of this kind is

rejected by most contemporary scientists, except in the case of a human or other observable intelligent agent. Yet both the laws of thermodynamics and various anthropic principles are suggestive of a universe that has a certain in-built direction.

Darwinists like Gould have claimed that were the evolutionary tape rewound and played again, it is most unlikely that life as we know it would re-evolve. However, theistic evolutionists, self-organizers, and proponents of Intelligent Design would expect similar patterns to emerge, pointing to the fine-tuning of physical constants and the stability of species as evidence. Some Darwinists also concede that what Dennett calls "forced moves in the game of life" would channel natural selection along somewhat predictable paths.

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Christianity also provided some additional presuppositions that helped science along its way. That this is so seems to many a matter of historical record, although it does not follow that these presuppositions cannot be detached from Christianity and supported on independent grounds.¹³ Christians contributed the idea that the entire universe was created *ex nihilo* by a single, rational being. As we saw, Greek science had supposed that the



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universe was bifurcated into the perfect heavens governed by celestial physics and the corruptible sub-lunar realm subject to terrestrial physics. A rational God who is sovereign of all can be expected to make no such distinction. As Jaki argues, even Buridan in the Middle Ages seems to have grasped this point, which is implied by his willingness to understand celestial motion by comparison to such mundane terrestrial examples as moving a smith's wheel and the long jump.¹⁴ It was not until Newton that a comprehensive set of universal laws was developed and the distinction between celestial and terrestrial physics finally was abolished. Despite his unorthodox Arianism, Newton shared with Buridan a strong belief in a single rational creator of the universe, and this certainly founded his faith that universal laws were available for discovery. The theological hermeneutic that insists the book of nature is the work of a single, coherent author has been very fruitful for science.

By distinguishing the Creator from the creation while yet retaining the idea that the creation was good, Christianity removed the universe's sacred status, making its study and dissection morally permissible, while upholding the value of matter against the Gnostic disdain for it.¹⁵ And if God is identified with the *logos*, a principle of rational order, and one in whose image we are made, there is a foundation for Plato's expectation of an intelligible, orderly universe.¹⁶ It seems undeniable that this assumption is one that can never be justified from the bottom-up (i.e., from human perceptions of phenomena), as it is essentially equivalent to solving the insoluble problem of induction. The pragmatic need for a faith in natural order seems to be a prerequisite for doing science, and it is a major challenge for naturalism to justify this faith.¹⁷

In all of these ways, the idea of divine design has helped science, not so much by providing specific theories, as by legitimating general research programs directed toward the discovery of universal laws. The secularist may grant the historical value of this theological scaffolding, but claim it has been used to build a materialist edifice that no longer has need of it. Conversely, quite a few philosophers, including me, are coming to the conclusion that scientific materialism cannot justify its foundational assumptions independently of theism.¹⁸

Still, it must be admitted that Christianity has not always been a friend to science. To be sure, most contemporary scholars agree that the Enlightenment picture of the Dark Ages as an authoritarian stifling of science is an overdrawn caricature that ignores important scientific advances in both mathematics and theoretical physics.¹⁹ But it is undeniable that scholasticism impeded the development of modern empirical science, and that some Christian assumptions were partly to blame for this.²⁰

From Scholasticism to Modern Science

There is little doubt that the scholastic scientists of the medieval period related textual interpretation to nature in unhelpful ways. Not only Scripture, but all classical works were taken as authoritative. It was supposed that Adam's knowledge before the Fall was much more complete than our own, and that even after the Fall, early texts retained many great insights now in danger of being lost through the progressive corruption of the human mind. Thus Peter Harrison argues:

The mastery of nature at which thirteenth and fourteenth century minds aimed, amounted to a reconstruction of a past body of knowledge, the ruins of which could be discovered in those texts of the ancients.²¹

Not only that, scholasticism followed the obsession of the early church fathers with allegorical interpretations of the text. This was extended from Scripture to the study of nature so that a hermeneutics of nature aimed not at an accurate description of the facts about an entity but at discernment of its symbolic meaning. These meanings were thought to reside in authoritative texts, making empirical investigation of the world unnecessary. Harrison writes:

The turn to nature as an entity in its own right was a turn to texts about nature ... Such was the nature of the scholastic method that discovery took place through exegesis and argument rather than by observation and experiment.²²

As a result, medieval bestiaries evince quite credulous acceptance of a variety of non-existent creatures (harpies, unicorns,

centaurs, satyrs and many more), and unsubstantiated fables about real creatures, such as the claim, going back at least as early as St. Ambrose, that the pelican's mother wounds itself in Christ-like manner to revive its young.²³

Behind this approach to the study of nature lies the assumption that natural objects, especially animals and plants, are designed by the Creator to educate humans, in particular, to teach moral lessons. This assumption is one that encourages the human mind to intuit and anticipate essential meanings in an armchair fashion, rather than carefully investigate the natural facts. The idea that nature *must* be a certain way effectively precludes our checking out whether this is the case. In that sense, Bacon was surely right to complain that an a priori notion of design is an idol of the mind, deadly to scientific progress. It also warrants an important distinction between the hermeneutics of theology and science. Theologically, we can assert that God works providentially. In this sense, granted God's revelation, we do have a priori knowledge of design. However, this does not imply that science can anticipate the means God will use or his final purpose. If design has a scientific role, it must be the more modest one of an a posteriori conclusion. As a result, science needs a different, more modest hermeneutic from theology.

Oddly enough, it was improvements in textual analysis that partly explain the fall of scholasticism.²⁴ The emerging science of textual criticism revealed that current copies were frequently corrupt, motivating a search for the original text. In the process of sorting out variant meanings to make sense of the original, it became necessary to actually investigate the natural world directly, to see which interpretation made most sense. At this point, a crucial move was made from following the claims of the ancients to following the scientific method that the ancients had used to substantiate those claims. We might think of this in terms of a distinction Susan Blackmore makes between two ways of copying memes (i.e., discrete memorable units, such as advertising jingles or the aphorisms of an ancient writer).²⁵ The medieval scientists moved from copying the product (the writings) to copying the instructions (the procedures the ancient scientists used to discover which statements were true). The exegesis of ancient texts could no longer progress without some exegesis of nature itself. As soon as scientists followed this path, however, they discovered all sorts of embarrassing errors and omissions, even in the original texts. By the time America was discovered, it became obvious that there were many flora and fauna of which Aristotle was completely ignorant.²⁶

But there was something else that had to happen before modern science could appear. Medieval thought was still mired in the idea that not only words, but also things are invested with a variety of symbolic meanings. The Bible and nature were alike viewed as a storehouse of allegory. As Harrison argues, the Reformation was decisive in its rejection of this view, proposing a new hermeneutic for

both Scripture and the book of nature. Luther, Calvin, and others believed that allegorical interpretations allowed all sorts of false or unnecessary doctrines to occlude the simple Gospel message of the Bible. While not denying the possibility of secondary, metaphorical interpretations, they insisted on the primacy of the literal meaning of the text. When the same approach was carried over to the natural world, symbolic meanings were rejected in favor of accurate, factual description. In the case of both revelation and the book of nature, the Reformers insisted that we should humbly confine ourselves to discovering what the text actually and clearly says, avoiding anticipatory flights of fancy. This outburst of intellectual humility was essential to science's decisive turn toward the *a posteriori*.²⁷

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When demonstrable fact and not traditional commentary is paramount, it becomes possible for theologians to uphold God's Word and for scientists to uphold nature as their final epistemic authorities. Harrison writes:

In freeing persons to make determinations about the meaning of the book of scripture without deferring to authorities, the reformers had at the same time made room for individuals to make determinations about the book of nature, unfettered by the opinions of approved authors.²⁸

The Reformation emphasis on total depravity and the sovereignty of God made it inappropriate for a mere human to claim to discern via unaided reason the symbolic meanings and ultimate purposes of God. Some of these purposes are revealed by Scripture and so can be read via the theological hermeneutic. But at best, the scientist could hope, like Lutheran astronomer Johannes Kepler, to discern the patterns God had left behind in nature, and, in this limited way, to think God's thoughts after him.

Nonetheless, the idea of design was still important in shaping scientific work. As Peter Barker argues, Lutheran theology provided grounds for expecting nature to obey a discernible Logos. He writes:

The specifically Lutheran doctrines of the ubiquity and the Real Presence of Christ in the host are the



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basis for the Lutheran belief in the universal presence of a providential deity, whose design or plan may be known through the study of nature.²⁹

Contrary to the assumption that Luther was anti-science, his emphasis on Real Presence and Providence predisposed him in favor of modern science. This explains the fact that Luther gave free rein to Erasmus Reinhold, Georg Rheticus, Caspar Peucer, and other Lutheran astronomers at the University of Wittenberg, allowing them to pursue the revolutionary Copernican heliocentric model even though it seemed to many to conflict with both Scripture and common sense.³⁰ The greatest of the Lutheran scientists was Johannes Kepler, who saw God as the Geometer of the universe, and who maintained that fallen humans retain a “natural light” of rational intuition, so that “the geometrical part of God’s providential plan for the world would be accessible to human beings through the natural light.”³¹ More generally, the rise of modern science depended on a fundamental “change from a world which is ordered symbolically by resemblances to one which is ordered according to structural similarities, or abstract mathematical relations, and always, at a higher level, divine purposes.”³²

In this perspective, the distinct hermeneutics of science and theology are part of an integrated whole, so that, for example, the problem of the natural evil disclosed by empirical science is addressed by applying the theological doctrine of providence. The theological ideas that harmful or noxious creatures exist as agents of divine justice, or as fillings for otherwise unoccupied levels of the “Great Chain of Being,” or as foils to show off the finer creatures more clearly, or as spurs to human soul-building, or simply as instruments of some divine purpose unknown to us were all developed at length, with the understanding that they were complementary, rather than irrelevant, to science. Likewise, Robert Boyle, a paragon of Christian science, saw scientific work as fulfilling God’s purposes by producing medicines and technologies to aid our neighbor and partially restore the effects of the Fall.

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it is also true that the reinvigorated Christianity of the Reformation came to its rescue.

Natural Theology and its Critics

The powerful integration of science and religion which began on the continent, later flourished in the predominantly British school of natural theology. What remained of Aristotle after the birth of modern science was widespread, although not universal, commitment to final causes. No longer, however, were these causes viewed as occult essences within substances, as Aristotle had supposed. Rather, final causes could be discerned by straightforwardly investigating the benefits of a phenomenon to humanity. Work along these lines varied from the sensible (Walter Charleston’s study of the uses of blood, respiration and muscles³³), to the suspect (Henry More’s claim that rivers are designed as natural quarries of stone³⁴), to the outrageously Panglossian. Perhaps Noël Pluche gets the prize for the latter category, with the following suggestion:

The woodworm, which eats the hull of ships, actually contributes to harmonious international relations, for it provides opportunities for some countries to sell to others pitch with which to protect ships’ hulls: “Thus does this little Animal, which we so much complain of as being troublesome and injurious to us, become the very Cement which unites these distant nations in one common Interest.”³⁵

At this extreme, science became an exercise in post hoc rationalization with the doubtful aim of defending God’s wisdom. At the same time, wiser heads like those of Robert Boyle, William Harvey, Robert Hooke, and John Ray argued that the microscope reveals an organic world brimming with evidence of design, regardless of whether or not we can discern its ultimate purpose.³⁶ Boyle was more careful to distinguish the theological from the scientific hermeneutic, confining his scientific investigation to the material mechanisms. Convinced that matter was completely passive and unable to give an ultimate explanation of its own order, Boyle was free to draw the theological conclusion that this order evinced divine design.³⁷ Indeed Boyle was concerned that

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science should not try to mingle the divine and the natural, as occurred in the immanent spiritism of van Helmont's active principles, because this tended to pantheism and denied God's free and sovereign will over his creation.³⁸

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Although distinct from science, natural theology has undoubtedly contributed to science by motivating careful examination of the functioning of physical and biological systems. For example, medicine started to flourish when scientists asked such questions as "What is the function of the heart, lungs, and other parts of the circulatory system?" Indeed, the identification of these physical structures *as* a circulatory system presupposes a functional stance of analysis, and this was contextually motivated by a belief in divine providence. But natural theology also came under increasing criticism, some friendly and some unfriendly.

As superior telescopes revealed the vastness of space, the possibility of extraterrestrial life was first discussed. To many it no longer seemed credible that humanity, residing in a tiny part of a huge universe, was the sole beneficiary of nature. This led to a decisive move away from anthropocentric to more broadly cosmological design.³⁹ The universe is for God's purposes to be sure, but these need not always be the purposes of humans.

At a more conceptual level, some philosophers, including Bacon, Descartes, and Hobbes, objected in various ways to the reliance of natural theologians on final causes. Bacon argued that the natural theologians were unwilling to accept the limits of human understanding and the inevitability of "brute facts" which admit of no further explanation. Instead, Bacon charged, humans project their own agency onto the world, supposing that a being like themselves is the ultimate explanation of mystery. He said:

As it strives to go further, [the human mind] falls back on things that are more familiar, namely final causes, which are plainly derived from the nature of man rather than of the universe ...⁴⁰

Bacon here warns against the human tendency to read human psychological categories into the universe beyond the warrant of the evidence. Hobbes made much the same point in critiquing the use of final causes in dynamics. He argued:

Men measure, not only other men, but all other things, by themselves; and because they find themselves subject after motion to pain, and lassitude, think everything else grows weary of motion and seeks repose of its own accord.⁴¹

Descartes also thought that science should focus on the mathematical properties of matter in motion and that the idea of final causes was "premised on a false analogy from human actions and motivations"⁴² to the divine. On the other hand, Harrison argues that the critics of final causes overplay their hand. He writes:

The search for divine purposes in the natural order provided a clear religious warrant for a pursuit which might otherwise have been regarded as the accumulation of vain and futile knowledge, little different from the bookish and unprofitable endeavors of the encyclopaedists. The scientific achievements of men such as Robert Boyle and John Ray give the lie to Bacon's assertion of the baleful influence of final causes.⁴³

It is true that Boyle did not regard final causes as part of physical science,⁴⁴ which he believed was concerned only with the secondary causes operative in material mechanisms.⁴⁵ Nonetheless, final causes were a crucial theological motivation for asking scientifically fruitful questions.⁴⁶

Against the idea of integrating the scientific and theological hermeneutics, Bacon argued that the words of Scripture and of the book of nature are of quite different kinds. He wrote: "Heretical religion as well as fanciful philosophy derives from the unhealthy mingling of divine and human."⁴⁷ Moreover, some argued that the more nature is viewed providentially, the more acute is the problem of evil. While some of the theodicies for natural evil were ingenious, many were strained. Also, there were many different ways of accounting for the same evil, and no clear way to adjudicate which of these was correct. From these considerations, many concluded that natural theologies were engaging in fanciful speculation with no relevance to the empirical demonstrations of science.

Despite his rejection of final causes in physics, Descartes grounded science in the confidence that if we restrain our errant will, we are capable of understanding the rational, and especially the geometric, order of the universe. But both Christian theology and agnostic skepticism gave grounds for doubting this optimistic view of human cognitive powers. The reformers took total depravity to mean that human will and reason is unable to know God personally without regeneration. But does this depravity also darken the human understanding of the book of nature? A radical form of theological skepticism would argue that human reason is no longer analogous to the divine, so that scientific realism is doomed to failure. Perhaps scientific theories do not justify ontological com-



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mitments, but merely provide useful calculation devices that capture the right predictions. The agnostic Hume also tended in this direction, arguing powerfully that there is no way to justify the scientific practice of induction, and hence no basis for the assumption that science can discover the true categories and regularities of nature.

The obvious way out of this skeptical miasma is to appeal to some transcendent and authoritative word. But as the Enlightenment progresses, modernist philosophers concluded that such a word was both epistemically inaccessible and practically dispensable. In his *Dialogues Concerning Natural Religion*, Hume saw a Divine Designer as only one of many hypotheses that save the phenomena, discerning that metaphysics is radically underdetermined by the totality of natural facts. However, Kant strove to restore the confidence in human reason that Hume had lost. Impressed with the triumph of Newton, himself a firm believer in providence and final causes, Kant attempted to understand Newton's laws of motion as synthetic *a priori* statements, i.e., necessary truths of our experience, as geometry appeared to him to be. In this way, Kant hoped to escape Humean skepticism about induction and to provide a foundation of rational certainty for science which did not depend on some inaccessible or nondemonstrable revelation. While Newton himself appealed to the divine to explain the formation and stability of planetary orbits, Laplace followed the Kantian line and argued that he no longer had need of such a hypothesis.

Skepticism was replaced by a confidence in human reason that made appeals to religious foundations seem redundant. Though Kant himself was devoutly Christian, there is no doubt that his thinking encouraged the move from an interventionist natural theology to deism. If Kant and Laplace were right about the inherent rational order of the cosmos, surely the universe is more like a carefully crafted machine than a living organism. While organisms need constant support and attention, an automaton devised by a perfect engineer might easily be supposed to require no further intervention, making of God a sort of cosmic Maytag repairman, with nothing left to do except read the newspaper. Aesthetically, some preferred the idea of a God who got it right the

first time and had no need to tinker with his handiwork.⁴⁸ Pushed too far, of course, this made the Incarnation itself a source of embarrassment. But it was just at this time that naturalistic criticism of the Bible began to suggest that the Bible was full of legendary material, and that the miracles did not really happen. For those who could not bear such a distant, uncaring God, pantheism and varieties of nature worship got God back into nature, sacrificing his transcendence to maintain his immanence. Such a God could easily be identified with the life force or spirit of progress that came to dominate in the eighteenth and nineteenth centuries. He was, of course, British!

Even by the nineteenth century, the criticisms of Bacon, Descartes, Hobbes, Hume, and Kant had not unseated the argument for design. Although many had unorthodox ideas about the nature of God, they were not incompatible with his being a designer, and Paley's *Bridgewater Treatises* were influential because, despite the skeptical worries about final causes, no one had a serious rival theory. To say that the divine might not be analogous to the human or that our faculties might not be able to discern divine purposes falls short of a demonstration that this is the case. Only a plausible reading of the natural text that makes appeal to a designer superfluous could justify outright rejection of the design hypothesis.⁴⁹ Such a reading was provided by Charles Darwin's *The Origin of Species* (1859).

Darwin's most important philosophical insight involved a careful distinction between the appearance and reality of design. Neither Darwin nor Richard Dawkins, his most vigorous contemporary spokesman, had any doubt that biological systems appear to be designed. This is why it is so worthwhile to treat creatures, organs, and biochemical structures as artifacts or machines. Nonetheless, from the fact that something appears to be designed, it does not follow that it actually is. Darwin's contribution was to supplement this philosophical distinction with a hypothesis that would account for the appearance of design in nature without invoking a designer. Darwin argued that living creatures diversify through a process of descent with modification, where some source of variation (unknown to Darwin) led to both advanta-

geous and disadvantageous traits among a species' progeny. The structure of the environment and competition for the crucial resources of food and mates jointly act as a sieve, tending to the extermination of the maladapted and the increase of the well-adapted. Since well-adapted creatures are those with traits that happen to suit their environment, this process of entirely natural selection fosters the illusion that the traits were explicitly designed for a purpose.

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The process is thoroughly mechanistic and, some felt, quite ruthless and wasteful, making it hard to see how a loving God could carry out his providential plans through such means. Deism, which was already on the theological scene, was co-opted as a means of keeping God's hands clean of the blood that ran from tooth and claw. It might be possible to explain why God would allow such goings on, but his active involvement in them seemed unjustifiable to many. Still, if evolution meant progress (a doubtful inference from Darwin's theory⁵⁰), perhaps one could think of a World Soul or Life Force, which was propelling us ever closer to enlightenment. The carnage of the primitive past was regrettable, but perhaps it was justified if it eventually produced people as civilized as Victorians. Some, however, felt that there was simply no way to get God off the hook. If Darwin was right about how life develops, then natural evil seemed to be an essential part of the process, and the conclusion must be that either God lacks one of the traditional attributes (omniscience, omnipotence, or holiness),⁵¹ or that he does not exist at all. Others were more determined to retain an orthodox Christian faith. Following Karl Barth, the Neo-Orthodox placed the salvific Gospel events (*Geschichte*) in a separate self-validating realm of suprahistoricity, where they could not be falsified by the facts of history, no matter how recalcitrant. The Gospel events then show that the Lord is a loving God, regardless what natural science uncovers. Conversely, some who insisted that God really acted in the same history about which science speaks, felt that there was no option but to reject much of Darwin's theory. To the latter group, Darwin's account was incompatible with the idea that God creates things good and continues to sustain and care for his creation.

Other approaches attempt to defang Darwin by showing that one can have one's cake and eat it, too. Some claim that the hermeneutic of science cannot uncover spiritual

truths, so that the medieval and Reformational hope for an integrated interpretive strategy for both Scripture and nature must be abandoned. The problem of evil in nature only occurs if we read the scientific facts spiritually, but that is to confuse science and theology. Perhaps Bacon was right that "heretical religion as well as fanciful philosophy derives from the unhealthy mingling of divine and human." One natural outcome of this line of thinking is Gould's model of theology and science as Non-Overlapping Magisteria (NOMA), with science the authority on natural fact and theology the arbiter of morality and ultimate meaning. Others, less skeptical of God's providence, argue that the process of evolution itself evinces God's purpose of moving toward perfection through suffering. They also may point out that natural selection seems to work too well and that species seem to be too stable for evolution to be a blind process. It still seems plausible to many that humans are part of the *telos* or direction of evolution and so, it is thought, Darwinists are wrong if they suppose themselves to have abolished final causes (a view with which a minority of Darwinists and many theistic evolutionists agree). Most recently, proponents of Intelligent Design (ID) argue that the natural text is not being given a fair reading because of the background assumption of methodological naturalism. Should nature have anything to say of the supernatural, this assumption serves as a gag order, producing a censored and mutilated text akin to Jefferson's Bible.

Intelligent Design raises red flags for some who see it as a return to the confusion of science and theology of which some of the natural theologians were guilty. Walter Thorson has developed this criticism with impressive sophistication, arguing on theological and methodological grounds that science proper is not in the business of detecting divine design.⁵² Thorson agrees with ID that the mechanistic, reductionist paradigm of physics is unable to account for the "functional logic" of biochemical structures, and he agrees that it is natural and warranted by the objective facts for Christians who are scientists to infer a designing intelligence. However, Thorson argues that this inference is not a scientific but a theological one. First, Thorson rightly notes that a foundational requirement of science is that its findings be accessible to all competent investigators, regardless of their spiritual condition. Second, Thorson claims on scriptural grounds that "transcendence means that God and God's agency in creation cannot be subjected to scrutiny by the *unrepentant and autonomous* rational powers of humans."⁵³ Unregenerate humanity cannot "name" God in the sense of identifying who he is or what he is doing in creation.

In my view, Thorson's second claim is largely, but not entirely correct. Thorson is absolutely right that unregenerate humans cannot gain a *personal* knowledge of God by their own reason; this is clearly incompatible with salvation by grace alone. But at least the more careful ID



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proponents would point out that one can detect the marks of an *unknown* agency, just as the pagans of Acts 17 had an altar to an unknown God. What is more, this agency might not even be personal. It might be the impersonal logos of the stoics. That we can detect design without knowing the agent or its motives is clear from human cases. Ancient archaeological finds include artifacts whose maker and purpose no one can identify.

Secondly, I think Thorson goes too far in limiting natural knowledge of God. Paul's Epistle to the Romans surely implies that the reason the unbeliever is "without excuse" is that he does have *impersonal* knowledge of God. Paul writes:

The wrath of God is being revealed from heaven against all the godlessness and wickedness of men who suppress the truth by their wickedness, since what may be known about God is plain to them, because God has made it plain to them. For since the creation of the world God's invisible qualities—his eternal power and divine nature—have been clearly seen, being understood from what has been made, so that men are without excuse (Rom. 1:18–20, NIV).

It is clear from these verses that the unbeliever does detect the *anonymous* agency of God; in other words, he can see the marks of God's agency and even the qualities of the agent, *without thereby attributing either of them to God*. It is not, as Thorson seems to claim, that these marks or qualities are *inaccessible* to the unbeliever, so that they violate the requirement that scientific evidence must be accessible to all competent investigators. The reason that the unbeliever continues to reject this knowledge is not cognitive but volitional impairment. Unbelieving scientists can access the marks of design, but their wills are opposed to interpreting it as evidence of a designer. If science is the search for objective knowledge, it should not be constrained by the fact that some wish to suppress that knowledge when it clearly, though anonymously, implicates the divine. Intelligent Design may or may not turn out to be fruitful for science. But so long as it only claims to detect anonymous design, I do not think it muddles the distinction between the scientific and theological hermeneutics, which

Thorson so rightly insists on. Science may detect altars to an unknown God. Theology will proclaim who that God is.

While hermeneutics by itself does not resolve the controversies, it is helpful to understand the various positions as ultimately tracing to rival hermeneutics. In particular, many of the most important issues in the current debates on evolution and design hinge on alternative methods of harmonizing natural and revealed texts and on alternative assumptions concerning the authority of a text and what, in principle, it is allowed to say to us.

Conclusion

Science began when nature appeared to be intelligible—something one might read like a book. Tracking the transformation and diversification of the nature as a text metaphor provides a useful means of understanding the successes and failures of science. Science stagnates when a hermeneutic for the natural text encourages a dogmatic presumption (or anticipation) of nature's proper course, as occurred in the Middle Ages. It is therefore essential to distinguish an a priori theological hermeneutic from the a posteriori hermeneutic appropriate for science. Nonetheless, the scientific and theological hermeneutics are related.

A good scientific interpretation is one that allows nature to speak for itself and yet which is motivated by and connected to an overarching frame of meaning provided by revealed theology. Such a method of reading nature was essential to the birth of modern science, but there is no guarantee it will continue to prevail today. There are now many rival hermeneutics, and some of these, by detaching natural processes from their divine direction, provide fragmentary or incoherent readings.⁵⁴ A good way to assess the overall worth of a *perspective* (that is, a family of hermeneutics) on the relationship between science and religion is to examine its overall success in providing a full and integrated reading of the texts, and this means both Scripture and the book of nature. ♦

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mous referee of this journal for many helpful suggestions, and to Ted Davis for advice about Robert Boyle. The mistakes that remain are all mine.

Notes

- ¹Francis Bacon rejected the idea of final causes in science, seeing them as camouflaging our ignorance of the real causal explanation of the phenomena. See Lisa Jardine and Michael Silverthorne, eds., *The New Organon* (Cambridge: Cambridge University Press, 2000), Bk. 1, LXV and Bk. 2, II.
- ²Bacon's *The New Organon* contrasts the "true" method of science, which proceeds via a posteriori induction from particulars (the "Interpretation of Nature"), with the a prioristic analysis of nature according to preconceived intuitions of essences (the "Anticipation of Nature"), which was employed by Aristotelian scholasticism. See Bk. 1, XXVI-XXXIII, and Bk. 2 as an outline of the method of interpretation.
- ³See Dennett's *Darwin's Dangerous Idea* (New York: Touchstone, 1995), 212-20.
- ⁴No one has made this point more vigorously than historian and philosopher of science Stanley Jaki. He has further pointed out that impoverished conceptions of nature tend toward stagnation and "still-births" in science. For a recent statement, see Jaki's *The Savior of Science* (Grand Rapids, MI: Eerdmans, 2000).
- ⁵Since our ancestors were almost universally religious, a fruitful theology of nature was practically, if not logically, essential to the birth of science. While this view was typically rejected by Enlightenment thinkers, it is uncontroversial among contemporary historians of science. See, for example, Margaret Osler's recent collection, *Rethinking the Scientific Revolution* (Cambridge: Cambridge University Press, 2000), where important essays show the connections between theological ideas and the development of modern science. The general point is also well made in the first chapter of Pearcey and Thaxton's *The Soul of Science* (Wheaton, IL: Crossway Books, 1994).
- ⁶Timaeus 29a. See Edith Hamilton and Huntington Cairnes, eds., *Plato: Collected Dialogues* (Princeton, NJ: Princeton University Press, 1963), 1162.
- ⁷Timaeus, 30b, *Plato: Collected Dialogues*, 1163.
- ⁸Stanley Jaki, *Bible and Science* (Front Royal, VA: Christendom Press, 1996), 77.
- ⁹If indeed there was a scientific revolution, a matter of much recent dispute. See, for example, the exchange between the late Betty Jo Dobbs, who questions the aptness of the revolution metaphor in her essay "Newton as Final Cause and First Mover," and Richard S. Westfall, who defends it in his "The Scientific Revolution Reasserted," both in Margaret Osler, ed., *Rethinking the Scientific Revolution*.
- ¹⁰Physics, 194a, 28-30 in Richard McKeon, ed., *The Basic Works of Aristotle* (New York: Random House, 1941), 239.
- ¹¹On the other hand, many Darwinists will be quick to dispute Aristotle's background essentialism about species. For example, Dennett argues that biological anti-essentialism is definitive of Darwinism (*Darwin's Dangerous Idea*, 35-9).
- ¹²Physics, 199a, 20-33, in *The Basic Works of Aristotle*, 250.
- ¹³Although Jaki is vigorous in his argument that alternatives to Christianity, both religious and secular, in fact, do not provide as fertile a soil for science. That is his main thesis in *The Savior of Science*.
- ¹⁴*Ibid.*, 54-8.
- ¹⁵*Ibid.*, 79-81.
- ¹⁶*Ibid.*, 83.
- ¹⁷For example, Robert Koons argues that naturalism is inconsistent with the view that science is a reliable guide to ontology. See Koons' "The Incompatibility of Naturalism and Scientific Realism," in William Lane Craig and J. P. Moreland, eds., *Naturalism: A Critical Analysis* (London: RKP, 2000), 49-63. In the same volume, Michael Rea argues that naturalism cannot even justify its commitment to physical objects, because they have modal characteristics for which spatio-temporal instantiation naturalism cannot account. See Rea's "Naturalism and Material Objects," *Naturalism: A Critical Analysis*, 110-32.
- ¹⁸I develop this case at length in my forthcoming book, *Agents Under Fire: Materialism and the Rationality of Science*.
- ¹⁹For example, consider the foundational work of the Mertonian mathematicians on the kinematics of average velocity and Buridan's own impetus theory.
- ²⁰Although it can and should be disputed whether these assumptions were doctrinally sound.
- ²¹Peter Harrison, *The Bible, Protestantism, and the Rise of Natural Science* (Cambridge: Cambridge University Press, 1998), 67.
- ²²*Ibid.*, 67-8.
- ²³*Ibid.*, 24-5.
- ²⁴*Ibid.*, 70.
- ²⁵Susan Blackmore, *The Meme Machine* (New York: Oxford University Press, 1999), 61-2.
- ²⁶Peter Harrison, *The Bible, Protestantism, and the Rise of Natural Science*, 82-92.
- ²⁷Jaki, a devout Roman Catholic, has a more negative view of the Reformation, arguing that the literalism of Luther and Calvin is responsible for bibliolatry and the excesses of creationism. See his *Bible and Science*, 109-11.
- ²⁸Peter Harrison, *The Bible, Protestantism, and the Rise of Natural Science*, 101.
- ²⁹Peter Barker, "The Role of Religion in the Lutheran Response to Copernicus," in Margaret Osler, ed., *Rethinking the Scientific Revolution* (Cambridge: University Press, 2000), 62.
- ³⁰Peter Barker, "The Role of Religion in the Lutheran Response to Copernicus," 62-72.
- ³¹*Ibid.*, 84.
- ³²Peter Harrison, *The Bible, Protestantism, and the Rise of Natural Science*, 162.
- ³³*Ibid.*, 170.
- ³⁴*Ibid.*, 171.
- ³⁵*Ibid.*, 175. The embedded quote is from Noël Pluche himself, *Spectacle de la Nature: or Nature Display'd*, 5th rev. and corrected ed., volume III (London: 1770), 318.
- ³⁶Peter Harrison, *The Bible, Protestantism, and the Rise of Natural Science*, 172-6.
- ³⁷See Pearcey and Thaxton, *The Soul of Science*, 88.
- ³⁸*Ibid.*, 87.
- ³⁹Peter Harrison, *The Bible, Protestantism, and the Rise of Natural Science*, 177-82.
- ⁴⁰Francis Bacon, *The New Organon*, Bk. I, XLVIII.
- ⁴¹Hobbes, *Leviathan* 1.2 in Works, ed. William Molesworth (Aalen: Scientia, 1962) III, 3f.
- ⁴²Peter Harrison, *The Bible, Protestantism, and the Rise of Natural Science*, 183.
- ⁴³*Ibid.*, 184.
- ⁴⁴Here, I am reading "physical science" as equivalent to what Boyle called "natural philosophy."
- ⁴⁵However, Boyle did not think that life had a mechanistic explanation. He does seem to have allowed final causes in biological science, as Ted Davis confirmed in private communication. See also Pearcey and Thaxton, *The Soul of Science*, 88.
- ⁴⁶In particular it was divine final causes that led Boyle to expect material mechanisms to obey laws. Boyle did not think that matter would obey such laws if simply left to its own devices, unlike the deistic mechanists. Rather, the orderly behavior of matter depended on God's "general concurrence" with the world. See Pearcey and Thaxton, *The Soul of Science*, 88.
- ⁴⁷Francis Bacon, *The New Organon*, Bk. I, LXV.
- ⁴⁸Kenneth Miller argues that the dichotomy between a nature in which God can intervene and a deistic nature is a false one, because he thinks there is a third alternative: "an active and present God ... can work his will ... in ways consistent with scientific materialism ..." [Kenneth Miller, *Finding Darwin's God: A Scientist's Search for Common Ground Between God and Evolution* (New York:

HarperCollins, 1999), 217.] On this view God does not need to intervene in a special way (except for miracles) because he is always involved in shaping creation via the ordinary means of his laws.

⁴⁹The hypothesis seemed to have the a posteriori support of the scientific hermeneutic as well as the a priori support of the theological hermeneutic.

⁵⁰Undirected evolution has no fixed and final goal. Consequently there is no way to define an absolute metric for progress. The best one can do is talk of relative progress, progress in adapting to the currently operative fitness landscape, which may change tomorrow.

⁵¹If God is not omniscient, perhaps he does not know about some of the evil; if he is not omnipotent, perhaps he cannot prevent it; and

if he is not holy, perhaps he does not want to do so. Such a being might be a god, but not the God of Abraham, Isaac and Jacob, and perhaps not one particularly worthy of worship.

⁵²Walter R. Thorson, "Legitimacy and Scope of 'Naturalism' in Science," *Perspectives on Science and the Christian Faith* 54, no. 1 (March 2002): 2-21.

⁵³Walter R. Thorson, "Thorson Replies ...," *Perspectives on Science and the Christian Faith* 54, no. 1 (March 2002): 42-46, 43.

⁵⁴For example, I think Walter Thorson is right to follow Michael Polanyi in arguing that the functional logic of biochemical structures cannot properly be read through the mechanistic lens of classical physics.

Books Received and Available for Review

(Contact the book review editor if you would like to review one of these books. Choose alternate selections.)
Richard Ruble, Book Review Editor, *Perspectives on Science and Christian Faith*, 212 Western Hills Drive, Siloam Springs, AR 72761. ruble@tcainternet.com

- Denis Alexander, *Rebuilding the Matrix: Science and Faith in the 21st Century*, Zondervan, 500 pages, 2003
- S. M. Barr, *Modern Physics and Ancient Faith*, Notre Dame Press, 328 pages, 2003
- R. J. Berry, *God's Book of Works: The Nature and Theology of Nature*, Continuum, 286 pages, 2003
- Robert Buckman, *Can We Be Good Without God? Biology, Behavior, and the Need to Believe*, Prometheus Books, 278 pages, 2002
- John Cavanagh, ed., *Alternatives to Economic Globalization: A Better World Is Possible*, BK Publishers, 266 pages, 2002
- W. J. Elliott, *A Place at the Table: A Journey to Rediscover the Real Jesus*, Doubleday, 420 pages, 2003
- George A. Erickson, *Time Traveling With Science and the Saints*, Prometheus Books, 177 pages, 2003
- Donald Fernie, *Setting Sail for the Universe: Astronomers and Their Discoveries*, Rutgers University Press, 200 pages, 2002
- T. M. Georges, *Digital Soul: Intelligent Machines and Human Values*, Westview, 285 pages, 2003
- Wayne Grady, *The Bone Museum: Travels in the Lost Worlds of Dinosaurs and Birds*, Four Walls Eight Windows Publishers, 291 pages, 2003
- J. F. Haught, *Deeper Than Darwin: The Prospect for Religion in the Age of Evolution*, Westview, 230 pages, 2003
- N. L. Herzfeld, *In Our Image: Artificial Intelligence and the Human Spirit*, Fortress Press, 135 pages, 2002
- Gary Kiwalski, *Science and the Search for God*, Lantern Books, 186 pages, 2003
- Paul Kurtz, ed., *Science and Religion: Are They Compatible?* Prometheus Books, 368 pages, 2003
- Michael Lemonick, *Echo of the Big Bang*, Princeton Press, 213 pages, 2003
- D. J. Lococo, *Towards a Theology of Science*, Novalis, 80 pages, 2002
- David Magnus, et al, eds., *Who Owns Life?* Prometheus Books, 291 pages, 2002
- Jack Nelson-Pallmeyer, *Is Religion Killing Us? Violence in the Bible and the Quran*, Trinity, 170 pages, 2003
- William Nesbitt, *Illusion of Time: Seeing Scripture Through Science*, Black Forest Press, 180 pages, 2002
- Mark Noll, *America's God: From Jonathan Edwards to Abraham Lincoln*, Oxford, 620 pages, 2002
- G. H. Peber, *Animals: Their Past and Future*, Pneuma Books, 77 pages, 2003
- G. R. Peterson, *Minding God: Theology and Cognitive Science*, Fortress Press, 250 pages, 2003
- M. W. Perry, *The Pivot of Civilization in Historical Perspective: Eugenics*, Inkling Books, 278 pages, 2001
- Susan Quinn, *Human Trials: Scientists, Investors, and Patients in the Quest for a Cure*, Perseus Publishing, 295 pages, 2001
- Victor Shane, *Book of Life: God, Cosmos and Man: A New Understanding of Human Nature*, Para-Anchors International, 300 pages, 2003
- David Toolan, *At Home in the Cosmos*, Orbis, 250 pages, 2001
- Cletus Wessels, *Jesus in the New Universe Story*, Orbis Press, 240 pages, 2003
- Larry Witham, *By Design: Science and the Search for God*, Encounter Books, 200 pages, 2003

Interpreting Nature. (Student Guide to World Philosophy). print Print. The strength and originality of Diderot's book has sometimes been said to lie in the philosopher's peculiar ability to "smell out" directions that were far beyond the intellectual horizon of the typical eighteenth century philosopher. This gift appears not only in his insights into experimental method but also in his own "interpretation of nature," for Diderot was not a positivist and had no intention of limiting human knowledge to the results of observation and experimentation. One of the main differences between the observer of nature and the interpreter of nature is that the latter takes as