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Science and Theology as Gifts to the Church: How Creation Allows Scientists and Theologians to Work Together

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In contrast to common practice, which separates science and theology, this article takes the doctrine of creation as the key to map out fruitful interactions between science and theology. In particular, it asks how theologians—and the wider church—can benefit from science and what scientists can learn from theology for their professional work. Such an integrated view enables us to understand science as a gift to the church and also to consciously take advantage of theological resources in scientific practice. Although this article mainly uses creation as the lens through which to address these questions, it also hints at contributions which the doctrines of sin and redemption offer.

Keywords: Doctrine of creation, science-engaged theology, theology-informed science, scientists, theologians, NOMA, truth claims, scientism, worship.

Science with Theology?*

The ASA statement of faith begins by affirming: "We accept the divine inspiration, trustworthiness and authority of the Bible in matters of faith and conduct."[1] What does accepting the "authority of the Bible in matters of faith and conduct" imply for the collaboration between scientists and theologians? A very common view is that science and theology should be pursued each in splendid isolation—thus adding an "only" to the first clause of the statement of faith: "We accept the … authority of the Bible [only] in matters of faith and conduct," whereas science is to be pursued without interference from theology. After all, the Bible is not a science book! Or so the story goes. And when it comes to interference in the opposite direction—from science into theology—most theologians, and the church as a whole, seem to assume that they can thrive without science. Scientists are not often invited to speak in churches or theological seminaries about their field of knowledge.

Obviously, such a restricted understanding of the ASA statement of faith is wrong, as it goes on to affirm: "We believe that in creating and preserving the universe God has endowed it with contingent order and intelligibility, the basis of scientific investigation."[2] We learn about creation and preservation from the Bible. Thus, this further clause acknowledges the relevance of biblical teaching, and therefore also of theology, for the scientific enterprise. The relevance of science for the church in general, and

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for theology in particular, is implied by the ASA statement of faith when it states: "We recognize our responsibility, as stewards of God's creation, to use science and technology for the good of humanity and the whole world." And the church is certainly part of "humanity."

But it is fair to say that the ASA statement of faith is not very explicit in spelling out how science could benefit from theology and the Christian faith, nor does it go to any lengths to explain how science and technology could be used for the good of humanity, of which the church is a part. This is not a critique: by their very nature, statements of faith need to be short. In addition, the ASA keeps to the policy that it "does not take a position when there is honest disagreement between Christians on an issue."[3]

This article then tries to show in what ways scientists and theologians can work together. I will cover a wide range of diverse topics, presenting as many avenues as possible for fruitful interaction between scientists and theologians in order to stretch our imaginations, and then let the readers work out the details of the different suggestions. I mainly use creation as the lens through which to address these questions, but also provide some hints along the way at contributions which the doctrines of sin and redemption offer. But first, the doctrine of creation.

The Doctrine of Creation as the Foundation upon Which to Engage in a Fruitful Partnership between Science and Theology

The classic definition by Reformed theologian Louis Berkhof states:

> Creation may be defined as that free act of God by which He … in the beginning brought forth the whole visible and invisible universe, without the use of pre-existing materials, and thus gave it an existence, distinct from his own and yet always dependent on Him.[4]

Without trying to unfold all the richness of the doctrine of creation, may I draw attention to several crucial aspects of the definition offered.

1. *Creation is a free act.* It depends on God's will. As the worship song in Revelation 4 declares: "Worthy are you, our Lord and God, to receive glory and honor and power, for you created all things, and by your will they existed and were created" (Rev. 4:11[5]). Therefore the world is contingent, which means that it is not necessary. It does not flow from God's nature (as pantheism claims). It could not exist or be different than it is. As we will see, this is foundational for the experimental method of science.

2. *The created order has a beginning.* Orthodox Christianity has always held to a beginning of the world in time. Creation is not just a statement about the metaphysical dependence upon God of all that exists (although it is that as well), but creation also opens up a history, with a beginning at the first act of creation and an endpoint decided by the Creator himself. In cosmology, this leads to challenging questions (which I will not pursue here), as time is a tricky parameter, especially for the very high densities which are believed to have been obtained close to the Big Bang. But it is fair to observe that historical categories have proved ever more important for the natural sciences—first for geology, and then for biology since the nineteenth century, and later for physics since the beginning of the twentieth century. Creation provides a congruent theological framework in this regard.

3. *Creation is* ex nihilo. The term "*ex nihilo*" (Latin for "from nothing") comes from an apocryphal writing of the Old Testament (2 Macc. 7:28), but the teaching is clearly biblical. In fact, it is a direct implication of the frequent insistence on the fact that all that exists has been created by God (Isa. 44:24; Jer. 10:16; Ps. 89:12–13; John 1:3; Col. 1:16; Rev. 4:11). This implies that there was no eternal, preexisting matter from which the world was drawn, contrary to the ancient Greek conception of the demiurge or the so-called scientific materialism of nineteenth-century communism. Strictly speaking, creation *ex nihilo* applies to the first moment of creation. Later creation acts can—and often did—build on what God created earlier, for example, as is suggested in the first creation account, when it states: "Let the earth sprout vegetation" (Gen. 1:11), and "Let the earth bring forth living creatures according to their kinds" (Gen. 1:24).

4. *Creation is continuously dependent on its Creator.* Creation excludes deism, that is, the notion that the natural order was set up by God at the beginning and continues to unfold without God intervening in it any further. No, creation has as its twin doctrine,

providence: the world relies from moment to moment on God sovereignly upholding it.

> When you hide your face, they are dismayed; when you take away their breath, they die and return to their dust. When you send forth your Spirit, they are created, and you renew the face of the ground. (Ps. 104:29–30)

You may have noticed that Berkhof's definition of creation is silent on the date of creation and on the means that God employed in order to create the world. His definition is in this regard fairly standard for historic Christianity (Berkhof himself represents the Orthodox Reformed tradition). There may be interesting debates about the age of the universe or about creationist versus evolutionary mechanisms leading to the current state of affairs. But we should not forget that these debates are not central to the doctrine of creation. In fact, a strong view of providence (over against deism) allows for the use of natural processes, as there is nothing in "nature" that is left to itself: whatever happens, happens under God's divine Lordship and by his gracious upholding of the natural order.[6]

Before going further in drawing out the implications of the doctrine of creation for science, let us pause and consider what the doctrine of creation implies for our topic of interest: scientists and theologians working together for the common good. In fact, the doctrine of creation provides the very foundation for scientists and theologians working together, and not just alongside each other. For creation precludes what is probably the most frequent conception of the relationship between science and theology, the idea that the sphere of faith, with which theology is concerned, can be totally isolated from the scientific endeavor. Henri Blocher names this posture "fideism,"[7] of which Stephen Jay Gould's NOMA, or "nonoverlapping magisteria,"[8] is a prominent contemporary representative. But if creation is true, this cannot be right, because creation is a theological statement, rooted in scripture, about the very same world which science examines.[9] Thus theology cannot ignore science. And science cannot ignore theology.

Obviously, there are very good reasons for not conflating science and theology. Each one of these human endeavors has its own starting point: natural revelation for science and special revelation (primarily the scriptures) for theology. And they use distinct methodologies.[10] The Galileo affair remains a constant warning not to forget this distinction. In fact, it not only tells the tale of the incompetence of the church for directing the scientific enterprise, it also highlights the danger for theology of relying too heavily on science. The Galileo affair was not foremost a conflict between science and Christian faith, but between two different sciences: the burgeoning new science promoted by Galileo and the Aristotelian-based science which the church, from the Middle Ages onward, had integrated into her theology.[11]

It seems to me that in our time and culture most are well aware of the pitfalls which threaten us when we do not sufficiently distinguish between science and theology. Thus this article will assume this as background knowledge, and it will instead focus on fruitful and helpful interactions which do exist—in fact, which must exist because of the doctrine of creation. Theologians need scientists and scientists need theologians. Let us see first what science can contribute to theology, before turning to examine what theology can contribute to science.

Science as a Gift to Theology and the Church

1. *Providing tools for theological work*

Let me start by pointing out practical benefits which science has offered to theology. It provides theologians with tools and resources for their studies. The most essential benefit goes largely unnoticed, as we take it for granted: scientifically informed medicine has hugely expanded the average time span during which theologians (like other humans) are able to live healthy lives and thus to pursue their work. Resources provided range from eyeglasses which allow middle-aged and older scholars to continue to read and write,[12] to sophisticated medical drugs and treatments which heal or delay so many illnesses that took their toll in previous ages (and, lest we forget, continue to do so in less-privileged places on our planet even today). Humans are the most precious resource in any enterprise. Imagine if most theologians (and pastors, evangelists, missionaries) were unable to continue to work beyond forty or fifty? What a wealth of experience, knowledge, and wisdom would be lost! What a hindrance to fruitful gospel ministry! The same is true for science:

although younger scientists are often more open to exploring new, promising avenues of research, the wisdom of the older teacher is necessary for providing a framework in which to develop research skills.

Science also provides technical resources that are useful for theological studies. Computers capable of handling large databases have made significant contributions in the lexical and syntactic study of the biblical texts. The internet allows worldwide collaboration. Church historians are helped immensely by being able to search large bodies of texts, once again assisted by information technology. We are now able to address and answer questions that previous generations were unable to address, even though they often knew the primary sources by heart (for example, the Bible, the writings of the Fathers and the Reformers)—a skill that is very rare today.

Allow me to provide just one example of the kind of new evidence that has emerged in theology using computer technology. Richard Bauckham, in his *Jesus and the Eyewitnesses: The Gospels as Eyewitness Testimony*, studies the frequencies of Jewish personal names in the New Testament Gospels and Acts and compares them to current knowledge of Jewish names in the ancient world.[13] Here are some of the results (table 1):

- The relative frequencies of names in the Gospels corresponds to what we know of Palestinian Jewish names at the time,[14] whereas the relative frequencies of Jewish names among the diaspora, or the Gentiles, are very different.[15]
- We find in the New Testament the usual ways of distinguishing between people with common first names: addition of (or even replacement by) the father's name; addition of the name of the husband or son (for women); addition of (or even replacement by) a nickname (Simon Peter, Simon the leper in Matt. 26:6, John the Baptist, Barnabas); addition of place of origin (Jesus of Nazareth, Simon of Cyrene); addition of profession (Simon the tanner in Acts 9:43); and double Hebrew/Greek name, or more rarely Hebrew/Latin (Silas-Silvanus in Acts 15:22; 2 Cor. 1:19).

This study was made possible only by the extensive use of computer software. It shows that the Gospels contain relative frequencies of personal Jewish names which correspond to the situation in Palestine at the time—a feature difficult to produce for anybody who might try to invent such stories. In addition, personal names are disambiguated in the New Testament texts in ways which were common among first-century Palestinian Jews. They also felt the need to disambiguate names which were frequent among

Table 1. Frequency of Names Found in the Jewish Palestinian Population and in the Gospels and Acts

Names	Jewish Palestinian Population %	Gospels and Acts %[1]
Men who bore one of the two most popular male names (Simon/Simeon, Joseph/Joses)	15.6	18.2
Men who bore one of the nine most popular male names (Simon/Simeon, Joseph/Joses, Lazarus, Judas, John, Jesus, Ananias, Jonathan, Matthiew/Matthias).	41.5	40.3
Men who bore a name that is attested only once in the sources	7.9	3.9
Women who bore one of the two most popular female names (Mary, Salome)	28.6	38.9
Women who bore one of the nine most popular female names (Mary, Salome, Shelamzion,[2] Martha, Joanna, Sapphira, Berenice, Imma, Mara[3])	49.7	61.1
Women who bore a name that is attested only once in the sources	9.6	2.5

[1]Richard Bauckham, *Jesus and the Eyewitnesses: The Gospels as Eyewitness Testimony* (Grand Rapids, MI: Eerdmans, 2006), 71–72.
[2]Long form of Salome.
[3]Possibly an abbreviated form of Martha.

Jews in the Holy Land, but not in the Jewish diaspora (although most Gospels were written outside Palestine). These different features demonstrate that the gospel writers had access to first-hand information about the life of Jesus.[16]

2. *Challenging results of biblical exegesis*

Beyond providing tools for theology, science offers knowledge which theologians would benefit from using. I want to specifically focus on scientific knowledge useful for biblical exegesis. It is uncontroversial that science understood in a broad sense can and should inform exegesis, insofar as one considers linguistics, archaeology, and ancient history as scientific disciplines (that is, investigations conducted according to a rigorous method). The use of knowledge gained through natural sciences is a much more delicate subject, and opinions may well vary among us. Without trying to present much argument for my position, may I just outline my current thinking on this issue.[17] The heart of the matter lies, in my view, in striking the right balance between two methodological principles.

a. *When it comes to establishing the meaning of a text, exegesis proper should only be constrained by knowledge accessible to the human author himself.* Only in this way do we take seriously the historical character of divine special revelation. Obviously, behind this affirmation lurk strong philosophical commitments, not least the presupposition that authorial intent is crucial for determining the meaning of a text. Nevertheless, the restriction to knowledge available to the human author is necessary in order to avoid arbitrary allegorical readings of the biblical texts, or concordist interpretations which force on the biblical texts contemporary concepts and questions, foreign to the original readers, thus falling into the pitfall of anachronistic eisegesis.[18]

b. *Knowledge not available to the human author may inform exegesis as an external motivation for checking the solidity of our understanding.* God does not contradict himself: knowledge gained from natural revelation and knowledge gained from scripture cannot be in opposition. Therefore, when we encounter a contradiction, something has gone wrong in the process of interpreting revelation. In this way, scientific knowledge, when it contradicts convictions which we have reached by reading scripture, can legitimately challenge our understanding of the texts. But beware, this is not a one-way process. The apparent contradiction may just as easily result from an overestimation of what we know in terms of science. Thus, scientific knowledge may provide a corrective for exegesis, but also theology may provide a corrective for the sciences. More on this later when we turn to the question of what scientists may learn from theologians.

Let me illustrate how these two principles work together by an example from my own experience. I had long believed that the mustard seed is the smallest of all seeds. This is what Jesus says in the parable of the mustard seed (Matt. 13:32)—or so I thought. One day, somebody challenged me, pointing out that the seed of an orchid is even smaller. He concluded that Jesus was voicing the wrong knowledge of his time. But this is unacceptable, as Jesus's words are totally trustworthy and therefore true. I went back to the gospel text, and in this case, the solution was ready at hand. In the parable, Jesus speaks of "a grain of mustard seed that a man took and sowed in his field" (v. 31).[19] The following statement about the mustard seed being "the smallest of all seeds" must be understood in this context. It is not meant as a general statement about all seeds, but about the seeds routinely used by a farmer in Jesus's day. Here is an example in which scientific knowledge—legitimately—changed my understanding of a biblical text. But observe how science comes in: *the meaning of the text has to be established in its own right, without bringing in knowledge foreign to the context of the author*. When a contradiction with science arises, it motivates us to go back and check whether our textual interpretation was correct.

3. *Modeling a rigorous method for seeking truth*

Beyond helpful tools and challenging questions, science offers theologians a model for a rigorous method of research. To be sure, the differences between science and theology on a methodological level should not be underestimated. Nevertheless, there are similarities as well. Both domains have an ultimate source of authority: natural order explored by observation and experiment for natural science, and scripture for Christian theology. In both fields, the construction of theories and knowledge from the ultimate source of authority is not a straightforward, inductive process; background assumptions and research paradigms prevalent in the scholarly community play a vital

role. Therefore, neither science nor theology is a metaphysically neutral enterprise, although it should be expected that faith commitments become ever more important, the closer questions get to matters of existential concern.[20]

Science has an impressive track record, and theologians would do well to pay close attention to what they can learn from scientists in terms of method. This is even more so for historic Christian theology, as it has a stronger emphasis on the factual, historical basis of faith claims than liberal forms of Christian theology—in line with Peter's assertion:

> For we did not follow cleverly devised myths when we made known to you the power and coming of our Lord Jesus Christ, but we were eyewitnesses of his majesty. For when … the voice was borne to him by the Majestic Glory, "This is my beloved Son, with whom I am well pleased," we ourselves heard this very voice borne from heaven, for we were with him on the holy mountain. (2 Pet. 1:16–18)

Note the emphasis on eyewitness reports,[21] on history, not myths:[22] theology, like science, is aiming at factual truth. Therefore, although both the object of study and the method of research are different, theologians may well gain insights from their scientific colleagues on how to pursue truth in a communal effort. The French Enlightenment philosopher and scientist Descartes considered that regular exposure to mathematics would help him in his critical thinking. As a preparation for his intellectual ascetic undertaking which would lead in due course to his famous *cogito ergo sum* ("I think, therefore I am"), Descartes writes,

> I reserved some hours from time to time which I expressly devoted to ... the solution of mathematical difficulties, or even … the solution likewise of some questions belonging to other sciences, but which, by my having detached them from such principles of these sciences as were of inadequate certainty, were rendered almost mathematical.[23]

I sometimes tell my theology students that we should introduce a compulsory math class in our curriculum. In general, they are not pleased at the prospect, but I agree with Descartes and consider that immersion in mathematics and rigorously conducted science is an excellent training field for logical thinking and stringent problem solving.

4. *Providing a better understanding of the world in which we are called to live and preach the gospel*

Our culture is heavily influenced by both science and theology. Scientists have a crucial role to play in helping all Christians, and specifically church leaders, to better understand certain aspects of the context in which we are called to live and preach the gospel. John Stott spoke of "dual listening"—holding a Bible in one hand and a newspaper (and we could add a science textbook or journal) in the other:

> I believe we are called to the difficult and even painful task of "double listening." That is, we are to listen carefully (although of course with differing degrees of respect) both to the ancient Word and to the modern world, in order to relate the one to the other with a combination of fidelity and sensitivity.[24]

The Christian community will not be able to accomplish this task of dual listening without the help of scientists. Examples abound:

- Christians are called to care for the nature around us, which God created; we are "stewards of God's creation," as the ASA statement of faith says.[25] But how can we do this effectively without an appropriate understanding of the natural order? Applications range from providing at least some space for wildlife in our neighborhood to lifestyle changes which may help to slow down global climate change.
- Medical science has had an enormous impact on human experience at the beginning and end of life. In the West, both birth and death are experienced in a hugely different way from traditional societies. There are numerous ethical questions unheard of even a century ago, but which now face us due to our increased technological capabilities: cloning, prenatal screening tests, deep sedation for terminally ill patients, excessive medical intervention … None of these existential ethical concerns can be appropriately answered without drawing on expert scientific knowledge.

5. *Informing our worship*

Often our worship centers on redemption. However, Psalm 104 (among other psalms proclaiming God's glorious action in nature) teaches us that our worship can and should also feed on creation. Adoration of the Redeemer God goes hand in hand with praising him as the Creator. Psalm 19 first celebrates God's

revelation in nature—"The heavens declare the glory of God" (Ps. 19:1)—before rejoicing in the perfection of God's law which makes "wise the simple" and "warns" God's servants, in order to keep them from "presumptuous sins" (Ps. 19:7–13). The vision of the throne of God in Revelation 4–5 is punctuated by grandiose choruses which celebrate both creation and redemption. In the first chorus, the four living beings praise the holiness of the Lord Almighty (Rev. 4:8). Then the twenty-four elders proclaim the glory of the Creator (Rev. 4:11 quoted above). Both groups next join in singing "a new song" to the Redeemer Lamb (Rev. 5:9–10), before the host of myriads of angels repeats and expands the heavenly praise: "Worthy is the Lamb who was slain" (Rev. 5:12). The vision culminates in the unison chorus spoken by

> every creature [in Greek, *ktisma*, "creature" from *ktizô*, "to create"] in heaven and on earth and under the earth and in the sea, and all that is in them, saying,
>
> > To him who sits on the throne and to the Lamb be blessing and honor and glory and might forever and ever!
>
> And the four living creatures said, "Amen!" and the elders fell down and worshiped. (Rev. 5:13–14)

This final chorus is both the conclusion and the climax of the vision. It is linked to the preceding worship by the four living beings confirming it with an "Amen!" and by the elders falling down and worshiping (Rev. 5:14).[26] The interweaving of all the different choruses emphasizes that the adoration of the Creator and the worship of the Redeemer are inseparable, one "God in three persons, blessed Trinity."[27]

Insofar as creation has a legitimate and specific place in praises sung by the redeemed, science has a contribution to offer for private and communal worship. Science leads us to a more precise understanding of creation and provides us with deeper insights into God's work in nature. But I fear that far too few of our church communities are aware of this gift that science has to offer. We are used to drawing on extra-biblical resources to extend our praise of the Redeemer, as we quite commonly include in our prayers thankfulness for God's saving grace in our life and in the lives of our fellow believers. Why not draw on science in order to deepen our appreciation of God's works in creation? Obviously, we need to ensure that our worship does not become elitist in that it might become understandable only to those trained in natural sciences. But overall, scientists are very good at popularizing their findings. Thus they would certainly find ways to nurture our praise of the Creator God if they were invited to do so. It would also help the Christian scientists themselves, as it would encourage them to overcome the compartmentalized, if not schizophrenic, posture which many adopt, keeping their faith at arm's length from their scientific work in the lab.

For believing scientists in the early times of modern science, it was normal to expect that their new scientific findings would enhance worship of the Creator. Let me provide you with two examples.

a. Johannes Kepler (1571–1630), whose three laws of planetary movement were decisive for the formulation of Newton's physics, concludes his first significant book, *The Secret of the Universe*, published in 1596, by the following admonition to his reader:

> Now, friendly reader, do not forget the end of all this, which is the conception, admiration and veneration of the Most Wise Maker. For it is nothing to have progressed from the eyes to the mind, from sight to contemplation, from the visible motion to the Creator's most profound plan, if you are willing to rest there, and do not soar in a single bound and with complete dedication of spirit to knowledge, love and worship of the Creator. Therefore with pure mind and thankful spirit sing with me the following hymn to the Architect of this most perfect work.[28]

Then follows a hymn to the glory of the Creator, inspired by Psalm 8.[29] Therefore, for Kepler, there are three layers in scientific work: observation, rational theory construction, and worship of the Creator. Theologians and scientists need to work together in order to reclaim the third level, the most noble goal of all scientific endeavor.

b. In the same vein, Robert Boyle (1627–1691), who was one of the founders of the Royal Society and contributed largely to the emergence of modern chemistry, considered that the scientist has much more reason to adore God than does the ordinary person:

> For the works of God are so worthy of their Author, that besides the impresses of his wisdom and goodness, that are left as it were on the surfaces, there are great and innermost recesses of them; and

> therefore are not discovered by the perfunctory looks of oscitant or unskillful but require, as well as deserve, the most attentive and prying inspection of inquisitive and well-instructed considerers.[30]

For this reason, "a true naturalist, who brings with him, besides a more than common attention and curiosity, a competent knowledge of anatomy, optics, cosmography, mechanics, and chemistry" finds "new motives to acknowledge and adore the divine Author of things."[31]

Theology as a Gift to Science and the Scientific Community

Having examined several ways in which science can be a gift to theology and the wider church community, let us now turn to the possibilities for theology to make a constructive contribution to science. Whoever endeavors to claim any fruitfulness of Christian theology for science encounters the formidable objection that science is practiced by scientists of all faiths and of none. Is this not proof enough that theology has to be kept out of science? I beg to differ.

Science is perhaps the most successful interfaith and interethnic project in our contemporary world, which is so often torn apart by religious conflicts—and ethnic conflicts disguised as religious. But this does not mean that theology has no positive role to play in science. To begin with, the doctrine of creation was influential in the birth of modern science. Why then should Christian theology have no resources to offer to science today? Of course, the very same doctrine of creation explains the possibility of doing science without explicit reference to God. Contrary to animistic or pantheistic worldviews, creation does establish a clear distinction between the divine and the world, so that it becomes possible to describe nature "in terms of reference defined by creaturely things themselves."[32] But distinction does not amount to separation. Theology draws on the Word of the very same God who created the world that science explores; therefore, it may well have some insights to offer to scientists. Let me enumerate five of them.

1. *Setting the metaphysical framework for science*

It was not by happenstance that modern science emerged in a context steeped in the Christian worldview. Admittedly, we need to guard ourselves from monocausal explanations; there were other highly influential factors in the emergence of modern science. But the Christian mindset played a crucial role, as many excellent historical studies have shown.[33] This is not surprising, as presuppositions of the scientific practice sit well with the biblical understanding of the world and of humanity's place in it.[34] The concordance between the biblical worldview and methodologies applied in natural sciences is largely forgotten today. It may be useful to show how science-friendly the biblical worldview is in our dialogue with non-Christian scientists and ordinary people who often think that science has disproved the Christian faith.

Let me present three examples of how the biblical worldview provides a metaphysical framework for scientific practice.

a. The experimental method and creation: One of the defining features of modern science is the role of planned experimental activity. Scholastic natural philosophers claimed observation to be the basis of scientific generalizations. But in practice, this was either prescientific commonsense experience, or it arose from thought experiments, or it was taken from written sources without personal verification (much of medieval science consisted in commenting on the works of masters of the past, in particular Aristotle).[35] During the scientific revolution, the role of experiments changed: they no longer served to corroborate theories adopted on other grounds, but became a decisive element in testing existing theories and developing new ones. Newton and his disciples explicitly appealed to the contingency of creation in order to justify their empiricism. Roger Cotes, who oversaw the publication of the second edition of the *Principia* (1713), writes in the preface:

> From this fountain [the will of God] it is that those laws, which we call the laws of Nature, have flowed, in which there appear many traces indeed of the most wise contrivance, but not the least shadow of necessity. These therefore we must not seek from uncertain conjectures, but learn them from observations and experiments.[36]

b. The experimental method and sin: Not only did the new experimental method respond to reflection on creation, but also (and perhaps more surprisingly) on sin. Drawing on a wide range of primary sources right from antiquity to early modern times, the science historian Peter Harrison argues that the renewal

of an Augustinian understanding of original sin at the Reformation "was the starting-point for the methodological discussions of the early modern period."[37] Different strands of early modern thought were influenced by the more pessimistic evaluation of reason that is implied (compared to the Aristotelian-Thomistic tradition). Some early modern thinkers sought to find in logic and mathematics a stronghold untouched by the corruption of the Fall, from which to construct certain knowledge. Others, more radical, thought that the only remedy was divine revelation (either scriptural or personal). Still others considered that Genesis 3:19 ("By the sweat of your face you shall eat bread") set the paradigm for gaining knowledge about the natural world: through laborious and cooperative experimentation, the Adamic curse could be at least partially reversed. The experimental philosophy of Francis Bacon illustrates this third option:

> For man by the fall fell at the same time from his state of innocence and from his dominion over creation. Both of these losses however can even in this life be in some part repaired; the former by religion and faith, the latter by arts and sciences.[38]

Thus, contrary to those who link the emergence of early modern science to the Enlightenment's optimism, Harrison considers that

> the birth of modern experimental science was not attended with a new awareness of the powers and capacities of human reason, but rather the opposite—a consciousness of the manifold deficiencies of the intellect, of the misery of the human condition, and of the limited scope of scientific achievement.[39]

c. Creation ex nihilo *and mathematical science:* Creation from nothing implies that all that exists is created by God. There is no preexisting eternal matter that can resist the creation work, as is the case with the Greek demiurge. Plato had taught that mathematical forms are only imperfectly realized in material objects,[40] thus prohibiting exact mathematical descriptions of material objects. But in the biblical conception, all that exists is created by the omnipotent and all-wise Creator. Therefore, the order instituted by him applies without exception to the whole natural realm.

In his preface to the first edition of the *Principia*, Newton ponders the difference which "the ancients" made between "perfectly accurate" geometry and mechanics which "is less so." But the new philosophy of nature that took shape in the seventeenth century was based on the conviction that the perceptible, the material, in itself, is the subject of rational knowledge and thus of mathematical description, "for the description of right lines and circles, upon which geometry is founded, belongs to mechanics."[41] Some decades earlier, Galileo had likewise affirmed that the book of nature is written in mathematical letters.[42] The doctrine of creation ex nihilo provides the justification of this central conviction of modern science. In the words of Robin Collingwood, "the possibility of an applied mathematics is an expression, in terms of natural science, of the Christian belief that nature is the creation of an omnipotent God."[43]

2. *Disseminating scientific knowledge*

We have seen then that the biblical worldview, rightly understood, provides a science-friendly metaphysics and thus facilitated the emergence of modern science. Yet even today, theologians may be of help to scientists in improving their communication of scientific findings to some audiences. For example:

a. Religiously motivated opposition to scientific knowledge: Cosmological and biological theories of origins offer a prime example. Conservative Christians will not accept scientific reconstructions if they cannot see how these can be reconciled with biblical teaching. And rightly so. If we are serious about our conviction that the Bible is God's word, we cannot accept as true any affirmation that goes against that which we have learned from divine revelation. At best, we can suspend our judgment, allowing for some uncertainty in our understanding of scriptural revelation.[44] But we can consider a scientific discovery to be true only if we can at least see how it can be compatible with biblical teaching—where biblical teaching not only comprehends direct conclusions drawn from biblical exegesis, but also, and even more so, from doctrinal statements included in the creeds.[45] True, scripture is our final authority and doctrine is subject to scripture, according to the Reformation principle of *sola Scriptura*. But well-crafted doctrinal statements that establish central faith commitments derived from major biblical themes have been tried and tested by many generations of biblical scholars and Christian believers. Whereas we may change our minds on the meaning of this or that biblical passage, we should

not easily renounce truths that historic Christianity has deemed important enough to include in the creeds.

b. Deficient performances of other channels of transmission (such as schools and public media): The lack of efficiency may be due to a lack of resources in the wider society—missionaries in developing countries have long been involved in the furthering of school teaching, including science classes and public health education. It may also be linked to the rapid expansion of scientific knowledge in a certain field, which implies that the usual contexts of science teaching are insufficient. Covid-19 vaccination provides a contemporary example. Recently, the smaller French sister organization of the ASA, the *Réseau des scientifiques évangéliques*, invited a vaccinologist to present the current state of knowledge with regard to this question.[46] The leadership team in my local congregation has labored to help members, in particular those with health risks, to correctly understand the risk-benefit balance of vaccination—probability calculus is not the most easily understood part of mathematics and well-informed church leaders may help in reaching population groups that are not easily reached through other channels, to enable them to grasp what is at stake.

c. Ideological biases and influential lobby groups rendering the objective search for truth arduous: Ideologically motivated resistance to scientific truth is not the privilege of believers alone. Strong societal trends may make it difficult, or even impossible, to conduct open-ended research and to voice results which go against the consensus. It is probably safe to mention gender and post-colonial studies as fields where many seem to know in advance what conclusions should be reached.[47] Research into possible long-term consequences of abortion on mental and physical health is another example. Christian scientists involved in these areas need strong pastoral support in order to follow the evidence wherever it leads and to stand by the truth.

3. *Guarding against scientism*

Setting science in the broader framework of biblical thought helps us to see that science cannot describe all of reality. It cannot offer a theory of everything. To start with, God escapes any scientific description. He simply will not submit to the canons of scientific experimentation: "You shall not put the Lord your God to the test" (Matt. 4:7, quoting Deut. 6:16) as Jesus sharply replied to the devil when he pushed our Lord to experimentally test the reliability of God's promises. Since humanity is created in God's image, it is to be expected that at least some aspects of the nature of humans are also beyond scientific grasp.

Scientism, that is, the idea that science can describe all of reality and provide ultimate answers to all questions worth asking, is an idol of our time, which is to be criticized on both epistemological and theological grounds. Obviously, scientism is not science. It is not a thesis open to scientific scrutiny, to be confirmed or refuted by experiment. It is an ideological extrapolation from science, a quasi-religious worldview. It often finds its most fervent defenders among popular writers who aim to make scientific knowledge more widely known.[48] But working scientists are perhaps not totally immune to the temptation to overestimate the promises which their professional expertise holds. Some help from theologians may be welcome, reminding scientists and the general public alike that there are limits to what science can achieve. Recognizing such limits will make us more alert to detect instances when unwarranted worldview conclusions are drawn from science: for example, when it is claimed that science "proves" that the universe has not been created by a benevolent deity, or that human beings are just material beings, or, on a more practical level, that science will, in the long run, solve all of humanity's problems.

A more modest approach to natural science will also help to unmask a second idol, closely related to scientism, that of reductionism: the idea that all sciences can ultimately be reduced to one fundamental science. Not only can science taken as a whole not describe exhaustively all of reality, but also no single scientific discipline can pretend to encompass everything that is scientifically accessible. Each discipline uses a restrictive research methodology, which is appropriate to its specific focus of study. Some questions occupy center stage, others are neglected. The limited perspective offered by each scientific discipline is worthwhile because it is obtained by using a rigorous method of enquiry, but it should not be mistaken for the whole picture. Evandro Agazzi even speaks of "reductionism as the negation of the scientific spirit," because the science of modern times

has revoked the past more-encompassing projects aiming at the "intrinsic 'essence'" of things. Instead,

> it is satisfied to study a certain number of their "affections," that is, a certain number of their properties, which lend themselves to being isolated and relatively simply described along with the help of mathematical language.[49]

Even within disciplines, reductions do not always succeed, but there is a notable tendency to pass over such restrictions when teaching students, and even more so when explaining the results of science to a wider public. How many physics students are aware of the fact that the second law of thermodynamics (stating the rise of entropy) is not derivable from microscopic physics?[50] And few are the lecturers, I fear, who explain to their students that macroscopic quantum effects such as superfluidity cannot be derived from first quantum physical principles.[51] Once again, it is possible to discover these limitations of reductionism by in-depth studies of science itself. But as such studies are often overlooked by scientists, theologians may provide precious help in order to unmask the idols of scientism and reductionism.[52]

Resisting the drive for the grandiose theory of everything can also favor interdisciplinary collaboration. When we no longer believe that our scientific domain offers the answers to all the interesting questions, nor believe that it sets the standard for the one and only scientifically acceptable methodology,[53] we understand the crucial importance of multidisciplinary projects.

Scientists who acknowledge that science is only penultimate, that it does not aim to describe all that there is, may perhaps also find it easier to keep a balanced lifestyle, not allowing their professional involvement in science to consume all of their energy. Listening to the theologians' call to modesty can have beneficial effects in the personal life of scientists. But, of course, theologians need to pay heed to the call to humility for themselves as well.

4. *Challenging and complementing scientific findings*

I will now turn to a controversial topic: I will claim that theology not only maps out the appropriate framework for the scientific method and guards against displaced overconfidence in science, but that it can also provide knowledge which can challenge or complement scientific findings. Such a claim immediately raises eyebrows, or worse, it sets off inner alarm bells—and rightly so, to a certain extent. There have been far too many preposterous proposals made in this area: misinterpretations of scripture were held against genuine scientific insights; literal readings were forced on biblical texts with literary genres favoring nonliteral readings; twisted claims about scientific results were made in order to align "science" with one's favorite understanding of nature texts in Job, to name a few.

Despite all these instances in which theological knowledge has been misused in science, I still hold to the claim that theology may provide truths which play a legitimate role in science. Ever since Kant, we have become accustomed to the separation between facts and values: science providing knowledge about the facts, and theology offering insights into values. But Christians cannot just buy into this Enlightenment dichotomy without betraying their core beliefs. The illusory peace of Stephen Gould's NOMA (considering that science and theology hold nonoverlapping magisteria) is not at our disposal.

Conflicts between scientific and theological knowledge claims are at least possible. Who are we to affirm *a priori* that God has not spoken in the Bible on matters of scientific interest? Given the ever-increasing scope of questions which the natural sciences address, this would be not only astonishing, but it would also limit the relevance of the Bible to a private religion of the heart. Therefore, the study of the scriptural revelation may well lead to truth claims that are relevant for science. This makes life more dangerous for those working at the intersection of science and theology, but it also holds the promise of true interdisciplinary collaboration involving scientists and theologians. Not only should theology listen to science, it should also be allowed a place at the table as an equal partner in the dialogue. This directly follows from acknowledging that the scientific method is one among several legitimate approaches to reality, including theology. Each approach offers a specific perspective on reality and has to learn from the others.[54] This claim is probably best understood by means of specific examples.

a. The beginning of the universe: There was no observational evidence or rigorous theoretical model for the beginning of the universe in time before well into the twentieth century. In fact, it was Einstein's general theory of relativity which first provided a

rigorous scientific framework for an evolving universe (although Einstein himself did not like the idea because of his Spinozism). Major observational evidence for the beginning of the cosmos in time was provided in the 1920s by the observation of the linear relationship between distance and red-shift in the light spectrum of far-away galaxies (predicted by Georges Lemaître two years before Edwin Hubble observed it in 1929), and decisively in the 1960s by the discovery of the cosmic microwave background radiation. In the 1960s, Roger Penrose and Stephen Hawking proved singularity theorems which show the existence of singularities (the Big Bang being one of them) under very general conditions. Nineteenth-century "scientific" materialism (which was turned into a political ideology, formative in Marxism) held that matter was eternal, as ancient Greek science had held before.[55] Throughout all these centuries, Christians knew from scriptural revelation that the world had an origin in time, although no scientific information was available. Obviously, the two sources of knowledge (scientific theorizing predominantly built on observing nature and theological theorizing predominantly built on reading the scriptures) are not to be conflated. But knowledge obtained from the Bible could have guarded against interpreting the absence of scientific evidence as evidence for the absence of a beginning in time.[56]

b. Religion in sociological field studies: Contemporary examples of theology providing relevant knowledge to the sciences tend to be more controversial. One relatively safe example stems from the field of the human sciences: the treatment of religious practices and beliefs in sociological field studies. Often (but fortunately not always), one can observe a reductionist approach to religion. In a secular mindset, religion cannot simply be what it claims to be: an encounter with the supernatural realm. Believing sociologists know better and are therefore more prone to conduct open-minded research.[57] But all need to heed the warning of the eminent historian of religions Mircea Eliade (1907–1986):

> A religious phenomenon will reveal itself as such only if it is apprehended in its own modality, i.e. if it is studied on a religious scale. To want to define this phenomenon by physiology, psychology, sociology, economics, linguistics, art, etc. ... is to betray it; it is to miss precisely what is unique and irreducible in it, that is to say its sacred character. Certainly [...], there is no phenomenon that is solely and exclusively religious. Religion being a human thing, it is therefore a social thing, a linguistic thing, and an economic thing—for we cannot conceive of man outside of language and community life. But it would be futile to try to explain religion in terms of one of those fundamental functions that define man in the ultimate sense.[58]

Although I am an outside observer, it seems to me that more-recent ethnological studies tend to adopt a less reductionist, more sympathetic approach to religion—trying to get inside the mindset of the people they observe and allowing them to speak for themselves. The supernatural is such a prevalent feature of non-Western outlooks on reality that it is hard, inside a reductionist framework, to get an even moderately adequate description of how they function. But when it comes to sociological research conducted in Western societies, the secular mindset still often prevails. This may even inform public policy making: religious fundamentalist violence is often explained in terms of socio-economic causes. Therefore, measures taken to prevent radicalization or to deradicalize those who have been radicalized tend to neglect proper religious categories such as the need for spirituality and for a transcendent meaning in life.

c. Sin in psychology and sociology: Another potentially more contentious example (once again from the human sciences) concerns taking sin into account in psychology and sociology. From a Christian perspective, it is to be expected that no satisfactory description of human inner life and outside behavior can be obtained without the category of sin. But sin is an inherently theological category: human beings are sinners because of their broken relationship with God. As in the cosmological case, the theological contribution inclines the Christian scientist to withhold belief with respect to some claims, made in the name of science, that are insufficiently grounded. In particular, they will be skeptical about those psychological and sociological models founded upon the presupposition that humans are fundamentally good. Furthermore, theology can also inform scientific practice and influence the kind of questions we ask and the evidence we take into account. In the sciences, as in all human inquiry, one will often find only what one is looking for. As a result, the insight provided by scripture can sharpen our discernment to see certain facts that would otherwise have remained unnoticed. As Pascal wrote:

> For myself, I confess that so soon as the Christian religion reveals the principle that human nature is corrupt and fallen from God, that opens my eyes to see everywhere the mark of this truth: for nature is such that she testifies everywhere, both within man and without him, to a lost God and a corrupt nature.[59]

5. *Protecting the nonnegotiable dignity of human beings*

Let me conclude with the biblical teaching of humanity being created in the image of God and its implications for scientific practice. Granted, there are other biblical teachings that may have practical implications for the way we do science. For example, what is the biblical teaching about animals and its consequences for animal rights? Or take the very burning issue of environmental care. Understanding that we borrow the Earth from our children may not provide enough motivation for sacrificial action. However, when we realize that we are "stewards of God's creation," as the ASA statement of faith says,[60] our responsibility is set in a much larger perspective. And once again, the category of sin must inform public policy formation. If we want to make any progress, we not only need to know what would be appropriate actions in order to protect endangered ecosystems and to combat climate change, but we also need to take into account both our sloth which prevents us from acting on what we know to be true, and our human propensity to egocentric and ethnocentric actions.

But as this article should be of finite length, I will limit myself to some quick remarks on human rights. As human beings are created in the image of God, they are endowed with a nonnegotiable dignity. This biblical teaching has multifaceted relevance for scientific practice:

a. "Human dignity is inviolable," as stated in the first article of the German constitution.[61] Adopted in 1949, this first sentence in the first article of the "Basic Law" tragically echoes back to the horrors of the Nazi regime, in which science played its part, not least by medical experimentation performed on prisoners and so-called racially "inferior" persons. Even if results obtained in such experiments were perhaps found to be scientifically valuable, human dignity sets ethical limits on experiments that we dare not transgress. This safeguard does not apply to humans only during their lifetime, but also before birth and around death. While this may frustrate the desire for omniscience and omnipotence, to which scientists are not immune, the abomination of Nazi medical research stands as a permanent warning that science should never cross this Rubicon again.

b. Not only are humans who are involved in scientific experiments worthy of special protection, but fellow scientists are also created in God's image and thus endowed with unalienable dignity. Respect is due to colleagues with whom we work and students whom we teach. The believing scientist should exhibit a special concern for furthering not only his own career, but also for the prospering of those working in his team. Paul's admonition is right on target for the competitive enterprise of science: "Do nothing from selfish ambition or conceit, but in humility count others more significant than yourselves" (Phil. 2:3). And could Jesus's command to love our enemies also mean that we should pay due homage to the accomplishments of scientists competing with our own research institution?

c. And finally, the scientist him- or herself is also created in God's image. This implies both a daunting responsibility and a God-given dignity. First, for the responsibility: scientists, like all human beings, will one day appear "before the judgment seat of Christ, so that each one may receive what is due for what he has done in the body, whether good or evil" (2 Cor. 5:11). This will include the work accomplished in science, which will also be judged for its moral value. Second, for the dignity: knowing myself to be created in God's image implies that my value as a person does not depend on the success of my scientific work or any other accomplishment. This can strengthen my resilience in the face of failure, when a paper, in which I have invested a lot of time, energy and money, is turned down, or when a long-running experiment in the end does not provide any usable results, or when I am driven out of the job because of personal rivalries. In the face of life's difficulties, scientists too can take courage in the fact that our final destiny depends on God's love and grace alone. ▲

Notes

[1]American Scientific Affiliation, ASA Statement of Faith, accessed February 24, 2020, https://network.asa3.org/page/ASAbeliefs.
[2]Ibid.
[3]Ibid.

[4]Louis Berkhof, *Systematic Theology* (Grand Rapids, MI: Eerdmans, 1932), 113; italics in original.

[5]All Bible quotes in this paper are taken from the ESV (https://www.esv.org/).

[6]David N. Livingstone, *Darwin's Forgotten Defenders: The Encounter between Evangelical Theology and Evolutionary Thought* (Edinburgh, UK: Scottish Academic Press, 1987).

[7]Henri Blocher, *In the Beginning: The Opening Chapters of Genesis* (Leicester, UK: IVP, 1984), 20–24.

[8]Stephen Jay Gould, "Nonoverlapping Magisteria," *Natural History* 106 (1997): 16–22, accessed January 14, 2022, https://web.archive.org/web/20190403152432/http://www.stephenjaygould.org/library/gould_noma.html.

[9]Wolfhart Pannenberg, "Theological Questions to Scientists," in *Toward a Theology of Nature: Essays on Science and Faith*, ed. Ted Peters (Louisville, KY: Westminster John Knox, 1993), 16.

[10]Cf. Lydia Jaeger, "Facts and Theories in Science and Theology: Implications for the Knowledge of Human Origins," *Themelios* 41, no. 3 (2016): 437–38, http://tgc-documents.s3.amazonaws.com/themelios/Themelios41-3.pdf.

[11]David C. Lindberg and Ronald L. Numbers, "Beyond War and Peace: A Reappraisal of the Encounter between Christianity and Science," *The Best in Theology* 1 (1987): 138–41; originally published in *Church History* 55 (1986): 338–54.

[12]Claire Préaux, "Grandeur et limites de la science hellénistique," *Chronique d'Egypte* 50, 99–100 (1975): 215–38, considers that the lack of optical lenses for reading and writing purposes is one factor (among many others) which may explain why ancient science didn't thrive as spectacularly as modern science does today.

[13]Richard Bauckham, *Jesus and the Eyewitnesses: The Gospels as Eyewitness Testimony* (Grand Rapids, MI: Eerdmans, 2006).

[14]Bauckham draws on data covering the whole period from 330 BC to AD 200. But the majority of the occurrences come from sources dating from the first or early second century (Josephus, New Testament, Judean desert texts, Masada, Jerusalem ossuaries, the earliest rabbinic sources); moreover, the frequencies of the first names seem to be relatively stable during this period.

[15]The larger deviations for female names are due to the smaller total number of occurrences.

[16]For the data presented in this section and its interpretation, cf. Peter J. Williams, *Can We Trust the Gospels?* (Wheaton, IL: Crossway, 2018), 64–69.

[17]See also Jaeger, "Facts and Theories in Science and Theology," 440–41.

[18]The double authorship of scripture has led some to admit a *sensus plenior* in biblical interpretation: the divine author can intend a meaning beyond the meaning intended by the human author. Without entering into this complex debate, I consider that the humanity of scripture implies that the meaning of the text is the meaning intended by the human authors, even if they did not understood all aspects of the reality to which they referred (cf. 1 Pet. 1:10–12; and Blocher's comments on the place of scientific knowledge in biblical exegesis: *In the Beginning*, 25–27).

[19]There is an interesting variation in the Lukan version of the parable. It speaks of "a grain of mustard seed that a man took and sowed in his garden" (Luke 13:19). The best explanation is what Joachim Jeremias called "representational change": for a predominantly urban, Hellenistic audience, the mustard seed growing in a domestic garden is more easily understandable than its growing in a rural field. Such contextualizing changes frequently appear in contemporary Bible translations based on dynamic equivalence. See Craig L Blomberg, "The Legitimacy and Limits of Harmonization," in *Hermeneutics, Authority and Canon*, ed. D. A. Carson and John D. Woodbridge (Grand Rapids, MI: Zondervan, 1986), 148–49. It is noteworthy that Luke allows himself such freedom specifically with regard to parables (another example is his transforming of the Palestinian wadi in Matt. 7:24–27 to a permanent, but sometimes overflowing, river in Luke 6:46–49). This is in line with contemporary translation practice which is at ease with contextualizing changes in symbolic and figurative speech, but considers similar changes problematic in narrative texts reporting history.

[20]For more detail, see Jaeger, "Facts and Theories in Science and Theology," 437.

[21]The claim to have been eyewitnesses of major events in Jesus's life is a regular feature of apostolic witness: John 19:35; 1 John 1:1–4. See also Paul's argument that the resurrection really happened, and his appeal to eyewitnesses (1 Cor. 15:5-8).

[22]C.S. Lewis famously wrote that in the gospel, "myth became fact" (title of an essay included in *God in the Dock*). In line with historic, over against liberal understandings of Christianity, Lewis underlines: "The heart of Christianity is a myth which is also a fact. The old myth of the dying god … comes down from the heaven of legend and imagination to the earth of history. It happens—at a particular date, in a particular place, followed by definable historical consequences." Lewis goes beyond (but not against!) Peter's emphasis on history, when he insists that "by becoming fact it does not cease to be myth," in the sense that the gospel fulfills the deep aspirations expressed in pagan myth and fuels our imagination and emotions as much as our intellect. Accessed January 14, 2022, http://mythbecamefact.com.

[23]René Descartes, *Discourse on the Method* (1637), part III, trans. John Veitch (1903), accessed February 27, 2020, http://www.gutenberg.org/files/59/59-h/59-h.htm#part3.

[24] John Stott, *The Contemporary Christian: An Urgent Plea for Double Listening* (Leicester, UK: IVP, 1992), 13.

[25]ASA Statement of Faith, https://network.asa3.org/page/ASAbeliefs.

[26]The ESV translates "living creatures," but the last word has no correspondence in the Greek text, which is rendered more literally by "the living ones."

[27]Quote taken from Reginald Heber's hymn, "Holy, Holy, Holy! Lord God Almighty!," accessed January 12, 2022, https://hymnary.org/text/holy_holy_holy_lord_god_almighty_early. The visionary diptych in Rev. 4–5 is one of the many trinitarian texts in the last book of the Bible (with the Spirit being mentioned in Rev. 5:6). Other texts include Rev. 1:4–5; 22:1. The fake trinity of the dragon, the beast and the false prophet (the second beast) is an indirect witness to the trinitarian structure of John's theological thinking: the first beast mimics Christ (Rev. 13:3), and the false prophet mimics the Spirit's witness (Rev. 13:12–15).

[28]Johannes Kepler, *Mysterium Cosmographicum: The Secret of the Universe,* trans. A. M. Duncan (New York: Abaris Books, 1981), 225.

[29]The two most notable differences with regard to the biblical model are the following: Kepler includes a reference to the five Platonic solids (which he uses in his explanation of the planetary system), and he understands the "domin-

ion over the works of your [the Lord's] hands" (Ps. 8:6), which God has given to humanity, not only to include the earthly sphere, the animals, but also to extend to the heavens: "Thou makest all that is above his head,/The great spheres with their motions, bow before/His genius" (Kepler, *The Secret of the Universe*, 225).

[30]"The Christian Virtuoso, Shewing, That by Being Addicted to Experimental Philosophy, a Man Is Rather Assisted Than Indisposed to Be a Good Christian," 1690, in Robert Boyle, *The Works,* vol. 5, ed. Thomas Birch (London, 1772), 516.

[31]Ibid.

[32]Walter R. Thorson, "Legitimacy and Scope of 'Naturalism' in Science: Part 1. Theological Basis for a 'Naturalistic' Science," *Perspectives on Science and Christian Faith* 54, no. 1 (2002): 10, https://www.asa3.org/ASA/PSCF/2002/PSCF3-02Thorson.pdf. See Berkhof's definition above, which speaks of God's creative act bringing forth the "*existence [of the world], distinct from his own*."

[33]For example, Robert K. Merton, "Puritanism, Pietism and Science," *Sociological Review (first series)* 28, no. 1 (1936), republished in *Science and Religious Belief: A Selection of Recent Historical Studies*, ed. C. A. Russell (London, UK: University of London Press, 1973), 20–54; Michael Foster, "The Christian Doctrine of Creation and the Rise of Modern Natural Science," *Mind* 43 (1934): 446–68, ___, "Christian Theology and Modern Science of Nature, Part 1," *Mind* 44 (1935): 439–66, and ___, "Christian Theology and Modern Science of Nature, Part 2," *Mind* 45 (1936): 1–27; Francis Oakley, "Christian Theology and the Newtonian Science: The Rise of the Concept of the Laws of Nature," *Church History* 30 (1961): 433–57 (republished in *Creation: The Impact of an Idea,* ed. Daniel O'Connor and Francis Oakley (New York: Charles Scribner's Sons, 1969), 54–83); Reijer Hooykaas, *Religion and the Rise of Modern Science* (Edinburgh, UK: Scottish Academic Press, 1972); Peter Harrison, *The Bible, Protestantism, and the Rise of Natural Science* (Cambridge, UK: Cambridge University Press, 1998); ___, *The Fall of Man and the Foundations of Science* (Cambridge, UK: Cambridge University Press, 2007). Cf. also Cameron Wybrow, ed., *Creation, Nature and Political Order in the Philosophy of Michael Foster (1903–1959): The Classic Mind Articles and Others, with Modern Critical Essays* (Lampeter, Wales: Edwin Mellen Press, 1992).

[34]To speak of the scientific practice is obviously a simplification. Different scientific disciplines employ different methodologies, and there has been some evolution over time. Nevertheless, there are basic presuppositions which characterize modern natural science and which set it aside from, for example, ancient Greek science or alchemy. More on the biblical justification of essential presuppositions of modern science can be found in Lydia Jaeger, "The Contingency of Creation and Modern Science," *Theology and Science* 16, no. 1 (2018): 62–78, https://doi.org/10.1080/14746700.2017.1413813; and ___, *What the Heavens Declare: Science in the Light of Creation*, trans. Jonathan Vaughan (Eugene, OR: Wipf and Stock, 2012), chap. 3.

[35]Edward Grant, *God and Reason in the Middle Ages* (Cambridge, UK: Cambridge University Press, 2001), 181–82.

[36]Sir Isaac Newton, *Mathematical Principles of Natural Philosophy,* 1st ed., 1687, trans. Andrew Motte, rev. Florian Cajori (Berkeley, CA: University of California Press, 1934), XXXII.

[37]Peter Harrison, *The Fall of Man and the Foundations of Science*, 87f.

[38]Francis Bacon, *Novum Organum* 1620, II, §52, quoted ibid., 139.

[39]Harrison, *The Fall of Man,* 258.

[40]Plato, *Timaeus* 50b, 53b, 56c. Cf. Lydia Jaeger, "Laws of Nature," in *The Blackwell Companion to Science and Christianity*, ed. James B. Stump and Alan G. Padgett (Oxford,UK: Wiley-Blackwell, 2012), 456–58.

[41]Newton, *Mathematical Principles of Natural Philosophy,* XVII.

[42]Galileo, *Letter to Fortunio Liceti*, January 1641, quoted in Carla Rita Palmerino, "The Mathematical Characters of Galileo's Book of Nature," in *The Book of Nature in Early Modern and Modern History*, ed. Klaas van Berkel and Arjo Vanderjagt (Leuven, Belgium: Peeters, 2006), 30.

[43]Robin G. Collingwood, *An Essay on Metaphysics* (Oxford, UK: Clarendon, 1940), 254. Joshua Harris, in his response to my talk at the 2021 ASA Annual Meeting, pointed out that the conviction that the book of nature was written in mathematical language has been used to foster modern scientism and secularism. Nevertheless, it is important to understand that mathematical science per se feeds on the biblical doctrine of creation, instead of opposing it. It doesn't support atheism—as long as one recognizes that each science uses a specific research methodology which allows one to address certain questions and leave others out. Thus, neither an individual scientific discipline nor natural science taken as a whole offers a complete description of reality. This guards against a too literal understanding of the image of nature's book written in mathematical language: mathematical models are abstractions from the real world. The appeal to mathematical science as an argument against religious belief may well be one incident of the general rule that human beings sin as much as they can; in the hands of sinners, even cultural achievements grounded in creation are turned into weapons against God.

[44]Note that this is a slippery slope and can in the end lead us to evade biblical authority. Against Erasmus, Luther insisted on the clarity of scripture, which allows us to act on the basis of what we have learned from biblical revelation, whereas Erasmus considered that our understanding is never sure enough so that it would allow us to go against the institutional church in the case of conflict between scripture and tradition.

[45]Thomas McCall pointed this out in his response to my talk at the 2021 ASA Annual Meeting, and I gladly take up his comment.

[46]Didier Favre, "Information Evening on Covid-19 Vaccines," June 28, 2021; 1:33:10, recorded here in French: http://amis.gbu.fr/docs/RSE/Soir%C3%A9e%20vaccins.mp4.

[47]See, for a warning: James A. Lindsay, Peter Boghossian, and Helen Pluckrose, "Academic Grievance Studies and the Corruption of Scholarship," *Areo*, October 2, 2018, https://areomagazine.com/2018/10/02/academic-grievance-studies-and-the-corruption-of-scholarship; and for a critical evaluation: Daniel Engber, "What the 'Grievance Studies' Hoax Actually Reveals: The Headline-Grabbing Prank Has More to Do with Gender Than with Academia," *Slate* (October 5, 2018), accessed September 24, 2021, https://slate.com/technology/2018/10/grievance-studies-hoax-not-academic-scandal.html.

[48]The science historian Herbert Butterfield points out that the deism (and later on, atheism) allegedly based on early modern science was less the working of the scientists themselves, than of people such as the Secretary of

the *Académie des sciences* Fontenelle (from 1699 to 1740), who "had held his sceptical views before coming into touch with the scientific movement at all—had learned them from Lucretius and from more modern writers like Machiavelli and Montaigne" (Herbert Butterfield, *The Origins of Modern Science 1300–1800* [London, UK: G. Bell, 1957], 166).

[49]Evandro Agazzi, "Reductionism as Negation of the Scientific Spirit," in *The Problem of Reductionism in Science*, ed. Evandro Agazzi (Dordrecht, Netherlands: Kluwer, 1991), 5.

[50]Barbara Drossel, "Strong Emergence in Condensed Matter Physics," in *Top-Down Causation and Emergence*, ed. Jan Voosholz and Markus Gabriel (New York: Springer, 2021), chap. 4, sec. 4.4, accessed January 14, 2022, https://arxiv.org/abs/1909.01134.

[51]Nobel prize winner Robert B. Laughlin relates a telling anecdote:

> One of my favorite times in the academic year occurs in early spring when I give my class of extremely bright graduate students, who have mastered quantum mechanics but are otherwise unsuspecting and innocent, a take-home exam in which they are asked to deduce superfluidity from first principles. … [T]he task is impossible. Superfluidity, like the fractional quantum Hall effect, is an emergent phenomenon … that cannot be deduced from the microscopic equations of motion in a rigorous way … The students feel betrayed and hurt by this experience because they have been trained to think in reductionist terms … But nature is much more heartless than I am, and those students who stay in physics long enough to seriously confront the experimental record eventually come to understand that the reductionist idea is wrong a great deal of the time, and perhaps always." ("Nobel Lecture: Fractional Quantization," *Reviews of Modern Physics* 71, no. 4 [1999]: 863, https://doi.org/10.1103/RevModPhys.71.863)

Laughlin points to "higher organizing principles in nature" which cannot "be deduced from microscopics" (Robert B. Laughlin and David Pines, "The Theory of Everything," *Proceedings of the National Academy of Sciences* 97 [2000]: 28, https://doi.org/10.1073/pnas.97.1.28). On the ambiguities of his position, see Drossel, "Strong Emergence in Condensed Matter Physics," sec 4.2, who takes a more consistent stance against reductionism.

[52]Opposition to reductionism is one of neo-Calvinism's key themes: Abraham Kuyper underlines the relative independence of different "spheres" of creation (Abraham Kuyper, "Sphere Sovereignty," in *Abraham Kuyper: A Centennial Reader*, ed. James Bratt [Grand Rapids, MI: Eerdmans, 1998], 461–90; and Abraham Kuyper, *Stone Lectures on Calvinism, 1898* [Grand Rapids, MI: Eerdmans, 2002], 29). Herman Dooyeweerd speaks of "modal aspects, [which] delimit … the special viewpoints under which the different branches of empirical science examine the empirical world" (Herman Dooyeweerd, *Twilight of Western Thought: Studies in the Pretended Autonomy of Philosophical Thought* [Nutley, NJ: Craig Press, 1975], 7).

[53]Not all properties studied by specific scientific disciplines lend themselves to mathematization and the same kind of experimental verification as used by physics. As Agazzi points out, all scientific disciplines should "offer criteria of *objectivity and rigor, but these criteria depend on the nature of their objects … while fully admitting that there is a certain 'normativity' in the activity of scientific research, one must see to it that it emerges from the domain of investigation in concern"* (Agazzi, "Reductionism as Negation of the Scientific Spirit," p. 19; italics in the original).

[54]See Alvin Plantinga's case against methodological atheism (or naturalism) as the norm in academic research: Alvin Plantinga, "Methodological Naturalism?," in *Facets of Faith and Science, Vol. 1: Historiography and Modes of Interaction*, ed. Jitse M. Van Der Meer (Lanham, MD: University Press of America, 1996), 177–221; and Alvin Plantinga, "Science: Augustinian or Duhemian?," *Faith and Philosophy* 13 (1996): 368–83, accessed January 12, 2022, https://andrewmbailey.com/ap/Science_Augustinian_or_Duhemian.pdf. For in-depth studies of the history of methodological and metaphysical naturalism in a wide area of academic disciplines, ranging from physics to anthropology and higher biblical criticism, see Peter Harrison and Jon H. Roberts, eds., *Science without God? Rethinking the History of Scientific Naturalism* (Oxford, UK: Oxford University Press, 2019).

[55]Peter van Inwagen points out that "the preferred universe of the Enlightenment … is infinite in space and time," whereas "the universe that was constructed to fit the imaginations of Christians … turned out to be consistent with what science has discovered" ("*Quam Dilecta,*" in *God and the Philosophers: The Reconciliation of Faith and Reason*, ed. Thomas V. Morris [New York: Oxford University Press, 1994], 50).

[56]I use the cautious "could have guarded" as it would need a study in the history of ideas in order to see what influence the biblical teaching on creation exerted on believing thinkers in their cosmological model-building. For example, given the knowledge available at his time, Thomas Aquinas considered that the creation of matter was not something to be known by reason alone, but by (special) revelation. Throughout this article, I use the anachronistic term of "science" for all rigorous study of the natural realm throughout the centuries.

[57]See Eloise Meneses et al., "Engaging the Religiously Committed Other: Anthropologists and Theologians in Dialogue," *Current Anthropology* 55, no. 1 (2014): 82–104.

[58]Mircea Eliade, *Traité d'histoire des religions* (1949; France: PAYOT, 1990), 11. [The quote is translated by Rachel Vaughan, whom I also thank for correcting the English style of this article.]

[59]Blaise Pascal, *Pensées, Fragment Contrariétés n° 9/15 (Brunschvicg n° 441; Lafuma n° 471; Sellier n° 708:* http://www.penseesdepascal.fr/XI/XI9-savante.php?r1=R%C3%A9f%C3%A9rence&r2=d%C3%A9couvre%20ce%20principe). English translation: *Pascal's Pensées* (New York: E.P. Dutton, 1958), https://www.gutenberg.org/files/18269/18269-h/18269-h.htm.

[60]ASA Statement of Faith, https://network.asa3.org/page/ASAbeliefs.

[61]My translation. In the orginal: "*Die Würde des Menschen ist unantastbar,*" accessed March 3, 2020, https://www.bundestag.de/parlament/aufgaben/rechtsgrundlagen/grundgesetz/gg_01-245122.

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