Christianity and Science in Historical Perspective

Ask the person on the street for an opinion about science and religion, and you are likely to hear something about a confrontation, perhaps combined with a reference to Galileo's trial for heresy by the Roman Inquisition in 1633. The view that science and religion have always been and are still engaged in an ongoing, inevitable conflict pervades the Western world and provides crucial support for the aggressively anti-religious agenda of the New Atheists. It is surely no accident that the two nineteenth-century books most commonly associated with advocating the 'warfare' view – A History of the Warfare of Science with Theology in Christendom, by Andrew Dickson White, and History of the Conflict between Religion and Science, by John William Draper – are available for free downloading at infidels.org and positiveatheism.org, respectively. (They are not accompanied by links to any of the many scholarly sources offering devastating criticisms of the works of White and Draper.)

White was an historian himself, and for several generations his riveting narrative of enlightened and progressive science triumphing over ignorant and obscurantist theology set the tone for many other historical studies of science and religion. In the past few decades, however, historians of science have decisively rejected the 'warfare' view, along with many of the widely believed myths that White and Draper promulgated – such as the fictitious claim that John Calvin cited Psalm 93 against Nicolaus Copernicus or the wholly unfounded assertion that most Christians prior to Christopher Columbus believed in a flat earth. By insisting that all aspects of the history of science and religion must fit into one poorly chosen conceptual box, the 'warfare' view lied by gross oversimplification and led numerous scholars to overlook the large amount of historical material that just didn't fit into that box. The history of Christianity and science is much richer and far more interesting than White and Draper could have imagined. We will mainly discuss the interaction of science and religion during the Scientific Revolution, a period of roughly two centuries (1500 to 1700) during which most of the important aspects of modern science emerged, but first we will look briefly at the first fifteen hundred years of interaction between Christianity and science.

Christianity & Science before Copernicus

Discussions of Christianity and science often begin with the Carthaginian lawyer Tertullian. Around 200 A.D., he formulated the central question for Christian scholars of all ages: 'What indeed has Athens to do with Jerusalem? What concord is there between the academy and the church?' Tertullian himself had no enthusiasm for Greek philosophy, including natural philosophy (what we now call science), but most early Christian authors took a more favourable view, especially Origen and Augustine. No Christians actually contributed to natural philosophy, however, until the sixth century, when John Philoponus of Alexandria wrote insightful commentaries on several works of Aristotle. Even at that time, though, Philoponus was an exception. Cultural and historical circumstances were such that, for the most part, Islamic scholars encountered Greek science and began making contributions of their own long before there was a thriving scientific tradition in Christian Europe.

It was not until the creation of the first universities by ecclesiastical and secular authorities in the twelfth and thirteenth centuries (or later, depending on the location) that Christian scholars began to engage Greek science and medicine in more than a sporadic and incomplete manner. Prior to that time, most of the writings of Aristotle, Ptolemy, and Galen had been unavailable to scholars in Western and Northern Europe. During the High Middle Ages, however, scientific texts and topics constituted about one-third of the undergraduate (arts) curriculum at the universities, which existed with active support from the church. Furthermore, the philosophers and theologians at those mainly autonomous universities freely debated a wide range of scientific and theological questions. In the process, they developed powerful analytical tools that aided in the subsequent development of modern science.

How did these early scholars conceive of the relationship between science and religion? Most Christian writers down through the Renaissance saw both reason and Scripture as valid sources of knowledge, but they did not usually regard them as equally authoritative. Philosophy (including what is now called science) was considered a 'handmaiden to theology', and not an autonomous enterprise in its own right, but it was still an important area of study to which considerable resources were given in the universities. Theology was 'queen of the sciences', or queen of all knowledge. These scholars thought that one of the roles of scientific knowledge was to help explain biblical passages about nature. The author of a commentary on Genesis, for example, might draw on Aristotelian cosmology and physics in connection with references to the heavens in the creation story. They did not think it appropriate, however, to question the traditional interpretation of a biblical text on the basis of a scientific theory. The book of nature (as philosophy was often called) did not have nearly as much authority as the book of Scripture.

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Christianity & the Rise of Modern Science

All of this changed with the advent of the new astronomy of Nicolaus Copernicus, an administrative officer at the cathedral in Frombork, a small coastal town in northern Poland. At the time, Roman Catholic officials recognized that the calendar that had been in use since the time of Julius Caesar was increasingly out of step with the stars. Copernicus was known to be working on a new theory of celestial motion, according to which the earth revolves around a stationary sun, and the church wanted him to participate in conversations about fixing the calendar. Copernicus, however, preferred to work quietly on his own. For many years he ignored the pleas of at least one cardinal and two bishops to publish his ideas, until finally a young Lutheran astronomer from the University of Wittenberg, Georg Joachim Rheticus, came for an extended visit and was able to persuade Copernicus to allow his book to be printed back in Germany. Contrary to what is often said or implied, Copernicus had full freedom to pursue his ideas while working for the church and was even encouraged to publish them.

It is true that Copernicus' ideas were controversial, but scientific objections (rather than religious objections) constituted the lion's share of this criticism. Most astronomers prior to Galileo considered heliocentrism to be a highly speculative hypothesis, entirely lacking in observational support and contrary to common sense. As Galileo himself said, his admiration for the Copernicans was so great precisely because they had 'done such violence to their own senses as to prefer what reason told them over that which sensible experience plainly showed them to the contrary'. The inability (at the time) to observe the annual parallax of the stars counted heavily against the idea of a moving earth, and Aristotelian physics made no sense if the earth were not at rest in the center of the heavens. Such considerations led Tycho Brahe (1546–1601), the greatest astronomer of his generation and an outspoken opponent of Aristotelian cosmology, to reject the Copernican view decisively. He advocated an alternative geocentric model that later proved adequate to account for everything Galileo observed with his telescope.

In short, it made perfect sense for theologians to reject the new theory – and to stick with a literal interpretation of the Bible. A handful of biblical texts appear to speak of the earth as immobile, or of the sun as in motion. Why should anyone seek to alter interpretations that only agreed with the best science of the day? Although Martin Luther had dismissed heliocentrism as a foolish idea that contradicted the account of Joshua's long day in the Bible, his disciple Philip Melanchthon revered mathematical astronomy: in his view, neither the perfection of the heavens nor the certainty of mathematics had been adversely affected by the Fall. Melanchthon also considered the earth's motion unbiblical, but he encouraged the teaching of Copernican theory as a false but useful hypothesis at Lutheran universities. Thus, a young Johannes Kepler learned about it from astronomer Michael Maestlin at Tübingen, where he was preparing to be a theologian. Kepler liked the Copernican view partly because he believed that the three parts of the heliocentric universe constituted an image of the Trinity – the central sun with its emanating light representing God the Father, the starry sphere God the Son, and the intermediate space God the Holy Spirit. As he realized, the opponents of heliocentrism had to be persuaded that it did not contradict the Bible. In the preface to his most important book, Astronomia nova (1609), Kepler argued that, in order to be widely understood, the Bible is written in the ordinary language of the common person and not in the technical language of the astronomer. Therefore, the Bible should not be read as a scientifically accurate text or used to refute an astronomical theory. Galileo made an identical argument a few years later, in an open letter about biblical interpretation and astronomy written for Christina of Lorraine, the Dowager Duchess of Tuscany and the mother of his patron, Cosimo II de' Medici.

The Roman Catholic Church's response to Galileo is often misunderstood. It is true that Galileo's views on biblical interpretation ultimately led to formal charges of heresy – but this was hardly the only factor. Galileo actually agreed with his principal Vatican critic, Roberto, Cardinal Bellarmine, that solid proof of the Copernican view would be required before the church should consider alternative interpretations. Although Galileo believed he had met the burden of proof, he pushed his conclusions more forcefully than the available evidence warranted, and when he appeared to portray the pope as a boorish ignoramus in the final paragraphs of his Dialogue on the Two Chief World Systems (1632), he brought the Inquisition down on his own head.

Kepler also figured prominently in another type of interaction between science and religion. For some early modern scientists, science became a form of religious worship, supplementing or even supplanting the offices of the church. Denied the Eucharist by his minister because he did not accept the Lutheran doctrine of the ubiquity of Christ, Kepler poured out his deeply spiritual soul repeatedly in rapturous praises to the Creator in the pages of his dizzyingly difficult astronomical treatises. Robert Boyle (1627 – 91), whose remarkable piety did not go unnoticed by his friends, considered himself a 'priest' in the 'temple of nature' and decided to become a chemist partly because he thought it would lead to advances in medicine. He publicized recipes for various pharmaceuticals in order to benefit everyone, especially the poor, and he believed that science was crucial for the biblically-mandated dominion of humanity over the creation. Above all, Boyle believed that the actual practice of laboratory science – and he was one of the creators of the scientific method – was highly conducive to leading the Christian life. The virtues of the scientist (honesty, humility, and devotion to one's calling) are also those of the Christian. And, Boyle claimed, the more we know about nature and the more deeply we understand the details, the more we will be led not only to glorify God, but also to admire and thank God – in short, science could help make us more pious. Isaac Newton (1643 –1727) went even further than Boyle in his endorsement of natural theology, the use of science to draw inferences about God. In a query added to the Latin edition of his book, Optics (1706), he said that 'The main business of natural philosophy is … to deduce causes from effects, till we come to the very first cause, which certainly is not mechanical.'

Throughout the Scientific Revolution, it was taken for granted that religion and science were closely intertwined

Another central feature of the Scientific Revolution was the mechanical philosophy, according to which the world is an impersonal machine rather than an organism that acts semi-consciously for purposes of its own. This is nothing other than the modern scientific worldview. Mechanical philosophers challenged prevailing Aristotelian and Galenic notions, according to which 'Nature' is a wise and benevolent being that does nothing in vain, abhors a vacuum, and functions as the wisest physician. Boyle was the most influential advocate of the new view, and he assumed this role substantially for theological reasons. The mechanical philosophy was so attractive to him precisely because it gave clearer, more coherent explanations of nature, enabling genuine progress in practical knowledge in accord with the Genesis mandate. It also did away with the idea of a semi-divine 'Nature' as an intermediary between God and the world, thus underscoring divine sovereignty: nature is a created object, and its created properties and powers are the proper subject of our study. Finally, by focusing attention on the astonishing complexity and intricacy of the created order, the mechanical philosophy underscored the wisdom, power, and goodness of the Creator himself.

Throughout the Scientific Revolution, it was taken for granted that religion and science were closely intertwined; both were needed for a complete understanding of the world. Indeed, the modern scientific method is to a significant degree a product of theological reflection on God, nature, and the human mind. (It is quite ironic that New Atheists claim that theology has never done anything for science.) During the Middle Ages, a common

topic of discussion by Christian scholars was the relationship between the divine will and the divine reason. They all agreed that God has both will and reason, but a lively debate ensued about which ought to receive more emphasis: are the activities of the divine will wholly determined by reason, or are they sometimes inscrutable? As surprising as it may seem, this abstract question from medieval theology had a profound influence on debates about scientific knowledge during the Scientific Revolution. What kind of knowledge is science – is it completely certain or is it provisional? What method is best for understanding the created order – reason alone (including mathematics) or some combination of reason and experience? Leading figures took part on both sides of the argument; while Galileo and René Descartes stressed the power of human reason made in the image of God, Boyle and Newton believed that our created minds were not capable of limiting the freely exercised power of God. Ultimately, the modern scientific method of rational empiricism (a combination of reason and observation) matches the fact that nature is a contingent order, created by a free and rational God. As creatures made in God's image, we can understand many of the patterns that God placed in the world, but those patterns must be discovered by observation, not dictated by human reason. God is free to create in ways that cannot be predicted, so we should not be astonished that nature sometimes does astonishing things.

Many Christian scientists today continue to place science in a larger theological context, while still keeping both ways of understanding reality in focus. In my view no one has done this more effectively than John Polkinghorne, a former mathematical physicist at Cambridge who is now an Anglican theologian. Polkinghorne sees science and Christianity as 'cousinly' enterprises that are both trying to establish 'motivated belief'. His recent book Theology in the Context of Science stresses the crucial point that larger questions of meaning and purpose go well beyond science – in other words, science cannot make sense of itself: why is science possible at all? The universe 'is not only rationally transparent', he argues, but also 'rationally beautiful, rewarding scientists with the experience of wonder at the marvelous order which is revealed through the labours of their research'. The laws of nature 'have a character that seems to point the enquirer beyond what science itself is capable of telling, making a materialist acceptance of them as unexplained brute facts an intellectually unsatisfying stance to take' (pp. 90-91). The fact that science is possible at all 'is not a mere happy accident, but it is a sign that the mind of the Creator lies behind the wonderful order that scientists are privileged to explore' (p. 37). In short, 'the activity of science is recognised to be an aspect of the imago dei' (p. 13). This is a robust theism, and Polkinghorne gives it an explicitly Christian content. Recognizing that the Resurrection is 'the pivot on which the claim of a unique and transcendent significance for Jesus must turn' (p. 135), he searches for motivated belief in such an event, sifting carefully through the evidence to conclude (with N.T. Wright) that a genuine miracle is the best explanation for the stories of the empty tomb and the post-crucifixion appearances of Jesus.

Here is the crucial link between someone like Polkinghorne and the founders of modern science: like his predecessors, Polkinghorne understands that nature is a 'contingent order' – and that both words in that phrase are important. Our knowledge of nature and its laws is possible because of our status as creatures bearing the divine image, but it is also limited by our status as creatures – and by the freedom of God to act in both wonderful and mysterious ways. As Boyle put it in a posthumously published Appendix to The Christian Virtuoso (1744), 'it is extremely difficult for us dim-sighted mortals, to discern the utmost extent of the divine power and knowledge'. The Christian encounter with science comes down to this: confidence in the reliability of the book of nature as an authentic divine revelation, tempered by genuine humility and augmented by reverence for the One who wrote the book.

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