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## HOW CHRISTIANITY LED TO THE RISE OF MODERN SCIENCE

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### SYNOPSIS

A central tenet of the new atheism is that Christianity and reason are antithetical, and that throughout history Christians have held back progress in science. Atheist historian Dr. Richard Carrier has promoted similar views in his contributions to essay collections such as *The Christian Delusion* and *Christianity Is Not Great*. He suggests that, but for the rise of Christianity, the ancient Greeks would have enjoyed a scientific revolution so that the "Dark Ages" never would have happened. However, the truth is very different. The science of the ancient Greek pagans was intended to reinforce their ethical and philosophical positions, rather than to be an objective study of nature. Admittedly, when Christians came to develop their own science in the Middle Ages, they were not being objective either. For them, science was the study of God's creation. But the metaphysical assumptions of Christianity, unlike those of the Greeks or even Muslims, turned out to be extremely conducive to uncovering true knowledge about nature. They weren't trying to, but it was Christians who laid the foundations for modern science.

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It's hard to imagine what life was like before the rise of modern science. For example, there were no computers, few effective medicines, and only the rich could afford colorful clothes because there were no artificial dyes. So central is science to our lives that the charge Christianity tried to hold back its advance is particularly damaging. It is particularly unfair as well. As historians have now realized, the evidence that the Christian faith actually had a positive influence on science is becoming ever stronger.

In this article, I'll explain how it was medieval Christians rather than ancient Greeks who provided the philosophical framework in which modern science could arise. I'll be paying special attention to the work of the atheist historian Richard Carrier, in particular the assertions he makes in two essays in anti-Christian collections edited by John Loftus.<sup>1</sup> Carrier is one of the few scholars working today who still supports the "conflict thesis," so it is important to understand why he reaches conclusions contrary to the vast majority of historians of science.

The common perception of a historical conflict between science and Christianity remains strong. That hasn't stopped almost all serious scholars from queuing up to condemn it. For example, historians David Lindberg and Ron Numbers have stated unequivocally that the popular view is wrong. But as Lindberg and Numbers ruefully admit, "Despite a developing consensus among scholars that science and Christianity have not been at war, the notion of conflict refused to die."<sup>2</sup> It is also becoming increasingly clear that much of the evidence cited to support the conflict thesis turns out to be bogus.<sup>3</sup> For example, the church never tried to ban human dissection, the number zero, or lightning rods, as has frequently been alleged. Although Christians did once countenance the despicable practice of burning heretics, no one was ever executed for scientific beliefs. Even the notorious trial of Galileo Galilei (1564–1642) turns out to have had almost as much to do with the papal ego as with astronomy. Finally, no one in the Middle Ages thought the earth was flat: Christopher Columbus most certainly did not need to prove it is a sphere.

## THE PURPOSE OF ANCIENT GREEK SCIENCE

Richard Carrier is far too knowledgeable a historian to fall for these old canards. Neither does he make the mistake of saying Christians deliberately held back science. However, in his chapter *in The Christian Delusion*, entitled "Christianity Was Not Responsible for Modern Science," he does make some striking claims. Much of this interesting chapter is taken up by a catalog of the achievements of ancient science. Carrier's thesis is that a "scientific revolution" was imminent in the third century AD, but this was curtailed by an economic collapse of the Roman Empire. The Empire partially recovered and survived for another couple of centuries, but it quickly

succumbed to Christianity. Because Christians were simply not interested in science, the chance of the ancient world matching the achievements of the seventeenth century was lost. Carrier accuses Christians of sins of omission because they neglected science. He doesn't claim that they actively opposed it.<sup>4</sup> Given that Christianity controlled all the seats of learning, it didn't have to go to the trouble of attacking what it didn't like. Just ignoring science ensured its stagnation.

### Progress in Greek Science

I'll come to the question of whether Christianity supported science in a moment. But first, it is worth examining exactly how far the achievements of ancient science extended. Is it true that a scientific revolution was just around the corner? To answer that, we need to examine the specific examples Carrier gives of progress in Greek science to see if they point toward a looming scientific revolution. He cites Hero of Alexandria (d. AD 70) as a major figure demonstrating that progress. But can we detect any real advances in science between the work of Aristotle (384–322 BC) and Hero, writing in the first century AD?

Carrier supports his theory with the example that one Strato of Lampsacus (335–269 BC) extended Aristotle's "experimental method to machines and physics."<sup>5</sup> Strato was the second head of Aristotle's Athenian school of philosophy in the mid-third century BC. Little of his work survives, but in antiquity he had such a reputation for science that he was known as The Naturalist. His major achievement that we know about today was to show that a true vacuum can be created artificially and that air can be compressed. That's an impressive step forward from Aristotle, who said a vacuum is impossible. However, the relevant passage of Strato's work has been incorporated into the introduction to Hero of Alexandria's *Pneumatics*, written three hundred years later.<sup>6</sup> Carrier claims that Hero experimentally refuted Aristotle's claim that a vacuum is impossible.<sup>7</sup> So why is Hero using a source that is three centuries old to prove it? This does not seem to be evidence of any progress in science at all.

Furthermore, in his *Mechanics*, Hero states unambiguously that heavy objects fall faster than light ones.<sup>8</sup> Now, this is a fundamental error that is easily proven wrong by the simplest of experiments. Yet Hero did not do this. He simply accepted the authority of Aristotle on the question. Hero also wrote about the law of reflection, correctly noting that the angles of incidence and reflection in a mirror are the same. But this had been known since at least Aristotle's day, so again Hero's knowledge is not new or the product of new experiments.<sup>9</sup> It would be fair to conclude that Hero was a practical mechanic and a tinker who pulled his theory from old books and never did anything approaching a true experiment in his life. As one eminent historian notes, "Hero is not

very original. His significance lies in the way that he summarises existing knowledge in the form of a handbook."<sup>10</sup> This is very different from the assessment of Hero implied by Carrier.

### **Faltering Science**

It looks like there was little scientific progress in the three hundred years between Hero and Aristotle's pupil, Strato. Admittedly, in the field of mathematical astronomy, we do see the models used to describe the movements of the planets getting more accurate up until the work of Ptolemy of Alexandria (fl. c. AD 150). But the underlying physical theory didn't really improve. The general impression is that science stagnates after the third century BC. There is a temptation to denigrate the ancient Greeks for making a good start and then letting it slip. But that would not be fair. The fact is, they were not trying to develop modern science. How could they when no one had any idea that such advances were even possible? Instead, the point of Greek science was to explain the natural world in terms that correlated with their ethical theories. Aristotle thought that the key to happiness was to know the ends for which we should live. His science is all about trying to find the purpose for which nature is designed. Plato (427–348 BC) wanted to raise our sights above mundane matters to unworldly perfection. For him, nature is a dim reflection of that perfection, and mathematics is a good way for the mind to contemplate higher reality. The other philosophical schools, such as the Epicureans and the Stoics, also had their own versions of science that were intended to provide a foundation for their ethical theories.<sup>11</sup>

So, the key to understanding Greek science is to realize that no one was seeking objectively to understand the natural world purely for its own sake. *On the Nature of the Universe*, the Epicurean poem of Lucretius (d. c. 55 BC), which lays out an atomic theory that was influential in the seventeenth century, is actually intended to teach morals and not science. Indeed, its science was already two hundred years out of date when it was written.<sup>12</sup> That didn't matter to Lucretius, whose purpose was not to describe accurately how nature worked but to show that the Epicurean philosophy was the best way to navigate life's perils.

### **SCIENCE, EARLY CHRISTIANITY, AND ISLAM**

Much ink has been spilled on the relationship between Christianity and pagan science. However, as we've seen, there were as many pagan sciences as there were pagan philosophies. And each of these philosophies developed a vision of science that reinforced the way they saw the world. The Christian attitude toward the natural world

was very similar to that of their pagan contemporaries. Christian thinkers were acutely aware that ancient Greek science was not the objective study of nature but an adjunct to pagan ethics and religion. Unsurprisingly, this meant some of them treated it with suspicion. For example, Tertullian (AD 160–220) famously asked what Athens (representing pagan philosophy) had to do with Jerusalem (representing Christianity).<sup>13</sup> Christians could not simply adopt one of the pagan natural philosophies since they were all intended to provide ballast for particular ethical systems. What was needed was a specifically Christian natural philosophy that understood nature as God’s creation and the backdrop against which the drama of salvation was played out. Christians did not neglect science but they did use it for their own purposes. Where pagan philosophy was helpful, Christians were happy to coopt it. A popular analogy, first proposed by Origen of Alexandria (AD 182–254), was that pagan learning was like the gold of the Egyptians that the Israelites took with them into the wilderness in the exodus.<sup>14</sup>

For church fathers such as Origen and St Augustine (354–430), God’s creative freedom always had to be respected. That meant reason alone was not enough to comprehend nature. This more skeptical attitude toward rational inquiry had some interesting results. For example, the Christian philosopher John Philoponus (490–570) carried out the simple experiment of dropping a heavy and light ball in the sixth century AD. He found they both fell at almost the same speed.<sup>15</sup> This demonstrated that the Aristotelians were wrong and showed that, to truly understand the laws of nature, empirical investigation was essential. Nonetheless, we should avoid applauding Philoponus for anticipating some elements of modern science. He was a Christian thinker whose aim was to attack pagan philosophers, not a protoscientist.

In any case, by the sixth century, the antique world was collapsing rapidly. The Western Roman Empire had been overrun by barbarian invaders in the course of the fifth century. The fragmentation of the empire into petty kingdoms caused an economic decline that was exacerbated by the policies of the barbarians themselves. The civilian elite that had patronized philosophers was gradually replaced by a warrior aristocracy, which eventually gave rise to the systems of chivalry and feudalism. The Eastern Roman Empire survived longer. Unfortunately, a devastating war with Persia in the seventh century meant it was in no condition to resist the rise of Islam. Muslims took over swaths of the empire, including its breadbasket of Egypt and the sacred city of Jerusalem. Although the Byzantine Empire, ruled from the great city of Constantinople, hung on for another seven centuries, it was under an almost constant state of siege from then on.

## **Scientific Light of the Church in the Early Middle Ages**

The period from the fifth to the tenth centuries used to be called the “Dark Ages.” Historians now reject that label as prejudicial, but there is little doubt that the years after the collapse of the Roman Empire were hard. The population shrank, and the economic surplus available for culture was reduced to a fraction of what it had been under Rome.<sup>16</sup> Only the Christian church remained a haven for learning. It helped preserve literacy and knowledge of the classics through the early middle ages. Dr Carrier claims, in his chapter on the Dark Ages in *Christianity Is Not Great*, that the decline of science in this period was the fault of Christians.<sup>17</sup> We’ve already seen how it is a category mistake to equate ancient natural philosophy with modern science. But even allowing that there was less interest in investigating the natural world in this period, the reasons are entirely down to external invasions and the change to a feudal society. In fact, as the example of John Philoponus shows, science in Alexandria continued to break new ground in the three centuries after Christianity became the religion of the Roman Empire. The end came only with the annexation of the city by Muslim invaders in AD 641.

## CHRISTIANITY AND THE RISE OF SCIENCE

We’ve seen how the schools of ancient Greek philosophers and early Christians developed their own versions of science to explain the world in a way that was consistent with their belief systems. The methodological mistake of Carrier is to measure ancient natural philosophies against the rules of modern science. But no one in the classical world was doing science objectively to study nature as an entity in its own right. They were all seeking to understand the natural background to their overarching philosophies. Admittedly, Carrier’s mistake is one shared by some partisans of Christianity’s place in the development of the modern world such as Rodney Stark and Thomas E. Woods.<sup>18</sup> Christians have always used science as a way to understand the natural world’s part in a bigger picture, which, in Christianity’s case, includes the Trinity and salvation. Medieval theologians studied God’s creation without any inkling or wish to produce the comprehensive account of the material universe provided by modern science. Nonetheless, their activity uniquely led to the incredible successes enjoyed by physics, chemistry, and biology, not to mention medicine, over the last couple of centuries. To believing Christians, it is hardly surprising that theologically conditioned natural philosophy should be better at leading to true knowledge about nature than rival systems of thought. However, the historian must tread carefully to understand the factors that Christianity brought to the study of the material universe.

The Bible has relatively little to say about the natural world, but at least the book of Genesis makes it clear where the universe came from. It is not eternal but created by God at the beginning of time. In the fourth century, St. Augustine clarified the doctrine

that the world was created *ex nihilo*, out of nothing.<sup>19</sup> God did not use preexisting material whose properties He had to work with. Thus, as Genesis affirms, creation was “good” and as God wished it to be.

From the twelfth century, Christian theologians began to explore what this meant in practice. One consequence was that nature was separate from God and followed the laws He had ordained for it. William of Conches (1085–c. 1154), one of the most important of the twelfth century’s thinkers, explained, “I take nothing away from God. All things that are in the world were made by God, except evil. But He made other things through the operation of nature which is the instrument of divine operation.”<sup>20</sup> Various Greek philosophies had accepted the rationality of the laws of nature, but for Christians, nature’s laws were God’s laws rather than the laws of logic. God was free to do as He pleased, so it was impossible to work out the laws of nature by using reason alone. To be sure, not everyone accepted this. A group of philosophers in thirteenth-century Paris, called the Averroists after a Muslim philosopher from Spain named Averroes (1126–1198), took the extreme view that everything, including God, was subject to logically necessary rules.<sup>21</sup> This meant that rational philosophy alone was enough to comprehend all of existence, even the divine mind. Orthodox Christians rejected this doctrine and insisted that God was not subject to any limits, except perhaps the law of noncontradiction. The principle of God’s freedom and absolute power was the subject of a decree by the bishop of Paris in 1277. He stated that because God could do as He pleased, He could do things that philosophers said were impossible, like creating a vacuum or more than one universe.<sup>22</sup> This opened up a world of possibility that Christian natural philosophers were quick to exploit.

In the fourteenth century, they began to consider many previously unthinkable ideas, such as whether the Earth was rotating. The Parisian scholar John Buridan (1295–1361) showed that the concept of relative motion means that we cannot tell if the Earth is moving. His arguments were used by Nicholas Copernicus (1473–1543) to support his theory that the Earth is orbiting the sun.<sup>23</sup> Buridan also built on concepts first suggested by John Philoponus in the sixth century to argue that the lack of friction in space means that the planets should continue to move forever after God has set them on their course. This anticipated the conservation of momentum.<sup>24</sup> These theories formed the basis of Galileo’s work and reached perfection with the *Mathematical Principles of Natural Philosophy* by Sir Isaac Newton (1643–1727) in 1687. Newton himself was explicit about the religious roots of his work, as were Johannes Kepler (1571–1630), Rene Descartes (1596–1650), and Robert Boyle (1627–1691), among many others.<sup>25</sup> Over the following centuries, their new kind of science grew into modern physics, chemistry, and biology, something that could never have happened in the ancient Greek or Islamic worlds.

Of course, we need to remember that medieval Christians were not deliberately trying to make progress toward science as we know it today. They were simply studying God's creation so that they could become better theologians and Christians. In that sense, their motives for doing science were no different from those of earlier eras. It was just that the metaphysical background to Christianity turned out to be uniquely conducive to successfully understanding the working of nature. In summary, atheist historians such as Richard Carrier are wrong to say Christians neglected science and that pagans were on the point of a scientific revolution. On the contrary, Christianity was a necessary, if not sufficient, cause of the flowering of modern science.

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## NOTES

- 1 Richard Carrier, "Christianity Was Not Responsible for Modern Science," in *The Christian Delusion: Why Faith Fails*, ed. John W. Loftus (Amherst, NY: Prometheus, 2010), 396–419; Richard Carrier, "The Dark Ages," in *Christianity Is Not Great: How Faith Fails*, ed. John W. Loftus (Amherst, NY: Prometheus Books, 2014), 209–21.
- 2 *God and Nature: Historical Essays on the Encounter between Christianity and Science*, ed. David C. Lindberg and Ronald L. Numbers (Berkeley: University of California Press, 1986), 6.
- 3 Many of the myths surrounding the conflict thesis are debunked in Ronald L. Numbers, *Galileo Goes to Jail and Other Myths about Science and Religion* (Cambridge, MA: Harvard University Press, 2009).
- 4 Carrier, "Christianity Was Not Responsible for Modern Science," 413.
- 5 *Ibid.*, 401.
- 6 Morris R. Cohen and I. E. Drabkin, *A Source Book in Greek Science* (Cambridge MA: Harvard University Press, 1958), 248n.
- 7 Carrier, "Christianity Was Not Responsible for Modern Science," 402.
- 8 Cohen and Drabkin, *A Source Book in Greek Science*, 208.
- 9 *Ibid.*, 262n.
- 10 Menso Folkerts, "Hero," in Hubert Cancik et al., eds., *Brill's New Pauly: Encyclopaedia of the Ancient World*, vol. 6 (Leiden, the Netherlands: Brill, 2002), 244–47.
- 11 Geoffrey Lloyd, *Greek Science after Aristotle* (New York: W. W. Norton and Company, 1975), 21.
- 12 Lucretius, *On the Nature of the Universe*, trans. Ronald Melville (Oxford: Clarendon Press, 1997), xxiv.
- 13 David Lindberg, "Science and Early Church," in *God and Nature*, ed. Lindberg and Numbers, 25.
- 14 *Origen* (London: Routledge, 1998), 211 (Letter to Gregory 2).
- 15 Cohen and Drabkin, *A Source Book in Greek Science*, 208.
- 16 Bryan Ward-Perkins, *The Fall of Rome: And the End of Civilization* (Oxford: Oxford University Press,

2006), 139.

- 17 Carrier, "The Dark Ages," 209.
- 18 See, e.g., Rodney Stark, *For the Glory of God* (Princeton, NJ: Princeton University Press, 2003) and Thomas Woods, Jr., *How the Catholic Church Built Western Civilization* (Washington, DC: Regnery, 2005).
- 19 Saint Augustine, *Confessions*, trans. R. S. Pine-Coffin (Harmondsworth, UK: Penguin, 2002), 285 (XII: 8).
- 20 David C. Lindberg, *The Beginnings of Western Science* (Chicago: University of Chicago Press, 1992), 201.
- 21 James Hannam, *The Genesis of Science: How the Christian Middle Ages Launched the Scientific Revolution* (Washington, D.C.: Regnery, 2011), 88.
- 22 *Ibid.*, 95.
- 23 *Ibid.*, 278.
- 24 *Ibid.*, 179.
- 25 John Hedley Brooke, *Science and Religion: Some Historical Perspectives* (Cambridge: Cambridge University Press, 1991), 18–19.