

# RELIGION, THE ROYAL SOCIETY, AND THE RISE OF SCIENCE

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Friday 9<sup>th</sup> July, in the year 1669 saw the opening of Oxford's Sheldonian Theatre. John Evelyn, a founding member of the Royal Society, attended and provides us with a description of the event in his diary:

The Vice-Chancellor, Heads of Houses, and Doctors, being seated in magisterial seats, the Vice-Chancellor's chaire and deske, Proctors &c. cover'd with brocatell and cloth of gold; the University Register read the founder's grant and gift of it to the Universitie for their scholastic exercises upon these solemn occasions. Then followed Dr. South, the Universitie's orator, in an eloquent speech, which was very long, and not without some malicious and indecent reflections on the Royal Society....

Robert South, the Oxford orator, was better known for his eloquence than his diplomacy, and his snide remarks about the Royal Society were particularly tactless given the presence on this occasion of a number of its founding fellows. These included not only Evelyn himself, but Elias Ashmole, who gave his name to the Ashmolean museum, John Wallis, the Savillian

Professor of Geometry and, not least, Christopher Wren the Savillian Professor of Astronomy and architect of theatre. There is little doubt about their embarrassment at being exposed to South's derisory remarks. Like Evelyn, John Wallis recorded his recollections of the event, complaining in a letter to Robert Boyle that the first part of South's address 'consisted of satirical invectives against Cromwell, the Royal Society and the new philosophy [science]... [and] the last of execrations against fanatics, conventicles, comprehension, and new philosophy, damning them *ad infernos, ad gehennam*.'<sup>1</sup>

For those who live in an age in which the cultural prestige of the empirical sciences is at a high ebb, and in which election to fellowship of the Royal Society is a mark of great distinction, the injudicious remarks of South on this important occasion at this great university may seem rather curious. Yet South was by no means alone in his prejudices against the Royal Society and the new scientific approaches of the seventeenth century. The political writer James Harrington (1611-1677) had written of the Oxford experimental club—a precursor to the Royal Society—that they were 'good at two things, at diminishing a Commonwealth, and multiplying a Louse'. South had touched upon the same theme with his observation that fellows of Royal Society 'can admire nothing except fleas, lice, and themselves'.<sup>2</sup> (These remarks were addressed to the Society's much publicized microscopic studies of vermin.) Even the Royal patron treated the society with scant respect. Evelyn's friend and fellow diarist Samuel Pepys reported that Charles II had 'laughed mightily' at the experimental exploits of a group which he regarded as being

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<sup>1</sup> Charles. S. Smith, 'Wren and Sheldon', *The Oxford Art Journal* 6 (1983), 45-50; *The Works of the Hon. Robert Boyle*, 6 vols., ed. Birch, (Hildesheim: Olms, 1965-6), vol. 6, p. 459.

<sup>2</sup> James Harrington, *The Prerogative of Popular Government* (London, 1658), Epistle Dedicatory. Robert South qu. in Margery Purver, *The Royal Society: Concept and Creation* (Cambridge, Mass., MIT Press, 1967), p. 71. On South's opposition to the Royal Society see Larry Stewart, *The Rise of Public Science: Rhetoric Technology, and Natural Philosophy in Newtonian Britain, 1660-1750* (Cambridge: Cambridge University Press, 1992), p. 6. See also J. R. McCulloch (ed.), *Early English tracts on Commerce* (Cambridge: Cambridge University Press, 1952), p. 357; Samuel Butler, 'Paedants', in *Satires and Miscellaneous Poetry and Prose*, ed. R. Lamar (Cambridge: Cambridge University Press, 1928), p.166.

unduly preoccupied with such trivial pastimes as ‘the weighing of air.’<sup>3</sup> It was said that he regarded the group as his court jesters. In his play, *The Virtuoso* (1676), dramatist and poet Thomas Shadwell mocked the pretensions of Fellows of the Royal Society with the character Sir Nicholas Gimcrack. This caricatured figure took pride in the fact that ‘We virtuosos [as men of science were then known] never find out anything of use.’<sup>4</sup> These widespread reservations about the contributions of experimental science persisted into the first half of the eighteenth century, as Jonathan Swift’s savage satire on scientific academies in *Gulliver’s Travels* testifies.<sup>5</sup>

It is worth enquiring then, why the cultural stocks of experimental science were not particularly high in an age that we tend to associate with unprecedented scientific progress and which produced individuals now regarded as scientific figures of heroic stature: Galileo, Johannes Kepler, René Descartes, Robert Boyle and Isaac Newton. We might also ask what has transpired between that age and our own to reverse the fortunes of the natural sciences, so that they now occupy a place of unparalleled prestige in our society and indeed in this university. After all, Robert South, for all his erudition, had few genuine insights into the activities of the Royal Society. Yet, on the basis of his status as an Anglican Divine and his not inconsiderable rhetoric abilities, he could presume to denigrate a set of practices that he knew little about, and garner wide approval as he did so. Now, of course, the situation has been almost entirely reversed, and expertise in the natural sciences provides a platform from which, if individuals so choose, pronouncements can be issued on a range of extra-curricula issues. At times this can extend to the propagation of ill-informed prejudices about religion.

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<sup>3</sup> *The Diary of Samuel Pepys*, Feb. 1, 1663/4, 11 vols., ed. R. Latham and W. Matthews (London: Bell, 1971), vol 5, p. 33.

<sup>4</sup> Thomas Shadwell, *The Virtuoso* (London, 1676) iii, 49; v, 84. For unflattering literary representations of the virtuosi, see Barbara M. Benedict, *Curiosity: A Cultural History of Early Modern Inquiry* (Chicago: University of Chicago Press, 2001), pp. 46-51.

<sup>5</sup> Jonathan Swift, *Travels into Several Remote Regions of the World* (London, 1726), Pt. III, ch. 5.

It is tempting to think that the main reason for this development—the rise of science to social and intellectual prominence—was that science proved itself to be self-evidently useful and valuable, that it was vindicated by its achievements and by the obvious payoffs of the new experimental method. Science, on this account, has been distinguished by its capacity to provide material benefits and it has contributed to the exceptional, some would say unique, progress of Western society. Yet, close examination shows that seventeenth-century experimental sciences had at best a mixed record in terms of their practical achievements.<sup>6</sup> More importantly, perhaps, there was serious debate at the time about whether the kinds of achievements at which the sciences aimed were worth pursuing in the first place. Both of these factors—to do with the ‘usefulness’ of science—were prominent in contemporary criticisms. The status of science, as we shall see, would come to depend on the development of new ideas about what would be counted as useful and constructive intellectual activity.

Insofar as religion itself was involved, it also seems plausible to suggest that the growing prestige of the natural sciences that we have witnessed over the past three centuries has come because science has acted as an agent of secularization and has displaced religion from the centre of intellectual life. Leaving aside for the moment the exceptional case of the USA, where this correlation of science and secularization does not seem to obtain, it seems reasonable to suggest that scientific progress will inevitably put the forces of religion to flight. This was the influential historical interpretation of French Enlightenment thinkers. This view was given formal expression in Auguste Comte’s (1798-1857) idea of the three successive historical stages of humanity—as he described them, the religious, the metaphysical and the positive (or scientific).

What I want to suggest in this lecture is that something like the opposite was the case. Far from displacing religion over the course of the seventeenth and eighteenth centuries, science relied heavily upon religion in order to move

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<sup>6</sup> See, e.g., Michael Hunter, *Science and Society in Restoration England* (Cambridge: Cambridge University Press, 1981), p. 111.

itself from the margins of intellectual life. What we witness in the seventeenth and eighteenth centuries, particularly in the English context, is the development of a much closer and more intimate relationship between science and religion than that seen during the middle ages. More than this, I want to suggest that a significant factor in the development which sees science attain social legitimacy, and a key reason for its rise to the prominent place which it now occupies, was a process that established its *religious* usefulness and its capacity to fulfil crucial religious functions. Part of the story, then, of the role of religion in the rise of modern science, is a story about how science gained intellectual credibility and social prestige because it was able to harness the considerable legitimizing power of religion. My main concern in this lecture will be to outline this process. A secondary concern will be to sketch out what happens to religion in all of this for, as we shall see, our conception of religion itself underwent significant change partly as a consequence of these interactions with science.

I should point out at the outset, that there are several other ways of talking about the role of religion in the rise of modern science, beyond the provision of social sanctions. (I am relying, for this analysis, on my predecessor in this Chair, John Hedley Brooke.) **First**, religious beliefs can inform *choices between competing scientific accounts*. In the case that one theory or approach proves more congenial to a particular religious viewpoint, this may become a reason to prefer it to the alternatives. **Second**, religious considerations might provide some of the *presuppositions* for scientific investigation. Here I have in mind theologically-grounded ideas about the intelligibility of nature, manifested in the early modern period as the notion that there were divinely authored laws of nature. **Third**, and related to this, is the way in which theological positions may, and indeed have *underpinned specific methods of investigation*. **Fourth**, religious convictions may provide the *motivations* for some individuals to pursue the formal study of nature. Most early modern natural philosophers were conventionally religious, and some (but by no means all) made a point of linking their religious commitments with their scientific activities. **Fifth**, religious contentions may provide the *constitutive content* of particular scientific positions. Hence, for

much of the eighteenth century, natural history in the English context was understood to be the investigation of divine design in the natural world.<sup>7</sup>

There is much to be said on each of these topics, and they shed considerable light on the role of religion in the *origins* of modern science and in the establishment of its metaphysical foundations. Our topic today, however, goes beyond this to consider what we might call the consolidation of scientific values in our culture.

### SCIENCE AND RELIGIOUS LEGITIMATION

Any satisfactory account of the rise and persistence of science must pay attention to the distinctive features of the scientific culture of Western modernity. When we look at scientific achievements in other times and in other cultures, what we tend to see is, as intellectual historian Stephen Gaukroger has recently put it, a ‘boom-bust’ pattern:

Scientific developments in the classical and Hellenistic worlds, China, the medieval Islamic world, and medieval Paris and Oxford, share a distinctive feature. They each exhibit a pattern of slow, irregular, intermittent growth, alternating with substantial periods of stagnation, in which interest shifts to political, economic, technological, moral, or other questions. Science is just one of a number of activities in the culture, and attention devoted to it changes in the same way that attention devoted to the other features may change, with the result that there is competition for intellectual resources within an overall balance of interests within the culture.<sup>8</sup>

From the time of the so-called ‘scientific revolution’ of the seventeenth century, however, we see a markedly different pattern—an unparalleled consolidation and growth of scientific activity. Science eventually displaces

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<sup>7</sup> On the different ways in which religion can influence science see John Hedley Brooke, *Science and Religion: Some Historical Perspectives* (Cambridge: Cambridge University Press, 1991), pp. 19-33.

<sup>8</sup> Stephen Gaukroger, *The Emergence of a Scientific Culture: Science and the Shaping of Modernity, 1210-1685* (Oxford: Oxford University Press, 2006), ch. 1.

all other cultural competitors and establishes its own cognitive standards as the ones to which all other activities must conform.

How do we account for this? As intimated earlier, a common explanation, from the period of the Enlightenment onwards, has been that science managed to establish itself as a new, rational and autonomous activity, and that part of this process required that it exert its independence from religion. Its vast potential, on this account, was self-evident. Insofar as religion played a role at all, it was perceived to have been an impediment to scientific progress, and this was thought to have been particularly true of Catholicism—witness Condorcet’s observation that that ‘the triumph of Christianity had been the signal for the complete decadence of philosophy and the sciences’.<sup>9</sup> By implication, the triumph of science had necessitated the social marginalization of religion. Secularization is thus often posited as both cause and consequence of the rise of science. Science, moreover, is understood as having provided the key to prosperity and progress, and the superiority of the West in this regard is attributed to the fact that, unlike most other cultures, it has managed to overcome the oppressive and stultifying forces of religion, and has done so with the help of science.

Some early histories of science—the history of science as a discipline dates from the early decades of the last century—drew upon this narrative, and various historical episodes were seen to confirm it. At this time there arose the idea that there had been a perennial conflict between science and religion, and the stories of such heroic scientific figures as Galileo and Darwin were retrospectively reconstructed to conform to this pattern. In its infancy, the history of science thus served to bolster a more general story about secularization, Western progress, and the slow but inevitable victory of science in its protracted struggle with the dark forces of religion.<sup>10</sup>

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<sup>9</sup> Marquis de Condorcet, *Progress of the Human Mind*, quoted in David C. Lindberg, *The Beginnings of Western Science* (Chicago: University of Chicago Press, 1992), p. 356.

<sup>10</sup> John Draper, *History of the Conflict between Religion and Science* (New York, 1875), Andrew Dickson White, *History of The Warfare of Science with Theology in Christendom*, 2 vols. (New York, 1896). See also George Sarton (1955),

Recent developments in the history of science make much of this difficult to sustain. There is an emerging view amongst historians that the seventeenth and eighteenth centuries witness not a distancing between science and religion, but rather a closer, if more complex, relationship than that of the Middle Ages. Much attention has recently been paid to the emergence of the modern notion of laws of nature, a conception which is underpinned by the theological conviction that nature's laws are direct volitions of God. Corpuscular or atomic matter theory was also thought to be more consistent with the idea of God who directly controlled the operations of nature, than was the prevailing Aristotelian hylomorphism. And the new methods of experimental natural philosophy were directly informed by theological anthropology (or at least I shall argue in a forthcoming book). Overall, it can be said that the new science presented itself as a more compatible with Christianity than 'pagan' Aristotelianism that it eventually replaced.

But as important as these substantive contributions was the role that religion was to play in offering ongoing social sanctions for scientific activity. In lending this support, religion was able to propel scientific activity from the margins of intellectual life and to ensure a strong future for science in a way that was quite unprecedented. As I have already indicated, that such support proved necessary may seem puzzling in light of what we may consider the startling success of the natural sciences. Yet, as the derisory remarks of Robert South and others demonstrate, the idea that the new science could offer something of value was far from obvious to contemporary observers. Moreover, from our knowledge of what we might call the 'arrested development' of the sciences in other times and places, we know that while exceptional scientific minds and scientific breakthroughs might be *necessary* for the development a scientific culture such as ours, they are by themselves, not *sufficient*. The taunts of South are indicative of the fragile social status of experimental science. (Consider also, in the context, the more recent observations of the distinguished Oxford philosopher Michael Dummett, who

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'Introductory Essay' in *Science, Religion and Reality*, ed. Joseph Needham (New York: George Braziller).



asks: ‘What sane man, magically given the ability, in 1900, to foresee the nuclear weapons which it would make possible, would not have opted, if given the power, to prohibit all future research in physics?’)

In the time remaining, then, I want to frame the discussion about this issue around three questions. (1) What substantive objections lay behind the attacks on science voiced by South and others? (2) How did the proponents of the new science address these criticisms? (3) What role did religion play in this response and in what ways was it transformed as a consequence of its involvement?

Before turning to these questions it is important first to understand something about the disciplinary labels used in the seventeenth century. Figures whom we would regard as scientists thought of themselves as being engaged in ‘natural philosophy’ and identified themselves as ‘natural philosophers’ or simply ‘philosophers’. The title of Newton’s masterpiece on gravity was thus entitled ‘The Mathematical Principles of Natural Philosophy’. As we have seen, critics of the Royal Society directed their attacks variously against ‘the new philosophy’ or ‘the experimental philosophy’ or ‘the mechanical philosophy’. The difference between modern science and natural philosophy was not entirely terminological, moreover, because natural philosophy bore with it certain philosophical and moral connotations that are absent from our present understanding of science, but which were part of the traditional understanding of philosophy. Indeed some of the criticisms of the new science were precisely along the lines that it had departed from the values associated with traditional natural philosophy. So although I shall tend to use the terms ‘science’ and ‘natural philosophy’ more or less interchangeably, we should bear in mind these important differences.

#### CRITICS OF THE NEW PHILOSOPHY

What substantive objections, if any, lay behind the attacks on science voiced by South and others) Undoubtedly some attacks on the practices of the Royal Society amounted to little more than facile ridicule, based on ignorance and misconception. But it would be a mistake to dismiss opponents of the

sciences as, to use John Evelyn's indignant characterization, 'ignorant and comical buffoons'.<sup>11</sup> Underlying the mockery were serious intellectual objections. In 1669, the year that saw the opening of the Sheldonian, a considered attack on the relevance of the new philosophy came from the pen of Meric Casaubon. Casaubon was the son of the famous classicist Isaac Casaubon, and an eminent scholar in his own right. He saw in the emerging sciences a dangerous trend in which the moral and religious ends of education—and these had been part and parcel of natural philosophy—would be supplanted by what, in his view, were the inferior ends of material utility. 'To *moralize* men', Casaubon argued, 'is the best *use* of any worldly thing which can be made.'<sup>12</sup> The great advantage of traditional Aristotelian philosophy was, in his view, that it promoted these moral goals. 'Had Aristotle never written any thing but his *Ethicks*', asserted Casaubon, 'he deserved the thanks of all ages.'<sup>13</sup> Casaubon thus championed moral and religious usefulness against what he perceived to be the incipiently materialistic thrust of the new philosophy.

Other complainants mounted similar arguments. Henry Stubbe (1631-1676), second keeper of the Bodleian Library and, incidentally, probably the first person to write book about chocolate, argued that the pursuit of science was incapable of producing 'that Moral discipline which instructs us in the nature of virtue and vice, of Distributive and Commutative Justice: humane actings and the due course, as well as exorbitances of our passions'.<sup>14</sup> The mechanical philosophy was thus presented as threatening the moral and religious priorities of the traditional education. For Stubbe, the Peripatetic philosophy was the only one that could imbue the student with the necessary virtues. In Aristotle, 'The *Ethicks* there are generous, and subservient to Religion, and civil prudence, and all manner of virtue: the *Logick* and *Metaphysicks* are so entwisted with the established Religion and so required

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<sup>11</sup> John Evelyn, *Sylva, Or a Discourse of Forest-Trees* (London, 1679), 3<sup>rd</sup> edn. sigs. Ar-v.

<sup>12</sup> Meric Casaubon, *A Letter of Meric Casaubon, D.D. &c. to Peter du Moulin D.D., concerning Natural Experimental Philosophie* (Cambridge, 1669), p. 31.

<sup>13</sup> *Ibid.*, p. 6.

<sup>14</sup> Henry Stubbe, *Campanella Revived* (London, 1670), p. 14.

to support it against Papists and Socinians.’<sup>15</sup> By way of contrast, the educational content of what he called the ‘*Mechanical Education*’ amounted to little more than ‘*Aphorisms of Cider, planting of Orchards, making of Optick Glasses, magnetic and hortulane Curiosities*’.<sup>16</sup> These last were specific references to the publications of John Evelyn, Robert Hooke, and other prominent Royal Society figures.

Criticisms of the practical and experimental orientation of the new natural philosophy were not confined to conservative supporters of Aristotelianism. The philosopher Thomas Hobbes, who was no friend of Aristotle or the universities and who had proposed his own innovations in the sphere of natural philosophy, also weighed into the argument:

Every man that hath spare money, can be at the charge of making great moulds, and hiring workmen to grind their glasses; and so may have the best and greatest telescopes. They can get engines made, and apply them to the stars; recipients made, and try conclusions; but they are never the more philosophers for all this.... not every one that brings from beyond seas a new gin, or other jaunty device, is therefore a philosopher. For if you reckon that way, not only apothecaries and gardeners, but many other sorts of workmen, will put in for, and get the prize.<sup>17</sup>

On Hobbes’s analysis, the practical and entrepreneurial orientation of many of those within the Royal Society rendered them unworthy of the name ‘natural philosopher’.

Placing these kinds of objections in a more familiar context, we might say that in some respects they anticipate the divide that emerges more clearly in the late nineteenth century, and which became a permanent feature of our intellectual landscape in the twentieth. This division was famously

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<sup>15</sup> *Ibid.*, p. 13.

<sup>16</sup> Henry Stubbe, *Plus Ultra reduced to a Non Plus*, p. 13, in *Legends no Histories: or a Specimen of some Animadversions upon the History of the Royal Society... together with the Plus Ultra reduced to a Non-Plus* (London, 1670).

<sup>17</sup> Thomas Hobbes, *Considerations upon the Reputation, Loyalty, Manners, etc.*, [1680] in *Works*, 11 vols., ed. William Molesworth (Aalen: Scientia, 1962), vol. 4, p. 436f.

characterised by C. P. Snow as a rift between ‘two cultures’—the cultures of the sciences and the humanities. The criticisms of Casaubon and Stubbe also exemplify the kinds of homeostatic mechanisms operable in other cultures, which militate against the ascendancy of any one particular set of cognitive standards, and which ensure that intellectual are resources spread more evenly between competing religious, moral, technological and political interests.

Clearly, given what we now know, these criticisms ultimately did not prevail. That they did not is owing to two quite distinctive features of the new science. First, experimental science initially presented itself as being capable of fulfilling the moral and religious goals traditionally associated with philosophy and with intellectual activity more generally. Indeed, proponents of the new science effectively argued that their activities were a legitimate expression of Christian religion. Second, the champions of the new philosophy argued that their practical goals—inventions and technological advances which had traditionally been excluded from natural philosophy—were an integral part of these moral and religious aims.

#### THE MORAL AND RELIGIOUS AIMS OF EARLY MODERN SCIENCE

How was the new science placed to respond to these criticisms? A key figure in establishing the religious and moral relevance of experimental science in the seventeenth century was Francis Bacon. While not particularly active in scientific pursuits himself, Bacon nonetheless establish a revolutionary blueprint for the kind of activity that natural science should be. His thinking about these issues was informed by a seminal biblical narrative. According to Bacon, the Fall of the human race, as described in Genesis 3, led to a loss of scientific knowledge and a diminution of human power over nature. The role of the new natural philosophy, Bacon believed, was to restore the dominion over the natural world that had been lost at the Fall. In *Novum Organum* he writes: ‘For man by the fall fell at the same time from his state of innocency 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.’ The idea that science was a means of restoring what was lost at the Fall was an enduring theme of Bacon’s work.<sup>18</sup>

Bacon’s script for the progress of the sciences was enormously influential. As Professor Charles Webster has shown, the remarkable proliferation of scientific activity in the middle decades of the seventeenth century in England was fuelled by Baconian ideals linked with a distinctively puritan eschatological vision. What Professor Webster referred to, as ‘the great instauration’ was an attempt to reform all aspects of human society—religion, the sciences, technology and agriculture—in order to prepare for the imminent end of the world. While these millenarian commitments came to be viewed with a degree of suspicion after the Restoration of the monarchy, it turned out that the Bacon’s programme of restoring a lost dominion over nature could function effectively without them.

So it was that when the Royal Society was founded in the 1660, Baconian justifications for the new natural philosophy were rehearsed by many of its key figures. Bishop Thomas Sprat, for example, who had taken it upon himself to defend the Royal Society against the slanders of South and others, saw in experimental science the possibility of re-establishing a human power over nature. Fellows of the Society, he announced, were engaged in the attempt to recapture a lost ‘Dominion over *Things*’ and restore knowledge of the ‘uses of all the *Creatures*’. Indeed, for Sprat, the practice of natural science had been the original form of religion, for only after the Fall of the human race had their been a need for conventional religion. Religion, in a sense, was ‘plan B’. The experimental philosopher (or scientist), declared Sprat:

will be led to admire the wonderful contrivance of the *Creation*;  
and so to apply, and direct his praises aright: which no doubt,  
when they are offer'd up to *heaven* [sic] from the mouth of one,  
who has well studied what he commends, will be more sutable  
[sic] to the *Divine Nature*, than the blind applauses of the

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<sup>18</sup> Bacon, *Novum Organum* II, §52, in *The Works of Francis Bacon*, ed. James Spedding, Robert Ellis, and Douglas Heath, 14 vols., (London, 1857-74), vol. 4, pp. 247-48. Cf. *Valerius Terminus, Works*, vol. 3, p. 222.

ignorant. This was the first service, that *Adam* perform'd to his *Creator*, when he obey'd him in mustering, and naming, and looking into the *Nature* of all the *Creatures*. This had bin the only *religion*, if men had continued innocent in *Paradise*, and had not wanted a *redemption*.<sup>19</sup>

This is a startling claim. But to a degree it was consistent with the this-worldly orientation of reformed religion, and with the Protestant animus against the supposedly ‘monkish’ cast of papism. Medieval Catholicism, according to its Protestant critics, had elevated clerical religiosity to a special status, while diminishing the religious significance of the mundane pursuits of the laity. Against this view, both Luther and Calvin had insisted on the sanctity of worldly vocations, and had pointed to the practical occupations of Adam in Eden as a warrant for this view.

The important idea that the clerical vocation was not different in kind from other vocations enabled those involved in the pursuit of the ‘sciences’—including many clerics—to make a plausible claim to be engaged in a sanctified or priestly activity. At the same time, the development of the new disciplinary category of physico-theology—a mixed science that combined natural philosophy (or ‘physics’) with theology—made the study of nature a proper pursuit for those engaged in clerical professions, for to study nature, it was argued, was to be engaged in an appropriately theological activity.

The idea that science was a religious vocation was an influential one. It enables us to understand, for example, Johannes Kepler’s conviction that astronomy should be understood as a priestly calling. Kepler had wavered between a socially-sanctioned career in theology and the pursuit of ‘science’. Eventually he arrived at the view that astronomy and theology were both religious vocations. Kepler described the world as ‘the temple of God’ and ‘the book of Nature’ and believed accordingly that the contemplation of

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<sup>19</sup> Thomas Sprat, *History of the Royal Society* (London, 1667), pp. 62, 438, 349f.

nature could be understood as true worship and veneration of God.<sup>20</sup> While the ‘temple’ and ‘book’ metaphors had a long history, the idea that an astronomer could be thought of as discharging a priestly function would have been inconceivable in a medieval world that sharply distinguished the estates of the priesthood and the laity. The Protestant notion that all believers, in principle, could be ‘priests’, thus made possible Kepler’s contention that the astronomical calling was in effect a priestly one.

These vocational considerations gave further impetus to the Baconian ideals of the Royal Society. Robert Boyle (1627-1691) was a key figure in the foundation of the Society and he is now widely regarded as the ‘father of modern chemistry’. With Robert Hooke he conducted a series of important experiments in a house on the High Street just a hundred metres from where are now gathered. Boyle echoed Kepler’s sentiments about the essentially religious functions of natural philosophy. ‘If the world be a temple’, he wrote, ‘man sure must be the priest, ordained (by being qualified) to celebrate divine service not only in it, but for it.’ Like Johannes Kepler and Thomas Sprat, Boyle suggested that the scientific investigation of nature should be thought of as an act of worship. The rational contemplation of nature was ‘the first act of religion, and equally obliging in all religions’. In another of Boyle’s formulations natural philosophy was ‘philosophical worship of God.’ Following Sprat, Boyle also suggested that this philosophical worship was more authentic than many traditional forms of religiosity: ‘Discovering to others the perfections of God displayed in the creatures is a more acceptable act of religion, than the burning of sacrifices or perfumes upon his altars.’<sup>21</sup> The pursuit of experimental science was thus presented as the original religion of Adam in Eden, and the means by which some of the Edenic amenities once enjoyed by Adam might be re-established in a fallen and imperfect world. Subsequently, Isaac Newton’s was to declare in the fourth edition of *Opticks* (1730), natural philosophy (or science) was a means of

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<sup>20</sup> Johannes Kepler, *Mysterium Cosmographicum*, tr. A. M. Duncan (Norwalk, CT., 1999), p. 53.

<sup>21</sup> Boyle, *Usefulness of Natural Philosophy*, in *Works* vol. 2, pp. 62f. Cf. Henry Power, *Experimental Philosophy in Three Books* (London, 1664), pp. 192f.

enlarging the bounds of moral philosophy, and of shedding light on the nature of the ‘first cause’—God.<sup>22</sup>

So much, then, for religion. The related objection that experimental science did not ‘moralise men’, to use Casaubon’s expression, was also taken up by exponents of the new philosophy. Bacon had already contended that the quest for material benefits aimed at relieving the human estate was nothing other than Christian charity in action.<sup>23</sup> This assertion was reprised by defenders of the Royal Society. A common theme in these defences was the need to unite the acquisition of personal virtue—a traditional goal of natural philosophy—with the performance of good works. The preface to Robert Boyle’s *Usefulness of Experimental Natural Philosophy* (1663) contains this statement which links the theoretical and practical aspects of philosophy:

By the one [i.e. theoretical], sound notions are proposed to the reader’s apprehension from the contemplation of God’s creation and the governance of the world, and thereby good matter is suggested to his affections for the advancement of his devotion: by the other [i.e. practical], there are divers things delivered, which may tend to enlarge mans power of doing good: by them, in the whole, both honour to God, and our charity to our neighbours may be assisted: in which two, the substantial part of all the most noble, not only human, by Christian virtues, both speculative and practical, are certainly contained.<sup>24</sup>

In an essay on a similar theme—‘The Usefulness of Real Philosophy to Religion’ (1676)—the Anglican divine and fellow of the Royal Society Joseph Glanvill repeated the claim that the experimental study of nature ‘promotes the *end* of *Religion*.’ Understanding the natural world, he insisted, confers a ‘practical knowledge’ which ‘will assist and promote our *Vertue*, and our *Happiness*; and incline us to imploy our selves in living according to

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<sup>22</sup> Isaac Newton, *Opticks*, Query 31, (New York: Dover, 1962), p. 405.

<sup>23</sup> Bacon, *Advancement of Learning*, I. 3 (Johnston edn. p. 8); *Essays, Works*, vol. 6, p. 403.

<sup>24</sup> Boyle, *Usefulness of Natural Philosophy* in *Works*, vol. 2, pp. 63, 2. Preface written by Roger Shorrock.



it.<sup>25</sup> Personal virtue, moreover, is accompanied by acts of charity, as enquiries into nature lead to the discovery of causes, ‘and *Invention of Arts*, and *Helps for the benefit of Mankind*.’<sup>26</sup> Other defenders of the moral and practical usefulness of experimental natural philosophy mounted similar arguments.<sup>27</sup>

To conclude this section of my lecture, then, it is often supposed that the physico-theological tradition that flourishes in the seventeenth and eighteenth centuries—and by ‘physico-theological’ I mean arguments for the existence of God based on the evidence of apparent design in nature—was a way of providing rational support for religion through the appeal to a set of scientific activities that were epistemically more secure than the religious claims to which they lent credence. Indeed, in time these arguments were to take on that role. But for the seventeenth and much of the eighteenth centuries the reverse was true. Arguments from design were deployed in the first instance to demonstrate the religious usefulness and social utility of a set of otherwise intellectually marginal scientific practices. In other words, it was science that needed religion. The deployment of arguments for God’s existence based on the natural sciences was the key strategy of a programme of legitimation, and one that proved to be remarkably successful in securing social status for the new sciences. In speaking of a strategy, I hasten to add, I do not mean that proponents of these arguments were being disingenuous in establishing these connections, for there is no indication that they were anything but utterly sincere in believing natural philosophy to be a religious activity.

The story from this time on is well known. Eventually, there would be an inversion of the power relations between religion and natural philosophy. This became apparent during the nineteenth century, when natural philosophy becomes modern science, and loses the final vestiges of its religious and philosophical past. During this period science has achieved the necessary confidence to assert its independence from religion and to wean itself off the

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<sup>25</sup> Joseph Glanvill, ‘Usefulness of Real Philosophy to Religion’, p. 5, in *Essays on Several Important Subjects in Philosophy and Religion* (London, 1676), p. 25.

<sup>26</sup> *Ibid.*, pp. 38f.

<sup>27</sup> See, e.g., Sprat, *History*, pp. 322f.; John Edwards, *A Demonstration of the Existence and Providence of God* (London, 1696), pt I, pp. 206-15, pt. II, p. 150.

support provided by it. This process is accompanied by the professionalization of science when, in this country, for example, individuals such as Thomas Huxley sought to extricate science from its domination by the clergy.<sup>28</sup> It was the assumed overlap between the clerical and scientific vocations that was the target of Huxley's campaign. And it is significant that the term 'scientist' first appears at this time, signalling the beginning of a distinct new profession. Darwin's ideas about evolution through natural selection were to become an important ally in this struggle.

It is difficult not to be sympathetic to certain aspects of Huxley's mission, but an unfortunate element of his rhetoric was the invention of a war between science and religion that was projected backwards into history. Huxley's idea of an opposition between science and religion found some support in the French Enlightenment reading of history, and the myth of a perennial historical conflict between science and religion dates from this period in the nineteenth century. This 'conflict myth' has proven to be a potent one and, while few historians subscribe to it, it has conspired against an accurate understanding of the legitimatory process that preceded it, and of the role played by religion in that process.

#### SCIENCE AND THE IDEA OF RELIGION

While the main focus of my attention has been the improving fortunes of the natural sciences, it is important to understand that these interactions were also related to a significant modification in the Western understanding of religion itself. We have known for some time that the very idea 'religion' become prominent in the West only during the early modern period. Prior to the seventeenth century, the term 'religion' was used very little. Equivalents of this term are virtually non-existent in the canonical documents of the Western religions—the Hebrew Bible, the New Testament, and the Qu'ran. When the term was used in the pre-modern West, it did not refer to discrete sets of beliefs and practices, but rather to something more like 'inner piety'. The

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<sup>28</sup> Frank Turner, 'The Victorian Conflict between Science and Religion: A Professional Dimension', *Isis*, 49 (1978), 356-76; Brooke, *Science and Religion*, pp. 5, 50.

appearance of the modern idea ‘religion’ was to signal the objectification of this interior disposition. As Wilfred Cantwell Smith wrote in 1962 classic, *The Meaning and End of Religion*: ‘The concept “religion,” then, in the West has evolved. Its evolution has included a long-range development that we may term a process of reification: mentally making religion into a thing, gradually coming to conceive it as an objective of systematic entity.’<sup>29</sup>

Smith’s contention is one that I believe to be basically correct, although I do not have the time now to demonstrate its plausibility. What I can say, however, is that the interactions of science and religion from the seventeenth century onwards contributed in a significant way to the reification of religion, to its construction as a system of ideas, and to a peculiarly modern view—although one that is by no means universal—that religions are to be distinguished primarily by what it is that their adherents believe.<sup>30</sup>

Relating this to the story thus far, it can be said that the close relations between science and religion during the seventeenth and eighteenth centuries resulted not only in the transmission of epistemic authority from religion to science, but also in the transfer of some of the properties of the new inductive sciences to religion. In this process—and there were many other factors in play here—religion came to be regarded by many as a propositional activity concerned primarily with beliefs and their rational support. This occurred because in order to establish the importance of their contributions to religion, it was necessary for natural philosophers to emphasize that aspect of religious activity that was relevant to their expertise. Arguably, this led to a distortion of the very activity that they wished to support, as they focused increasingly on the creedal content of religion and on question of its rational foundations. This is an application of the general principle that to a person with a hammer, everything looks like a nail. Or think of an example closer to our hearts, how the imposition of the RAE (Research Assessment Exercise) framework manages to distort the very research activities that it seeks to measure and

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<sup>29</sup> Wilfred Cantwell Smith, *The Meaning and End of Religion* (London: SPCK, 1978), p. 51.

<sup>30</sup> For a more general description of this process of reification see Peter Harrison, *‘Religion’ and the religions in the English Enlightenment* (Cambridge: Cambridge University Press, 1990).

support. Imagine, for example, if a metrics based approach that suited the science were to be employed to research in the humanities, how this would fail to capture the true nature of research and scholarship.

We have already seen how the attempt was made to present scientific activity as a form of religion, indeed as the original form of religion. As an almost inevitable consequence of this, the truth claims of religion came to be regarded as on a par with the factual claims of natural philosophy. This development is evident in the attitudes of key figures in the new sciences. Robert Boyle suggested that because of an ability to discern the ‘certain and genuine characters truth’ natural philosophers could be trusted to make reliable judgements about the truth claims of religion.<sup>31</sup> In a similar vein, the Anglican divine Joseph Glanvill (1636–80), one of the first Fellows of the Royal Society, claimed that the new philosophy demonstrated the certainty of foundational Christian beliefs. The truths of the Christian religion, he argued, can be established with the kind of assurance that we find in geometry.<sup>32</sup> As a consequence of the attentions of natural philosophers, Christian conviction came to be understood less in terms of personal piety and faith, and became more a matter of impartially sifting evidence and coming to the ‘correct’ conclusion. For this reason the seventeenth century is witness to a welter of new religious works that set out to demonstrate the ‘evidences’ or ‘grounds and reasons’ of religious belief, or which engage in ‘impartial comparisons’ of religions. (An important part of the context here was the process of confessionalism that followed the Protestant reformation and the related issues of religious pluralism that came in the wake of the voyages of discovery. Natural philosophy, to its exponents at least, seemed to provide an impartial way of navigating these almost intractable questions of which religious beliefs were true.)

This pattern continued into the eighteenth and early nineteenth centuries, during which time the predominant forms of natural theology and natural

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<sup>31</sup> Robert Boyle, *The Christian Virtuoso*, in *Works* vol. 5, pp. 531, 538.

<sup>32</sup> Joseph Glanvill, *Philosophia Pia* (London, 1671), p. 84. Cf. Bernard Nieuwentijdt, *The Religious Philosopher: or the right use of contemplating the works of the Creator*, tr. J. Chamberlayne, 3 vols., (London, 1718), vol. 1, pp. vii, lxi.

history were virtually indistinguishable. Almost imperceptibly, as a consequence of gratuitous support from the natural sciences, Western religion began to assume some of the characteristics of the auxiliary discipline. Let me offer just two examples of this. One nineteenth-century writer expressed the view that natural theology was a certain science—‘open to no objection’, ‘in strict conformity with the rules of the inductive philosophy’, and ‘consistently denied by those only who reject the “Principia” of Newton’.<sup>33</sup> To take our second examples, this view of the scientific nature of theology also infected revealed theology. Princeton theologian Charles Hodge (1797-1878) asserted that Protestant theology conformed to the principles of Baconian science, because it consisted in the drawing of generalizations from the assortment of facts contained in the Bible. According to Hodge: ‘The true method of theology is ... the inductive, which assumes that the Bible contains all the facts or truths which form the contents of theology, just as the facts of nature are the contents of the natural sciences.’<sup>34</sup>

While, as I have maintained, these close connections between science and religion were important for the social standing of the natural sciences, questions can be raised about whether the advantages flowed both ways. From a certain perspective it is possible to regard this trajectory of modern religion as unfortunate. First, some might argue that religion is better construed as something more like a ‘way of life’, rather than being identified with, or reduced to, its propositional content. This objection need not entail the view that religious beliefs should be evacuated of their cognitive content. ‘Belief in’, it seems to me, requires ‘belief that’. But traditionally, the propositional beliefs of religion had functioned in a wider context that included virtues and affections, values, rituals, worship, and existential commitments. It is this feature of religious faith that Blaise Pascal had in mind in his famous ‘Wager’, when he made this recommendation to the unbeliever: Act as if you believe, immerse yourself in the rituals and

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<sup>33</sup> Anon, ‘Crombie’s *Natural Theology*’, *Quarterly Review*, LI, no. 101 (March, 1834), pp. 216, 217.

<sup>34</sup> Charles Hodge, *Systematic Theology* 3 vols., [1872-3] I, 1, §5, §6 (Grand Rapids, 1970), I, 9-17.

practices of religion, and this will train you in belief.<sup>35</sup> The idea that religious propositions functioned in some putatively neutral sphere and were capable of a completely dispassionate treatment might be regarded as somewhat problematic from this perspective. However, if natural philosophers were to establish their usefulness to religion, this was precisely how religious propositions needed to be treated.

Second, these developments were to contribute to the demise of the idea that the contemplation of nature was a kind of religious activity, and they promoted its replacement by a new formal approach (which, as we now know, eventually turns out to be consistent with methodological agnosticism). No longer a meditative process, the scientific study of nature was regarded as yielding a set of premises upon which rational arguments for God's existence could be constructed. This transition is evident in suggestions from the eighteenth century onwards that theology is a kind of inductive science. But whereas science gained strength through its sharing intellectual territory with religion, religion arguably became more vulnerable—hence the aphorism that no one doubted the existence of God until the Boyle lecturers undertook to prove it. For example, it may have been plausible to argue, in the middle of the eighteenth century, that the religious hypothesis represented a kind of inference to the best explanation (although David Hume and Pierre Bayle had already mounted serious challenges against such an inference).<sup>36</sup> But that stance was possible only because of the current state of natural history. The advent of Darwinism rendered this much far less plausible.

Third, and I offer this more as an unsupported observation than an argument, philosophy itself was involved in these transactions. As natural philosophy mutated into modern science, shedding its moral and contemplative elements, philosophy itself, in the Anglophone world, was finally reduced to a tool-bag of arguments and techniques. Once, philosophy, like religion, had presented itself as a way of life supported by 'spiritual exercises'. Hence from

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<sup>35</sup> Blaise Pascal, *Pensées*, §418.

<sup>36</sup> On some of the difficulties with this view see John Cottingham, *The Spiritual Dimension: Religion, Philosophy and Human Value* (Cambridge: Cambridge University Press, 2005), pp. 18-36.

Augustine to Aquinas and beyond, Christianity itself was understood to be the ultimate *philosophia*—the realisation of the unfulfilled goals of pagan philosophy. This broad and generous conception of philosophy persisted in some form into the early modern period. The distillation of modern science out of philosophy, however, was the final stage in the creation of a new idea of religion and a new idea of philosophy. I do not have the time to develop this line of argument here, but simply point out that the very existence of the discipline ‘philosophy of religion’ offers mute testimony to the dual historical mutations of philosophy and of religion. That there could be a genitive philosophy, a ‘philosophy *of* anything would have come as a surprise to ancient and medieval practitioners of philosophy. That there could be a philosophy *of religion*, would have been doubly surprising because it implies an object ‘religion’, propositionally constructed and susceptible to this kind of technical analysis.

Finally, some contemporary science and religion discussions have themselves furthered the modern tendency to identify religion with its propositional contents, by treating religious beliefs as a kind of surrogate for religion itself. My point here is not that religious doctrines are unimportant, but rather that they function within a context that is rather different from science. They are not on a par with scientific hypotheses. Again, I am not suggesting that science and religion should be regarded as non-overlapping magisteria, to use Stephen J. Gould’s well-known expression, or incommensurable paradigms, to use another over-worked phrase. For surely, there are significant areas of overlap, and these areas make possible constructive science and religion discussion. (And this is where I am sympathetic to the agree with the old-fashioned verificationists who insisted that meaningful cognitive propositions should have at least some empirical implications.) That said, it is important to keep in mind the very fundamental differences that now exist between science and religion, and an examination of their increasingly divergent historical trajectories can help keep us mindful of those differences.<sup>37</sup>

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<sup>37</sup> For a more developed account of some of the ideas in this section see Peter Harrison, “‘Science’ and ‘Religion’: Constructing the Boundaries”, *The Journal of Religion* 86 (2006), 81-106.

## CONCLUSION

What I have put forward in this lecture is something of re-reading of the role of religion in the rise of science. Given the current status of science, it is natural to assume that the positive interactions of science and religion during the seventeenth and eighteenth centuries are to be understood primarily as attempts to establish the rational foundations of theistic belief. Arguments from design, thus interpreted, are apologetic exercises intended to support religion. My suggestion is that these are indeed apologetic exercises, but they are apologias for science, not religion, and that their primary function, at least initially, was to provide religious legitimation for the new sciences. I should concede that my chief focus has been the English context, and questions may be asked about the extent to which this story is more universally applicable. It may well be, for example, that the French Enlightenment interpretation, as I have called it, is a more accurate reflection of what transpired in early modern France.

But if a broader generalisation is possible, we can conclude that while there may have been scientific ideas and practices without religion, there would not have been a longstanding and evolving scientific *culture* of the kind that emerged in the West without the support of religion. More than this, just as it is possible to speak of religion and the origins of modern science, we might also begin to speak about science and the origins of modern religion. The fact that many individuals now conceptualise religion as being primarily about subscribing to a set of beliefs is owing in part to past interactions of science and religion. These historical considerations, I would suggest, are not matters of mere antiquarian interest, for they shed important light on the power relations between two of the most important institutions of our society and, more importantly, on how our contemporary discussions are shaped and constrained by categories that were constructed in our recent historical past.