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# Introduction

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In 1939 the eminent Cambridge philosopher C. D. Broad observed that discussions of the relations between religion and science among his contemporaries had 'acquired something of the repulsiveness of half-cold mutton in half-congealed gravy'.[1] Fortunately for readers of this volume much has changed in the years since Broad offered this droll assessment and it is safe to say that the field of science and religion now offers a much more appetizing prospect. There are several reasons for the renewed vigour of discussions about science and religion. Developments in the sciences themselves have played a key role. In cosmology, the rise to prominence of Big Bang theory has led to speculations about how the temporal origins of the universe might be linked with the idea of creation. Related to this, the surprising fact that our universe seems remarkably fine-tuned for the emergence of intelligent life has, for some commentators at least, breathed new life into what had once been regarded as moribund arguments from design. Fine-tuning arguments have also found their way into chemistry and biology, raising intriguing questions about purpose, teleology and their place in the sciences. The profoundly mysterious quantum world continues to challenge commonsense understandings of matter and causation, inspiring religious and philosophical speculations about divine action and free will and, more generally, about the nature of reality itself. In the neurosciences, our increased capacity to study brain structure and function holds out the promise of laying bare some of the physical correlates of religious experience, and thus of shedding some light on the nature of religion itself. Knowledge of the physical basis of heredity with the discovery of the structure of DNA in 1953, followed by the complete mapping of the human genome in 2000, also have implications for religious views of the person, and for what it is to be a human being. Developments such as these point to the possibility of purely materialist explanations of human thoughts, beliefs and desires – explanations often judged to be at odds with religious understandings of personhood.



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Leaving aside developments in the sciences themselves, another reason for heightened interest in science and religion has been the persistence, and indeed growth, of influential anti-evolutionary movements. Young-earth creationism, which rejects both macroevolution and geological evidence for the antiquity of the earth, was once associated solely with conservative Christian groups in the United States, but has now begun to enjoy international success in a variety of different religious settings. Also growing in influence is the intelligent design movement which, although it differs from young-earth creationism in important respects, also asserts that biological accounts of the adaptations of living things are incomplete unless they allow room for theistic explanation. These movements enjoy a significant public profile, partly on account of well-publicized court cases relating to their inclusion in the science curriculum of secondary schools. The activities of these anti-evolutionary movements, and the reactions which they have provoked from the scientific community, have led to a perpetuation of the common view that science and religion have been, and will continue to be, locked in perennial conflict. From a philosophical perspective, they also raise some interesting questions about what counts as legitimate science and about where the boundaries between science and religion are to be drawn. Equally significantly, these debates have inspired more general discussions about the roles of science and religion in modern liberal democracies.

Confirming Newton's third law, the rise to prominence of anti-evolutionary groups has been matched by a recent upsurge in an aggressive, scientifically motivated atheism. Many of the basic tenets of the new atheism (represented by such figures as Richard Dawkins, Sam Harris and Daniel Dennett) bear directly on science and religion questions, and it is common to hear its chief advocates claiming that science and religion represent mutually incompatible worldviews, since the former is the embodiment of reason and the latter of a dubious and credulous faith.[2] These views are attended by a historical thesis according to which science and religion have throughout history been at loggerheads. Religion, in this starkly dualistic view of the world, is the primary cause of the ills of modern society. Science, by way of contrast, is depicted as the chief engine of progress and hence as the future hope for the world. To be sure, the arguments generated by this muscular atheism, like those of many of its religious opponents, have not always been of the first rank – indeed much of the rhetoric has been redolent of the old debates that prompted Broad's 'reheated supper' remark – but their emergence has led to the renewal of public discussions of the nature of science, religion and their mutual relations.

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Contributing in a less direct way to a renewed interest in science and religion is the fact that dramatic technological achievements in the biomedical sciences now present enormous challenges to traditional moral positions, many of which have been informed by religious perspectives. New reproductive technologies, stem cell research, the prospect of human cloning, along with increased capacity for human enhancement and the prolongation of life, present moral and religious thinkers with unprecedented ethical conundrums. These include not only practical questions to do with specific biomedical procedures, but also more general philosophical questions about how time-honoured religious principles such as the sanctity of human life might be applied in the brave new world generated by these medical technologies. At times, new medical policies and therapeutic techniques have met with resistance from particular religious groups. By the same token, this situation has also prompted new and creative ways of thinking about the meaning of traditional religious values and how they might be applied in these novel and unfamiliar contexts.

As we can see, the questions that cluster around the broad topic of science and religion are varied, and there are a number of different ways of approaching them. Historians are interested in the mutual interactions of science and religion in the past, and the ways in which their past relations inform the present. Philosophers have a concern to see how developments in the sciences might have a bearing on traditional arguments for the existence of God, on accounts of his activity, and on perennial philosophical questions about the nature of the human mind and free will. Also relevant to philosophy are questions about the boundaries of science and religion, and the basis of their knowledge claims. Theologians are concerned to identify features of the sciences that have theological implications, and to determine whether theology can respond to these, or indeed whether theology needs to respond. Sociologists identify patterns of belief about religion and the sciences in society, and analyse the power relations between scientific and religious institutions. Finally, scientists themselves have often engaged in speculation about what implications their scientific endeavours might have for religious belief.

All of these perspectives are represented in this collection. For convenience, however, the contributions have been grouped into three parts. The first will offer a chronological overview of science–religion relations in the West, looking at seminal periods and offering commentary on key episodes. The second will provide an account of prominent contemporary issues in science and religion. The third will explore

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some underlying philosophical issues to do with the nature of religion, scientific explanation, divine action, and ways of modelling science and religion relations.

## THE HISTORICAL DIMENSION

The first five chapters treat historical relations between science and religion. Much recent writing by historians of science has addressed itself, in various ways, to the popular assumption that throughout history science and religion have been engaged in a perennial battle. It is now generally accepted by historians that this erroneous view, known as 'the conflict myth', was largely the invention of two nineteenth-century controversialists, John Draper and Andrew Dickson White.[3] The basic position is clear enough from the titles of their best-known works, respectively, *History of the Conflict between Religion and Science* (1874) and *A History of the Warfare of Science with Theology in Christendom* (1896). Invented or not, the conflict model would not have endured had it not enjoyed at least a superficial plausibility and if it did not play an important role in the self-understandings of those who perpetuate it. In fact, this model draws support from a number of sources: our present experience of religiously motivated anti-evolutionary sentiments and scientifically motivated atheism; well-known historical cases such as the Galileo affair that seem to exemplify conflict; the assumption that science and religion are forms of knowledge based upon mutually exclusive foundations – reason and experience in the case of science, and faith and authority in the case of religion.

When examined closely, however, the historical record simply does not bear out this model of enduring warfare. For a start, study of the historical relations between science and religion does not reveal any simple pattern at all.[4] In so far as there is any general trend, it is that for much of the time religion has facilitated scientific endeavour and has done so in various ways. Thus, religious ideas inform and underpin scientific investigation, those pursuing science were often motivated by religious impulses, religious institutions frequently turn out to have been the chief sources of support for the scientific enterprise and, in its infancy, science established itself by appealing to religious values. This is not to say that there are no instances of conflict, but rather that these instances need to be understood within a broader context. Considered in this light, celebrated cases such as the Galileo affair turn out to be atypical and highly dependent on local rather than global considerations.

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Galileo's trial makes for a good story, but it is not emblematic of a larger historical picture.[5]

It is also clear from the historical record that putative instances of science–religion conflict frequently turn out to be conflicts of a rather different kind. It is often forgotten, for example, that new scientific theories almost invariably meet with resistance from the scientific community itself. At times scientific opposition to novel theories has been conflated with religious opposition. In the case of Galileo, the Catholic Church was not opposing science per se. On the contrary, it was using its considerable authority to endorse what was then the consensus of the scientific community. This course of action may have been imprudent, and it offends modern sensibilities. But it does not betray any intrinsic antipathy towards science on the part of the Roman Church. Moreover, the boundaries between science and religion were drawn rather differently in the past, and this complicates the way in which we interpret particular historical episodes. Isaac Newton, for example, contended that discussion of the existence of God was a legitimate part of the formal study of nature – a view that few, if any, twenty-first-century scientists would subscribe to.[6] The piety of scientists such as Newton (and indeed of the vast bulk of scientists who, prior to the twentieth century, were committed to theism) also gives the lie to the notion that there is some kind of scientific mindset that is inherently incompatible with religious belief.

Another important consideration in this discussion is the fact that historians have become increasingly sensitive to the dangers of projecting their experience of present events back into the pages of history. Indeed it is clear that the progenitors of the conflict myth, Draper and White, were guilty of precisely this kind of anachronism, reading history through the lens of their present experience of parochial controversies about science and religion. The historical chapters in this volume tell a different kind of story – one that resists the alluring but simplistic narrative of enduring warfare, and seeks to give due consideration to the understandings of the historical actors themselves.

In the first chapter David Lindberg makes direct reference to the conflict myth, and its application to the early interactions between the Christian church and science. It is often assumed that the patristic and medieval periods with which Lindberg deals were the dark ages, in which Christianity exercised its power to smother the science that had been inaugurated by the Greeks and nurtured by the Romans. Lindberg paints a rather different picture, acknowledging episodes of conflict, but pointing out that the more usual pattern was one of peaceful co-existence. In

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the patristic period, science was of value to the church at least in part because it could be harnessed to serve religious purposes. In the later medieval period, the church was patron of the universities, and thus indirectly a sponsor of science, which came to be increasingly valued as an independent activity in its own right.

John Henry takes up the story in the next chapter, which deals with the Scientific Revolution – a period which spans the sixteenth and seventeenth centuries. He begins with the Galileo affair, which occupies a special place in understandings of the history of science–religion relations. While not denying that the resources of the Catholic Church were at times mobilized against promoters of particular scientific views, he none the less points out that the circumstances of Galileo's condemnation were unique, and that it is not helpful to draw general conclusions from this single unfortunate episode. Henry also draws our attention to the fact that, like Galileo himself, virtually all of the major scientific innovators of this period were religious believers, and that many of them were secular theologians who thought carefully about the theological significance of their work. Various theories of the religious origins of modern science are also described and evaluated in this chapter. Rather than thinking about the birth of modern science as arising out of the separation of religious and scientific concerns, Henry suggests that we might regard this period as one that saw Christianity set the agenda for the emergence of modern science.

Natural theology is the topic of the next chapter, in which Jonathan Topham first explores different understandings of natural theology before offering an account of its role in the sciences from the Middle Ages to the end of the nineteenth century. Topham describes the ways in which various natural theologies were mobilized during the seventeenth and eighteenth centuries not only to provide social legitimacy for the new sciences, but to explore their theological implications and, more generally, to foster religious belief in the faithful and sceptic alike. There follows an account of the mixed fortunes of natural theology in the eighteenth century. During this period it was subjected to searching philosophical critiques by Hume and Kant, while influential religious thinkers also expressed reservations about its relevance. Topham's analysis thus points to the fact that while the advent of Darwinism in the nineteenth century is often identified as the sole cause of the demise of natural theology and especially the argument from design, religious factors themselves played a role.

Darwin and Darwinism figure centrally in chapter 4, in which Jon Roberts describes the variety of religious reactions to the theory of

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evolution by means of natural selection. Taking as his focus the period between the publication of the *Origin of Species* in 1859 and the Scopes 'monkey trial' in 1925, and concentrating mostly on England and North America, he offers a detailed account of the variety of religious responses to Darwinism during this period. Darwin's views provoked strongly negative reactions among many of the faithful, and for a variety of reasons: evolution and the mechanism of natural selection appeared to challenge the literal truth of the Bible, the idea of a divine plan for the creation, and the unique status of human beings. Yet, as Roberts clearly shows, the story was not simply one of uniform religious rejection. Darwin also had a number of influential religious supporters and, for that matter, some highly placed scientific critics. Then, as now, religious communities were divided on the question of Darwinism and its theological import.

The fifth chapter, by John Hedley Brooke, explores the connection between science and secularization. Here Brooke challenges the superficially plausible 'science causes secularization' thesis, demonstrating that it is difficult to sustain without significant qualification. Thus, sociologists inform us that reports of the demise of religion are premature. Positing science to account for a historical development that has not actually taken place does not make for a convincing thesis. Brooke also points out that the roots of the idea of a future scientific utopia in which religion has no place is a vestige of the dated and discredited historicism of nineteenth-century positivists. That said, in his conclusion Brooke alerts us to what he calls 'a recurring ironic pattern' in science–religion relations in the West, in which religion provides the initial foundations for a scientific enterprise that will eventually seek to displace it.

## CONTEMPORARY RELATIONS

An important element of the present interest in science and religion is the controversy about evolution, and in particular the teaching of evolution in secondary schools. As we have noted, potential sources of conflict had already surfaced in the nineteenth-century debates. Evolution by natural selection seemed to call into question the literal truth of the Bible, human distinctiveness, divine providence and the foundation of moral values. But beyond these specific difficulties, which mainstream Christian denominations have largely come to terms with, is the fact that for many of its detractors, evolution is more than a scientific

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theory – it is a powerful medium for the propagation of materialism and atheism. In the minds of its religiously conservative critics, moreover, evolution is associated with a variety of social ills: racism, moral relativism, abortion, pornography, and the breakdown of the family unit. While these specific associations may seem far-fetched, the more general perception that acceptance of evolution necessarily entails commitment to materialistic atheism has been rendered more credible by the rise of the new atheism. A number of the new atheists thus enlist evolution as a weapon in their crusade against religion, confirming their opponents' view that evolution is not just science, but an anti-religious ideology. All of this suggests that creation–evolution debates are not instances of a more general conflict between science and religion, but are a symptom of a collision between competing ideologies.

In the first of the chapters dealing with contemporary relations between science and religion, Ronald Numbers takes up a number of these issues, offering a detailed description of the rise of scientific creationism and its recent offshoot, intelligent design. While the former takes as its point of departure the biblical account of creation and is hence committed to a young earth and the centrality of the Genesis flood, the latter seeks to establish the existence of design in nature by identifying instances of irreducible or specified complexity. Common to both groups is the conviction that their work represents legitimate scientific activity, and this explains why they do not consider themselves to be anti-science. Numbers' chapter clearly shows that these movements are not the ineradicable residue of a longstanding Christian commitment to divine creation and biblical literalism, but rather a modern movement whose origins date from the twentieth century. Moreover, while Numbers points to the importance of the US constitutional and educational factors in the growth of scientific creationism and intelligent design, he also provides evidence of the increasingly global profile of anti-evolutionary movements and of their emergence in religious traditions quite remote from the conservative evangelicalism of North America. As a global phenomenon, religiously inspired anti-evolutionism is emblematic of the deeper ideological dimensions of modern discussions of evolutionary theory.

Turning from these more general historical and sociological matters to substantive issues, we can identify as one of the core difficulties generated for religious belief by the theory of natural selection the apparent randomness of natural selection. On the standard evolutionary view, human beings are the happenstance end products of a purposeless process that did not have them in mind. Such a view is at odds both with

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traditional religious conceptions of the special status of human beings, and with the idea of God's providential control of nature. In chapter 7, Simon Conway Morris addresses this question, putting forward the suggestion that in spite of the contingencies of natural selection, the evolution of something very much like human beings was, in fact, virtually inevitable. His argument is that natural selection is a search engine that tends to arrive repeatedly at similar solutions. In support of this view he points to the numerous instances of evolutionary convergence. These suggest that while random events clearly have a major role in the evolutionary process, it may still be possible to speak of directionality in this context. Such a perspective (which is not to be confused with intelligent design) considerably reduces the tension between the randomness of evolutionary processes and religious assertions of purpose and directionality.

Questions of cosmic purpose are also addressed in the next chapter, which deals with the larger scale of cosmology. The now dominant Big Bang cosmological theory was first proposed in the 1920s by the Belgian mathematician and Catholic priest Georges Lemaitre, but did not achieve wide acceptance until the discovery of cosmic microwave background radiation in the 1960s. In fact, 'Big Bang' was the derogatory name proposed for the theory by the Cambridge astronomer Fred Hoyle, who at that time supported the alternative Steady-State hypothesis. One reason for initial resistance to the Big Bang theory was that, unlike the rival Steady-State hypothesis, it proposed that the universe has a beginning – a proposition that for some had unwelcome religious implications. Now that the theory is well established, discussions of its religious implications continue and they constitute one of the liveliest areas of contemporary science–religion interchange. An additional dimension has been added to these discussions with the discovery of the remarkable fine-tuning of the fundamental parameters of our universe.

In chapter 8, William Stoeger provides an account of what is at stake in these discussions. He sets out the current view of the history of the universe from the moment of the Big Bang to the present, before proceeding to discuss the possible religious implications of this story. As Stoeger points out, it has been known for some time that our universe is very special and that if any of the four fundamental forces had even slightly different values, our universe would have been simple, sterile and unproductive. On one interpretation, a supernatural intelligence predetermined the basic parameters of the universe so that it would eventually give rise to carbon-based life. On another view, our universe is simply one of a vast ensemble of universes, in which case its

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fine-tuned character is less remarkable. Both are legitimate interpretations, Stoeger argues, and while the first lends itself to a form of the design argument for God's existence, both are consistent with a theistic understanding of the universe as created by God. In fact, Stoeger suggests, any cosmological theory will be consistent with a theistic understanding of creation, since the idea of creation refers to the ultimate source of the being and order of the universe while cosmology seeks to provide an account of that order.

In most contemporary interactions between science and religion, including those discussed to this point, religion tends to be the silent partner. It is usually assumed that science is the authoritative voice to which religion must accommodate itself, if it can. In the cases of evolutionary theory and Big Bang cosmology, it might be claimed that religion can add a dimension that is lacking to a purely scientific perspective, but this does not amount to a substantive religious input into the science itself. In chapter 9, Fraser Watts suggests that in the case of psychology and theology a different model is possible. Theology, he contends, can offer special insights into the nature of the human person and can thus both critique and enrich psychology. It does so on the first count by contesting overly reductionistic explanations of human persons, and on the second, by making contributions that arise out of its special familiarity with such features of human experience as guilt and forgiveness. Watts also demonstrates ways in which psychology can make positive contributions to theology. Here the discussion extends to theological anthropology, biblical hermeneutics, religious experience and glossolalia. The general model he offers, then, is one in which theology and psychology can be mutually enriching. This chapter also serves as an important reminder of the difference between religion and theology. The religious life is not simply a matter of making particular propositional claims about the world which are more or less on a par with scientific hypotheses. Religion typically involves practices, behaviours and attitudes which have no direct counterpart in the scientific enterprise. These non-propositional features of religion are often overlooked in science–religion discussions, as a consequence of which religions are often reduced to their propositional contents.

Drawing a distinction between religion and theology reminds us of the fact that there is a moral component to religious belief which is lacking in the sciences. Scientific knowledge is usually considered to be value free. This does not mean that scientists are amoral or that scientific discoveries have no moral implications, but rather that determining what those moral implications might be is not the business of

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