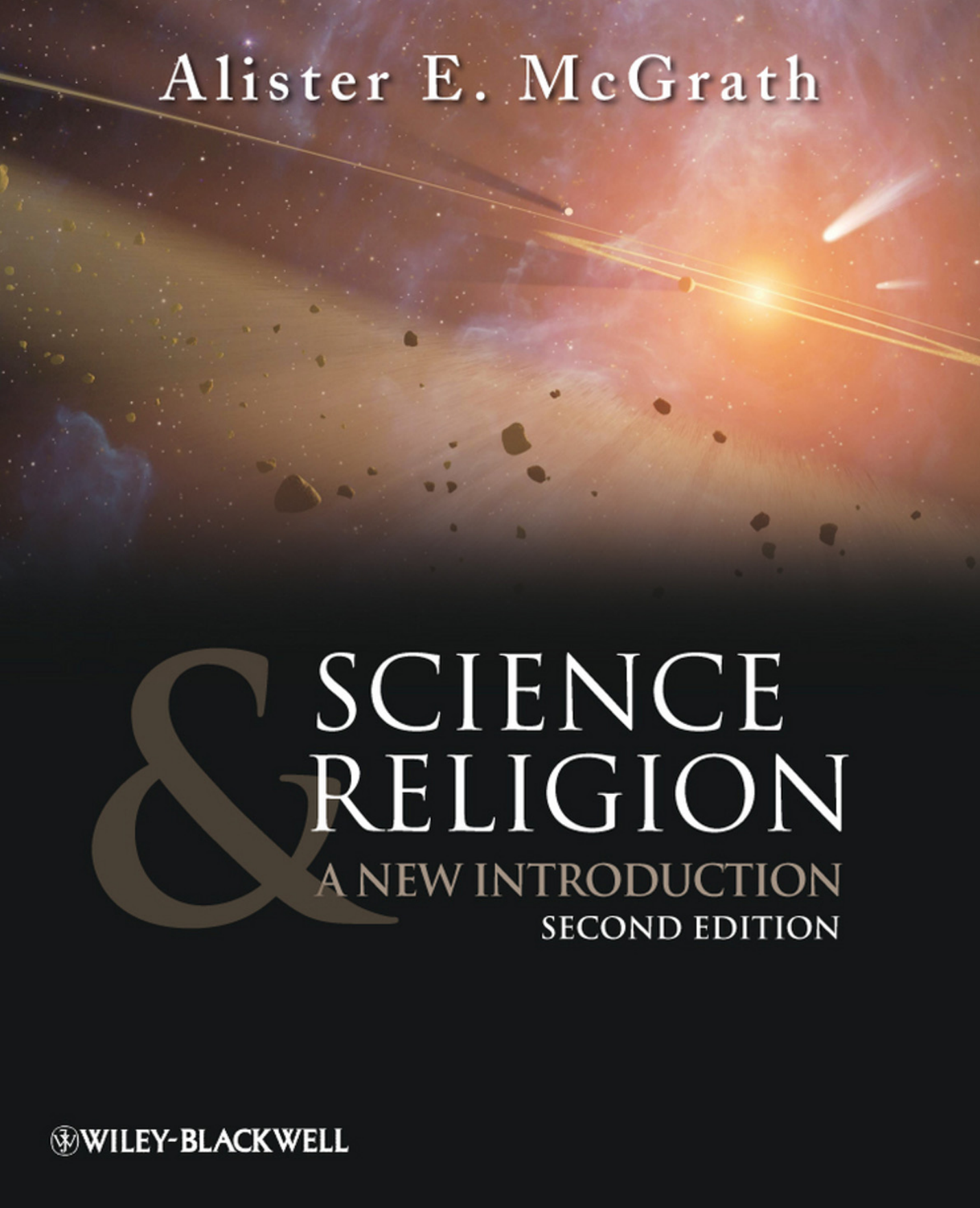




Alister E. McGrath

 SCIENCE
& RELIGION
A NEW INTRODUCTION
SECOND EDITION

 WILEY-BLACKWELL

& SCIENCE RELIGION

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SECOND EDITION

Alister E. McGrath

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Preface

The study of science and religion is one of the most fascinating areas of human inquiry. It brings together two of the most significant forces in contemporary society. The remarkable surge in books and television documentaries dealing with God and physics, spirituality and science, and the great mysteries of human nature and destiny are a clear sign that there is growing interest in this area. Many colleges, seminaries, and universities now offer courses dealing with the general theme of science and religion, which often attract large and appreciative audiences.

Yet there is a problem here. To make sense of the dialogue between sciences and religion, it is necessary to know something about both. A major difficulty facing the field of “science and religion” studies concerns the extent of prior knowledge of those interested in this area of study. To appreciate the complex interaction of the natural sciences and religion, it is necessary to have at least a good general working knowledge of at least one religion and one major natural science, preferably physics or biology. Many of those who would like to explore this fascinating field find themselves discouraged through this lack of prior knowledge.

This book aims to deal with this situation by assuming that its readers know little, if anything, about the natural sciences or religion, and aims to introduce everything on the basis of the assumption of very limited knowledge on the part of its readers. The main themes and issues in the study of religion and the natural sciences are carefully explored and explained without making unrealistic assumptions about what its readers are likely to know already. Those with some previous knowledge in the areas

Preface

of science or religion will therefore find that they are from time to time presented with material with which they are already familiar. It is hoped that this will not prove tedious. In any case, the particular concern of this volume is to explore the interface of science and religion. Those who already have some knowledge of science or religion should therefore find that material with which they are already familiar is handled in new ways, so that its connections with our theme become clear.

My own interest in this field goes back for more than 30 years. I began my studies at Oxford University in 1971 by studying chemistry, focusing on quantum theory, before going on to gain my doctorate in molecular biophysics. After this, I studied theology at both Oxford and Cambridge Universities, focusing particularly on the historical interaction of science and religion, particularly during the sixteenth and nineteenth centuries. It is my hope that my own experience of relating the two areas of study may be of value to others seeking to do the same.

This work represents a major revision of the first edition of this work, which benefited considerably from the feedback of its many users. It is hoped that this second edition represents an improvement on its predecessor, both in terms of the scope and level of its coverage. Both the author and publisher welcome comments and criticism, which will be of value to them in developing future editions of this work.

Alister E. McGrath
King's College, London
January, 2009

How To Use This Book

This book is an introduction to the dialogue between science and religion. It assumes that you know little, if anything, about either science or religion, and sets out to explore this exciting and important field as if you were encountering it for the very first time.

This emphasis on *accessibility* means that this book includes lots of explanatory material that you will not find in other works of this kind. Years of teaching experience have helped me to realize that students who are new to this field often need far more help than is often appreciated. All the material that is included in this volume has been tested on students and modified to make sure it is easily understood. You should find that you are able to cope with the entire book without undue difficulty, even if you have relatively little scientific or religious background knowledge.

Some readers who already have a background in relevant fields may find that they can skip sections, or read them through very quickly. Yet they may find that other sections introduce them to material which they have not come across before, and will welcome the entry-level introduction to those areas that this work provides.

This book is an introduction, not a comprehensive textbook. It is a starting point for your exploration of the field, but it cannot hope to deal with the questions raised in detail. Its discussions of complex issues – such as the nature of realism – must be seen as opening the door to further reflection. They are intended to help you become familiar with issues, but cannot deal with them in depth. For this reason, each chapter includes a short list of suitable works for further reading, which will be helpful and accessible to readers who wish to take their thinking further.

It is not necessary to read the material in the order in which it is presented in this work. Each chapter has been designed to be self-contained, and has been written in such a way that it can be understood without the need for additional information. This occasionally means that there is some repetition of material within this book, and it is hoped that readers will be able to overlook this minor irritation. However, readers will find that they will get the most out of this work by reading the material in the order in which it is arranged. For example, some readers may prefer to omit the historical material altogether. However, they will find that they gain more from later chapters if they possess the background information which is provided in these chapters.

As is customary in this field, this book concentrates on the dialogue between Christianity and the natural sciences. This interaction has been of major importance historically in the shaping of western culture, and also shapes most courses on science and religion taught in western universities. However, a brief introduction is also provided to the issues found in four other world religions, for those wishing to broaden their horizons.

Finally, as already noted, the work aims to direct students to more advanced works that will allow them to take their reading and thinking further. Each chapter includes a short section for further reading, identifying the best recent works in these areas. Rather than provide extended reading lists, a selection of works of proven value have been identified as suitable next areas for exploration of the field. All major citations in the text are sourced, so that readers can follow them through if they wish to study them in their original context.

Both the author and publisher intend to ensure that this work is kept up-to-date, accessible, and relevant, and welcome comments from users which will help them plan future editions of this work. User feedback was of enormous importance in developing the second edition of this work, and both author and publisher are very grateful for the many comments they received which enabled the numerous improvements which it includes.

Chapter

1

Introducing the Dialogue Between Science and Religion

Why study the interaction of science and religion? The fact that you are reading this book in the first place suggests that you probably think it that it is worth your while to explore their mutual relationship. Yet it is important to begin any engagement with the burgeoning field of science and religion studies by considering its importance and potential benefits, and also clarifying what it is that is being studied.

Religion and science are two of the most powerful cultural and intellectual forces in today's world. Some scientists and religious believers see them as locked in mortal combat: science and religion are thus at war with each other, and that war will continue until one of them is eradicated. Although this view tends to be associated particularly with dogmatic atheist scientists, such as Peter Atkins (born 1940) or Richard Dawkins (born 1941), they are also encountered among religious believers. Some fundamentalist Christians and Muslims, for example, see science as a threat to their faith. A good example of this can be found in the criticisms of evolution made by conservative Protestant Christians, who see it as undermining the biblical creation accounts.

We shall explore the origins of this “warfare” model of the interaction between science and religion later in this work. Although it is influential culturally, it is not seen by historians of science as being particularly reliable or defensible. If anything, science now seems to be opening up religious questions, rather than closing them down, or declaring them to be meaningless. It is increasingly being recognized that natural science can “throw up questions that point beyond itself and transcend its power to answer” (Polkinghorne, 1988, p. 23). Commenting on the scientific search

for the origins of the universe, the astronomer Robert Jastrow notes how modern science finds itself asking precisely the same questions as those posed in earlier generations by religious thinkers.

It is not a matter of another year, another decade of work, another measurement, or another theory; at this moment, it seems as though science will never be able to raise the curtain on the mystery of creation. For the scientist who has lived by his faith in the power of reason, the story ends like a bad dream. He has scaled the mountains of ignorance; he is about to conquer the highest peaks; as he pulls himself over the final rock, he is greeted by a band of theologians who have been sitting there for centuries. (Jastrow, 1978, pp. 115–16)

The dialogue between science and religion sets out to ask whether, in what ways, and to what extents, these two conversation partners might learn from each other. Given the cultural importance of both science and religion, the exploration of how they relate to each other has the potential for both conflict and enrichment. Despite the risks to both sides, it remains profoundly worthwhile. Why? Three reasons are often given for this judgment.

1 Neither science nor religion can claim to give a total account of reality. It is certainly true that some on each side have offered grand visions of their discipline being able to answer every question about the nature of the universe and the meaning of life – as, for example, in Richard Dawkins’s notion of “universal Darwinism.” These, however, are not regarded as representative by their peers. Nor is the notion of “nonoverlapping magisteria,” as developed by writers such as the late Stephen Jay Gould (1941–2002), acceptable. This envisages that science and religion occupy well-defined domains or areas of competency, which do not overlap or intersect.

Science and religion are perhaps better thought of as operating at different levels, often reflecting on similar questions, yet answering them in different ways. Historians suggest that both science and religion lose their way when they play at being what they are not. There are some scientists who declare they have displaced religion (evident in recent “scientific atheism”), just as there are religious activists who claim to have displaced science (evident in modern “creationism”). Science does not answer every question that we might have about the world. Neither does religion. Yet taken together they can offer a stereoscopic view of reality denied to those who limit themselves to one discipline’s perspective on things. The science and religion dialogue allows us to appreciate the distinct identities, strengths, and limits of each conversation partner. It also offers us a deeper understanding of things than either religion or science could offer unaided.

2 Both science and religion are concerned about making sense of things. Although many religions, including Christianity, can be argued to place an emphasis upon the transformation of the human situation, most set out to offer explanations of the world. Why are things the way they are? What explanations may be offered for what we observe? What is the “bigger picture” which makes sense of our observations and experience? Scientific and religious explanations generally take different forms, even when reflecting on the same observations. Perhaps most importantly, science tends to ask “how” questions, where religion asks “why.” Science seeks to clarify mechanisms; religions offer meaning.

These approaches do not need to be seen as being in competition, or as being mutually incompatible. They operate at different levels. While some scientists hold that explaining how things happen is the best answer to life’s biggest questions, most would argue for a clear distinction between “explanation” and “meaning.” One of the most influential discussions of this point is found in Roy Baumeister’s classic work *Meanings of Life* (1991). For Baumeister, “meaning” transcends “explanation.” Baumeister suggested that four basic needs – purpose, efficacy, value, and self-worth – appeared to underlie the human quest for meaning, understood as “shared mental representations of possible relationships among things, events, and relationships” (1991, p. 15).

3 In recent years there has been a significant increase in awareness within the scientific community of the broader issues raised by its research, and limits placed upon that community’s ability to answer them. An obvious example concerns ethical questions. Is science able to determine what is right and what is wrong? Most scientists would affirm that their discipline is fundamentally amoral – that is, that the scientific method does not extend to moral questions. For example, Richard Dawkins succinctly confirmed that “science has no methods for deciding what is ethical” (Dawkins, 2003, p. 34). Stephen Jay Gould made a similar point in his important essay “Nonmoral Nature”:

Our failure to discern a universal good does not record any lack of insight or ingenuity, but merely demonstrates that nature contains no moral messages framed in human terms. Morality is a subject for philosophers, theologians, students of the humanities, indeed for all thinking people. The answers will not be read passively from nature; they do not, and cannot, arise from the data of science. The factual state of the world does not teach us how we, with our powers for good and evil, should alter or preserve it in the most ethical manner. (Gould, 1994, p. 42)

This has led to growing interest in complementary approaches to such issues. Natural scientists seem increasingly willing to complement scientific understandings of the world with additional approaches that permit or encourage the ethical,



Figure 1.1 Stephen Jay Gould (Jon Chase/Harvard News Office)

aesthetical, and spiritual enhancement of their approaches. Religion is being seen increasingly as an important dialogue partner in allowing the natural sciences to engage with questions which are raised, yet not answered, by scientific research. Debates about the ethics of biotechnology, for example, often raise important questions which science cannot answer – such as when a human “person” comes into existence, or what constitutes an acceptable quality of life.

Other reasons may easily be added for encouraging such a conversation. Yet it is important to appreciate that there are also difficulties associated with the dialogue between science and religion. The most obvious of these is the outright refusal on the part of some “scientific atheists” on the one hand, or religious fundamentalists on the other, to engage in any dialogue. For both sides of this highly polarized argument, science and religion are enemies, and those who engage in dialogue are either traitors or appeasers. Both the atheist scientific writer Richard Dawkins and the biblical creationist Henry Morris, for example, represent this extreme position, arguing that there is a war between

science and religion. Antireligious and antiscientific bias or prejudice remain a significant obstacle to a fruitful dialogue.

Yet other concerns should also be noted, of which the following are the most important.

First, the term “science” covers a wide range of disciplines, each with its own distinctive methodology. To speak of the dialogue between “science and religion” seems to imply that there is some uniform entity called “science,” whereas in fact there are many scientific disciplines, each with its own distinctive sphere of study and associated method of investigation. As we shall see later in this study, the interaction of physics and religion is significantly different from that of biology and religion. The term “science” thus needs to be qualified or further defined before the question can be answered properly.

Second, in much the same way, the term “religion” is very vague, referring to a wide variety of movements. Christianity, Islam, and Hinduism, for example, adopt quite different attitudes towards the natural world, and especially its capacity to disclose or point to God. It is virtually impossible to generalize about “religion,” when it embraces such a wide variety of viewpoints. It is remarkably difficult to offer a viable

definition of what constitutes a “religion.” Since there is no generally accepted definition of religion, it is often difficult to know whether the dialogue should include worldviews with religious elements (such as Confucianism). Developing this point further, a significant variety of viewpoints on the relation of faith and science can be found within any single religion. For example, Christianity consists of a number of important groups, including Catholicism, Orthodoxy, and Protestantism, each of which in turn consists of subgroups. This raises the possibility of a significant number of different religious attitudes towards science.

Thirdly, many would question whether the dialogue is best thought of in terms of “science and *religion*.” The term “religion” designates a broad range of activities, attitudes, and beliefs, and is not purely about ideas. Some writers have argued that the real dialogue between science and religion takes place at the level of methods and ideas. If this is so, we should really speak about a dialogue between science and *theology*. This point has been developed by a number of writings, including some by the leading British theologian Thomas F. Torrance (1913–2007).

These are all important points to bear in mind as we explore the important and intellectually exciting interaction between science and religion. We begin by sketching some historical background, before moving on to look at the big debates of the present.

For Further Reading

Baumeister, Roy F. *Meanings of Life*. New York: Guilford Press, 1991.

Clayton, Philip (ed.). *Oxford Handbook of Science and Religion*. Oxford: Oxford University Press, 2006.

Dear, Peter R. *The Intelligibility of Nature: How Science Makes Sense of the World*. Chicago: University of Chicago Press, 2006.

Polkinghorne, John. *Science and Creation: The Search for Understanding*, 2nd edn. Philadelphia, PA: Templeton Foundation Press, 2006.

Watts, Fraser, and Kevin Dutton (eds). *Why the Science and Religion Dialogue Matters*. Philadelphia, PA: Templeton Foundation Press, 2006.



PART

I

History

Three Landmark Debates

Many are attracted to study the relation of science and religion because of its contemporary relevance. What are the implications of the “big bang” for belief in a creator God? Do the latest developments in evolutionary psychology undermine or reinforce traditional religious arguments for the existence of God based on desire? Part of the sheer excitement of this field is the fact that it engages live debates, issues that are of immediate relevance.

Why, then, study past debates? Surely this is irrelevant to contemporary concerns. Why look at the past, when so much is happening in the present? This is a real concern, and must be taken seriously. For many natural scientists, for example, there is little point in reflecting on the history of their disciplines. They are developing so rapidly that older ideas become outdated with alarming speed. To study history seems to be about disengaging from the real world, and entering a very different world that bears little relation to ours. As L. P. Hartley wrote at the beginning of *The Go-Between*, “The past is a foreign country: they do things differently there.”

Yet anyone wishing to understand the interaction of science and religion needs to become familiar with three major landmarks – the astronomical debates of the sixteenth and early seventeenth centuries; the rise of the Newtonian worldview in the late seventeenth and eighteenth century; and the Darwinian controversy of the nineteenth. The issues raised by these developments are found again and again in contemporary debates.

Part I aims to introduce these landmark debates, indicating the points at issue and their significance for our theme. As these three debates are constantly referred to in the literature concerning the theme of “science and religion” – as they are also in the present text – readers must consider it essential to master the basic ideas and developments which are discussed in this part. For this reason, it has been placed at the opening of the work.

Yet many, while recognizing the practical force of this point, will still want to ask why they should bother studying history at all. Before looking at these three specific debates, we shall pause and give some thought to the place of history in the interaction between science and religion.

Chapter

2 Why Study History?

What is the point of referring back to the past when we are meant to be talking about themes concerning science and religion in the twenty-first century? Why study the past, when there is so much of importance and interest in the present? This is a fair question, and merits a careful answer. To explore the importance of this point, we shall consider the origins of the widespread popular belief that science and religion are permanently at loggerheads – the so-called “warfare” model of the interaction of science and religion. This is still deeply embedded in popular thinking.

The Historical Origins of the “Warfare” Model of Science and Religion

In the eighteenth century, a remarkable synergy developed between religion and the sciences in England. Newton’s “celestial mechanics” was widely regarded as at worst consistent with, and at best a glorious confirmation of, the Christian view of God as creator of a harmonious universe. Many members of the Royal Society of London – founded to advance scientific understanding and research – were strongly religious in their outlooks, and saw this as enhancing their commitment to scientific advancement.

Yet all this changed in the second half of the nineteenth century. The general tone of the later nineteenth-century encounter between religion (especially Christianity)

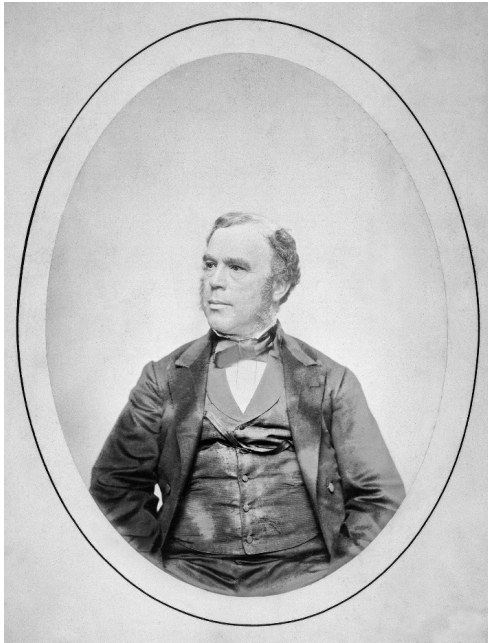


Figure 2.1 John William Draper (Draper Family Collection, Archives Center, National Museum of American History, Smithsonian Institution)



Figure 2.2 Andrew Dickson White (Courtesy of the Division of Rare and Manuscript Collections, Cornell University Library)

and the natural sciences was set by two works – John William Draper’s *History of the Conflict Between Religion and Science* (1874) and Andrew Dickson White’s *The Warfare of Science with Theology in Christendom* (1896). The crystallization of the “warfare” metaphor in the popular mind was unquestionably catalyzed by such vigorously polemical writings.

As a generation of historians has now pointed out, the notion of an endemic conflict between science and religion, so aggressively advocated by White and Draper, is itself socially determined, created in the lengthening shadows of hostility towards individual clergy and church institutions. The interaction of science and religion has been influenced more by their social circumstances than by their specific ideas. The Victorian period itself gave rise to the social pressures and tensions which engendered the myth of permanent warfare between science and religion.

A significant social shift can be discerned behind the emergence of this “conflict” model. From a sociological perspective, scientific knowledge was advocated by

particular social groups to advance their own specific goals and interests. There was growing competition between two specific groups within English society in the nineteenth century: the clergy and the scientific professionals. The clergy were widely regarded as an elite at the beginning of the nineteenth century, with the “scientific parson” a well-established social stereotype. With the appearance of the professional scientist, however, a struggle for supremacy began, to determine who would gain the cultural ascendancy within British culture in the second half of the nineteenth century. The “conflict” model has its origins in the specific conditions of the Victorian era, in which an emerging professional intellectual group sought to displace a group which had hitherto occupied the place of honor.

The “conflict” model of science and religion thus came to prominence at a time when professional scientists wished to distance themselves from their amateur colleagues, and when changing patterns in academic culture necessitated demonstrating its independence from the church and other bastions of the establishment. Academic freedom demanded a break with the church; it was a small step towards depicting the church as the opponent of learning and scientific advance in the late nineteenth century, and the natural sciences as its strongest advocates. This naturally led to earlier incidents – such as the Galileo debate – being read and interpreted in the light of this controlling paradigm of the warfare of science and religion.

It will be clear that the idea that science and religion are in permanent conflict thus reflects the agendas and concerns of a specific period. Yet that moment is now past, and its agendas can be set to one side, allowing a more informed and dispassionate assessment of things. The study of history allows us both to account for the origins of this deeply problematic understanding of the relation of science and religion, and to assess its reliability. Above all, it allows us to move beyond it, and construct more informed and positive approaches to the interaction of these two distinct domains of thought.

There Is No “Master Narrative” for Science and Religion

The relationship between science and religion has always been complex. There is no “master narrative” which describes their relationship – such as the notoriously inaccurate “warfare” narrative, which posits that science and religion have always been engaged in a fight to the death. Every generation has given careful thought to the big questions of life, both scientific and religious. The scientific revolution witnessed both tension and collaboration between traditional religious viewpoints, and innovative scientific theories.

To illustrate this complex picture, let us consider the Christian doctrine of creation, which shaped the intellectual world of early modern Europe, and encouraged people to think of a regular, ordered universe, which reflected the wisdom of its creator. Intense study of the created order was a means of gaining an increased appreciation of the “mind of God.” There was thus a positive religious motivation for undertaking scientific research. Yet this same traditional doctrine of creation generated tensions, especially as Charles Darwin’s narrative of human origins began to gain the ascendancy in the late nineteenth century. On a literal reading of the opening chapters of the Christian Bible, Darwin’s theory seemed to be incorrect. Tensions emerged, which remain to this day.

It is also important to appreciate that science is, almost by definition, a subversive activity, challenging all kinds of vested interests and power groups. The physicist Freeman Dyson penned an important essay entitled “The Scientist as Rebel,” in which he pointed out that many scientists have found themselves engaged in a “rebellion against the restrictions imposed by the locally prevailing culture” (Dyson, 1995, p. 1).

This can easily be illustrated from the history of the interaction of science and culture. For the Arab mathematician and astronomer Omar Khayyam (1048–1122), science was a rebellion against the intellectual constraints of Islam; for nineteenth-century Japanese scientists, science was a rebellion against the lingering feudalism of their culture; for the great Indian physicists of the twentieth century, their discipline was a powerful intellectual force directed against the fatalistic ethic of Hinduism (not to mention British imperialism, which was then dominant in the region). And in western Europe, scientific advance inevitably involved confrontation with the culture of the day – including its political, social, and religious elements. In that the West has been dominated by Christianity, it is thus unsurprising that the tension between science and western culture has often been viewed as a confrontation between science and Christianity. In fact, the real tension is between scientific innovation and cultural traditionalism.

The Essentialist Fallacy About Science and Religion ---

Some writers take the view that the relation between science and Christian theology is permanently defined, at least in its fundamental respects, by the essential nature of the two disciplines. It is argued that, once the essential nature of the two disciplines is grasped, their mutual relationship can be inferred as a matter of course.

This view is found particularly in writers who are hostile to religion. “The *real* war is between rationalism and superstition. Science is but one form of rationalism, while religion is the most common form of superstition” (Jerry Coyne, quoted in Dawkins,

2006, p. 67). However, it is not limited to those who advocate the “warfare” model, being also encountered in the writings of those who argue that science and religion are essentially collaborative.

Underlying these “essentialist” accounts of the interaction of science and religion is the assumption that each of these terms designates something fixed, permanent, and essential. This means that their mutual relationship is determined by something essential to each of the disciplines, which is not affected by the contingencies of history or culture.

This tendency to attribute fixed and unchanging defining qualities to both science and religion has been successfully challenged by a series of rigorous historical studies. These have demonstrated the diversity, occasional inconsistency, and sheer complexity of understandings of the mutual relationship of science and religion since about the year 1500. No single account or “metanarrative” may be offered of this relationship, precisely because the variety of relationships that have existed reflect prevailing social, political, economic, and cultural factors.

There are three main difficulties with the “essentialist” approach, all of which are shown up by historical scholarship.

- 1 It treats “science” and “religion” as essentially fixed and unchanging entities, whose relationship is permanently defined by their subject matter.
- 2 It assumes that this relationship may be universally defined in terms of the “warfare” imagery which became popular during the nineteenth century, for reasons we explored earlier. This is then used as a controlling metanarrative, a prism through which all related intellectual engagements throughout history are to be viewed, permanently adversarial.
- 3 It fails to draw a distinction between the institution of the Christian church and the ideas of Christian theology, especially during the late Middle Ages, and fails to appreciate that the political decisions of the former often rest on considerations which have little to do with the latter. To critique the leading ideas of Christian theology on the basis of the actions of certain late medieval ecclesiastical figures is to assume a simple, direct, and linear connection between these entities which rarely existed in practice.

Dispelling Myths About Science and Religion

Certain stereotypes about science and religion remain prevalent in western culture. These often rest on misunderstandings or misreading of history. The study of history helps clear the air for the dialogue between science and religion by neutralizing the

purely negative perceptions of this relationship which are often perpetuated in the media. An obvious example is the controversy surrounding Galileo Galilei's views on the solar system. The Galileo affair is often portrayed as yet another illustration of the perennial war between science and religion. Yet things were much more complicated.

Galileo and his heliocentric theories were initially well received within papal circles. It is generally agreed that Galileo's positive reputation in ecclesiastical circles until a surprisingly late date was linked to his close relationship with the papal favorite, Giovanni Ciampoli. When Ciampoli fell from grace in the spring of 1632, Galileo found his position seriously weakened, perhaps to the point of being fatally compromised. Without the protection of Ciampoli, Galileo became vulnerable to those who wished to discredit him. Sadly, Galileo and his theories became interlocked with papal politics, and the wider political and ecclesiastical conflicts of his age.

A second example of a stereotypical account of the relation of science and religion which can be defused by serious historical scholarship concerns the famous meeting of the British Association at Oxford on June 30, 1860. The British Association had always seen one of its most significant objectives as being to popularize science. As Charles Darwin's *Origin of Species* had been published the previous year, it was natural that it should be a subject of discussion at the 1860 meeting. Darwin himself was in ill health, and was unable to attend the meeting in person. Samuel Wilberforce, Bishop of Oxford, was pitted against Thomas Henry Huxley. According to the popular legend, repeated uncritically in many biographies of Darwin, Wilberforce attempted to pour scorn on the theory of evolution by suggesting that it implied that humans were recently descended from monkeys. Would Huxley, he asked, prefer to think of himself being descended from an ape on his grandfather's or grandmother's side? He was then duly rebuked by Huxley, who turned the tables on him, showing him up to be an ignorant and arrogant cleric. Wilberforce had, in fact, written an extensive review of the *Origin of Species*, pointing out some serious weaknesses. Darwin regarded this review as significant, and modified his discussion at several points in response to Wilberforce's criticisms. Nevertheless, by 1900 the legend was firmly established, and went some way towards reinforcing the "conflict" or "warfare" model of the interaction of science and religion.

The classic statement of this legend is actually quite late. It dates from 1898, and takes the form of an autobiographical memory from Mrs Isabella Sidgwick, published in *Macmillan's Magazine*. This account is inconsistent with accounts published or in circulation closer to the time of the meeting itself. A review in the *Athenaeum*, published shortly after the event, expressed the consensus at that time. Wilberforce and Huxley, it declared, "have each found foemen worthy of their steel, and made their charges and countercharges very much to their own satisfaction and the delight of their respective friends." One of Huxley's most recent and empathetic biographers,

Adrian Desmond, argues that it is ridiculous to speak of Huxley being a “victor” in this situation. Yet the legend still lingers!

The Importance of Biblical Interpretation

Finally, we may note one issue that recurs throughout the history of the interaction of science and religion – the importance of biblical interpretation. Conflict between science and religion often arises when scientific advance is seen to conflict with the prevailing modes of biblical interpretation. Two obvious examples may be given to illustrate the importance of this point.

The Copernican debate centered on the question of whether the earth rotated around the sun (the “heliocentric” model) or the sun around the earth (the “geocentric” model). One or two passages in the Christian Bible seemed to point to the earth being stationary and the sun rotating – for example, references to the sun standing still (Joshua 10: 12), or to the foundations of the earth being “immovable” (Psalm 96: 10). A “common sense” or “literal” reading of these texts pointed to a geocentric view of the solar system. But was this what was actually intended? Was this simply a conventional way of speaking, which was not intended to have metaphysical implications?

Similarly, the Darwinian controversy raised some important questions about how the Genesis creation accounts were to be understood. Were they literal accounts of the origins of the universe and humanity, which taught that the universe originated about six thousand years ago? Or were they to be interpreted in terms of a more extended vision of creation? In this case, Darwinism found itself pitted against very literal approaches to the interpretation of the Genesis creation narratives. These had developed within English-speaking Protestantism since the early eighteenth century, and had been assumed to be normative. Darwinism called that into question.

Yet it must not be supposed that the advance of science has constantly challenged traditional biblical interpretation, as is sometimes suggested. Traditional Christian views of creation, for example, speak of the cosmos coming into being from nothing. Yet the western scientific tradition, from Aristotle until the 1940s, tended to treat the universe as something that was permanent or eternal. The idea that it had a chronological beginning was seen as absurd. The rise of what is now known as the “standard cosmological model” in the last 50 years is based on the notion that the universe is not eternal, but that it came into being at a definite point. Here we have a situation in which a traditional Christian interpretation of the Bible resonates with modern cosmology.