Alister E. McGrath

SCIENCE & RELIGION

A NEW INTRODUCTION

THIRD EDITION

WILEY Blackwell

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Preface to the Third Edition

The study of science and religion brings together two of the most significant – and different – forces in human culture. 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 of the growing interest in this area. Many colleges, seminaries, and universities now offer courses dealing with the field of science and religion, which often attract large and appreciative audiences. This book introduces this field, offering a window into some of its more interesting themes and debates.

Based on lectures given to students at Oxford University over the period 2014–2019, this book aims to be accessible and engaging, encouraging its readers to take its themes further. It sets out to introduce this fascinating field on the assumption that its readers have no detailed knowledge about either the natural sciences or theology. 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.

My own interest in the field of science and religion goes back to the early 1970s. I began my studies at Oxford University by studying Chemistry, specializing in quantum theory, before going on to gain an Oxford doctorate in molecular biophysics. After this, I studied theology at Oxford and Cambridge, 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 book represents a major revision of the first and second editions of this work, responding to feedback from many readers. This revision is reflected in changes that have been made to both its structure and contents, aiming to make the book useful and helpful in engaging questions that are seen as both important and representative within the field. Both the author and publisher will be delighted to receive further comments and criticism, which will be helpful to them in developing future editions of this work.

Alister E. McGrath
Oxford University
September 2019

Chapter

1 Science and Religion

Exploring a Relationship

Religion and science are two of the most significant and interesting cultural and intellectual forces in today's world. The field of science and religion, which this book aims to introduce, sets out to explore what these two conversation partners might learn from each other, and where they diverge. Many leading thinkers at the time of the Renaissance used the metaphor of the 'God's Two Books' as a way of visualizing this process of allowing both science and religious faith to illuminate reality. It was, many believed, both possible and important to read the 'Book of Nature' and the 'Book of Scripture' side by side and allow them to inform and enrich each other. Although the invention of the idea of a permanent warfare between science and religion in the late nineteenth century caused many to question this approach, the scholarly discrediting of this 'warfare' metanarrative, which was essentially complete by the opening of the twenty-first century, has given rise to new interest in finding ways of reclaiming and reformulating this dialogue. As Albert Einstein famously remarked: 'Science without religion is lame, religion without science is blind.'

Science & Religion: A New Introduction, Third Edition. Alister E. McGrath.

Why Study Science and Religion?

Many people are drawn to study the relation of science and religion because it is interdisciplinary – in other words, it offers a richer and grander vision of our world and humanity than is possible for either of the dialogue partners on their own. Neither science nor religion can provide a total account of reality. Science does not answer every question that we might have about the world. Neither does religion. Yet, taken together, these can offer us a stereoscopic view of reality denied to those who limit themselves to one discipline's perspective.

The Spanish philosopher José Ortega y Gasset is one of many to argue that human beings need more than the partial account of reality that science offers if they are to lead fulfilled lives. We need a 'big picture', an 'integral idea of the universe'. Any philosophy of life, any way of thinking about the questions that really matter, according to Ortega, will thus end up going beyond science – not because there is anything wrong with science, but precisely because it is so focused and specific in its methods.

> Scientific truth is characterized by its precision and the certainty of its predictions. But science achieves these admirable qualities at the cost of remaining on the level of secondary concerns, leaving ultimate and decisive questions untouched.

Albert Einstein made a similar point concerning the strengths and limits of the natural sciences, opening up the possibility of some form of dialogue or intellectual synergy to permit the crossing of intellectual frontiers in pursuit of new understandings.

> The scientific method can teach us nothing else beyond how facts are related to, and conditioned by, each other. … Yet it is equally clear that knowledge of what is does not open the door directly to what should be. One can have the clearest and most complete knowledge of what is, and yet not be able to deduce from that what should be the goal of our human aspirations.

The study of the interaction of religion and the natural sciences continues to be influenced by the 'warfare' model of the relation of science and religion, which leads some scientists and religious believers to see them as necessarily 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), it is 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 their interpretation of the biblical creation accounts.

We shall explore the origins of this 'warfare' model of the interaction between science and religion later in this work. Yet although it remains influential culturally, it is not seen by historians of science as being reliable or defensible, and is no longer taken seriously by historical scholarship. It is certainly true that there are tensions between science and religion; yet their relationship is far more complex than this. If anything, science now seems to be opening up religious questions, rather than closing them down or declaring them to be meaningless. Natural science is increasingly being recognized to throw up questions that point beyond itself and transcend its power to answer.

Commenting on the scientific search for the origins of the universe, the astronomer Robert Jastrow notes how modern science seems to end up 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.

Science and religion are, this work will suggest, able to engage in a meaningful dialogue about some of the great questions of life. Yet the term 'dialogue' is too easily understood as a cosy and uncritical conversation, often tending towards an agreeable yet unwarranted assimilation of ideas. That is not the view advocated in this work. This kind of dialogue needs to be robust and challenging, probing deep and potentially threatening questions concerning the authority and limits of each participant and discipline. A dialogue is characterized by what many now call 'epistemic virtue', requiring each participant to take the other seriously, attempting to identify its strengths and weaknesses, while at the same time being willing to learn from the other, and face up to its own limits and vulnerabilities.

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. Give 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 judgement.

1 Neither science nor religion can lay 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 'non-overlapping magisteria', developed by writers such as the late Stephen Jay Gould. This envisages that

science and religion occupy well-defined domains or areas of competency, which do not overlap or intersect. No conversation is necessary – or possible.

Science and religion are perhaps better thought of as operating at their own distinct levels, often reflecting on similar questions, yet answering them in different ways. There are indeed 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 American 'creationism'). Yet these are merely extreme positions in a spectrum of possibilities. Most would suggest that science does not – and cannot – 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, aim for the transformation of the human situation, most also link this with offering an explanation of the world and human beings. Why are things the way they are? What explanations may be offered for what we observe? What is the 'bigger picture' which helps us to make sense of our observations and experience? Scientific and religious explanations generally take different forms, even when reflecting on the same observations. Although there is an obvious risk in this simplification, it is helpful to think of science asking 'how' questions, where religion asks 'why' questions. Science seeks to clarify mechanisms; religions seek to explore questions of 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 we can go no further than understanding how things happen, others argue that we need to answer what the philosopher of science Karl Popper termed 'ultimate questions' – such as the meaning of life. One of the most influential discussions of this point is found in the social psychologist Roy Baumeister's classic work *Meanings of Life* (1993). For Baumeister, the human quest for meaning focuses on a series of basic human needs – such purpose, efficacy, and self-worth. Why am I here? Can I make a difference? Do I really matter? Science may *inform* the answers given to these questions, but it does not *determine* them.

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 the 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.

This does not mean that scientists lack interest in moral questions; the point is that most scientists recognize that their disciplines cannot create or sustain moral values – a point to which we shall return later in this volume (**179–85**). For example, consider the point made by Stephen Jay Gould 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.

This has led to growing interest in dialogical 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, 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.

The Chessboard: The Diversity of Science and Religion

Many rightly express a concern about the coherence of the field of science and religion. Is it conceptually integrated – or is it just a sprawling mass of disconnected debates and discussions, gathered together for the sake of convenience under the loose framework of 'science and religion'? This is a fair point to raise, given the diversity of individual sciences and religions, and the multiplicity of their possible interactions.

The term 'science' is often used to designate the overall empirical and theoretical enterprise that lies behind or is enfolded within the various scientific disciplines – such as chemistry, biology, and psychology. Yet these are individual *sciences*, which have their own distinct research methods, histories, and professional communities of interpretation and application. The uncritical use of the more general term 'science' flattens the landscape of the natural sciences, failing to do justice to the distinctiveness of each individual science.

'Religion' is not a well-defined category and is thus resistant to rigorous definition. Scholars working in the field of the psychology of religion and other empirical approaches to religious thought and behaviour constantly find themselves frustrated by the lack of an agreed empirical definition of religion. To name one obvious problem: if religion is defined in terms of belief in a god or god(s), this excludes one of the world's major

religions – Buddhism. Religion is not an empirical concept, but a socially constructed notion. We might agree that there are individual 'religions' – such as Islam, Judaism, and Buddhism – but this does not mean that there exists some universal essential category of 'religion' which each exemplifies in its own distinct way.

There is now a general consensus that it is seriously misleading to regard the various religious traditions of the world as variations on a single theme. During the early 1960s, for example, the Canadian Islamic scholar Wilfred Cantwell Smith argued that religions do not possess some common defining feature that is captured and expressed by the term or underlying category of 'religion'. Rather, Smith argued, the concept of 'religion' was created by modern Western scholars and superimposed upon a variety of phenomena, thus creating the misleading impression of some underlying universal concept of 'religion'.

It is also important to appreciate that, in addition to clear differences across the world's religions, there are also significant variations within individual religious traditions, such as Christianity. Conservative Protestants and liberal Catholics are likely to hold very different views on Charles Darwin's theory of natural selection. So can one of these alone be identified as 'the Christian view', which is somehow to be seen as normative within a religion? Or must we learn to acknowledge a diversity of views within a single religious tradition? Perhaps the wisest approach is simply to respect the integrity of religious traditions and movements within such traditions, rather than to attempt to homogenize their ideas or force them into some artificial common mould. The complexity of modern Buddhism, Christianity, Islam, and Judaism is such that it is intellectually precarious to generalize about them without acknowledging debate and diversity within them.

Yet perhaps the most obvious difficulty with the field of science and religion is that it designates such a broad field that it runs the risk of becoming meaningless and useless. *Which* science? *Which* religion? If the field of 'science and religion' claims to represent all sciences and all religions, it becomes unmanageable and incoherent, given the diversity and complexity of both specific scientific disciplines and specific religious traditions.

In discussing this point with students at Oxford, I have found the analogy of a chessboard to be helpful. A chessboard has multiple spaces (in this case, 64) – but they are not all occupied. The field of science and religion, at least in theory, offers a vast array of intellectual possibilities – such as the relation of Buddhism and Psychology, or Islam and Biology. Yet not all of these possibilities have attracted intellectual attention. Some spaces are packed full of researchers, scholars, and interested readers; others are virtually empty. Examples of highly populated areas of interest within this field include:

- The Natural Sciences and Arguments for the Existence of God;
- The Significance of Darwinism for Religious Belief.

Yet other areas, despite clearly being of intellectual interest, remain understudied. Christianity remains the religious tradition whose engagements with science have been

most widely discussed within the 'science and religion' community, and many highly populated spaces on the chessboard specifically engage this religious tradition, particularly in relation to historical questions, such as the relation of Christianity and the origins of the scientific revolution in western Europe.

The chessboard model helps us visualize the extensive field of science and religion, and identify the spaces that have dominated discussion within the field – and which thus need to be included within this book. Given that this work is intended to serve as a textbook, it is clearly important to map its contents onto both scholarly activity within the field, and popular interest in the field. This work thus engages the most highly populated squares on the chessboard, while recognizing that there are other areas of legitimate intellectual interest which have not yet secured the attention that they deserve.

Ian Barbour's Four Models of the Relation of Science and Religion

So how do we understand the general relationship of science and religion? What models are available to us as we try to envisage their possible relationships? One of the most influential accounts of approaches to the relation of science and religion is due to Ian G. Barbour (1923–2013), a pioneer of studies in the field of science and religion. Many would argue that the emergence of the field of 'science and religion' as an area of study in its own right dates from 1966, when Barbour's landmark work *Issues in Science and Religion* was published. Barbour was born on 5th October 1923 in Beijing, China, and initially focused his studies on the field of physics, gaining his PhD from the University of Chicago in 1950. His first academic appointment was at Kalamazoo College, Michigan, as professor of physics. However, he had a strong interest in religion, which he was able to pursue through studies at Yale University, leading to a BD in 1956. He served for many years in various roles, including Chairman of the Department of Religion and Professor of Physics at Carleton College, Northfield, Minnesota (1955–1981). He finally became Winifred and Atherton Bean Professor of Science, Technology and Society at the college (1981–1986). He died in 2013.

Barbour's characteristic concern to relate science and religion developed during the 1960s, and led to the publication of the book for which he is best known – *Issues in Science and Religion* (1966). This book reflected his experience of teaching in both the areas of science and religion – teaching interests which he was able to maintain throughout most of his academic career. During the 1970s, Barbour developed his interests further through a program on ethics, public policy, and technology, which identified and engaged with a series of religious issues. *Issues in Science and Religion* is widely regarded as an authoritative, clearly written, and learned book that introduced many people to the

fascinating questions which were associated with this field. Since then, Barbour has authored or edited a series of works dealing with issues on the interface of science and religion (most notably *Religion in an Age of Science*, which appeared in 1990, based on the Gifford lectures given at the University of Aberdeen in 1989). He is widely regarded as the doyen of dialogue in this field, and was honoured for this by the American Academy of Religion in 1993. Barbour was awarded the Templeton Prize for Progress in Religion in 1999 in recognition of his efforts to create a dialogue between the worlds of science and religion.

Barbour has played an enormous role in catalysing the emergence of this distinct field, and has had considerable personal influence on shaping its dynamics – including his formulation of an influential typology of possible relationships between science and religion. Barbour's typology of 'ways of relating science and religion' first appeared in 1988 and remains widely used, despite some obvious weaknesses. Barbour lists four broad types of relations: conflict; independence; dialogue; and integration. In what follows, we shall set out and illustrate Barbour's fourfold scheme, before noting some questions that need further exploration.

Conflict

Historically, the most significant understanding of the relation between science and religion is that of 'conflict', or perhaps even 'warfare'. This strongly confrontational model continues to be deeply influential at the popular level, even if its appeal has diminished considerably at a more scholarly level. 'The war between science and theology in colonial America has existed primarily in the cliché-bound minds of historians' (Ron Numbers). This influential model was expounded in two influential works published in the later part of the nineteenth century – John William Draper's *History of the Conflict between Religion and Science* (1874) and Andrew Dickson White's *History of the Warfare of Science with Theology in Christendom* (1896). The best-known late twentieth century representative of this approach is Richard Dawkins, who argues that: 'Faith is one of the world's great evils, comparable to the smallpox virus but harder to eradicate.' For Dawkins, science and religion are implacably opposed.

Yet this model is not restricted to anti-religious scientists. It is widespread within conservative religious groups within Christianity and Islam, who are often virulently hostile to the idea of biological evolution. The creationist Henry M. Morris (1918–2006) published a sustained critique of modern evolutionary theory with the title *The Long War against God* (1989). In an appreciative foreword to the book, a conservative Baptist pastor declares that: 'Modern evolutionism is simply the continuation of Satan's long war against God.' Morris even invites us to imagine Satan imagining the idea of evolution as a means of dethroning God.

Yet many of the historical episodes that are traditionally placed in this category, or held to represent its manifestation, can be interpreted in other ways. The Galileo controversy of the seventeenth century, for example, is still presented as a classic example of 'science against religion', even though it is now recognized to be a much more complex and nuanced matter. Similarly, Darwin's theory of evolution is often presented in the popular media as anti-religious in nature and intention, even though Darwin himself was adamant that it was not. Indeed, in 1889 the Anglican theologian Aubrey Moore remarked that: 'Darwinism appeared, and, under the disguise of a foe, did the work of a friend.' The issue of whether science and religion are in conflict all too often seems to rest on complex issues of interpretation, which are often sidelined by those looking for simple answers and slick slogans.

More importantly, the conflict model is increasingly being seen as a distinctively Western way of thinking, which is grounded in the specific histories and the implicit cultural norms of Western nations, particularly the United States of America. Researchers have noted that the relation of science and religion in non-Western cultures – such as India – is understood in a very different (and much more positive) way. Recent surveys indicate that the general approach which Barbour designates 'independence' (see below) is dominant amongst scientists in North America and Western Europe, whereas a more collaborative or dialogical approach is dominant within scientific communities in Asia.

Although some Western cultural commentators regard the 'warfare' model as normative, it is nothing of the sort. It is simply one option within a spectrum of possibilities, which became influential as a result of a set of historical circumstances, rather than having anything to do with the essential nature of either science or religion. Furthermore, the 'conflict' model retains its credulity largely on account of conflicts arising from very specific issues – chiefly the teaching of evolution in schools and issues of therapeutic gene modification.

Independence

The Darwinian controversy caused many to distrust the 'warfare' or 'conflict' model. In the first place, it was seen to be historically questionable. Yet in the second, there was growing concern to prevent any alleged 'conflict' to damage either science or religion. This led many to insist that the two fields had to be regarded as completely independent of each other. This approach insists that science and religion are to be seen as independent, autonomous fields of study or spheres of reality, with their own distinct rules and languages. Science has little to say about religious beliefs, and religion has little to say about scientific study.

This approach is found in the 1981 policy statement of the American National Academy of Science, which declared that: 'Religion and science are separate and mutually exclusive realms of human thought whose presentation in the same context leads to misunderstanding of both scientific theory and religious belief.' It is also found in Stephen Jay Gould's

model of 'non-overlapping magisteria' (NOMA), which argues for the affirmation of mutual respect and the recognition of differing methodologies and domains of interpretation between science and religion:

> I believe, with all my heart, in a respectful, even loving concordat between our magisterial – the NOMA solution. NOMA represents a principled position on moral and intellectual grounds, not a mere diplomatic stance. NOMA also cuts both ways. If religion can no longer dictate the nature of factual conclusions properly under the magisterium of science, then scientists cannot claim higher insight into moral truth from any superior knowledge of the world's empirical constitution. This mutual humility has important practical consequences in a world of such diverse passions.

A variant of this approach is provided by the American theologian Langdon Gilkey (1919–2004). In his 1959 work *Maker of Heaven and Earth*, Gilkey argues that theology and the natural sciences represent independent and different ways of approaching reality. The natural sciences are concerned with asking 'how' questions, where theology asks 'why' questions. The former deals with secondary causes (that is, interactions within the sphere of nature), while the latter deals with primary causes (that is, the ultimate origin and purpose of nature).

This independence model appeals to many scientists and theologians because it gives them freedom to believe and think what they like in their own respective fields ('magisteria', to use Gould's phrase), without forcing them to relate these magisterial to each other. However, as Ian Barbour points out, this inevitably compartmentalizes reality. 'We do not experience life as neatly divided into separate compartments; we experience it in wholeness and interconnectedness before we develop particular disciplines to study different aspects of it.' In other words, these circles cannot avoid some degree of overlap and interaction; they are not completely separate.

Dialogue

A third way of understanding the relation between science and religion is to see them as engaged in a dialogue, leading to enhanced mutual understanding. As the late pope John Paul II commented in 1998: 'The Church and the scientific community will inevitably interact; their options do not include isolation.' So what form might their interaction take? How might they complement each other? For John Paul II, the answer was clear: 'Science can purify religion from error and superstition; religion can purify science from idolatry and false absolutes. Each can draw the other into a wider world, a world in which both can flourish.'

This point was further developed by the 'Dialogue Group' of scientists and Catholic bishops in the United States, who declared that: 'Science and religion can offer complementary insights on complex topics like the emerging bio-technologies.' We see here a recognition

that the moral limitations placed on the natural sciences by virtue of the amoral character of the scientific method leads to a realization of the need to supplement the scientific discussion from other sources. We shall return to this discussion later in this work (**179–85**).

This dialogue respects the distinct identity of its participants, while exploring shared presuppositions and assumptions. Ian Barbour regards this model as probably the most satisfactory of the possible range of approaches. It is also found throughout the recent writings of John Polkinghorne, who points out a series of significant parallels between the two magisterial. For example, both science and religion involve at least some degree of personal judgement, in that both deal with data that is 'theory laden'. Similarly, both involve a series of what might be termed 'fiduciary' assumptions – for example, that the universe is rational, coherent, ordered, and whole. A similar concern underlies Alister E. McGrath's *Enriching Our Vision of Reality* (2016), which aims to enhance the intellectual rigour of Christian theology through an extended dialogue with the natural sciences, especially in relation to issues of methods of investigating and representing reality.

Integration

A fourth understanding of the way in which science and religion interact can be found in the writings of the British theologian Charles Raven (1885–1964). In his *Natural Religion and Christian Theology* (1953), Raven argued that the same basic methods had to be used in every aspect of the human search for knowledge, whether religious or scientific. 'The main process is the same, whether we are investigating the structure of an atom or a problem in animal evolution, a period of history or the religious experience of saint.' Raven vigorously resists any attempt to divide the universe into 'spiritual' and 'physical' components, and insists that we must 'tell a single tale which shall treat the whole universe as one and indivisible.' Barbour himself is very sympathetic to this approach, and sees process thought as a catalyst to this process of integration. A similar outlook is found in the later writings of Arthur Peacocke, who interprets evolution as God's preferred mode of creation.

It is important to note that Barbour tends to present these four options as stages in an intellectual journey of discovery, perhaps analogous to John Bunyan's classic *The Pilgrim*'s *Progress*. The intellectual wayfarer might begin with Conflict, following by a brief and unsatisfactory flirtation with Independence, and finally finding a satisfactory resting place in Dialogue or some form of Integration. Both the Conflict and Independence models are *wrong*, Barbour argues, whereas the Dialogue and Integration approaches are *right*. Inevitably, those who are interested in trying to find a reliable and unbiased account of the possibilities will find Barbour's presuppositions slightly unsettling at this point, and wonder if less prescriptive approaches might be available.

So what difficulties are raised by this simple taxonomy? The most obvious is that it is inadequate to do justice to the complexity of history. As Geoffrey Cantor and Chris Kenny

point out in a thoughtful critique of Barbour's approach, history bears witness to a series of complications that cannot be incorporated in simplistic taxonomies. It is difficult to refute this point. Barbour's four-fold scheme is useful precisely because it is so simple. Yet its simplicity can be a weakness, as much as a strength.

More seriously, the model is purely intellectual in its approach, concerning how ideas are held together. What about the social and cultural aspects of the matter, which play such an important role in any attempt to understand how the interaction of science and religion works out in practice, either in the past or the present? There has been a growing trend in recent scholarship to shift the analysis away from a purely intellectual approach to the interaction of science and religion, in order to consider their symbolic and social dimensions, where the interaction is much more nuanced.

Furthermore, the historical context often needs close examination. Supposed tensions and conflicts between science and religion, such as the Galileo controversy, often turn out to have more to do with papal politics, ecclesiastical power struggles, and personality issues than with any fundamental tensions between faith and science. Historians of science have made it clear that the interaction of science and religion is determined primarily by the specifics of their historical circumstances, and only secondarily by their respective subject matters. There is no universal paradigm for the relation of science and religion, either theoretically or historically.

The case of Christian attitudes to evolutionary theory in the late nineteenth century makes this point particularly evident. As the geographer and intellectual historian David Livingstone demonstrated in his ground-breaking study of the reception of Darwinism in two very different contexts – Belfast, Northern Ireland, and Princeton, New Jersey – local issues and personalities were often of decisive importance in determining the outcome, rather than any fundamental theological or scientific principles.

Nevertheless, despite its limitations, the framework set out by Barbour remains helpful as a means of approaching the field of science and religion studies. It represents a useful description of possible approaches but should not be pressed too far in terms of a rigorous analysis of the issues. Perhaps it could be thought of as a useful sketch of the terrain, rather than as a detailed and precise map.

This sketch has been extended by others working in the field, such as Ted Peters, who suggests that ten approaches can be discerned, four of which rest on the assumption of conflict between science and religion and six of which offer approaches which assume there is a truce or even a potential partnership between them. Peters describes these as follows:

> The first four assume conflict or even war: (1) scientism; (2) scientific imperialism; (3) theological authoritarianism; and (4) the evolution controversy. Six additional models assume a truce or even more, they pursue partnership: (5) the Two Books; (6) the Two Languages (separation; independence); (7) ethical alliance; (8) dialogue leading to creative mutual interaction; (9) naturalism; and (10) theology of nature.

Four Ways of Imagining the Relation of Science and Religion

Complex relationships are often best represented visually or imaginatively. Analogies and metaphors are helpful in exploring disciplinary boundaries, mapping complex structures, and framing potential relationships. In this section, we shall consider four ways of imagining the relation of science and religion. The first three make no religious assumptions; the fourth is based on some Christian assumptions, making it helpful for those who work within this way of thinking, although perhaps less useful for those who do not share its core theological assumptions. In what follows, we shall consider four ways of envisaging or imagining the relation of science and religion. They are not 'models', as this word is normally used, but are rather lenses or frameworks which allow us to visualize possible relationships.

Science and Religion Offer Distinct Perspectives on Reality

The first analogy invites us to see science and religion as offering distinct perspectives on a complex reality. I shall explore this approach as it is presented in the writings of Charles A. Coulson, one of the pioneers in the dialogue between science and religion. Coulson was Professor of Theoretical Chemistry at Oxford University and author of *Science and Christian Belief* (1955), an influential account of the relation of the natural sciences and Christianity.

Coulson was an enthusiastic mountaineer and illustrated his approach with the Scottish mountain Ben Nevis. Coulson invited his readers to join him in an imaginative walk around this mountain and reflect on how the mountain appeared when viewed from different angles of approach. Seen from the south, the mountain presents itself as a 'huge grassy slope'; from the north, as 'rugged rock buttresses'. Regular visitors to the mountain are familiar with these different perspectives. 'Each looks at the mountain; each sees certain things and each tries to describe his encounter with the mountain in terms that make sense. Each devises a language that is suitable for his particular purpose.' The complex structure of Ben Nevis cannot be grasped fully from any single angle of approach. 'Different views of the same reality will appear different, yet both be valid.' A full description requires these different perspectives to be brought together, and integrated into a single coherent picture. The whole is the sum of these multiple perspectives.

It was a simple analogy, and it is easily applied to the relation of science and faith. Coulson's core insight is that 'different viewpoints yield different descriptions'. A scientist, a poet, and a theologian each offers a distinct perspective on the complex reality of our experience. Each describes what they see using their own distinct language and imagery. For Coulson, this shows the need for an overall, cumulative, and integrated picture of reality, with both science and religion offering their own perspectives, each of which is *valid* yet *incomplete*.

The human experience of reality is complex, and there is space for both scientific and religious approaches to grasping that reality. 'The two worlds are one, though seen and described in appropriate terms; and it is only the man who cannot, or will not, look at it from more than one viewpoint who claims an exclusive authority for his own description.' Coulson recognized that some scientists and theologians claimed their own insights represented a monopoly on truth. His view, however, was that they both offered partial insights, which needed to be woven together into a more complete and reliable picture.

This is a helpful approach. However, it offers a somewhat flat account of reality. Many would argue that reality is multi-layered, and that each of these layers needs to be explored in a distinct way, adapted to its characteristics. This leads us neatly into the second approach we need to consider.

Science and Religion Engage Distinct Levels of Reality

The theoretical physicist Werner Heisenberg is one of many influential scientists who emphasize that it is not possible to speak of '*the* scientific method'. Each scientific discipline develops its own research methods, which are adapted to its research tasks and field of inquiry. 'We need to remember that what we observe is not nature itself, but nature as it is disclosed by our methods of investigation.' Heisenberg's point suggests that the scientific need to use a multiplicity of research methods leads to a corresponding plurality of perspectives or insights about reality, which thus need to be woven together in some way to give rise to the best possible overall representation of nature.

Heisenberg recognizes both the complexity of the natural world and human experience, and offers an account of this which recognizes a plurality of approaches and intellectual outcomes. Heisenberg was able to accommodate both art and religion within his overall approach, distinguishing these from the natural sciences, while affirming their cultural legitimacy and intellectual distinctiveness. Art, science, and religion were the outcomes of different methods, and were to be seen as part of the greater human engagement with reality, which requires multiple research methods.

This framework offers some important possibilities for both identifying the distinct 'knowledge products' of science and religion. It respects the difference between science and religion, avoiding any attempt to confuse or conflate them; however, it holds that it is possible to bring together the different levels of knowledge that they produce. As we shall consider at several points in this work, the natural sciences are primarily concerned with understanding how things *function*, whereas religion is more concerned with what they *mean*. These represent different levels of engagement with human existence. Yet they can be brought together to give a fuller and richer understanding of the distinct nature of humanity.

Science and Religion Offer Distinct Maps of Reality

A third approach is found in the writings of the British philosopher Mary Midgley, who frequently considered the relationship between the natural sciences and other disciplines. Midgley argued that the project of engaging the most important questions in human life demanded that a number of different conceptual tool-boxes had to be used together to disclose the full picture of human existence. A single method of investigation will illuminate only some aspects of our world. To limit ourselves to the methods of the natural sciences in general, or one natural science (such as physics) in particular, leads to what Midgley calls a 'bizarrely restrictive view of meaning'.

Midgley thus argues that we need to develop 'multiple maps' of reality. No single approach is adequate to do justice to the natural world. We need 'many windows' on a complex reality if we are to represent it adequately rather than reduce it to one privileged perspective. Consider an atlas, which provides us with many maps of the same region – for example, North America or Europe. But why do we need so many maps to represent one region? Surely one is enough? Midgley's answer is simple: because different maps provide different information about the same reality.

A physical map of Europe shows us the features of the landscape. A political map shows the borders of its nation states. Midgley's point is that each map is designed to answer a specific set of questions. What language is spoken here? Who rules this territory? Each map makes sense of the landscape by answering certain questions about it – and not others. If we want to gain a comprehensive understanding of our world, we have to find some way of bringing them all together. We might superimpose them, so that their information can be fully integrated. One map on its own cannot tell us everything we wish to know. It can help us understand part of a bigger picture – but to see the full picture we need multiple maps. Each map answers a different question – and each of those questions is important. Science maps our world at one level, explaining how it functions; religion maps our world at another level, explaining what it means.

The Two Books: Two Complementary Approaches to Reality

Finally, we turn to a way of visualizing the relation of the natural sciences and Christianity which emerged during the European Renaissance, and did much to encourage the rise of science by showing how it was consistent with a religious way of thinking. The metaphor of the 'Two Books of God' invites us to imagine both nature and the Christian Bible as texts originating from the same author, both of which require interpretation. The metaphor of the 'Two Books of God' was widely used to maintain the distinctiveness of the natural sciences and Christian theology on the one hand, yet to affirm their capacity for positive interaction on the other. Both, it was argued, were written by God; both disclosed God, in