Science and Religion in Quest of Truth

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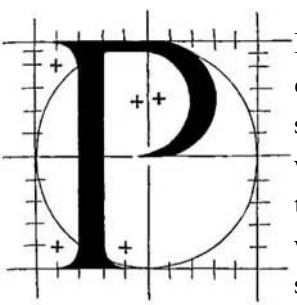
Contents

CHAPTER ONE

Truth and Understanding



EOPLE sometimes say that science deals with facts but that religion simply trades in opinions. In other words, science's concern is with truth, understood as correspondence with reality, but the best that can be said of religion is that it might be 'true' for an individual, but only in the weak sense that it was helpful for that particular person to look at life in that particular way, without necessarily implying anything about the way reality actually is. Two bad mistakes lie behind this claim.

The first is a mistake about science. There are no scientifically interesting facts that are not already interpreted facts. No doubt all could agree what the reading was on the dial of some piece of measuring apparatus, but for that reading to have meaning one would need to know what the instrument is actually capable of measuring. For that one needs a theoretical understanding of the nature and operation of the apparatus. In science, experimental 'fact' and theoretical 'opinion' inter-

twine in a subtle circularity, as experiment seeks to confirm or disconfirm theory and theory seeks to interpret experiment.

The second mistake is about religion. The question of truth is as central to its concern as it is in science. Religious belief can guide one in life or strengthen one at the approach of death, but unless it is actually true it can do neither of these things and so would amount to no more than an illusionary exercise in comforting fantasy.

Both science and religion are part of the great human quest for truthful understanding. Before we explore what this might imply for their mutual relationship, we must pay further attention to the individual characters of these two truth-seeking endeavours. The claim will be that both are seeking truth through the attainment of well-motivated beliefs.

THE NATURE OF SCIENCE[1]

Perhaps the first thing to say about science is that it has been wonderfully successful in its quest for understanding. Time and again it has been able to present results of the greatest interest which have been universally agreed by the whole scientific community. Repeatedly in science, questions actually get settled. At the beginning of the twentieth century, there were still some physicists who thought that the notion of atoms might be no more than a manner of speaking, useful for some purposes but not needing to be taken seriously as indicating the actual existence of a particle structure in matter. Today, it is universally acknowledged that matter has a granular nature, even if the current elementary constituents are quarks and gluons and electrons, rather than the much larger atoms. To

1. OW 2; BS 1–2.

take another example, when expounding his theory of evolution in 1859, Darwin had to appeal to the existence of unexplained small variations between the characteristics of successive generations of living beings, which produced results that could then be sifted and preserved by natural selection. We now know that these variations arise from mutations in the genetic material DNA. No other realm of human enquiry can present such a successively enlarging catalogue of successful agreed conclusions as that which science is able to claim.

Science has purchased this great success by the modesty of its ambition. It sets out to ask only the question of what are the processes by which things happen, bracketing out of its consideration other questions, such as whether there is meaning, value or purpose present in what is happening. Science is principally concerned to explore only one dimension of the human encounter with reality, essentially that which can be called impersonal, open to the unproblematic repetition of the same phenomena, irrespective of the place of investigation or the character of the investigator. Even in historical sciences such as cosmology or evolutionary biology, concerned with understanding unique sequences of events, much scientific explanatory power depends upon the insights of directly experimental sciences, such as physics and genetics. It is this self-defining limitation to impersonal experience that has given science the great secret weapon of experiment as its unique means for attaining intersubjective agreement. Repeatability of this kind is unattainable in any realm of personal encounter with reality, where each event possesses its own unique character, and the resulting diversity of experience makes complete agreement much more difficult to achieve. Science's declining to engage with the personal dimension of experience

implies the limited character of the account that it can give of reality. A scientist, speaking as a scientist, can say no more about music than that it is vibrations in the air, but speaking as a person there would surely be much more to say about the mysterious way in which a temporal succession of sounds can give us access to a timeless realm of beauty.

Despite agreement being readily attained in science about immediately perceptible phenomena (all those watching see the pointer move to the same point on the scale), the question of the significance of the phenomena observed is made complex by there being the circular interaction, already noted, between experiment and theory in interpreting the meaning of the results. The frequent attainment of universal agreement in the scientific community arises from the conviction among scientists that this circularity is usually benign rather than vicious. A number of factors produce this belief.

A really successful scientific theory attains a persuasive naturalness of explanation from the fact that an economically formulated hypothesis is seen to lead, without forcing or manifest contrivance, to the understanding of a wide range of diverse phenomena. Darwin's theory of evolution not only made sense of the fossil record but also explained the existence of vestigial organs, such as the human appendix, and it made intelligible the local variations in species observed in groups of nearby islands, such as finches in the Galapagos Islands. Much later in the development of evolutionary biology, it became apparent that the order in which species had emerged could also be inferred from study of the differences between their genomes and the results of this independent assessment were found to be in good accord with the ordering derived from the fossil record, a compatibility that afforded an im-

pressive confirmation of the basic concept of descent with modification.

A successful scientific idea frequently manifests long-term fruitfulness by showing a capacity to explain not only the phenomena that originally led to its discovery but also other phenomena, known at the time but not understood or taken into account in framing the theory. Even more impressively, the theory can also lead to the prediction of unanticipated phenomena which are subsequently found experimentally to occur. Paul Dirac discovered a celebrated equation that describes the electron. He hit upon it by finding an elegant way in which to combine quantum theory with special relativity. The equation immediately provided an unexpected bonus by turning out to explain a known, but till then not understood, aspect of the electron's magnetic properties. A little later the equation was shown by Dirac also to imply the existence of antimatter, a wholly unexpected consequence that was quickly confirmed experimentally. This experience of the long-term fertility of an insight strongly encourages scientists to take their discoveries with ontological seriousness. Unless there was a correspondence between ideas and reality, these successes would seem unintelligibly gratuitous. Instinctively scientists are philosophical realists, believing that what we come to know about the physical world is indeed telling us what that world is actually like.

Such a realist belief receives further support from the way in which the physical world is often found to resist our prior expectations and prove stranger in its character than we had thought, or perhaps even could have thought without being prompted by the stubborn nudge of nature. A striking example of this experience is provided by the discovery of

quantum physics.[2] No one in 1899 could have supposed that light could manifest the oxymoronic property of sometimes behaving like a wave and sometimes like a particle. After all, waves are spread out and flappy, while particles are small and bullet-like. Nevertheless, as we all know, this is how light has actually been found to behave. This led eventually to the discovery of quantum theory, in which states can exist that are mixtures of possibilities that classical physics and commonsense would say could never be combined together (technically this is called the superposition principle). For example, in the clear Newtonian world there could only be states with a specific number of particles present in them (just look and count how many). However, in the cloudy quantum world there can be states that correspond to an *indefinite* number of particles (formed out of superpositions of states with different particle numbers). These are the states that turn out to display wave-like properties. The recalcitrant way in which nature can resist our prior expectation is a powerful incentive to believing that in science we are actually exploring a world that stands over against us in its independent character.

Nevertheless, the strangely elusive and counterintuitive character of the quantum world has encouraged some to suggest that the idea of entities like electrons which can be in unpicturable states such as superpositions of being 'here' and being 'there' is no more than a convenient manner of speaking which facilitates calculations, and that electrons themselves are not to be taken with ontological seriousness. The counterattack of the scientific realist appeals to intelligibility as the

2. See, for example, J. C. Polkinghorne, *Quantum Theory: A Very Short Introduction*, Oxford University Press, 2002.

key to reality. It is precisely because the assumption of the existence of electrons allows us to understand a vast range of directly accessible phenomena—such as the periodic table in chemistry, the phenomenon of superconductivity at low temperatures and the behaviour of devices such as the laser—that we take their existence seriously.

Belief in scientific realism is well-motivated, but one cannot claim that it is logically proved to be true beyond any possibility of question, as if it would be wilfully stupid for anyone to deny it. This relatively modest assertion of status of the belief recognises that there are some possible difficulties opposing a realist point of view, which now need to be considered and evaluated. The progress of science, with the changes of understanding that can result from this, make it clear that scientific achievement cannot be claimed to constitute the attainment of complete and absolute truth. Instead, science's exploration of reality must be seen as resulting in the creation of 'maps' of the physical world which are indeed reliable, but only on a particular scale. No map can reproduce all the detail of the terrain and changing the scale can lead to the exhibition of new features not previously recorded. The immense success of Newtonian physics had eventually to be qualified by the recognition that understanding phenomena on the subatomic scale required the quite different insights of quantum theory, together with the recognition that phenomena involving particles moving with velocities close to the speed of light required the insights of relativity. The Newtonian map was not torn up, but its limitations had been identified. Some philosophers of science, such as Thomas Kuhn, saw these changes as revolutions that subverted the realist claims of science. However, the issue is more subtle

than that and Kuhn's conclusion does not follow. A really successful scientific theory, such as Newtonian mechanics, never totally disappears. In fact, it is still good enough to send a space probe to Mars. What happened was that the domain of Newtonian applicability had been circumscribed and the appropriate scale of its map had been determined. When a new theory, such as quantum theory or relativity, has been discovered, one of the vital tasks is to establish what are called 'correspondence principles', explaining how the new theory can attach to itself the undoubted successes of the old one in appropriate circumstances. The different maps of the reality offered by physics are not identical, but they can be shown to be mutually compatible where there is an overlap between them. While the achievement of science does not amount to absolute and exhaustive truth, it can be asserted to be what one may call 'verisimilitude', an ever tightening, but never total, grasp of physical reality. Science can claim to attain the discovery of yet more satisfactory levels of understanding, adequate to what is currently known, without pretending to rule out the possibility of future discoveries revealing an even deeper and more complex order present in the physical world. Its achievement can be characterised as a kind of convergent realism.

Michael Polanyi was a philosopher of science who brought to his task the prior experience of a long and distinguished career as a physical chemist. In *Personal Knowledge*[3] he recognises that there is no coercively logical certainty in science, yet he also maintains that it affords an understanding that should rightly command our intellectual assent and com-

3. M. Polanyi, *Personal Knowledge*, Routledge and Kegan Paul, 1958.

mitment. Not only does Polanyi duly recognise the delicately circular nature of the interaction of theory and experiment but also he identifies the need for acts of personal judgement in the practice of science, involving decisions taken with universal intent, that are open to assessment within the truth-seeking community of science but which are not simply the result of following an explicitly prescribed protocol. For example, all experimental analysis has to deal with the problem of 'background', that is, the possible presence of spurious effects arising from uncontrolled environmental influences, such as the collisions of stray cosmic rays accidently traversing a bubble chamber. These have to be eliminated or allowed for in some way. There is no little black book or computer program guaranteed to tell the experimenter exactly how to do this. Solving the background problem requires individual acts of personal judgement. These require the exercise of tacit skills—'we know more than we can tell' is a favourite Polanyi remark—that have to be acquired through apprenticeship within the practice of the truth-seeking scientific community. Polanyi tells us that he wrote *Personal Knowledge* to show how he could rationally commit himself to what he believed scientifically to be true, although he knew that it might be false.

The concept of commitment is very important in Polanyi's thinking about the nature of science. People sometimes say that scientists doubt everything, but in fact that would be a stultifying policy to pursue, leading to a paralysing enslavement to uncertainty. Instead, scientific discovery requires the boldness of provisional commitment to a point of view, while remaining aware that this may require subsequent modification in the light of further experience. Above all, science requires commitment to the basic act of faith that there is a deep

rational order in the world awaiting discovery, and that there is a sufficient degree of uniform consistency in the working of the universe to permit successful argument by induction as a means to discover aspects of that order, despite the inevitably limited and particular character of the experience that motivates the belief.

This section has sought to set out considerations that present a reasoned defence of the realist interpretation of science. This philosophical conviction arises out of the actual experience of doing science, with its repeated feeling of satisfying discovery, rather than from a logical argument purporting to show that the world had to be open to our enquiry in this manner. The deep intelligibility of the universe is a fortunate fact, a wonderful gift that makes science possible. The deeper significance of this gift is a question to which we shall have to return in due course. Meanwhile, the kind of issues we have been discussing make it clear that scientific realism is something more subtle and more interesting than just naïve objectivity of the kind that an Enlightenment belief in access to clear and certain ideas might have encouraged one to expect. At the same time, acknowledging the subtlety of scientific belief should not drive us to embrace a post-modern account of science as social construction, as if its insights were the result of a largely unconscious and arbitrary choice by the invisible college of scientists, selected from a large portfolio of equally possible ways of thinking. Rather, the insights of science arise from and are controlled by our encounter with the way the world is, but in a complex and delicate manner that requires us to speak of scientific realism under the rubric of *critical realism*. The noun asserts the positive relationship of scientific knowledge to the way the world is, while the adjec-

tive acknowledges the subtle role that circularity and commitment play in its practice. Science yields well-motivated beliefs, but it does not deliver complete and absolute certainty about them. It is no stranger to belief in unseen realities—for example, quarks are thought to be 'confined' within the particles that they constitute, so that a single quark will never be observed in isolation. The existence of quarks must be defended by appeal to the intelligibility that they offer of more directly accessible phenomena (the properties of the particles that are made of quarks). In fact I believe that critical realism is a concept that is fundamental to the entire human quest for truth and understanding and that theology can defend its belief in the unseen reality of God by a similar appeal to the intelligibility that this offers of the general nature of the world and of great swathes of well-testified spiritual experience. A sophisticated twentieth-century approach of this kind can be found in the writing of Bernard Lonergan,[4] whose thought was shaped by the theological tradition stemming from Thomas Aquinas.

At this stage, a final point remains to be made. Discussion in later chapters will show that when one comes to very broad issues about the character of reality, such as the nature of time and the nature of causality, while our thinking is constrained by scientific knowledge it is not totally determined by it. We shall see that there remain judgements to be made which require acts of metaphysical decision. Scientists often eschew the idea of metaphysics and claim to have no need of it, but later in this chapter I shall seek to show the indispensability of metaphysical thinking for anyone wishing to attain an integrated world-view.

4. B. Lonergan, *Insight*, Longman, 1958.

THE NATURE OF THEOLOGY[5]

If science is human reflection on impersonal encounter with the physical world, theology is reflection on transpersonal encounter with the sacred reality of God. It is immediately apparent that this is likely to be a much more difficult and subtle task even than that pursued by science. We transcend the physical world and can put it to empirical testing through the contrivance of experiments. In science the initiative of discovery lies largely with the experimenter. God transcends finite humanity and is not open to experimental manipulation. To suppose the contrary is to commit the sinful error of attempting magic. 'You shall not put the Lord your God to the test' is just an inescapable condition of true encounter with divine reality. In those acts of divine disclosure that theology calls revelation, the initiative lies with God. Moreover, finite minds will never be able to capture the Infinite adequately in their logical nets. There is a tradition in theology, called apophaticism, which warns against the hubris of claiming exact knowledge of deity. Yet belief in the existence of revelatory divine self-disclosures means that this insight is not a counsel of despair, but simply a caution about the degree of success that theology can expect to attain. In consequence, the language of theology will have to be the allusive and open language of symbol rather than the precise language of mathematics that is so effective in science. To a significant degree in theology, prosaic clarity has to give way to something more like poetic discourse. Thus the search for truthful understanding is more difficult theologically than it is in science, but it is not impossible, as later discussions of the grounds for particular theo-

5. OW 3; SC 6; RR 4–5; SCB 3; FSU 1–2; TCS 1.

logical beliefs will seek to illustrate. Fundamentally, the two disciplines of enquiry should be thought of as cousins under the skin because of their shared truthful intent. Both operate under the rubric of critical realism, claiming the attainment of well-motivated beliefs, but not asserting the achievement of absolute certainty.[6] The religious recognition of this fact is expressed in the understanding that believers walk by faith and not by sight. Like Michael Polanyi in the case of science, the beliefs of religious people are sufficiently well-motivated for them to be able to commit themselves, despite knowing that in principle they might be mistaken. Religious faith does not demand irrational submission to some unquestionable authority, but it does involve rational commitment to well-motivated belief.

Having said this, we must also acknowledge some further significant differences between truth-seeking in science and in theology. Despite the role of personal skills and judgement in the practice of science, the investigator is able to adopt a detached attitude to the actual objects of his or her enquiry. Theology, like any form of personal encounter with reality, must take the risk of a more vulnerable kind of engagement. God is not to be met with simply in a spirit of intellectual curiosity, but with openness to the experience of awe and a demand for obedience. Religious knowledge is much more 'dangerous' than scientific knowledge, for it can imply consequences for the way we live our lives, requiring not only the assent of the intellect but also the assent of the will.

The impersonal dimension of science means that it is a linearly progressive discipline in which knowledge and under-

6. See the views of scientist-theologians summarised in S as T 2.

standing accumulate from generation to generation. Any physicist today understands much more about the universe than Isaac Newton ever did, simply by living three centuries later than that great genius. In religion, as in every other kind of personal encounter with reality, there is no presumption to be made of the superiority of the present over the past. Just as the individual creative work of Bach and Beethoven is an indispensable part of our present experience of music, so in theology the insights of great figures of the past—Augustine, Aquinas, Calvin and the rest—remain a necessary part of the contemporary conversation. There is no necessary implication of the superiority in every respect of twenty-first-century theological insight over that of earlier centuries, any more than there is of contemporary music over that of the past. Theological thinking has to be prepared to span the centuries in a way that is not paralleled in science.

Theology's anchorage in human encounter with the divine means that it is more sensitive to experiential context than is the case for science. Deeply personal experience will always be enabled and articulated within a specific cultural setting, which both offers opportunities of insight and imposes possible constraints of perspective. Part of the richness of theological thinking arises from its including within itself specific contextual theologies, grounded in the particular experiences of specific communities: feminist theology (based on the insights of women and often severely critical of what it perceives to be a male-dominated Church); liberation theology (drawing on the insights of the poor, especially in developing countries, and oriented to a demand for social justice); and so on. The present volume is an exercise in doing

theology in the context of science.[7] Further theological complexity arises from a distinction, to be explored later, between natural theology (appealing to aspects of general experience) and revealed theology (appealing to particular persons and happenings, held to be specific occasions of divine self-disclosure). Scripture is to be understood as the record of these latter revelatory events—of course requiring interpretation for reception of the truths that they carry—and not as the delivery of propositional truths to be received as having non-negotiable verbal authority. Despite the diversity of its component parts, theology can nevertheless claim to be fundamentally a single integrated discipline, ultimately reflecting the unity of the God of whom it seeks to speak, just as science is essentially a unity, reflecting the unity of the natural world, despite the particular characters of its component disciplines of physics, biology and so on.

It is a central thesis of this book that both science and theology can lay claim to the achievement of a degree of truthful understanding that warrants their insights being described under the rubric of critical realism. Yet one must also acknowledge that the adjective 'critical' has the stronger force in the case of theology, because of the profound nature of its subject matter. The fact that theology is concerned with the acquisition of motivated belief, rather than the assertion of fideistic certainties, means that it is open to development and correction in its understanding. The history of Christian thinking from the New Testament to the great Councils of the fourth and fifth centuries, which articulated the doctrines of the Trinity and the two natures of Christ, shows just such

7. TCS.

a character in the process of the clarification of belief and the correction of heresy. In fact the challenges of those later deemed as heretical played an important role in provoking those later deemed orthodox to seek clearer understanding of the profound truths with which both groups were seeking to wrestle. The development of theological thinking has continued in the centuries that followed, down to the present day. Religious belief has not proved immune to the need for correction, even if the pace of change has sometimes been slow. It took the Christian community 18 centuries to recognise that the institution of slavery was inconsistent with human dignity, and rather longer to question whether a loving God would exact eternal punishment for finite sins.

The theological discussions in the chapters that follow will seek to illustrate and clarify the nature of truth-seeking activity on the part of theologians.

RATIONAL STRATEGY[8]

The essence of rationality is to seek to conform one's thought to the nature of what is being thought about. Science makes it clear that there is no single form that such rationality has to take. We think about the clear and orderly world of Newtonian physics in one way, but we have to think about the cloudy and fitful quantum world in a different fashion, in a manner quite counterintuitive to the expectations of everyday understanding. Different logics apply in these two domains. The everyday logic of Aristotle is based on the law of the excluded middle, requiring that there is no possibility intermediate between the two extremes of A and not-A. The billiard ball is

8. SC 6; RR 1–2; SCB 2; BG 2; S as T 2; TCS 2; QPT.

either here or it is not here. In the quantum world, however, we have seen that the superposition principle allows an infinite range of intermediate possibilities, formed of mixtures of the state in which the electron is 'here' (A) and the states in which it is 'elsewhere' (not-A). Consequently, in the quantum world a different, quantum logic has to apply. It is scarcely surprising then that theology also calls for its own form of rational discourse. Christian belief centres on the conviction that in Jesus Christ the truly human and the truly divine are both present. Here is a duality even more counterintuitive than the wave/particle duality of light. Of course, the strangeness of the latter does not explain or license the strangeness of the former, but there is at least encouragement to think as boldly as experience has been found to demand of us.

There is also no single epistemology. In science we can know the Newtonian world in all its clarity, but the quantum world has to be known in accordance with its Heisenbergian uncertainty, so that if we know where an electron is we cannot know its momentum (how it is moving), and if we know its momentum we cannot know where it is. The ways in which we know persons, and the way in which we know God, are different again from the ways in which we know the impersonal objects of science. While there may be analogies between ways of knowing persons and ways of knowing God, they are certainly not identical. True knowledge of God must be open to the experience of awe, the duty of worship and the divine demand for obedience.

I believe that science and theology both require the rational strategy that I have called 'bottom-up' thinking, seeking to move from experience to the attainment of well-motivated belief and understanding, rather than relying on

a 'top-down' approach based on the hope that one has prior access to clear and certain general ideas from which one can then descend to the consideration of the particularities of experience. I do not assert that there is no place for top-down thinking, but I do believe that it must always be open to bottom-up evaluation and critique. The unexpected and surprising strangeness that science has so often encountered in its exploration of the physical world does not encourage reliance on the top-down approach. Allegedly 'clear and certain' ideas have often proved to be neither clear nor certain. In consequence, the natural question for a scientist to ask about any proposed belief is not 'Is it reasonable?', as if we felt we knew beforehand the shape that rationality had to take, but rather 'What makes you think that might be the case?' This form of enquiry is open to surprise and it does not seek to lay down beforehand the character of an acceptable account of reality. Yet it is also demanding, for the answer given will only be acceptable if motivating evidence is offered in its support. I think this strategy of bottom-up thinking is also to be followed in theology and later discussions will seek to give some examples of how this may be done. The very fact of the use of this approach in theology is the reason why I place it in the spectrum of the human search for truth achieved through *motivated* belief.

Bottom-up theological thinkers reject the claims of fideism to have access to indubitable knowledge of the divine, mysteriously conveyed in the form of infallible propositions that are endowed with unquestionable authority and immune from challenge or critique. The discourse of theology is not concerned with 'proofs' of God's existence that only the stupid could deny. In fact, even in science the concept of cer-

tain proof is seldom appropriate. Recall Polanyi's statement that scientifically he was able to commit himself to what he believed to be true, though he knew it might be false. The bottom-up thinker in science or theology lives by reasonable faith but not by certain sight. Even in mathematics a degree of commitment is called for, since Kurt Goedel has shown that axiomatised systems cannot establish their own consistency by means of internal argument.

In their explorations of reality both science and theology have recourse to the use of models in order to gain partial insight. A model is based on a picture of reality which reproduces certain features thought to be relevant for addressing a particular issue, without pretending that the model offers a fully ontologically adequate account of the nature of a complex reality. Models offer valuable partial insight, but not complete understanding. This means that one may often employ a variety of different models of the same entity, useful for different purposes, even if these models would be mutually incompatible if taken to be literally precise. For example, in nuclear physics, when concerned with nuclear fission it is helpful to picture the nucleus as a 'liquid drop', while discussion of the scattering of particles by a nucleus is better understood in terms of the picture of a 'cloudy crystal ball'. Of course, the nucleus is, in fact, neither of these things. Ultimate understanding requires the eventual replacement of a portfolio of incompatible models by a single integrated theory.

Theology also uses models, for example, pictures of God as righteous Judge and as loving Father, but the challenge of its intellectual task means theological theory-making is much more difficult and only a limited degree of success can reason-

ably be expected. Once again we must remind ourselves of the warning of apophatic theology that that Infinite Reality will never be fully captured by finite human thought. Acknowledgement of this is not to devalue theology, but to recognise its intrinsic character.

SCIENCE AND THEOLOGY[9]

I hold a passionate belief in the unity of knowledge. Therefore I believe that one must look beyond the insights achieved by the individual disciplines of enquiry, such as science and theology, to seek an integrated account of the whole of reality. Pursuing this desire leads to the consideration of further issues.

The first is to begin to seek an understanding of how science and theology relate to each other. Ian Barbour offered a taxonomy of possibilities that many have found helpful.[10] He outlined four possible stances, which he labelled conflict, independence, dialogue and integration. Conflict corresponds to the situation in which one or other discipline asserts the claim to be the only source of worthwhile truth and understanding. Either it is science that is said to answer all questions that are meaningful to ask and capable of being answered, or theology is said to be in possession of an exclusive key to knowledge that enables it to give authoritative answers even about issues such as the age of the Earth and the history of life. These claims are vociferously maintained today by fundamentalists of one conviction or the other, but both positions are, in fact, perverse. A good deal of the fairly widespread

9. BG 4; S as T 7; ST 1; TCS 5.
10. I. G. Barbour, *Religion in an Age of Science*, Harper Row, 1990, ch. 1.

belief in society today that science and religion are engaged in a battle to the death arises from the crude claims of what is supposed to be either a totally omnicompetent science or an infallibly omniscient religion. An honest science addresses only one set of questions (roughly How?—concerned with the processes of the physical world), while theology addresses another set (roughly Why?—concerned with the meaning, value and purpose present in what is happening). Neither side can claim to answer the other's questions, but we are perfectly familiar with the fact that both kinds of question are meaningful and necessary to ask. The kettle is boiling both because gas heats the water (the scientific explanation) *and* because I want to make a cup of tea (an explanation invoking purpose). We do not have to choose between these two accounts, for both are true. Without taking the two of them together, the event of the boiling kettle would only be partially understood. If we are truly to understand the rich, many-levelled world in which we live, we shall need the insights of both science and religion.

Recognising the different kinds of question that science and theology address has led some to take the stance that Barbour calls Independence. Science and theology are then said to be so distinct from each other that there is no possibility of interaction between them. Each goes its own way, freely exploring the two disjoint realms of insight to which they refer. But this is a highly implausible claim. It is true that How? and Why? are different questions, but the ways in which they are answered must be consonantly related to each other. Putting the kettle in the refrigerator is clearly incompatible with the claim to want to make a cup of tea! It is surely clear that science's discovery of evolutionary processes acting over vast

spans of deep time has influenced the tone of theological discourse on the world as a divine creation, without at all having negated the possibility of that discourse.

Dialogue is the stance that recognises that there has to be consonance between the perspectives on reality offered by science and theology if both are indeed truth-seeking endeavours, and therefore there must be a mutually respectful interaction between the insights of the two. The ways in which they answer their separate questions must be congruent with each other. The resulting binocular vision onto reality may be expected to yield a view that is deeper and more comprehensive than either discipline could offer on its own. This is the premise on which the enquiry pursued in this book is based, presented as an expression of its author's belief in the ultimate unity of knowledge.

The stance of Integration seeks to carry this interaction further with the ambitious aim of attaining a fully unified synthesis of science and theology, merged into a single discipline. The danger in this project is that the synthesis will in fact be achieved by one discipline taking the dominating role, so that the other is simply assimilated to its partner's style of thinking. A better strategy is the even-handed quest for a theistic metaphysics, within whose wide embrace both science and theology can both find their proper place without prejudice to the status of their individual insights.

We have already noted that metaphysics is not a word that many scientists feel very happy with. It is not uncommon for the concept to be dismissed with the remark that the writer has no time or use for the notion of metaphysical thinking. In actual fact, it is impossible to think seriously without taking a metaphysical stance, since this simply means adopting a

world-view. We think metaphysics as naturally and inevitably as we speak prose. The physical reductionist who claims that there is nothing but matter and energy, and no truth but the truth of science, is making a metaphysical statement as clearly as someone who looks at the world from a theistic perspective. The reductionists have not derived their belief from science alone. Everyone, implicitly or explicitly, has a metaphysics.

Scientism is the metaphysical belief that science tells us all that can be known or is worth knowing. It must clearly be distinguished from science itself which, owing to its intrinsic limitation to only a certain kind of encounter with reality, is far from being in a position to make such an overblown claim for its explanatory power. Science has bracketed out too much (meaning, purpose, beauty) from its consideration for it to be the universal source of understanding.

Every metaphysical scheme has to rest on a defining basis, which is not itself explained, but which is assumed as the foundation for the subsequent explanations that flow from it. In the tradition of Western thought, there are, broadly speaking, two choices for this foundational assumption. One takes as its assumed basis the brute fact of the properties of matter; the assumed basis of the other is the brute fact of the existence of a divine Agent or Creator. The first choice corresponds to materialism; the second choice corresponds to theism. Each choice has to defend itself by seeking to show that it provides the most economic, coherent, adequately comprehensive and intellectually satisfying understanding of the rich range of human experience of reality. In neither case can there be a claim to attain indubitable proof of the point of view adopted, but instead warrant must be sought by seeking to show that this metaphysical perspective affords access to the 'best expla-

nation' of the nature of reality, a claim to be assessed in terms of the achievement of economy, naturalness of explanation and full adequacy to experience.

Theology practised in this metaphysical mode is often called philosophical theology, in contrast to a more narrowly defined reflection focused on religious experience and insight, which is called systematic theology. Science and systematic theology are both first-order disciplines, engaging with the specific dimensions of the human experience of encounter with reality that are their defining concerns, and seeking to respond to the questions that arise from these concerns. Philosophical theology is a second-order project, metaphysical in character, aiming to articulate a comprehensive world-view. In that role, it has to take seriously the insights of all the first-order disciplines, without pretending that it is in a position to exercise a right of correction over the conclusions that each has reached in its proper domain. The task of philosophical theology is to take these conclusions and incorporate them in an account that affords the widest and most profound context of truthful understanding, based on belief in the existence of God.

A positive evaluation of the interaction of science and theology will aim at exhibiting a consonant relationship between the two, expressed through a theistic metaphysics. The resulting view of reality will take a form significantly shaped by the content of the relevant theological component and I have suggested a taxonomy that reflects this fact.[11] Four broad approaches seem possible. Deism simply sees God as the Great Architect of the universe, the One who ordained its wonderful

11. ST 1.

order but, having set the worlds spinning, then simply left cosmic history to unfold. The stance labelled Theism allows some concept of continuing divine concern and interaction with creation, but it sits comparatively lightly to the specific insights of any particular religious tradition, such as Christianity with its belief in the resurrection of Christ. A Revisionary stance takes tradition seriously, but considers that its insights are likely to need radical modification in the light of modern knowledge. A Developmental stance acknowledges that theological discourse will be influenced by modern discoveries but believes that this can happen in a way that maintains significant continuity with the foundational insights of the past. The discussion that follows offers resources for evaluating these different approaches.