

*Faith,
Science and
Understanding*

JOHN POLKINGHORNE

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fides quaerens intellectum
faith seeking understanding
— St Anselm

Contents

Preface xi

Acknowledgements xvi

I ISSUES

ONE. Theology in the University 3

TWO. Motivations for Belief 27

THREE. The Role of Revelation 52

FOUR. Design in Biology? 66

FIVE. Second Thoughts 78

*1 Critical Realism 78; 2 Quantum Cosmology
and the Anthropic Principle 85; 3 Panentheism 89;
4 Dual Aspect Monism 95; 5 Chaos Theory 99*

II DIVINE AGENCY

SIX. God in Relation to Nature:

Kenotic Creation and Divine Action 105

SEVEN. Natural Science, Temporality and
Divine Action 130

III SIGNIFICANT THINKERS

EIGHT. Contemporaries	155
1 <i>Wolfhart Pannenberg's Engagement with the Natural Sciences</i> 156;	
2 <i>Thomas Torrance's Engagement with the Natural Sciences</i> 173;	
3 <i>Paul Davies' Engagement with Theology</i> 186	
NINE. Science and Theology in England	195
Index	207

Preface

After I had written a trilogy of short books about science and theology, I permitted myself the liberty of writing a subsequent volume, *Reason and Reality*, that enabled me to return to some of the issues then raised in somewhat greater depth. Since then I have written four books that each, in their own particular way, seek to contribute to the presently burgeoning field of science and theology studies: my Gifford Lectures, *Science and Christian Belief* (in the United States, *The Faith of a Physicist*); a survey of the writings of scientist-theologians, *Scientists as Theologians*; my Terry Lectures, *Belief in God in an Age of Science*; and an introductory textbook, *Science and Theology*. I now wish to offer a second ‘further thoughts’ volume, looking again at some of the issues raised in these four books.

The first section of the book is concerned with a number of key issues that arise in the interaction between science and theology. Its underlying basis is the conviction that both disciplines have things of value to say to each other because both, in their differing domains of experience, are concerned with

PREFACE

the search for truth attained by the formation and evaluation of motivated beliefs.

The invitation to give the Firth Lectures at the University of Nottingham gave me the opportunity to reflect on the place of theology in the university. What I said then is the basis for the first two chapters of this book. In chapter 1, I defend the concepts of the value of knowledge for knowledge's sake and of the essential unity of knowledge. I believe these to be the foundations on which the life of a university is built. If theology does not make its own distinctive contribution to this intellectual endeavour, the enterprise of higher education is incomplete. In the course of an open search for understanding, the personal and subjective elements of human experience must be accorded equal weight with the impersonal and objective aspects which constitute science's self-limited domain of enquiry. In chapter 2, I draw upon science's success in its own task, to give encouragement both to the due recognition of an inescapable degree of precariousness present in all forms of human search for knowledge, and also to resist succumbing to epistemological despair. Theology's appeal to revelation is seen as being recourse to illuminating experience, analogous to science's recourse to observation and experiment, and not an appeal to some ineffable and unquestionable authority.

In chapter 3, I further look at the role of revelation in religion, so often felt by enquiring scientists to constitute a stumbling block for them. The particular and unique has a necessary significance in the realm of the personal and transpersonal. Scripture is the record of remarkable individual encounters with the divine, but it is neither uniform in its character nor immune from critical evaluation. It is to be read as evidence for the way in which God has made the divine

PREFACE

nature known, and not as a textbook in which God has provided ready-made answers for our unquestioning acceptance.

Among contemporary scientists, biologists tend to be much more sceptical of religion, and indeed often hostile to it, than are many physicists. Therefore, it was an unexpected development in the 1990s to see some revival of the discussion of teleological arguments among certain biologists. Chapter 4 gives a concise survey of this activity and an assessment of its possible relevance to theology. Questions of significant interest have certainly been raised, but a cautious view is taken of what metaphysical conclusions might flow from this.

In chapter 5, five short essays are gathered together that reconsider topics that have received considerable recent attention in the interaction between science and theology. First, critical realism is defended in the face of the apparent discontinuity involved in moving from Newton's inverse square law of gravitation to Einstein's geometry of curved space. The conclusion is that it is only at the level of the fundamental mathematical structures, that underlie physically picturable models, that the degree of continuity of account that realism demands is to be discerned. This recognition reinforces the perception of mathematics as being the fundamental language of physical science. Second, attempts to use quantum cosmology as a device for generating a many-worlds interpretation of anthropic coincidences are shown to be no more than somewhat desperate metaphysical strategies. Third, panentheism is looked at again in the light of a vigorous defence of that concept mounted recently by Philip Clayton. I remain unconvinced, presenting some critiques of Clayton's arguments. In my opinion it remains unclear why one should not be content simply to achieve a balance between divine transcendence and

PREFACE

divine immanence without recourse to doubtful panentheistic language. Fourth, a form of dual-aspect monism is reconsidered in which the material and the mental are complementary to each other. It is supposed that the truths of mathematics are entities existing at the extreme mental pole (just as stones exist at the extreme material pole). This leads to the conclusion that the duality involved is not only mental/material but also being/becoming and everlasting/temporal. Finally, I try yet again to correct certain persistent misunderstandings about my proposals for an ontologically realistic interpretation of chaos theory.

Part 2 of the book is concerned with what was the dominant issue in the science and theology debate in the 1990s: How we may conceive of divine agency in a way that respects the integrity of the scientific account of the process of the physical world and which also does justice to the religious intuition and experience of God's providential interaction within history?

Chapter 6 provides an overview of the issues. There are two novel features in the discussion here presented. One is the employment of a typology of attitudes to nature, first presented by the historian of ideas R. G. Collingwood. The other is a putting into question the traditional theological assumption that God should never be considered as acting as a cause among causes. I suggest that divine self-limitation, implied in the act of allowing the being of the creaturely other, can be held to extend to the divine condescension involved in providential action functioning as a cause among the causes of the world. A key theological concept in this discussion is the idea that the act of creation was an act of divine kenosis, a volun-

PREFACE

tary limitation accepted by God as the necessary consequence of the divine love allowing the creation truly to be itself.

In chapter 7, I discuss the nature of time as a means of exploring how one might propose different chains of allogical linkings together of scientific, metaphysical and theological ideas, in certain clusters of natural association. This chapter makes the greatest technical demands upon the reader, though I have reduced these demands to the minimum that is compatible with a careful treatment of the issues. Because science does not determine metascience, though it certainly constrains it, several different schemes are explored and evaluated in the chapter.

Part 3 concentrates on the contributions that a variety of significant thinkers have made to the interaction between science and theology.

In *Scientists as Theologians* I discussed the work of three contemporary scientist-theologians. In chapter 8, I extend this survey by considering the work of two theologians, Wolfhart Pannenberg and Thomas Torrance, who have taken a serious interest in scientific matters, and the work of a scientist, Paul Davies, who, though standing outside any religious tradition, has nevertheless shown considerable interest in the possibilities of theistic explanation.

Discussing the relationship between science and theology has been a preoccupation of the English. My final chapter reviews this long history, stretching over several centuries, finding it to be anchored in a national tendency to move from experience to understanding, of a kind that I have labelled 'bottom-up thinking'.

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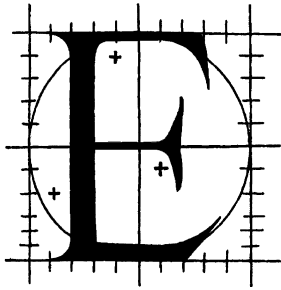
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Part I

ISSUES

CHAPTER ONE

Theology in the University



VER since their origins in the late Middle Ages, universities have been sources of trained personnel apt for the service of the community, whether by providing clerks for the Royal Court or canon lawyers for the service of the Church. Advances in scientific technology, which have done so much to define the context of our life today, have only broadened and intensified the importance of this role. I believe that the universities can claim significant success in meeting this need. It would, however, be a bad error to mistake a valuable byproduct for the principal object of activity. The essential purpose of a regime of physical exercise and good nutrition is the maintenance of health. If it also produces some excellent football players, that is to be welcomed, but that result is a collateral good rather than the main objective. The essential purpose of a university is the discovery and propagation of knowledge. Many other goods will derive from the fulfilment of that main objective, but their

continuance depends, in the long run, upon not losing sight of the central aim. I state very clearly my belief in the value of knowledge for knowledge's sake, together with my belief in the essential unity of all knowledge. Universities are the institutionalised expressions of these beliefs.

I became very aware of these issues in the late 1970s when I was briefly Chairman of the Nuclear Physics Board of what was then called the Science Research Council (SRC). It was my job to ask the British taxpayer, through SRC, for the £40 million or so necessary to finance our national contribution to the international field of research into the fundamental structure of matter. Then, as always, money was short and the arguments between the different sciences seeking their share of what was available, correspondingly intense. We particle physicists were studying the behaviour of matter in extreme regimes that were far removed from circumstances relevant to everyday technology. In fact, that was the source of much of the expense, since such unusual states of matter could be created only in accelerators costing hundreds of millions of pounds to build and tens of millions of pounds per year to run. These machines were too expensive for any single European nation to construct and maintain on their own, but we belonged to CERN, the international consortium that ran this activity in Europe. Developing precision engineering on kilometre scales, and control devices with nanosecond response times, certainly generated remarkable technical advances that would find application outside the particle physicists' specialised field of use. Many talented young people served their scientific apprenticeship within our community, and most of them subsequently went on to use the skills they had acquired

in a variety of totally different contexts. In terms of spin-off, there was much that could be said for particle physics. But when the chips were finally down, when the last round of argument was in progress about whether it was to be £40 million or only 35, there was just one central honest argument to be used in our cause. It was that to understand the fundamental structure of the matter of the universe, to unravel the mysteries of quarks and gluons, was in itself a worthwhile thing to do, a high human achievement that did not need to find its justification outside itself. It was a case of knowledge for knowledge's sake.

Arguing in such terms cut ice with my scientific colleagues on SRC because the argument is fundamental to the whole practice of natural science, whether it be physical, biological or psychological enquiry. The prime motivation of science lies in the desire to understand the physical world. Contrary to the priorities stated by Karl Marx, scientists give first place to science's power to understand the world, even over technology's power to change it.

Arguing in such terms would have cut ice with theologians also, had they been sitting round the table at SRC. They too are concerned with the search for understanding—though of a more profound Mystery than that of quarks and gluons. Theology has a natural role in an age of science just because it shares with modern science this quest for intelligibility. A theological faculty is a necessary presence in a true university because the search for knowledge is incomplete if it does not include in its aim gaining knowledge of the Creator as well as gaining knowledge of creatures. The unity of knowledge is fractured if theology is excluded. Before I attempt to justify

these large claims, it will be helpful to look more closely at the scientific sector of this universal quest for truthful understanding.

The first thing we can learn is the distinction between understanding, on the one hand, and the lesser attainment of explanation, on the other. Quantum theory makes the point most clearly for us. In its modern form it was discovered in the mid 1920s. Since then its techniques have been used daily in many branches of physical science with impressive success. It explains the nature of chemical reactions, the properties of materials, the way the Sun shines. We know how to do the sums and they always seem to come out right. Invented to deal with atoms, quantum theory now makes successful predictions about the behaviour of quarks, which are at least a hundred million times smaller than atoms. At the level of explanation and prediction, it is, perhaps, the most successful scientific theory ever. Yet we do not *understand* it. By that I mean that we are not in a position to feel intellectually content about it, to reckon that we see how it constitutes a totally satisfactory matrix of understanding, whose intrinsic nature and inner consistency we are able to grasp. The problem does not lie in the strangeness of quantum phenomena viewed from our everyday perspective, with their probabilistic character and the unpicturable behaviour in which an entity sometimes appears to show wavelike properties and sometimes appears to show particlelike properties. All that may seem very odd to the commonsense mind, but we have come to see how quantum thinking has to deviate from everyday thinking if it is to accommodate these unexpected possibilities. Once we have grasped that, these counterintuitive properties yield themselves up to being understood in terms of a modified quan-

tum form of intuition. One way of dealing with these seeming perplexities is to recognise that in the quantum world those little logical words ‘and’ and ‘or’ have different properties to those that they possess in everyday discourse. It turns out that quantum mechanically, you can mix together possibilities, like ‘being here’ and ‘being there’, that we normally think of as being mutually exclusive of each other. The quantum mechanically learned follow their master, Paul Dirac, in calling this the ‘superposition principle’.¹

All that may sound pretty weird, but if you trust what I have said, you can draw from it a useful moral about how to pursue the quest for understanding: ‘Do not make common sense the measure of everything but be prepared to recognise aspects of reality in those modes that are intrinsic to their natures, however strange these modes may at first sight seem to be’. There is not one single, simple way in which we can know everything; there is no universal epistemology. We know the everyday world in one way, in its Newtonian clarity; we know the quantum world in another way, in its Heisenbergian uncertainty. Our knowledge of entities must be allowed to conform to the way in which they actually can be known. If we are to meet reality at all, we must meet it on its own terms. If that is a lesson applying to our knowledge of the quantum world, it would not be altogether surprising if it were a principle that also applied to theology’s quest for knowledge of the mystery of God.

Once we have grasped the principle of quantum superposition, it turns out, we are also in a position to understand

1. See, for example, J. C. Polkinghorne, *The Quantum World* (Penguin, 1990).

the strange duality of wave and particle. Dirac solved this problem through the discovery of quantum field theory. A field is a spread out entity, and so has wave properties, but stirring in quantum theory also produces countable packets of energy (quanta, in fact!), so that there are particle properties as well. The wavelike states are superpositions of states with different numbers of particles, an option impossible in a Newtonian world (where you simply count however many particles you have, and that's that), but perfectly natural in the quantum world.

However, there are other aspects of quantum mechanics that continue to resist our understanding more than seventy years after the theory's original discovery. The most perplexing of these is called 'the measurement problem'. The theory predicts probabilities for various possible outcomes only when a measurement is made on a quantum system. Yet each time such a measurement is actually made, one of these possibilities emerges as the unequivocal result of the experimental observation. How does this definite answer come about? One might attempt to rephrase the question, as Niels Bohr essentially did, by asking, How does the cloudy and fitful quantum world interlock with the clear and determined world of laboratory equipment? Yet, putting the issue in that form is really begging the question, for there are not two worlds—quantum and laboratory—but one single physical world of which both are aspects. It is humiliating for a quantum physicist to have to admit that currently there is no satisfactory and agreed solution to the measurement problem—a particularly troublesome confession given the fundamental role of measurement in the whole of physics. There is clearly more still to be understood. Another difficulty makes a similar point.

The two great fundamental discoveries of physical science in this century have been quantum theory and the general theory of relativity, which is Einstein's profoundly beautiful and successful account of gravitation. Yet these two theories are imperfectly reconciled with each other. Every attempt so far to combine them has come to grief through the generation of infinite inconsistencies. Most of the time, the problem can be ignored. General relativity is mostly applied to large systems, including the universe itself. Quantum theory is concerned with small-scale behaviour. The normal fields of application of the two theories are thus well separated from each other. However, not only must two such fundamental physical theories eventually find a satisfactory merger for reasons of principle but also those cosmologists, like Stephen Hawking, who are bold enough to talk about the extremely early universe must make some sort of shift at combining them. This is because the cosmos is then so small that it must be treated in a quantum mechanical way. The dazzling speculations with which the quantum cosmologists regale us in their popular books are intellectual arabesques performed on extremely thin theoretical ice. Here is another area of physical science in which understanding is still lacking and where it is much needed.

There is something further we can learn from science's quest for understanding. It is the multi-levelled complexity of reality. The Holy Grail of contemporary particle physics is the so-called Grand Unified Theory (GUT) in which all the fundamental forces of nature might be unified in a description based on a single set of equations—equations so compact that they could be written on your T-shirt, and so beautiful that they would make an intellectually thrilling adornment. So far,

the quest, though actively pursued by many very able people, has not succeeded. I certainly wish it well and entertain hopes of its eventual success. However, I begin to dissent when some of my erstwhile colleagues go on in a grandiose way to rename the putative Grand Unified Theory, a ‘Theory of Everything’. For that to be true it would be necessary that we had attained a remarkable degree of universal understanding, and that criterion would not even be satisfied within physics itself. A GUT would be an immensely satisfying intellectual discovery but many, many physical phenomena of the highest interest—such as the turbulent motion of fluids, the superconducting properties of metals and the thermodynamic properties of bulk matter—would lie far outside its explanatory range. Conceptually, as well as methodologically, physics cannot be reduced to particle physics. The imperialist claims of a Theory of Everything that asserts it has all within its grasp are no more realistic within physics than are the imperialistic claims of physics outside itself to have all of biology or psychology within its grasp. In turn, it is even less true that science encompasses all that is attainable or significant in the universal quest for understanding.

Galileo encouraged concentration on the primary quantities of matter and motion and a discounting of those secondary qualities, such as colour, that are directly accessible through human perception. Explanations of change were expressed in terms of the mechanical consequences of efficient causes and not in terms of the teleological action of final causes. There is no contesting the brilliant success of this narrow methodological strategy. Limiting the field of view brought into sharp focus certain kinds of phenomena which then yielded up their secrets to the investigating scientist.

Newton's laws of motion and the universal inverse square law of gravity provided a profound, though ultimately (as it turned out) only approximate, understanding of the nature of the solar system. Yet to believe that what had been omitted in order to make these gains had thereby been shown to be insignificant or peripheral would, from the point of view of an adequate understanding of reality, be an altogether unwarranted conclusion. It would amount to mistaking Mr Gradgrind's definition of a horse—'quadruped, graminivorous, forty teeth, namely twenty-four grinders, four eye teeth and twelve incisive' and so on—for a living animal. A. N. Whitehead would have called it 'the fallacy of misplaced concreteness'.

Let us come straight to the point. A central question is the significance to be assigned to personhood in forming a credible and adequate account of reality. By a person I mean at least this: a self-conscious being, able to use the future tense in anticipation, hope and dread; able to perceive meaning and to assign value; able to respond to beauty and to the call of moral duty; able to love other persons, even to the point of self-sacrifice. To this I would also wish to add an explicit religious dimension arising from the sense of a Reality beyond oneself, without whose gracious sustaining power life is incomplete, a Reality which is the ground of value and being and to whom the proper response is worship and obedience. I believe that we all know ourselves to be persons, even if we do not all wish to label as 'religious' certain aspects of our experience of personhood. Then the question is, What do we make of this phenomenon of personhood? Is the appearance of persons here on planet Earth (and, for all we know, maybe on many other planets elsewhere in the universe) an event of prime significance for the understanding of what is going on,

or is it just a curious byproduct of the physiology of certain kinds of animals, so that it is more complicated than, but no more meaningful than, the fact that some animals can digest grass and some cannot? Are we to believe that some animals are self-conscious and some are not, and that's that? To take so dismissive and epiphenomenal a view of personhood seems to be tantamount to denying that there are any meaningful events in cosmic history at all. I cannot conceive of an occurrence in the universe's evolutionary development that is more astonishing and fraught with signs of fruitful significance than that it should have become aware of itself through the coming to be of humanity. Pascal spoke of us as 'thinking reeds', so insignificant on a cosmic scale but yet exceeding all the stars, since we know them and ourselves, and they know nothing. The mystery of consciousness must surely be a deep clue to the mystery of reality. A small but important aspect of this coming-to-be of cosmic awareness is that it permitted the development of science. It is strange, therefore, that some scientists seem to repudiate the insights of consciousness, preferring instead to remain set in the misplaced concreteness of a world of atoms and the void.

If the event of the evolution of persons is a profound pointer to the nature of reality, then science's deliberately chosen self-restriction to impersonally describable phenomena may be methodologically effective but it is metaphysically jejune. The search for understanding will have to be widened to a very considerable degree beyond the limits of purely scientific discourse. In doing so we shall have to learn to discard some intellectual restrictive practices that have been encouraged by that Enlightenment style of thinking of which we are all, to some extent, the heirs. The impersonal is not to

be given precedence over the personal, or the quantitative over the qualitative, for they are simply differing aspects of our encounter with a reality whose character is complex and multi-dimensional and whose different levels can be known only in ways that conform to their distinctive natures. Our study of the experience of doing science has prepared us for such a possibility, with its recognition of the limited role of a reductionist particle physics within the totality of scientific understanding. Reality is too rich to be taken in at a single glance; it must be viewed from many perspectives.

If it is true that the evolution of persons is of prime significance, then it is also true that the personally perceived qualities of reality must be expected to carry a corresponding prime significance. All personal perceptions are, to use a phrase of Thomas Nagel's, 'views from somewhere'.² A person has a perspective on the world, with the opportunities for insight and the dangers of deception that every perspective confers. Of course, the same is true of the scientists' perceptions of what they choose to look at, for scientists are persons and I shall argue in the next chapter that this fact is fundamental to the whole scientific enterprise and to its success. Yet the differing perspectives involved in the practice of science are usually rather easily superposed and reconciled—intersubjectively agreed, as we say—with the consequence that the resulting construct has the air of a 'view from nowhere'; it has the air of an 'objective account'.

Once we move on to consider more deeply personal encounters with reality—the perception of beauty, for example—the situation no longer seems so straightforward. There are

2. T. Nagel, *The View from Nowhere* (Oxford University Press, 1986).

differing degrees of individual sensitivity and there are cultural contexts that shape and constrain the reactions of the perceivers. The inexhaustible richness of great art evokes different responses in different people, so that its perception is always a view from somewhere, a personal response. Yet, it seems that there is a sufficient degree of commonality within this range of idiosyncrasy to persuade us that the perception of beauty is an encounter with the way things are, that aesthetic experience offers us a window into reality. This window has its frame—we can only see certain wavelengths of light, hear certain sound frequencies—but it appears that, nevertheless, the opening is wide enough for access to something of great significance. In the search for understanding we must take account of the mysterious fact that the matter of the world, which in the impersonal terms of science has a behaviour that can be described with the crystal clarity of mathematics, is also the carrier of beauty, conveying a personal experience of symbolic power that evades all attempts to reduce it to a restricted and specifiable content, for it always overflows with surplus meaning. If you want to make a materialist reductionist uneasy, ask one what he or she makes of music, and insist on a response that corresponds to the actual way one lives and not to an ideologically glossed version of it. ‘Neurological response to vibrations in the air’, seems totally inadequate as an account of listening to a performance of the Mass in B Minor.

There are other windows into the multi-levelled character of the world, in addition to science and aesthetics, that afford us insights that must be taken into account in an adequate mapping of the domain of reality. One of the most important is provided by our intuitions of morality. Nowhere is the pov-

erty of a scientific approach more evident than in the realm of ethical decision.

It has been my privilege to serve on a number of government-appointed committees charged with making recommendations about ethical codes of practice. Often I have been in the chair. The problems we were given to consider derived from advances in medicine and in genetics, areas in which I do not have expert knowledge. Of course, some of my colleagues on these committees were leaders in these fields and we always sought and received opinions and advice from relevant professional bodies and from individual experts. A great weight of scientific evidence was thus accumulated and the fact that I know from the inside how scientists tend to think was helpful to me in evaluating it, even if the technical details were, inevitably, often beyond me. We needed all the understanding we could acquire of the scientific concepts and techniques involved, and of the practical possibilities and their likely consequences, in order to help us in our deliberations. Knowledge is a much better basis for recommendations than ignorance. Yet purely scientific information could not settle the ethical issues. A different kind of insight and understanding was then required. In the search for wisdom in this area, I and my other non-technical colleagues on the committee could contribute on at least equal terms with the scientifically expert members. I say 'at least', because the fact that we were not caught up in the immediate excitement of technical discovery may have given us a degree of helpful detachment, enabling us to recognise that not everything that can be done necessarily should be done, however scientifically remarkable it might be. In these ethical discussions we were no longer a committee

of two kinds, experts and non-experts, but a committee of a single kind, a committee of persons, of moral beings in search of wise conclusions.

The universe, composed as it is of quarks and gluons and electrons, is also the carrier of beauty and the arena of moral decision. With the dawning of self-consciousness, not only did there come into being 'thinking reeds' but there also came to be what we might call 'joyful reeds', which perceived and responded to beauty, and 'moral reeds', which acknowledged and obeyed ethical imperatives. Not only do I defend the significance of these different layers of our personal experience, but I also defend their autonomy. I deny that one is basic and the rest are derivable from it. It is the moral imperative that has been subject to the most determined reductionist onslaught in this respect.

Anthropologists draw our attention to the many cultural variations of ethical rules. Of course, we should acknowledge this and take account of it. However, I cannot believe that a morally repellant act, such as the ethnic cleansing of despised minorities through acts of genocide, is properly viewed as being just one conventional choice for the way in which a society might decide to handle its problems. Such evil deeds are not cultural customs but they are absolutely wrong. Sociobiologists of a fairly extreme kind may assure us that what seem to be our moral intuitions are, in fact, genetically imprinted survival strategies. But evolutionary biologists are persons, too, and such a morally reductionist stance is almost impossible to maintain outside the study or the laboratory. In a way, Richard Dawkins is frank about this. He concludes *The Selfish Gene* by saying, 'We are built as gene machines and cultured as meme machines, but we have the power to turn

against our creators. We, alone on earth, can rebel against the tyranny of the selfish replicators'.³ It seems a pity that Dawkins did not go on to ask not only where does this power come from but also what is the source of our urge to exercise it? If he had done so, he might well have concluded that 'person' was a better description for a human being than either 'gene machine' or 'meme machine'.

I believe that there is a further level of experience involved in personhood, widely attested to and of great significance. It is connected with a recognition of human finitude and also with the intuition of an infinite Reality beyond the community of humankind. Death is perhaps one of the most direct ways in which to broach the issue. In one sense, there could be no more obvious illustration of limitation and transience than the thought that death comes to all. 'Golden lads and lasses must, as chimney sweepers, come to dust'. Mortality is universal, for death affects not only human beings and animals but also, on immensely longer timescales, there will be the demise of the Sun and eventually that of the universe itself. Against these sombre facts, however, there is another fact to be set: that deep in the human heart there is an intuition of hope, a belief that the word of death, though certainly spoken, is not the last word. The burial customs of our Neanderthal ancestors suggest that they expected some kind of destiny beyond death. That hope has continued widespread among humankind, though articulated in a great variety of different ways. Some will see this as just a comforting illusion, a strategy diverting attention from the stern fact of individual annihilation, but I do not accept this quick dismissal. For one thing,

3. R. Dawkins, *The Selfish Gene* (Oxford University Press, 1976), 215.

notions of postmortem judgement do not altogether look like dreams of wish fulfilment. If indeed there is a ground for such hope, it can lie only outside the domain of reality directly apprehended by us in this world of transience. If there is a destiny for the finite beyond their finitude, it must surely lie in an infinite and continuing reality. To appropriate a phrase of Thomas Aquinas, that would be a reality ‘that all call God’.

Many things could be said about this essentially religious level of experience. Of course, I would want to say them from a Christian perspective, informed by the insights of scripture and of the Church. The hope of a destiny beyond death would then be addressed in terms of the revealed faithfulness of the God of steadfast love and in the light of the resurrection of Jesus Christ. I discussed such issues in my Gifford Lectures⁴ and it is not my purpose to repeat that material here. On this occasion I am not attempting either to adjudicate or to persuade in relation to specific theological understandings. Instead, I simply argue that an adequate account of personal experience, either in respect of individuals or in respect of the history of the world, cannot neglect the level of encounter with reality that broadly can be labelled ‘religious’. A somewhat regional way of recognising this would be to note how much of the history of Western civilisation is unintelligible without an understanding of the Judaeo-Christian tradition, which permeates its art and culture and informs and shapes its ideas. A number of historians⁵ have claimed that even the

4. J. C. Polkinghorne, published as *Science and Christian Belief* and *The Faith of a Physicist* (London: SPCK; Princeton: Princeton University Press, 1994).

5. For example, S. Jaki, *The Road of Science and the Ways to God* (Scottish Academic Press, 1978); C. A. Russell, *Cross-Currents* (IVP, 1986).

rise of modern science in seventeenth-century Europe needs as part of its understanding a recognition of the influence of a theological doctrine of creation that affirmed the worth of that creation and emphasised the freely chosen character of the rationality with which the Creator had endowed it. This implied that there was indeed an order to be found in the physical world, but one that could be discovered only by looking and seeing what God had actually chosen to do. The Greek reliance on the power of reason was insufficient; it needed to be supplemented by the insights yielded by experimental observation.

One of the roles of theology in any age is the intellectual study of the religious dimension of personal experience. As with all academic disciplines, that study must be open and honest, prepared to conform to the discovered nature of reality and not shackled by prior prescription of what are the acceptable outcomes of the enquiry. Thus atheism is a possible theological option, provided it arises from consideration of the evidence and not from a preemptive narrowness of prior view. There is a vast—and one must confess, perplexingly varied—body of human testimony down the ages that provides the raw material for this theological quest for understanding. If the religious aspect of personhood has the significance that I believe is rightly attributed to it, then theological study is an indispensable component of the search for understanding, in a scientific age as much as in any other. I say again, a theological faculty is a necessary part of a university.

To speak of theology in this way is to speak of it as a first-order discipline of enquiry, taking its place alongside science's investigation of the physical world or moral philosophy's in-

vestigations of the nature of ethical decision. However, there is a further important role for theology to play, as a second-order reflection upon the whole of human knowledge. To seek to speak of God is to seek to speak of the One who is the ground of all that is. Such discourse, which we might call theological metaphysics, must take account of the first-order insights of science, aesthetics, morality and also, of course, of theology itself in its first-order mode of particular investigation into the understanding and significance of religious experience. Theological metaphysics must respect the integrity of these primary disciplines. It is not its role to instruct them or to correct their conclusions, but to listen to what they have to say about their individual fields of study. The aim of theological metaphysics is the integration of these partial perspectives, afforded by the first-order disciplines, into a single consistent and coherent account of reality. Thereby it seeks to provide a more profound and comprehensive understanding than could be acquired through any single primary mode on its own.

Any scheme of this all-embracing kind has to be based on its chosen and defining explanatory principle, the justification for which must lie in the intelligibility of the resulting account of reality. 'Nothing comes of nothing', and no metaphysics can function without its assumed, and thus unexplained, ground of explanation. *Theological* metaphysics is based on the belief that the will of a self-subsistent divine Agent is the true explanatory principle. If personhood and its qualities have the significance that has been suggested in the course of this chapter, a transpersonal God is surely the more fitting basis for the search for universal understanding than

the impersonal power of matter that David Hume and other proponents of physical reductionism recommend to us.

Theological metaphysics naturally accommodates the multi-layered character of reality that we have been considering. Science has many things to tell us. It investigates a physical world whose wonderful order is transparent to our investigation and whose fruitful processes are increasingly understood in terms of an intertwining of order and openness. That world is no piece of cosmic clockwork, for the twentieth century has seen the death of a merely mechanical view of the universe. Both quantum theory and chaos theory portray a more subtle, and I believe more supple, structure than that. In fundamental physics it is an actual technique to seek theories whose expression is in terms of equations endowed with the unmistakable character of mathematical beauty. This is no mere exercise of aesthetic preference, because the experience of three centuries of doing theoretical physics indicates that it is precisely such economic and elegant theories that also exhibit a long-term fruitfulness that is convincing support for the belief that they are verisimilitudinous approximations to physical reality. The more we understand the history of the evolution of life, including the ten-billion-year prehistory in which the necessary chemical elements were being formed in the interior nuclear furnaces of first generation stars, the more we see that the potentiality for this happening had to be present from the start, built into the laws of nature which must take a very precise, 'finely tuned' form if they are to sustain the delicate chain of process that links an expanding ball of energy (the universe post big bang) to the inhabited Earth of today. (I am referring, of course, to the remarkable and unexpected collection

of scientific insights that go under the name of the Anthropic Principle.⁶) These are the kinds of things that have become known through scientific discovery.

One might sum it up by saying that we live in a universe whose rational beauty makes it seem a world shot through with signs of mind and that from the beginning was pregnant with the possibility of carbon-based life. That is what science says but, of itself, it can say no more. Yet, if we are people endowed with a thirst for the kind of intellectual satisfaction that comes from gaining understanding through and through, it does not seem sufficient just to treat these remarkable properties as happy accidents. They surely signal the need for a deeper form of intelligibility, going beyond the scientific.

Theological metaphysics can offer us that more profound understanding. The wonderful order of the world is perceived by it as being a reflection of the Mind of the Creator, and the universe's finely tuned aptness to the evolution of life is perceived as an expression of the Creator's fruitful intent. In its turn, theological metaphysics can receive from science important help with one of its most difficult perplexities: the existence of suffering, so widespread in a creation claimed by first-order theology to be good. Science is increasingly aware of the interconnectedness of the processes of the physical world. If some cells are to mutate and produce new forms of life, then other cells will possibly mutate also, but with malignancy the inevitable consequence in their case. The presence of cancer in creation is not due to the Creator's callousness or incompetence; it is the necessary cost of the evolving complexity

6. J. D. Barrow and F. J. Tipler, *The Anthropic Cosmological Principle* (Oxford University Press, 1986); J. Leslie *Universes* (Routledge, 1989).

of life. The whole evolutionary process itself can be understood theologically as the Creator's gift to creation of a due independence, so that it is allowed to explore and realise in its own way the fertility with which it has been endowed. This idea—that an evolutionary universe is a creation 'allowed to make itself'—was part of the immediate Christian reaction to the publication of *The Origin of Species*, being expressed by such clergymen as Charles Kingsley and Frederick Temple. The notion that the Church was unanimous in an obscurantist rejection of Darwin in 1859 is as ignorant and incorrect as is also the belief that the scientific community was unanimous in welcoming him. The black-and-white accounts of those intellectually tempestuous times, so assiduously propagated in the media and in certain kinds of popular scientific writing, are just not true.

I have argued that human appreciations of beauty constitute another level in our encounter with reality, as do our moral convictions and our religious experiences, including those intuitions of hope that arise despite the apparent fact of finitude and transience. In my opinion, no metaphysical scheme that dismisses these aspects of personhood as incidental epiphenomena would be doing justice to the richness of reality. Equally, no metaphysical scheme would be adequate that did not seek to provide an integrated understanding of this multi-levelled encounter with the way things are. How does it come about that the same sequence of events can be a set of physical happenings, yet also the carriers of beauty, moments of moral challenge and decision, opportunities for awareness of the presence of God? For many worshippers, a church service will have all these characteristics and it could not properly be described without taking them all into ac-

count. A theistic point of view makes this plenitude of experience intelligible. Just as science's insights of order and potentiality can be understood in the light of the divine Mind and Purpose, so our experiences of beauty can be understood as a sharing in the Creator's joy in creation, our moral intuitions as intimations of God's good and perfect will, our worshipful experiences as discernments of the divine presence, and our hopeful aspirations as grounded in God's unchanging fidelity.

My argument has been based on two assumptions, both of which are congenial to a scientist, so that they ought to find ready acceptance in a scientific age. One is that in forming our account of reality we should be open to all aspects of our encounter with it. Tidy schemes, produced by selective oversimplification and resulting in a neglect of part of the data, are not of any value. Within science itself, this principle meant that in the early years of the twentieth century the physicists had to acknowledge that they had detected both wavelike and particlelike properties in the behaviour of light, however difficult it was to comprehend how these apparently conflicting characteristics could be reconciled with each other. It was an intellectually uncomfortable situation to be in, but ultimately the policy of experiential honesty led to the most profound and exciting discovery about the properties of matter made since the days of Newton. In the wider domain of metaphysical enquiry, the same principle requires us to take seriously all aspects of our experience and to refrain from reaching easy but worthless conclusions by exalting the objective over the subjective, the repeatable over the unique, the impersonal over the personal.

The second presumption is that we live in a cosmos, not a chaos, so that the world makes total sense. In other words,

there is indeed a Theory of Everything, but a theory that is much grander and more comprehensive and intellectually satisfying than any Grand Unified Theory of particle physics could ever be. I have been suggesting that the name of that Theory is Theology, that the world makes total sense because it is a creation, the unified expression of the Mind and Will of its Creator. In short, I believe that the search for understanding through and through, if pursued with total openness and honesty, will in the end be found to be the search for God.

That total intelligibility, as far as we are able to glimpse it, must yield not just a contemporary intelligibility, but it must embrace the whole sweep of cosmic history, both past and yet to come. The universe, as cosmologists know it today and extrapolate it into the future, will end in cosmic death, either through collapse or through decay. That recognition seemed to the distinguished theoretical physicist Steven Weinberg to confirm him in his atheism. At the end of his book *The First Three Minutes*, he wrote, ‘The more the universe seems comprehensible, the more it also seems pointless’.⁷ Weinberg is moved by science’s discernment of the rational beauty of the universe but he sees ‘futility’ written all over its mortal fabric.

There are two ways in which to seek to resolve this tension between science’s account of a present universe of wonderful order and cosmology’s well-founded prognostications of an ending in eventual chaos. One is the stance of heroic atheism in which humanity defies the meaninglessness with which it is surrounded. Weinberg goes on to express this attitude when he says, ‘The effort to understand the universe is one of the very few things that lifts human life a little above the

7. S. Weinberg, *The First Three Minutes* (A Deutsch, 1977), 149.

level of farce and gives it some of the grace of tragedy'.⁸ There is a stoic nobility in this stance which I respect, but I believe that it is mistaken. Instead, I choose the theistic resolution of the dilemma posed by cosmic futility, believing that, though the universe will die on a timescale of tens of billions of years, just as you and I will die on a timescale of tens of years, yet we and it have a true hope of a destiny beyond our deaths, assured to us by the faithfulness of the Creator. Theistic metaphysics offers an understanding that embraces the fact of mortality but sets it within the context of a divinely grounded expectation of fulfilment nevertheless. In Christian terms, this hope stems from the resurrection of Christ seen, as Paul understood it, as being the seed of a new creation which is the redemption of the old creation's mortality.

I started this chapter with two assertions fundamental to the life of a university—namely, the value of knowledge for knowledge's sake and a belief in the ultimate unity of all knowledge. Just as the university system of Western Europe historically originated in the setting of the Church's encouragement of learning, so these two foundations of our contemporary life of learning are undergirded by the insights of theological metaphysics. Knowledge is of value because it is the exploration of a created reality, itself given value by the love of its Creator. Knowledge is one because God is one, so that our encounter is with a created unity. The search for understanding is fundamental to our being human, an expression, whether acknowledged as such or not, of a profound obligation to seek for and to honour the Creator.

8. *Ibid.*