SPIRITUAL GROWTH AND THE SCIENTIFIC QUEST

By JOHN POLKINGHORNE

THE PRACTICE OF SCIENCE, like any other worthwhile activity, involves a good deal of wearying routine and dispiriting frustration which comes when yesterday's good idea proves to be today's misconception. So why do we do it? The driving force of fundamental science is the search for truth, the desire to understand. The reward of fundamental science is the sense of wonder at the marvellous pattern of the physical world revealed to our inquiry. For most of us that revelatory insight will come, not from our own modest discoveries (satisfying though these can be), but from our sharing in the enlightenment which comes to the scientific community through the great achievements of the men and women of genius. For a theoretical physicist like myself this profound intellectual satisfaction finds its focus in the economic and elegant equations which form the basis of our understanding of the laws of nature. The consequent combination of mathematical beauty and empirical adequacy testifies to a universe characterized by a deep rationality. It is hard to convey this feeling to those outside the discipline, but Dirac's relativistic equation of the electron and Einstein's equations of general relativity have about them a quality which makes them carriers of disclosure and objects of contemplation.

A different kind of deep satisfaction arises from the insight that underlying simplicity is so structured that it is capable of sustaining fruitful complexity. When I first began to read about how the discoveries of molecular biology afford some preliminary understanding of how complex replicating macromolecules could be the basis of coming-to-be of life, I was greatly excited. The chemical basis of the behaviour of such molecules derives from simple physics (electromagnetism and quantum mechanics), whose fundamental equations I could literally write on the back of an envelope. The thought that these compact equations could have consequences, through the exploratory and sifting processes of evolution, which led to you and me, was an idea of the highest significance. It induced in me, not a facile reductionism ('we are nothing but collections of atoms'), but a sense of wonder at the profound potentiality for fruitfulness built into the very fabric of our world. From

the amino acid-rich shallow waters of early Earth have arisen saints and mathematicians.

The search for understanding and the experience of wonder are basically religious experiences, whether recognized as such or not. In that way, the scientific quest is a spiritual experience, made possible by the theological fact that the physical world is creation. I do not want to be too starry-eyed about scientists. Human sinfulness also finds its reflection in their activity, not least in the self-assertive drive for the recognition of priority in discovery, so skilfully and recognizably recorded, for instance, in the frank pages of James Watson's account of the unravelling of the structure of DNA.[1] Yet there is also a certain purity in the quest. Incidents of intellectual theft or falsification are really very rare. The integrity of the scientific world is impressive.

The thoughts I have been articulating are not to be found among the pious alone. Those scientists who stand outside any religious tradition are often profoundly moved by the rational beauty and transparency of the universe.[2] In consequence, we are living in a period of a widespread revival of natural theology, among the physicists at least, if not among the theologians. In my own spiritual life, these insights lead me to give particular attention and value to the Wisdom writers of the Old Testament. It is an astonishing fact that the answer that poor suffering Job receives from the Lord out of the whirlwind is an exhortation to look up at all the mysterious and wonderful things that God is doing in his creation: 'Behold, Behemoth, which I made as I made you' (Job 40,15). In the New Testament, the three great chapters speaking of the Cosmic Christ as the rational ground of all that is (Jn 1; Col 1; Heb 1) are particularly significant. Science, in its way, discerns the *Logos*.

Yet science does not know that the Word was made flesh. My own spiritual life, though enhanced by the intimations of creation brought to me through my scientific experience, is centred on the figure of Christ made known in scripture, the Church and the sacraments. Here the influence of my career as a physicist is oblique, mediated by the habits of thought which, for good or ill, have become natural for me.

The first thing to say is that science does not encourage scepticism as an intellectual strategy. One must be open to the possibility of revision and correction, but to question everything all the time would be scientifically stultifying. All scientific advance requires a degree of intellectual daring in which one goes further than what is demonstrable beyond a peradventure, and so one bets on the value of current theory as a guide to future discovery.[4] Most of the time this is the way progress is made. Of course, occasionally radical change is called for, but scientists find this as painful and difficult as anyone else.

The second thing to say is that science is pursued by a community and within a tradition. Isaac Newton said that if he had seen further than others it was because he had stood on the shoulders of giants. As a scientist I feel no difficulty in recognizing the indispensable role that membership of the Church plays in my Christian life, through present fellowship, the insights of tradition and the inspiring examples of the saints. All have precise parallels in the pursuit of science.

Scientists are by nature bottom-up thinkers. That is to say, their instinct is to start with particularity, with the phenomena to be understood, and to make their way upwards towards general conclusions, rather than beginning with general principles and making their way downwards to specific instances. They know that the physical world is full of surprises—in fact, one of the pleasures of science is its habitual encounter with the unexpected. Scientists are not disposed to make common sense the measure of everything, for once we leave the realm of everyday experience we find that behaviour is often contrary to our expectation. The counter-intuitive, unpicturable world of quantum theory makes the point. Scientists know how limited are the powers of human reason to anticipate the way things actually are, so that their natural question is not 'Is it reasonable?' but 'What makes you think it might be the case?'

In my spiritual life, as I encounter the figure of Jesus Christ in the gospels and in the other New Testament records of foundational Christian experience, I meet with a commanding and mysterious figure whose words contain the promise of a great hope and who can only fittingly be spoken of as a present Lord rather than an historical founding-figure. I find that my understanding of Christ, like that of millions of Christians before me, cannot be contained within human categories alone and that I must make use of divine language in my response to him: 'My Lord and my God!' (Jn 20,28). I do not know how divine infinity and human finitude can be combined in one person, but I know that this is my experience. If the study of science teaches one anything, it is to hold fast to experience, however perplexing that experience may be. When physicists in the early years of this century found that light sometimes behaved as a stream of particles, they would have made no progress by denying that result, embarrassing though it was in the face of the nineteenth-century discovery that, equally undeniably, light sometimes behaved as if composed of waves. They just had to hang on to these paradoxical experiences by the skin of their intellectual teeth until, in Cambridge in 1927, Paul Dirac discovered quantum field theory and thereby made this ambiguous behaviour

intelligible. Christology has not found its Dirac, but it will make no progress by denying either the humanity or the deity of Christ.

Similar considerations apply to an experience which is central to my own spiritual life: the Real Presence of Christ in the Eucharist. That when one obeys the Lord's command to do this in remembrance of him, then he is present in a particular way with the gathered worshippers and their gifts, is a fact of my Christian life. In my view, no satisfying explanation of this sacramental presence has been achieved, but this lack in no way leads me to deny the reality. It would be most 'unscientific' to do so.

Scientists continually ask questions. But they also know that there comes a time when the questioning has to cease. There is a recognizable pattern to the character of much scientific discovery. First one must soak oneself in the problem and all that is known about it, engaging one's mind in a restless probing of the questions at issue. Seldom is this enough by itself to produce a breakthrough into new understanding. There must follow, in one way or another, a period of quiet where conscious questioning is set aside and the unconscious mind pursues its hidden work. Then, if one is lucky, there may come the moment of illumination when the necessary new idea, or the novel recognition of a hitherto undiscerned pattern, surfaces in the mind, often fully formed, often instantly persuasive, often released at an unattended moment—shaving or the bath have been good times for me. This role of the unconscious mind is most important in the practice of what is often thought to be a discipline of the rational ego alone. In my days as Fellow of Trinity I knew an elderly pure mathematician of the highest distinction. He invariably drank port in the Combination Room after dinner. He explained that, after a day of rigorous mathematical thinking, it was essential to stop the mind pursuing further unfruitful wrestling with problems in the course of the evening. This necessary fallowness he achieved by the mildly fuddling effects of alcohol. There are other ways of attaining the same effect.

There is some kinship here with those periods of attentive stillness which are a necessary part of the spiritual life. I cannot claim any contemplative experience but I do know a meditative quiet which is part of my prayer life. The simple techniques taught by Anthony de Mello S.J. have been particularly helpful to me.[5]

Prayer involves discipline. As an Anglican priest, I find that the daily offices of morning and evening prayer provide a framework for my day. I value that discipline and do not find its routine uncongenial. There are connections with my previous scientific career, where an organized

pattern of work was helpful in getting things done amid the many competing demands of university life. Perhaps I can pursue these somewhat banal comparisons a little further. In physics, it is important to enjoy a change of intellectual scene from time to time and to benefit from the different perspectives on the subject that periods of study leave provide. I had certain institutions to which I was a reasonably regular visitor and in which I could readily feel at home—for example the Theory Division at CERN, the large European collaborative laboratory outside Geneva. In my spiritual life I have a spiritual home, a community of Anglican nuns in South Wales of which I am a priest-associate. Visits to Tymawr Convent, usually brief and usually part retreat, provide encouragement and insight for me in my Christian pilgrimage. Physicists also belong to professional societies at whose meetings they can meet their colleagues and benefit from the resulting interchange of ideas. I belong to the Society of Ordained Scientists. It was not formed to be a talking-shop about science and religion (that role is admirably fulfilled by the Science and Religion Forum) but its purpose is to provide a network of prayerful support for each other as we seek to fulfil our vocations as priest-scientists. Our annual meeting has much of the character of a retreat, with a good deal of silence and some meditative addresses from an invited speaker. We also have a monthly prayer rota in whose course we remember each other.

Mention of intercessory prayer makes one ask the question whether a scientist can, with integrity, ask God to do anything in particular? Is not the world so regular in its process that all we can do is to praise the Creator for the wonder of his creation and hope that things will not turn out too badly for us? Such a question shows that its asker is still in thrall to an out-dated mechanical view of the physical world. Twentieth-century science has shown the universe to be something more subtle and more supple than a giant piece of cosmic clockwork. Partly that is due to the fitfulness of quantum theory hidden at the level of atoms and below, but more significantly it is also true of the physics of the everyday world. Most systems are so exquisitely sensitive to circumstance that their behaviour is *intrinsically* unpredictable. The so-called theory of chaos has shown that there are very many more clouds than clocks around. The subject is too complex to develop further here,[6] but I believe that science now describes a world which is not only hospitable to notions of human purposive action within it, but also to notions of divine providential interaction with it. A scientist can pray prayers of intercession.

Underlying all our considerations is the question of truth. I believe that both science and religion are concerned with the question of what

really is. In their different ways, each is seeking to submit itself to the nature of reality. In that great tradition of Christian thinking stemming from St Thomas Aquinas, I believe that all who truly and openly seek the truth through and through are ultimately seeking God, whether they name him by name or not. Herein lies the fundamental kinship between the spiritual quest and the scientific quest. One of my favourite quotations is from the twentieth-century Canadian Jesuit, Bernard Lonergan, 'God is the unrestricted act of understanding, the eternal rapture glimpsed in every Archimedean cry of Eureka'.[7] The scientist and the priest can both say amen to that.

NOTES

[1] Watson, J. D.: *The double helix* (London, 1968).
[2] E.g. Davies, P.: *The mind of God* (New York, 1992).
[3] Polkinghorne, J. C.: *Science and creation* (London, 1988), chs 1 and 2.
[4] Polkinghorne, J. C.: *Reason and reality* (London, 1991).
[5] de Mello, A.: *Sadhana* (Gujarat, 1978).
[6] See Polkinghorne, J. C.: *Science and providence* (London, 1989).
[7] Lonergan, B.: *Insight* (London, 1958), p 668.