

## Book Reviews

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### Stanley L. Jaki *God and the Cosmologists*

Scottish Academic Press, 1989.  
286pp. £10.95

Most readers of this journal will be familiar with the name of Stanley Jaki as one of the foremost contemporary commentators on the theological aspects of physical science. A Hungarian-born Catholic priest of the Benedictine Order and a distinguished professor at Seton Hall University, New Jersey, Jaki has written extensively on the history of modern science, always within the context of his distinctive apologetic programme. Both as Gifford Lecturer in the University of Edinburgh (1974-6), and as Fremantle Lecturer at Balliol College, Oxford (1977), he developed a controversial version of the historical thesis that science has conspicuously flourished only within Christendom. He argues from this premise that a theistic commitment to the order and rationality of the universe was historically essential for the development of science, and that this in turn affords evidence of the validity of theism. Similar themes are enunciated in Jaki's well-researched if controversial biographies of Pierre Duhem and G. K. Chesterton, whose defences of realist metaphysics he finds to accord closely with his own apologetic concerns.

The present work, an enlargement of eight lectures delivered under the auspices of the Farmington Institute for Christian Studies, maintains the central apologetic core found in Jaki's earlier publications. His starting point is the current vogue among theoretical physicists to indulge themselves by writing works of popular scientific cosmology, a task for which he considers them to be philosophically ill-fitted. Even worse,

in the author's view, are those theologians who have 'mixed second-hand information in science with philosophies and theologies steeped in trendiness.' Taking a strong hand, Jaki seeks to employ his expertise in physics and theology (he has doctorates in both subjects) to demonstrate the validity of his own Christian cosmology. His argument rests on the assertion that modern physical science has re-established the reality and specificity of the universe as a temporally and spacially finite, non-homogeneous entity. It follows from this, Jaki claims, that the universe is contingent, and that its origin must therefore be 'a factor metaphysically beyond the universe', namely the God and Father of our Lord Jesus Christ. Having laid out his stall as an exponent of the cosmological argument for the existence of God, Jaki proceeds in the remaining five chapters to 'deal with various objections that may be raised'. These chapters provide a running critique of much in modern scientific cosmology, and most topically of the Cosmological Anthropic Principle, but the discussion is inevitably polemical rather than even-handed.

Jaki offers his lectures 'to those whose religion is anchored in the belief in the Creator of all, the Father Almighty' with the intention of convincing them that they must achieve a firm hold on the philosophical foundations of their faith 'in order to see what is gold and what is chaff in modern scientific cosmology', rather than expecting those foundations 'to come from popularizations of scientific cosmology even if written by first-rate scientists.' The work is by no means introductory, and demands considerable familiarity with 'the history of scientific cosmology, especially of its 20th-century phase'.

The author pursues the argument relentlessly, often at the expense of historical niceties (a characteristic of his otherwise scholarly historical writings), and he is certainly provocative if not persuasive. This is a well-researched and well-documented contribution to the literature of scientific cosmology, and it should be required reading for all those involved or interested in the on-going debate.

**Jonathan Topham**

**Jonathan Topham, is a Doctoral Student in History of Science, University of Lancaster.**

**Keith Ward**  
***Divine Action***

London: Collins, 1990  
274pp. pb. £7.95

Ward begins his account of divine action with the Christian doctrine of creation. God's primordial act contradicts the empiricist dogma of the contingency of all things. Universal contingency confronts us with an abyss in whose depths there is only meaninglessness. By contrast, creation reminds us that all things are founded upon divine necessity—and, hence, have an ultimate meaning. The topic of creation is followed up by an exploration of the relationship between freedom and necessity in divine action.

For the modern mind, one of the most compelling arguments against the possibility of divine action is the presence of so much suffering in the world. Chapters 3 and 4 examine this argument in some detail. Ward recognises that there is a case to be answered. However the criticism assumes that there were superior alternatives to this universe. Ward casts doubt on this assumption. Is the concept of a best possible cosmos coherent? Different goods will be actualised by different creations—but by what calculus can we compare different goods?

Furthermore the moral criticism of divine action assumes that the extent of suffering is a detail which can be

altered without changing the entire picture. Against this Ward appeals to modern physics for a picture of the universe as a 'quasi-organic whole'. The world in which we exist is an intimately interconnected network of events and processes. We would not exist at all if the universe were only very slightly different. For Ward, the natural suffering which so many people find offensive is an integral part of this network. More precisely it is a foreseeable consequence of our law-governed but probabilistic cosmos.

The other major stumbling block for the modern mind is the close deterministic model of the physical universe inherited from Newtonian mechanics. Once again Ward appeals to modern physics in his rejection of this model. In particular, he subjects LaPlace's form of the model to a devastating critique. There is a degree of openness to novelty which leaves ample room for divine action.

However, the lawfulness of the cosmos places constraints upon divine action. Ward envisages God having the power to determine the outcome of events. But, to maintain the integrity of the system, he may not act in a manner which significantly alters the natural probabilities of events. Crudely, the more improbable a particular outcome, the less frequently God will be able to bring it about. This seems to leave room for situations in which God is a helpless bystander in the face of terrible evil or suffering.

In view of these constraints, what becomes of special providence? Ward's approach might suggest a deity who actively governs the overall sweep of history while having little interest in individuals. But this is certainly not his intention—the very next chapter addresses the highly complex issue of special providence. Ward insists that a God who created free rational creatures for a personal relationship with him will relate to them as individuals—that love entails particularity. Furthermore, this God is never entirely helpless. While he may not act to prevent a

particular case of suffering he is, nevertheless, able to bring ultimate good out of that event.

A discussion of special providence leads naturally to an examination of prayer. For me this was one of the highlights of the book. His defence of an orthodox understanding of petitionary prayer is very welcome. Why should prayer change things? In a nutshell, our prayers express a positive openness to God which so alters the situation that God may act in ways which would not otherwise have been appropriate: 'What is best if we do not pray might well be different from what is best if we do pray' (p.161). This relates closely to his understanding of special providence since an integral part of God's unique action in relation to every creature will be that creature's response.

What of miracles? Ward is highly critical of Hume's tendentious definition of miracles as violations of the laws of nature. He stresses the revelatory nature of divine miracles but, unlike Tillich, insists on their objective reality. The demise of the closed mechanistic world-view allows him to suggest that miracles are a sub-class of paranormal phenomena in general.

The revelatory aspect of miracles is his cue to move on to a discussion of revelation as divine action. He is critical of John Hick's attempts to relativise religious traditions—such a move can only convince us of the relative inadequacy of all religion. Instead Ward envisages God seeking to reveal himself through all religious traditions. However, some traditions have proved more adequate as vehicles of divine revelation. In the end he remains convinced that the Judaeo-Christian tradition is the most adequate vehicle available to God. But he is not content to stop there—the most adequate expression of personal being is not a verbal revelation but a human life. For Christians, the incarnation is the crucial divine act. Ward is no exception and he turns to an examination of the rationale behind this concept. From this insistence on

incarnation as the ultimate divine act of self-revelation he moves on to a defence of history as a source of truth.

The book concludes with a brief examination of the ultimate purpose of God's activity. Once again Ward defends an orthodox viewpoint, namely, that God seeks 'the integration of every moment into an eternal fulfilment' (p.269).

Throughout, Ward approaches the subject matter in a manner that is intellectually demanding but non-technical. As always he writes with great clarity. Here the effect of his clarity is to confront us with the genuine complexity of the issues. In conclusion, this volume is a valuable contribution to current discussions about divine action.

**Lawrence Osborn**

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**Jean Heidman**  
***Cosmic Odyssey***

Cambridge University Press, 1989  
182pp. hb. £11.95

In 182 pages, and with no equations, this book gives an excellent account of most of the important features of the present scientific knowledge of the universe. As would be expected from a book written by an astronomer, it is best where it is describing the large scale facts of the universe. There are also simple discussions of the structure of space-time (relativity theory), of the elementary constituents of matter, including the possibility of a structure beyond that of quarks, and of the forces between them. The idea of the inflationary universe as a solution to some of the problems of the standard big-bang cosmological model is given a separate chapter.

This book is aimed at a general

readership, and it succeeds well in presenting facts in a simple way. The emphasis is on the facts, with rather little discussion of theoretical background. There is no mention of gauge theories for example. Similarly, apart from a few comments in the final chapter, which deals with our place, and future, in the universe, 'deeper' issues are not discussed. Topics like the measurement problem of quantum theory, the origin of the arrow of time, or of human consciousness, are outside the scope of this book. What it does, however, it does well, although I wish it had an index.

**E. J. Squires**

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**Fang Li Zhi and Li Shu Xian**  
***Creation of the Universe***

World Scientific, 1989  
180pp. hb. £28.00; pb. £12.00

This is a delightful little book. With a refreshing economy of words, with interesting historical anecdotes and charming quotations, many taken from Chinese sources, and with a deep physical understanding, the authors, assisted by an excellent translator, succeed in their aim of explaining the current situation in astrophysics and cosmology in a form suitable for a non-specialist readership. The book contains several brief, but very informative, calculations which show how certain results arise. Hence, in order properly to appreciate it, some background in mathematics or physics is desirable.

The contents include a discussion of the expanding universe, the question of whether it is opened or closed, possible hidden mass, the way in which gravity can circumvent the second law of thermodynamics, the microwave background, synthesis of helium and other elements, the possibility that the non-zero baryon number of the universe has its origin in non-

conservation of baryon number, and the idea of inflation.

The last two chapters, 'Physics of the First Move' and 'The Anthropic Principle', are more metaphysical than the rest of the book and are also less satisfactory. They raise interesting questions which, not surprisingly, are not answered. Sometimes, however, the impression is given that there are easy answers. The text is littered with assertions like 'The logic . . . is this: Why is the matter in the universe in such a state of motion? Because all this matter is not outside the universe', or 'Time should originate in a timeless state', or 'if the universe can produce . . . humans that have power of comprehension, then the universe must be comprehensible'. The best that can be said about such statements is that they are meaningless.

The above remarks, however, apply to a very small part of this book and do not seriously detract from its value.

**E. J. Squires**

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**S. M. Kingsman & A. J. Kingsman**  
***Genetic Engineering: An Introduction to Gene Analysis and Exploitation in Eukaryotes***

Blackwell Scientific, 1988  
522pp. pb. £19.50

This is a comprehensive volume on the science of genetic engineering in eukaryotes. It is based on a third year undergraduate biochemistry course. It is one of the better text-books available in this field, but like all of them, will need to be frequently updated in this rapidly advancing field. For example, it was written before the widespread introduction of the DNA Polymerase Chain reaction.

Unlike many recent texts it does not concentrate on the cloning of genes, but rather on what can be done once a gene is isolated. It covers a broad range of

techniques, giving some of the biological background behind them, and examples of their use. The book is written at a level suitable for University students. It is useful to scientists who are thinking of using the tools of genetic engineering to solve a variety of biological problems. The examples are also useful to students of biochemistry or biology as a reference material. It contains more references than most texts.

After a general introduction to eukaryote genes, DNA and genome organisation, there is an introduction to gene transfer. I found the first introductory chapter the most difficult to read. Chapters 3-6 concentrate on different gene transfer systems in microbial eukaryotes, animal cells, whole animals and plants. The basic model organism systems used for gene study and transfer are discussed.

The second half of the book, chapters 7-12, concentrate on the use and exploitation of gene transfer technology. The applications of gene transfer experiments to gene identification, isolation, investigation of gene expression, chromosomal structure, and protein structure and function, cover many of the basics of molecular biology. The technology is being applied to experiments in every branch of biology, and from this array, many examples are presented.

The eleventh chapter gives examples of how genetic technology can aid our understanding of human disease, principally focusing on oncogenes and cancer, making animal models of human disease using genetic engineering, and AIDS. The twelfth chapter is an introduction to biotechnology using genetic engineering, and is somewhat disappointing in its lack of detail compared to that given in the rest of the book. The applications of gene transfer technology to production of useful substance, and agricultural production, warrant several chapters of a book of such detail. However, such information can be found in other recent books which specifically deal with these

aspects, and one could argue that this book fills more of the gap between books that deal specifically with biotechnology, and those which concentrate on gene cloning techniques.

To its merit the book gives many examples from the broad spectrum of gene transfer, which makes it useful as a background to the subject for students and scientists. It will provide the reader with new ideas to explore in their research, pointing to different lines of experimental work, for which they can obtain more recent journal reviews, if they require such.

**Darryl Macer**

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**James Rachels**

***Created from Animals: The Moral Implications of Darwinism***

Oxford University Press, 1990

245pp. cb. £17.50; 1991, pb. £6.99

Dr. Rachels is Professor of Philosophy at the University of Alabama at Birmingham, and the author of *The Elements of Moral Philosophy* and *The End of Life: Euthanasia and Morality*. His style is pleasant, thoughtful, fair-minded and well-argued; and if the Christian reader is not convinced of the case Dr. Rachels espouses he will nevertheless find this an interesting, instructive and rewarding study. The author's case is that Darwinism (which he regards as established truth) necessitates a new view of the totality of man's position in the world, including especially the question of his ethical relationship with the lower animals. The book is accordingly orientated towards practical issues rather than to the abstract philosophy of things. Its arguments are often very cogent and compelling; at other times they show serious weaknesses. His first chapter (of 56pp.), *Darwin's Discovery*, is a fine account of Darwin's life, character and scientific achievements. The next chapter, *How Evolution and Ethics might be*

*Related* deals with the two principal attempts to relate ethics and evolution: Herbert Spencer's (ended by Moore's exposure of the 'naturalistic fallacy', that an 'ought' cannot be derived from an 'is'), and the more recent Sociobiologists', which in his view succumbs for a similar reason. He then outlines his own, which turns on the idea that man is not 'morally special'; he does not possess something which Kant called an 'intrinsic worth' or 'dignity' (the image of God) which is different in kind from what the lower animals possess. This is where, of course, the author parts company with traditional Christian teaching. His next chapter, *Must a Darwinian be Sceptical about Religion?*, I found fascinating. He deals fairly with philosophical arguments for the existence of God, Darwinian responses to them, and finally the liberal theologians' refuge in a sort of deism, which he (rightly, I think) regards as a retreat from a 'central place' for religion to a significance which is 'vanishingly small'. 'If, by abolishing the view of nature as designed in substantial detail, Darwinism forces a retreat to something like deism, then we are deprived of the idea that man has a special place in the divine order—we no longer have a theism that supports the doctrine of human dignity'. I am inclined to agree with him; and his position certainly challenges the common liberal view that God has built in to nature a large element of absolute chance.

The next chapter, *How different are Humans from Other Animals?* develops his case. He discusses whether humans alone possess rationality, language, or a moral sense. No, he replies; Darwin was even ready to attribute some degree of intelligence to worms! Dr. Rachels' treatment struck me as cautious and fair-minded; for instance, in discussing the claims of those who believe they have taught the man-like apes what can reasonably be called 'language' he is not uncritical. Nevertheless he believes that Darwinism cuts the ground from under the claim

that man is 'special', either because he is made in the image of God morally, or because he alone has rationality. What then is he going to substitute as his ground for discrimination in ethical decisions which involve both man and the lower animals?

His last chapter, *Morality without the Idea that Humans are Special*, gives his answer. He calls it the principle of 'Moral Individualism'. By this he means that the way an individual should be treated depends on his or her own particular characteristics, not on the group to which he or she belongs—even the group of human beings'. Two things are involved in the ethical decision: the sort of treatment being envisaged, and the characteristics possessed by the individual relevant to that treatment. Thus, 'Is it right to torture animals?' is paired with the consideration, 'Do they suffer?'; 'Should chimpanzees be admitted to University?' with 'Can they study?'. In many ways this is a very poignant chapter, especially when it deals, unemotionally enough, with such questions as the ethics of factory farming, testing cosmetics on animals, or vivisection. The believer will often agree with the author; but in the end he will have to differ. Suppose a life has to be sacrificed through shortage of facilities: either a healthy chimpanzee, or an infant with Tay-Sachs disease who will inevitably die within a few months. 'Moral individualism' asks which life is of more value to the individual concerned (infant or chimpanzee), and opts for the latter; Christian faith asks which life is of more value to God, and its answer is understandably different.

The great weakness of this book is that while the author has—rightly—studied attentively the profound feeling for the lower animals which Darwin possessed and taught, he has given no comparable attention to the Bible's doctrine. He might have reflected that the Bible says of the lower animals that 'God blessed them', just as He did man; that He 'feeds the young ravens which cry'; and that 'His tender mercy is over

all that He has made'. He might have noticed too that the Bible holds out the promise that the whole creation will be set free from its bondage to decay into glorious liberty; and that one day nothing in nature 'shall hurt or destroy' any more. These are all indications of the value the Bible places on the lower creation, however far short of accepting it our western civilization has fallen in practice. His derivation of the moral imperative from the social instinct is unconvincing, and he fails to give the notion of 'rights' (which he often uses) any solid anchorage. A 'right' is after all surely a 'privilege granted by authority'; and the Darwinian has really none to appeal to. Nevertheless this is a fascinating and worthwhile book.

There are nine pages of References; a Bibliography of six; and an Index of two.

**D. C. Spanner**

**D. C. Spanner, is a retired professor of plant biophysics, and non-stipendiary Anglican priest.**

**Nevill Mott (Ed.)**  
***Can Scientists Believe?***

James & James, 1991  
182pp. hb. £21.00

This book contains a fascinating and original collection of essays by authors who are either senior scientists or clergy with postgraduate scientific qualifications. They have been compiled by a Nobel Laureate in theoretical physics, Sir Nevill Mott, who has also written the first essay. His contribution is outstanding and bears witness to his admission to the Church of England, when he was Head of the Cavendish Laboratory in Cambridge. He recognises three sorts of truth: scientific truth, always provisional, but accepted universally; everyday truth of the factual and legal sort; and religious truth, which demands personal commitment and is not universally accepted. He has sought, and found, a belief in God through Jesus, but his Christianity is

'without miracles', especially of the 'conjuring trick type'.

His basic, but arbitrary, assumptions are that 'God relates to men and women who seek Him, and that He works within natural law'. However, he states that the newest form of physical law, quantum mechanics, 'has freed us from determinism', so that modern physics does not conflict with belief in free will. Further, he accepts a form of complementarity due to Sir Brian Pippard in his 1988 Eddington Memorial Lecture, namely that human consciousness can, in principle, never be deduced from the laws of physics and so lies 'outside science'. Apart from this 'miracle of the human spirit', Sir Nevill repudiates any idea of the 'God of the Gaps'.

His chapter is remarkable as the testimony of an internationally famous scientist, who was not brought up in any religious faith, and had little interest in religion until he was about fifty. Now in his 86th year, he has put together a collection of fifteen personal accounts of their beliefs by scientists and theologians, to demonstrate that science and faith can co-exist, and to confound the humanists. Readers of this journal, while welcoming his conversion, will hope that his doubts about the atonement and the resurrection will be, like those of doubting Thomas, finally dispelled 'through the teaching of Jesus and His followers', acknowledged by Sir Nevill as the only road to a true knowledge of God.

After this wonderful introduction, the other contributions range from the single page on 'Science in My Christian Belief' by Professor Dionysiou-Kouimtzi of the University of Thessaloniki to the highly technical twenty pages on 'The Mystery of Being Human' by Sir John Eccles of the University of New York, a Nobel Laureate in Medicine. Perhaps the enormous variety of approaches and digressions on the central question of the attitude of working scientists to religion is the most attractive feature of this unusual book. The majority of the essays are scholarly accounts complete

with a bibliography, but a minority are personal statements with no references. The comments that follow, on four of the articles, aim to present the fascination of this book rather better than would snippets from all fifteen authors. They have been chosen to convey the enormous breadth of outlook possible by scientists who are believers.

First, a pharmacologist who left his research in Cambridge for the priesthood when he was 26, and is now well known as the Archbishop of York, John Habgood. He is just one of a number of scientists who have been ordained and was a founder member of the Society of Ordained Scientists. He writes of the 'parallel between the scientific and the priestly task in terms of three characteristics of the priesthood: (i) the representation of order, (ii) the evocation of worship and (iii) the exercise of sacramental authority'. In (i) he shows that scientists and theologians have a common belief that the universe is fundamentally an orderly place and that through this belief scientists can discover truths that are everlasting, while theologians can point to 'some deeper truth about God's dealings with humanity'. In (ii) he recognises that 'worship and science are very different activities', but shows that the wonder experienced by scientists when they discover a new feature of the natural world, although not worship, is closely related to the wonder in which worship begins. His third characteristic is unexpected: how can anything sacramental be linked to the scientific endeavour? As he shows, 'the way we understand the world depends in part on what we do with it, and on what prior understandings we bring to it ... a purely objective understanding of the world is a chimera'. Sacramental thinking implies that all of us, including especially scientists, need to be sensitive in our investigations of this world that 'bears the image of the divine'.

Dr. Hodgson is a theoretical physicist at Oxford University who writes on 'Science and the Christian World View' from the standpoint of a Roman

Catholic. Much of his article rehearses arguments on the origins of modern science that have been expounded before (e.g. Frank Rhodes in 'Christianity in a Mechanistic Universe, IVF, 1965) and are widely held by scientists who are Christians. However, many readers of this journal will find his views on the superiority of the Church of Rome in guiding scientists controversial. He is also in direct conflict with Sir Nevill in his beliefs in a deterministic world whose laws can nevertheless be suspended by God so that He can produce events ('miracles') to this day which are 'totally inexplicable by any conceivable natural process'.

By contrast, Richard Bube, Professor of Materials Science at Stanford University, asks 'How can a scientist be a Christian in to-day's world?' His arguments are based on careful definitions of 'authentic science and authentic Christianity' to show that it is not schizophrenic to be both a scientist and a Christian. His science 'tells us some things about the nature of reality, but ... does not give us an absolute understanding of anything'. In this he rejects 'scientism', the exaltation of science into the equivalent of a religious world view, while his theology is complementary to his science, providing different kinds of information about the same things, as so often described by Donald Mackay. Surprisingly, Richard Bube quotes only his own publications, ignoring many others who have written on this topic.

Finally, a most interesting and scholarly essay by Cyril Domb, formerly Professor of Theoretical Physics at King's College London, explains how he reconciles his faith in Judaism with rational thought. He discusses five concepts: belief, divine providence, free will, Genesis and modern science, and evolution. He concludes that a commitment to the 'Jewish faith has derived inspiration and support from the scientific advances of the twentieth century and that the tensions which existed between science and Judaism in the nineteenth century have largely

disappeared'. His essay will be found illuminating by Christians in showing how the revelations of God in the Old Testament are consistent with a proper understanding of scientific thought today. Readers will also find that he refers to the writings of many others, Jews and Gentiles, in his bibliography.

In summary, this book is important, both because its distinguished editor has already brought it to the notice of 'The Times' and to many physicists through a long review in 'Europhysics News' (May 1991), and because it describes so many different ways in which scientists have reconciled their scientific knowledge with their knowledge of God.

**Roland Dobbs**

**Roland Dobbs, is Emeritus Professor of Physics, University of London.**

**John D. Barrow**

***Theories of Everything—The Quest for Ultimate Explanation***

Clarendon Press, Oxford, 1991  
223pp. hb. £14.95

Ever since Einstein spent—some would say wasted—much of the latter part of his life, searching for a unification of gravity and electromagnetism, the desire for this and more has been a compelling drive of theoretical physicists. The search has been on to bring together in a comprehensive grand unified theory the description of the four basic forces of nature which, in our terrestrial conditions, appear so distinct. The paradigm was, of course, set in the last century by Maxwell's unification of electricity and magnetism after the necessary experimental data had been so carefully sought by Faraday. But the electromagnetic, weak, strong and gravity forces, modelled by exchange of photons, massive boson, gluons and gravitons, began to yield their distinctness and show their similarities under the influence of gauge theory. The relevant experimental data involves the study of the interaction of particles at huge

energies, energy equivalent to the mass of these exchange particles. The theoretical unification is dependent on mathematically expressed ideas of symmetry. The unification of the weak and electromagnetic forces has already yielded to this two pronged approach and that way ahead looks very promising, though the cost of building and running the huge particle accelerators needed is daunting. The pursuit of the theoretical symmetry ideas, however, goes on apace and points strongly to the forces all being one at extremely high temperatures. (Mysteriously, it is the properties of the vacuum, properties which years ago were shown to have experimentally observable effects which bear on the relevance of temperature.) The highest temperature in the whole of space time would be at the 'big bang' and the concept of but a single kind of force at that instant, governed by 'beautiful' mathematics, already points strongly towards a 'theory of everything' goal, especially as the variety of forces in our relatively low temperature world can be intelligibly accounted for by the 'symmetry breaking' to be expected as the system cooled.

Unifying the forces is one thing but what about the variety of particles? Here again ideas of symmetry are beginning to play a part while, at the same time, the concept of a particle is being replaced by that of elementary 'strings', thereby removing many of the mathematical difficulties implicit in considering the interaction of points. The result of all this is an (intoxicating?) brew cupped in the increasing realisation that maybe the net energy of the Universe is zero, its kinetic energies being exactly cancelled by its (negative) gravitational potential energy. Is the whole, then, nothing but a quantum fluctuation in the mysterious nothingness of the vacuum, all its properties being wholly defined by the inexorable symmetries of mathematical logic?

Anyone who writes on such matters at Professor Barrow's level of insight and understanding can only do so because he also thinks and reads

widely in such fields as epistemology, history and philosophy of science. Inevitably, the author's own beliefs colour his writing. Here Barrow gives less of an insight into his own ultimate 'religious' thinking than he does in an earlier book with Tipler, 'The Anthropic Cosmological Principle', which has become something of a classic. Amongst the few omissions which this reviewer regrets in this immensely readable volume, is an insufficient address of basic ontology (Has the very being of the 'beautiful' mathematics anything transcendental to hint at?) coupled with no hint that ultimate religious questions must not only do justice to the logic of mathematics and the data of the physical world but also to human history and experience. To decide whether St. Paul was mistaken or not when, on the basis of recent history and experience, he declared 'God was in Christ' is hardly a question that can be resolved by cosmology. But cosmology does have more to say on the character of 'The Giver of the Whole Show' than Jeans's 'God is a pure mathematician' and at least raises, even if it does not answer, the question of the 'imago dei' and the relationship of the logic of mathematics—and any logic—to Him.

Although Barrow does not adequately address such issues, I know of no scientist who writes more fairly nor more attractively. His very chapter titles are a call to read them and their quotation headings are little short of a poem. His closing paragraph reads 'There is no formula that can deliver all truth, all harmony, all simplicity. No Theory of Everything can ever provide total insight. For, to see through everything, would leave us nothing to see at all.'

**Robert Boyd**

**Sir Robert Boyd FRS, is Fellow of University College, London, and Emeritus Professor of Physics.**

**Alan G. Johnson**  
***Pathways in Medical Ethics***

Edward Arnold, 1990  
167pp. pb. £7.95

**Albert R. Jonsen**  
***The New Medicine & The Old Ethics***

Harvard University Press, 1990  
171pp. hb. £12.25

Here are two books on Medical Ethics which are as different from one another as the proverbial chalk and cheese. The first is by a surgeon and the second a historian ethicist and which is preferred is likely to depend as much on the reader's personality and experience of medico-ethical problems as on the merits of the books themselves.

The title of Alan Johnson's book, *Pathways in Medical Ethics*, explains its remit. Aimed chiefly at students it sets out in concise terms the various general ethical principles such as beneficence, autonomy and truth telling and then in Part II applies these to common clinical dilemmas by using a series of algorithms. The earlier chapters describe the history of medicine and the recent explosion of knowledge during the past one hundred years. This includes a description of the contribution of Islamic cultures and leads on to a discussion of the sources of basic ethical guidelines. The author shows how differing world views will lead to differing orders of priorities and these are referred to again in the chapter on absolutes. This chapter provides guidance in dealing with the occasions when two ethical principles may appear to be in conflict. The author's two overriding absolutes which emerge from his Christian convictions are the value of the individual and the fundamental importance of truth and integrity. This is an intensely practical book and having described the various philosophical aspects we are brought face to face with the law and the various ethical codes which aim to clarify the issues and delineate boundaries. Several of these codes were drawn up following some

disastrous episode, the Declaration of Helsinki for example following the dreadful exposure of human experimentation in Nazi Germany. One of the most useful features of this book is that not only the much referred to Hippocratic Oath but also a number of later internationally agreed Ethical Codes are printed in their entirety thus providing a useful reference source.

The scene is now set for Part II which tackles a number of topical issues such as informing some one of a diagnosis of malignant disease, AIDS, animal research, fetal brain transplants, and perhaps unexpectedly, the use of strike action by doctors and nurses. Each topic is dealt with using a decision-tree style of analysis. This will appeal to those who like a cut and dried surgical approach but may raise too many 'yes but . . .'s in others.

Overall, therefore, a pragmatic down-to-earth book designed to create in students an awareness of the issues and show them a way through the maze that the cover depicts. Cartoon style drawings are scattered throughout and emphasise the puzzlement which thinking students may and should experience as they meet new clinical situations. It is well indexed and referenced and includes useful appendices and the text of the codes mentioned above.

The second book, also probably initially created for students but likely to appeal as much to the older practitioner, adopts an entirely different approach. In *The New Medicine and The Old Ethics* Albert Jonsen unravels the reasons for the feeling of 'beleagueredness' current in the medical profession in many Western countries. He traces the changing ethos of medicine by drawing on historical and mythical characters who illustrate the seminal influences on medical behaviour patterns. The mythical Greek physician Asklepios, the Good Samaritan whose Christian influence continues to be profound, the medieval Knights Hospitallers who cared for 'their Lords the sick', John Locke and the development of 'rights' and Jeremy Bentham and the rise of

Utilitarianism. Each strand continues to influence current views of medicine and yet each is unable to resolve the complexities and tensions of today's high technology medicine with its capacity to do harm as well as good, its multidisciplinary approach and the inevitable imbalance between need and resources.

The author uses the first renal transplant done in 1960 as a landmark signifying the start of a new era in medicine and shows the inability of these old guiding principles to cope with the cascade of developments that continue to flow. No wonder today's medical profession feels beleaguered. Times of change and adaptation are inevitably stressful. It is here that the author's historical perspectives come into play and he believes that we should follow Osler's suggestion and allow the study of history and philosophy to have a 'hormonal effect', restoring homeostasis and enabling the body medical to adapt successfully to these new alterations in its environment.

Two useful books therefore, one aimed at the student while the other should be read by those grappling with management and resource allocation as they should find illumination and encouragement in the author's positive attitudes.

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***Greening Business: Managing for sustainable development***

Basil Blackwell, 1991

215pp. £18.95

The author held a senior position in the Shell Group. He then worked with Dr. E. F. Schumacher for a while. He has clearly been influenced by Schumacher as well as by George Goyder's books. This book is a very original approach to

business management from the perspective of the need for 'Sustainable Development' if we are not to face global catastrophe. That possibility is taken for granted and not elaborated here. Sustainable development does not mean zero growth. It means growth in ways that do not damage the prospects of future generations. The emphasis, therefore, is on maximising the use of renewable resources and more efficient use of what we have, amongst other things.

Intertwined with that is a concern to refute the idea that small firms are less efficient than large ones and that capital intensive operations are the most efficient. Both also tend to devalue the work-force. There is also throughout a very valid concern to stress that people matter as much in business as everywhere else and that a neglect of this in favour of thinking in terms of finance alone is firstly, counter-productive, and secondly in any case unjust and unacceptable to all who hold a high view of the value of the individual.

How these three themes inter-relate is not always clear, but is sometimes well set out. If, for example, electricity supply companies aimed not merely to

use the cheapest fuel (at present non-renewable) and sell the most electricity, but were also concerned to provide for customers a comfortable home environment at minimum cost and minimum waste, the industry would look different. Again the drift towards 'large scale energy-and-chemical-intensive agriculture' is beginning to be generally regarded as a mistake and, in the long run, he argues that it is.

Those involved in management must judge the numerous practical proposals that are made. For the purposes of most readers of this journal its importance is the attempt to work out some of the consequences of trying to apply the concept of sustainable development to the business world and arguing that it is practical policy and not just visionary talk. In the end, of course, it is the wealth created by business that will pay for environmental care. It is a great gain if it can be shown not to mean a lowering of standards of living, but better management along perhaps unfamiliar lines. That is what is claimed.  
**Oliver R. Barclay**

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