S & CB (2001), **13**, 69–96 0954–4194

Book Reviews

Kim Sterelny and Paul E. Griffiths
Sex and Death: An Introduction to Philosophy of Biology
Chicago: University of Chicago Press, 1999. 440pp. pb. $22.00; £17.50.
ISBN 0-226-77304-3.

This book makes a refreshing change from the plethora of popular science books written by evolutionary biologists attempting, with varying degrees of success, to demonstrate the truth about life as we know it. These two philosophers of science provide an account of contemporary biology which examines the work of biologists such as Dawkins, Dennett, Gould and Wilson, as well as a host of less popular authors, and offer the critique of informed outsiders.

The subject is divided into five sections. The first section introduces issues which will be discussed in detail in subsequent sections and provides an analysis of the 'received view' of evolution. Subsequent sections focus on the nature and role of genes, the role of the organism and the significance of species, the bigger picture offered by ecology and the direction of evolution, and finally a focus on evolutionary insights into human nature. Within each chapter the main text is allowed to flow without intrusive citations and there is a helpful discussion of texts for further reading at the end of each chapter. Some chapters also include a summary before the further reading material. The book is written as a textbook for advanced undergraduate students of biology and is not a light read. However the features of the layout mentioned above, together with the thorough coverage of material at each level of the analysis would make it accessible to non-biologists interested in this area of the philosophy of science.

I found the sections on the place of genes and on human nature particularly stimulating. The former section concludes with a discussion of the pros and cons of reductionism, a topic familiar to most readers of this journal. The authors note that the relationship between classical Mendelian genetics and molecular genetics is 'not one in which the new theory explains the old, but one in which the new and old theories represent complementary and mutually illuminating ways of viewing the same physical process'(138). However I would challenge the limitation of such 'mutually illuminating ways' to those that are 'scientific' whilst accepting that 'scientific theories cannot traffic in apparently miraculous mechanisms' (139). Having presented the arguments for defining a gene as DNA plus its context, the authors conclude that both reductionism and anti-reductionism have helped our growing understanding of the relationship between molecular genetics and classical genetics. Molecular genetics is not a simple extension of biochemistry but incorporates insights from cell biology in an understanding of the physical process of heredity.

The section on human nature traces the application of evolutionary theory to behaviour through sociobiology and more recently the field of evolutionary psychology. A balanced assessment of these fields is offered. The authors concede that although some progress has been made 'the practical and theoretical problems that infest this project are far from being overcome' (353).

In conclusion the authors state that groups, species and organisms cannot be explained away as 'epiphenomena of processes at lower levels of biological organisation' (380). They maintain that there is no convincing argument against the possibility of group selection in some cases. They are therefore critical of an overemphasis on the reductionist

approach to evolution. This is a much-needed challenge to the dominant view of Dawkins et al. and deserves careful study by those interested in a detailed critique of contemporary evolutionary thought.

Andrew Fox is the Methodist Chaplain to Liverpool University and a former animal physiologist.

Max Jammer

Einstein and Religion. Physics and theology

Princeton, NJ: Princeton University Press, 1999, 279pp, hb. £14.50.
ISBN 0-691-00699-7

Everyone with an interest in the relationship between physics and theology will welcome the publication of this volume by the distinguished philosopher of physics, Max Jammer. In spite of the general recognition of the importance of Einstein's thought both for modern physics and its relationship with religion this is, as far as I am aware, the first comprehensive account of Einstein's own views on the relationship.

Jammer has organised his material into three main sections. The first of these deals with 'Einstein's Religiosity and the Role of Religion in His Private Life'. As the title suggests, this chapter deals with Einstein's personal attitude toward religion from childhood until his death. It is a detailed and roughly chronological account in which Jammer documents Einstein's apparently self-contradictory attitude towards religion. On the one hand, he had a lifelong aversion to authority that was expressed in a distaste for organised religion (culminating in his request not to be given a Jewish funeral). On the other hand, as a personal response to the cosmos, he experienced what can only be described as profound religious feelings. In short, Einstein's personal religion is shown to be typically late modern – affirming personal spirituality while disavowing organised religion.

In his second chapter, Jammer turns from Einstein's personal attitude to what he has written about religion and its role in human society. The chapter is entitled 'Einstein's Philosophy of Religion' and sets out to be a logical justification of the attitudes described in the first chapter. I must confess that I felt rather suspicious of this (re)construction of Einstein's philosophy of religion. Jammer's interpretative approach seems to have been to assume that it must always be possible to reconcile apparently contradictory statements. The result is a superhuman degree of consistency. Frankly I doubt whether even someone of Einstein's stature could achieve such consistency outside his own field (and, indeed, his vacillations about the implications of relativity theory for the nature of time suggest that he did not always achieve it within his own field). That criticism apart, this chapter offers a valuable summary of Einstein's articulated views about religion. In particular it explores his lifelong admiration for Spinoza and sets his well-known determinism, realism and insistence on the impersonality of God in that context.

The final chapter is devoted to 'Einstein's Physics and Theology.' Here Jammer moves on from Einstein's own views to explore some of the ways in which his contributions to science have been received by theologians and philosophers of religion. These explorations are organised logically (following roughly the order in which the ideas on which they are based appeared within the development of relativity theory) rather than chronologically. Among the issues tackled are the implications of Einstein's redefinition of simultaneity for our understanding of eternity, determinism and omniscience; theological uses (and abuses) of time dilation; T F Torrance's use of mass-energy equivalence as an exegesis of Incarnation and, more generally, Pannenberg's assignment of theological significance to Einstein's concept of field. Finally he explores some

of the theological implications of quantum mechanics (on the grounds that Einstein's criticisms played a major role in shaping its development). Some readers may find this final chapter both confusing and inconclusive. In part this is due to the fact that Jammer distances both Einstein and himself from the discussions he is reporting. Thus it reflects the current status of theological efforts to appropriate Einstein's ideas.

Jammer has done an excellent job in bringing together and making accessible the scattered evidence for Einstein's views about religion. Unfortunately the work is marred by the extreme length of the chapters (Chapter 3 runs to 110 pages!) and the complete lack of internal divisions. This makes reading the book a more daunting task than is necessary. Nevertheless, this is a valuable contribution to the subject.

Lawrence Osborn is a theologian who has written extensively on the interaction between Christianity and contemporary culture.

Everett L. Worthington, Jr. (ed.)

Dimensions of Forgiveness – Psychological Research & Theological Perspectives

Philadephia: Templeton Foundation Press, 1998. 368 pp. hb. $22.95.
ISBN 1-890151-21-1

Forgiveness is undoubtedly a central concept in Christian theology and Christian life. But exactly what is forgiveness? What makes people forgive others? What are the psychological and social consequences of forgiveness? And how can forgiveness be promoted? These are the questions into which this very interesting book provides some insights. The book contains the papers from a conference on the scientific study of forgiveness organised by the John Templeton Foundation. Two initial papers outline the Christian and Jewish understanding of the role of forgiveness and the remaining 8 papers give a very comprehensive overview of our current knowledge about the psychology and sociology of forgiveness. Not surprisingly it is shown that forgiveness is a very complex concept and that forgiveness can be blocked by a range of social and psychological processes.

The most interesting part of the book is the 3 chapters on how forgiveness and reconciliation can be promoted. First it is very clearly argued that forgiveness and reconciliation are two rather different things. It is possible to forgive unilaterally but reconciliation requires efforts from both sides. In order for reconciliation to occur the offenders have to acknowledge their responsibility for the acts that have harmed others. Second it is shown through a review of a number of intervention studies that it is actually possible to promote forgiveness and reconciliation through carefully structured therapeutic and social processes, and that those who forgive do gain measurable psychological benefits.

The chapters in the book clearly show that forgiveness is no longer just something that is advocated by Christianity and other religions, and which is also more generally believed to be a nice thing to do. Forgiveness is a specifiable social and psychological process with concrete social and psychological outcomes.

This analysis of the concept of forgiveness and its research base has important implications in a number of academic areas concerned with interactions between people (peace studies, bioethics, education just to mention a few), but the implications extend even further to more practical questions with importance for many Christian churches. Many churches have in the past been engaged in activities that have deeply hurt people (e.g. overt racism). It is necessary that these past abuses of power are recognised and that reconciliation is sought with the affected groups of people. This book helps to show how such reconciliation can be promoted, and why forgiveness

and reconciliation will benefit both past offenders and past victims.

Søren Holm is Reader in Bioethics at the Institute of Medicine, Law and Bioethics, University of Manchester, and Professor of Medical Ethics at the Centre for Medical Ethics, University of Oslo

Craig M Gay

The Way of the (Modern) World Or, Why it's Tempting to Live As If God Doesn't Exist

Grand Rapids: William B Eerdmans & Vancouver: Regent College Publishing, 1998. 338 pp. pb. $22.00.
ISBN 0-85364-890-5

Followers of Gospel & Culture issues will be familiar with the broad lines of this book. I once went to a study day given by the late great Lesslie Newbigin entitled *How can we sing the Lord's Song in a Strange Land?* The masterful thing about it was that it was all in the title; there was a morning session on 'The Strange Land' and an afternoon one on 'Singing the Lord's Song'. That lament (from Psalm 137, 'By the waters of Babylon'), and its context of spiritual and cultural exile, encapsulates both the Christian sense of cultural dislocation and the Christian calling within it.

A rather similar purpose is served by an opening quotation in Gay's book, from Psalm 2: 'The kings of the earth take their stand and the rulers gather together against the Lord and against his Anointed One. "Let us break their chains," they say, "and throw off their fetters."'

The book is about secularisation, its history and effects. Gay views the process as a simultaneous throwing away of divine explanations and divine authority. He traces this in the fields of politics (chapter 1), science and technology (ch 2), economics (ch 3) and culture (ch. 4). Readers of this journal will be especially interested in chapter 2. Gay looks at what he calls the 'disestablishment' of theological reasoning in North American intellectual culture between roughly 1890 and 1930. He believes it to have stemmed 'in large part from the failure of evangelicals to develop an adequate theology of science' (128). But the rot goes back much further than that – to the via moderna of William of Ockham et al. and the move to find the meaning of the created order entirely within it, as discerned by observation and experience. The subsequent history of science has thus overemphasised the autonomy of creation and led to the complete objectification of the world and the death of the soul or person.

What I am unclear about is whether Gay therefore thinks science – or at least the study of creation – should be concerned with God and the human person. Is he advocating natural theology? I was relieved to reach the following sentence: 'if the truth of our existence is to be known it must be spoken into the world from outside the world. It must be revealed' (127). But you can't have your cake and eat it: either creation can teach us about the divine (in which case the door is opened to natural theology) or it cannot (in which case science is necessarily a secular enterprise).

Having said that, I am sure that his analysis of the objectification of the universe and its depersonalisation is spot on. And his theological diagnosis is also excellent: via a magisterial survey of theologians from Kierkegaard to Vladimir Lossky, and following the I-Thou of Martin Buber, Gay urges us towards a proper relational view of God (as Trinity) and ourselves (as persons). With an insightful sideswipe at 'the contemporary culture of therapeutic narcissism' (234), he commends a Christian recovery of the 'relational telos of all Christian propositions' (280).

Gay is learned, clear and largely convincing. But I think that his psalm verse leads him into a view of submission as a requirement of God which owes too much to Ancient Near East autocracy and not enough to his well argued view on

discovering our true identities through the mutual give and take of personal relationships (especially with God).

Nicholas Moir is the Vicar of Waterbeach and Rector of Landbeach, near Cambridge

Norman Cohn

Noah's Flood: The Genesis Story in Western Thought

New Haven & London: Yale University Press, 1996, 154 pp. hb. £22.50
ISBN 0-300-06823-9. 1999, 154 pp. pb. £10.50 ISBN 0-300-07648-7

It's not often on finishing a book from a distinguished university press that I wish it had been a bit longer so that the issues raised could have been discussed in more depth! But having said that, this book is a good introduction to the influence the flood story in Genesis has had on people at various times down the centuries. And it is also well illustrated. The author takes a more 'liberal' view of the origin of the biblical story than many readers of this journal might be happy with, placing its writing during the Babylonian exile as an adaptation and critique of the Epic of Gilgamesh (he takes Jeremiah 4: 23-25 as a literary clue for this idea).

Be that as it may, the author quickly traces the use of the flood story by the New Testament writers, the various allegorical and literal interpretations of the Flood and the Ark by the Church Fathers and medieval rabbis in order to arrive at what seems to interest him the most: the 17th-19th centuries. It was during this time that the modern discipline of geology arose, and Cohn devotes five of the book's eleven chapters to this period.

In general terms up to the early 19th century, the author states that British natural philosophers were more concerned than their French counterparts to explain what they saw in the field in terms of the Great Flood, often thought of as the last of a series of catastrophes to have occurred on the Earth. Many ingenious theories were published to explain where the water came from and where it went afterwards, what effects this had on the continents and seas, how the animals survived on the Ark, how the present distribution of animals on the continents fitted with radiation from Ararat etc. Cohn points out that these last two issues had been discussed by many authors before this: the discovery of the Americas in particular had posed problems for the literal interpretation of Genesis back in Tudor times. Cohn recounts how vigorous the debates were during these centuries.

The origins of modern Young Earth Creationism are only briefly discussed. Cohn points out that Whitcomb and Morris's idea of stratification of fossils by fluid resistance on the basis of shape had its precursor in Woodward's idea of stratification by density.

The chapter I found most frustratingly short is the last one where Cohn deals with the use made of the story from the late 19th and through the 20th century by writers such as Frazer (*The Golden Bough*), Freud, and Jung among others. Cohn states that they went back to an old tradition exemplified by the medieval cabbalists of looking for hidden meanings. Cohn accuses these more recent writers of paying no attention to the thought of the biblical author, of being mutually contradictory, and of being farfetched!

As an introduction the book is useful. However, there are other books that I would still turn to first as they deal with the issues in more detail, such as: *The Meaning of Fossils* by Martin J.S. Rudwick (Univ. Chicago Press, 1976), *The Creationists* by Ronald L. Numbers (Alfred A. Knopf, 1992), and *The Biblical Flood* by Davis A. Young (Eerdmans, 1995).

Stephen Walley is a Research Associate at the Cavendish Laboratory, Cambridge, UK.

John Maynard Smith and Eors Szathmary
The Origin of Life: From the Birth of Life to the Origin of Language
Oxford: Oxford University Press, 2000.
192 pp. pb. £7.99
ISBN 0-19-28620-9X

This book is a version for general readership of '*The Major Transitions in Evolution*' (Oxford: W.H. Freeman/ Spektrum, 1995) which was written for professional biologists. According to the author's preface *The Origins of Life* 'presents a novel picture of evolution. Our basic idea was that evolution depends on changes in the information that is passed between generations, and that there have been "major transitions" in the way that information is stored and transmitted, starting with the origin of the first replicating molecules and ending with the origin of language'.

A book entitled *The Origins of Life* should show some awareness of what the general reader's preconceptions are likely to be. In this review we shall see to what extent these conditions have been fulfilled.

From the first page, the authors make clear to us that in their view evolution, from the formation of the first replicating molecules on the newly formed earth to the living forms we know at present, has been due to Darwinian natural selection. For them this is the chief, and probably the only, mechanism responsible for the adaptation of organisms to their environment and for the creation of new species. What is new, and what makes the book exhilarating reading is the idea that evolution has been dominated by eight changes, or transitions, consisting of: (1) enclosure of replicating molecules into protocells, (2) linking together of genes to form chromosomes, (3) evolution of the genetic code, (4) transition of procaryotes (bacteria) to eucaryotes (all other organisms), (5) transformation of asexual groups of cells into sexual populations, (6) formation of multicellular organisms consisting of many different types of cells, (7) linking up of solitary individuals into groups to form colonies and finally (8) development of language which caused the transition from primate (ape) societies to human societies.

Transfer of information starts in stage (3) with the evolution of the genetic code. The code is used throughout the ensuing stages until in stage (8) the human language is reached. The authors stress the analogy between the genetic code and human language: both depend on a limited number of units arranged in linear sequences, which can carry an indefinitely large number of meanings. The analogy is illuminating, but is it meaningful or simply fortuitous?

In this book the authors have covered the entire field of biology, including genetics – the field at least one of them (JMS) has led for several decades – molecular biology, cell physiology, ecology and linguistics. They cannot be equally expert in every field and indeed the reviewers have found in the fields in which they themselves have some competence (cell physiology and linguistics) that some of the information given is faulty. For instance, a rather large section of Chapter 6 on the origin of wall-less cells is controversial since there is a misinterpretation of the role of the cytoskeleton, a network of protein fibres within the interior of nucleated cells. The authors believe that the cytoskeleton acts like a sort of firm corset within cells that have lost their cell-wall, whereas in fact it does maintain cell shape, but it is flexible and cannot control cell-volume.

The final chapter, on the origin of language, is heavily dependent on Chomsky and his followers, whose thesis is that the ability to speak is due to a specific language organ lying somewhere within the brain so that the acquisition of language (a term they prefer to 'learning to speak') is a matter of instinct. The entire chapter is devoted to proving the existence of this 'language organ', though as they themselves sometimes put it in quotation

marks and sometimes not, it is hard to know whether they take it to be a metaphorical organ or a real solid object like the liver or the gall bladder. All the evidence they quote has been disputed (see e.g. G. Sampson, *Educating Eve*, London: Cassell, 1997) and some is downright faulty. For instance, the section on genetics of language, which depends on the study of a single family in Essex, has been repeated and the conclusions of the original worker revised. In short the idea that we acquire language by instinct, rather than learning it from our patient Mothers, is far from being proven, though Chomsky's critics agree that there must be genetic control of the ability to learn one's mother-tongue and indeed any language.

However, Chomsky's hypothesis suits well the underlying message of the book, which is the overwhelming importance of natural selection in the creation and development of life from its inception to the formation of human societies. Admittedly, the authors are careful to give some role to the importance of culture in human development and they stress the importance of myth and ritual in solving conflicts between different societies (Chapter 12).

But here we come to the major shortcoming of this book. The authors are not out merely to teach us rather a lot of biology, a thing they do very well. Their message is that natural selection, and nothing else is responsible for life on earth. They ignore scientific evidence, which demonstrates other creative forces. The picture Maynard Smith and Szathmary give us does not accord with that of other scientists, such as Stephen Jay Gould, who think about the origins of life (Gould,S.J. and Lewontin, R.C., 'The Spandrels of San Marco and the Panglossian Paradigm: a critique of the adaptionist programme', Proc. Roy. Soc. 205(1978), 581-589).

The book ends: "Will electronic devices acquire means of self-replication (i.e. life), and evolve or replace the primitive life forms that gave them birth? We do not know". At that, I felt deflated: so much science has led…. To what? Non-professional readers do not regard themselves as merely one more kind of machine, which is what biology reduces them to. Mary Midgley (*The Ethical Primate*, London: Routledge, 1994) has dealt with this attitude at length. Am I like a wonderful motorcar standing in a show room, admirably built no doubt but what for, if anything? This appears to be the biological picture of the human being whose only fate is to evolve into a better model.

At this point I turned to Keith Ward (*God, chance and Necessity*, Oxford: Oneworld, 1996) who has dealt at some length with problems to religion arising from reductionism in biology. He tells us that the theist has an answer to the question: what for? "The universe was created for a purpose, and this purpose is to realise intrinsic values among persons in relationship and community…. I should aim at goodness because that is the objective purpose of my existence".

Darwin is commonly said to have abandoned religion, yet he ended The Origin of Species by writing "… from so simple a beginning, endless forms most beautiful and most wonderful have been and are being evolved." Purpose, awe, wonder, these, I feel, are the true outcomes of the origin of life, no doubt for the professional biologist as well as for the general reader.

To conclude, is this book to be recommended to readers of *Science & Christian Belief*? In my opinion, yes, most definitely. It is challenging to intelligence and to faith; it stimulates the reader to think deeply on the many issues it raises. No final answers may be found but for God's sake, lets go on searching for them.

Margaret Ginzburg, Associate Professor, Institute of Life Sciences, the Hebrew University of Jerusalem, Israel, and Jonathan Ginzburg, Department of Philosophy, King's College London, U.K.

Harry Collins and Trevor Pinch
The Golem: What You Should Know about Science (second edition)
Cambridge: Cambridge University Press, 1998. 192 pp. pb. £7.95
ISBN 0 521 64550 6

Harry Collins and Trevor Pinch
The Golem at Large: What You Should Know about Technology
Cambridge: Cambridge University Press, 1998. 163 pp. hb. £12.95
ISBN 0 521 55141 2

In Kabbalistic legend a Golem is a figure shaped from clay and animated by a magical inscription. As might be expected, this procedure is not without its hazards. The Golem commonly runs out of control, destroying its surroundings and its creator. Like Frankenstein's Creature, the Golem has become a metaphor for the dangers of overreaching intellectual ambition.

In *The Golem: What You Should Know about Science*, first published in 1993, Harry Collins and Trevor Pinch give the metaphor a twist. The Golem here is not just a product of science but science itself. For the authors, science is neither all good nor all bad: if treated with care, it will do useful work, 'But it is clumsy and dangerous. Without control, a golem may destroy its masters with its flailing vigour… it is not an evil creature, but it is a little daft' (2).

The first edition received much praise and some criticism. The second edition includes a new preface and an afterword commenting on issues raised. There are some minor amendments to the text, but the main conclusions of the book are retained and defended. Alongside the new edition comes a sequel, *The Golem at Large*, dealing with technology in the broad sense of 'applied science'.

As readers of the first edition (reviewed in *S&CB*, Vol. 7, 1995) will recall, *The Golem* proceeds through case studies of episodes in both physical and life sciences: the Michelson-Morley experiments on the speed of light; Eddington's observations to test the general theory of relativity; recent attempts to detect gravity waves and to measure the flux of solar neutrinos; the cold fusion fiasco; Pasteur's debate with Pouchet in the 1860s over spontaneous generation; experiments on learning and memory in flatworms; and the mating behaviour of whiptail lizards. The common theme of the studies is that work at the cutting edge of science is messy and inconclusive. Successful experimentation requires skill and judgement; different experimenters get different results, and the outcome is seldom immediately clear. There may arise what the authors call the 'experimenter's regress', where the acceptance of an experimental result depends on its consistency with the very theory it is meant to test. Only after a consensus has emerged in the scientific community can the 'right' results be identified. History is then tidied up in the textbook accounts, which serve as 'sustaining myths'.

The Golem at Large follows the same format. A series of case studies cover the performance of the Patriot missile in the Gulf War; the causes of the Challenger disaster; the safety testing of nuclear fuel flasks; Thomas Gold's unorthodox theories of the origin of oil; the problems of macro-economic forecasting; the Chernobyl radiation leak; and the testing of AIDS treatments. As in their earlier book, the authors emphasise the messiness of real life problems. Even the Challenger disaster, usually presented as a simple case of reckless deadline-chasing, turns out on examination to be highly complex. Technological decisions cannot be reached by simple formulae: expert judgement is indispensable, and non-scientists themselves may have expert knowledge to contribute on some aspects of a problem.

On the merits of the books, it must be said at once that they are exceptionally lively, wide-ranging and stimulating. And I agree with the authors that real sci-

ence is seldom as neat and tidy as textbook accounts and popularisations imply. Muddle, fudge and conflicting results are commonplace.

But *The Golem* goes beyond this. The crunch issue is how uncertainties in science are *resolved*. Scientists would like to think that they are resolved primarily by the accumulation of ever-clearer evidence. Collins and Pinch, however, maintain that resolution is achieved through social consensus: an 'agreement to agree about new things' and not 'by the inexorable logic of a set of crucial experiments' (54). The process as they describe it appears subjective and irrational, for 'scientists at the research front cannot settle their deep disagreements through better experimentation, more knowledge, more advanced theories, or clearer thinking' (142). The 'experimenter's regress' means that evidence can never refute a theory (3, 85, 97, 101, 116). Disputes are therefore settled 'within the field of human argument' (119), in which rhetoric (97), tricks (149), individual reputation (104, 113), professional jealousies (71, 110), and political and religious bias (79) all play a part. Empirical evidence plays at best a subordinate role: 'Nature imposes much less of a constraint than we normally imagine… Science works the way it does, not because of any absolute constraint from Nature, but because we make our science the way that we do' (138).

Such ideas do not come out of the blue. Collins and Pinch are leading exponents of the movement variously known as the 'Sociology of Scientific Knowledge', the 'Strong Programme', or the 'Edinburgh School' (after one of its strongholds). The central thesis of the movement is that scientific knowledge is 'socially constructed', and has no privileged claim to objective truth about the world. As Collins himself has described this position, it 'embraces an explicit relativism in which the natural world has a small or non-existent role in the construction of scientific knowledge' (*Social Studies of Science*, 1981).

Such views are bound to attract opposition, and *The Golem* has been caught up in the (mainly American) controversy known as the 'Science Wars'. I shall not address the general issue of relativism here, beyond remarking that the relativists have not, it seems to me, explained the striking fact that science usually does reach a consensus on disputed issues, which is not the rule in human endeavours.

So far as The Golem itself is concerned, we may ask: are the case studies reliable? And do they justify the authors' generalisations about science? Few individuals (and certainly not the present reviewer) can claim expert knowledge of all the fields covered in The Golem, but several of the case studies have been criticised by specialists. My own impression is that they are accurate and fair as far as they go, but they give too little of the broader context of the episodes described. For example, from the authors' discussion of the Pasteur-Pouchet controversy, one might think that this was a parochial French issue settled by a diktat of the *Academie des Sciences*. But this is quite misleading. The work of Schwann and Helmholtz had already created a strong presumption that putrefaction was caused by living micro-organisms, and Pasteur's own experiments were replicated and refined in Britain by Huxley and especially by the physicist John Tyndall. Tyndall's results were considered by many contemporaries even more decisive than Pasteur's. But the only mention of all this in *The Golem* is a passing reference to 'the British scientist William [*sic*] Tyndall' (82).

On the second question, the case studies, if reliable, do support the authors' conclusions, but I think they make too much of the 'experimenter's regress'. The studies themselves show that scientists look for independent ways of checking the validity of an experiment. A more general criticism is that the studies are unrepresentative. They all deal with situ-

ations where, for various reasons, empirical evidence is scarce or ambiguous. It is not surprising that in these circumstances disputes may be fierce and prolonged. But this is not the case with science as a whole – if it were, the scientific enterprise would never have got off the ground.

In the new edition Collins and Pinch accept that the case studies are not statistically representative of science, but claim that this was never their intention: their aim was always to deal only with 'controversial' or 'deeply disputed' science (xiv, xv, 175). This, they argue, is what is 'philosophically representative' (176), because it shows what science can and cannot do in problematic cases, and these, they believe, are all that the *citizen* need understand (xv). I believe this defence takes an unduly narrow view of the citizen's interest in science, and one which was not apparent in the original text.

I could not recommend these books in isolation to a layperson seeking a balanced introduction to science or technology. For the more sophisticated reader, they should be on the menu. The stew is a rich one, but use a long spoon.

David Burbridge is a writer on the history of biology.

D. Gareth Jones

Valuing People: Human Value in a World of Medical Technology

Carlisle: Paternoster, 1999. 241 pp. pb. £ 12.99.
ISBN 0-85364-991-X

The world of Christian medical ethics is already indebted to Professor Gareth Jones for his two books on the ethical problems arising from assisted reproduction technology, *Brave New People* (1984) and *Manufacturing Humans* (1987). His latest book, *Valuing People*, is more wide-ranging, but still illustrates his greater interest in the problems at the beginning of life to which he devotes four chapters, as opposed to those at the end of life to which he gives only one chapter.

The author makes much use of 'scenarios' to illustrate his discussion, but some of these may seem forced and artificial. Thus in his first chapter he proposes what he calls 'a macabre game' (3) in which he pictures a number of people trapped in a burning building and considers the order in which they should be rescued on the basis of their physical or mental condition, and their status and value in society. However, when called to the fire, fire officers would be unlikely to know anything about the health and status of the persons trapped in the building. The only value which they could usually take into account would be life, i.e. that the victims were alive and needed to be rescued. Nevertheless, this use of scenarios makes the book very valuable as a source book for use in discussion groups.

Another valuable section of the book is the three chapters in which the author deals with the Biblical foundation of the value of human life and its practical assessment. He writes as an evangelical Christian who regards the Bible as God's revelation of himself and his purposes, and therefore relevant to any discussion of human value. The Bible contains certain basic moral rules such as the Ten Commandments. These rules are absolute in the situations they cover, but they do not cover all situations and their demands may even conflict with each other on occasion. In addition, the Bible contains moral principles which are of two kinds, which the author distinguishes as first-order and second-order. The first-order principles are general, absolute and all-embracing, such as love and justice about which there is no ambiguity. The second-order ones are more specific and may be morally ambiguous, such as preserving life whatever the cost and telling the truth whatever the situation. These principles may also be divided into those which are absolute

and those which are consequentialist, and many medical ethical dilemmas arise from the conflict between these two kinds.

In his preface, the author defines the intention of the book by saying that it is not a text-book of ethics or of theology; nor is it exhaustive in its coverage since it says little about the problems of clinical ethics. It is written for all who wish to think long and hard about the ethical problems posed for the Christian believer by modern technology, 'to throw light on ways in which human life might be valued more' (xi), whether by scientist or non-scientist. It is written in lucid non-technical language and is warmly recommended as an informed contribution to the on-going debate about the Christian attitude to modern medical ethical problems.

The Revd Dr John Wilkinson is a retired medical missionary and consultant in public health medicine, a graduate in medicine and divinity of Edinburgh University and the author of Christian Ethics in Health Care (Handsel Press 1988).

Ulrich Kropac

Naturwissenschaft und Theologie im Dialog

Münster: LIT Verlag, 1999. XVII + 393 pp. hb. 69.80 DM
ISBN 3-8258-3727-0

The questions raised by modern natural science for Christian theology are discussed in all Christian traditions and in many different countries. The English language literature is only a subset of the literature in this field, and it can often be profitable to broaden the horizon to other parts of the literature.

This book is written by a German Catholic theologian, who also has a background in mathematics and information science. The main argument put forward in the book is that new developments in the foundations of the natural sciences, especially in mathematics and physics, open up possibilities for a new dialogue between theology and the natural sciences.

In order to establish this conclusion the author first looks at three foundational problems in the natural sciences in great detail. These are the problems concerning 1) the correct interpretation of quantum physics, 2) the impact of chaos theory and non-linear dynamics on our understanding of causality and determinism, and 3) the discussions about the final foundation of mathematics (logicism v. intuitionism v. formalism). In each case it is shown that there are unresolved problems that touch the very basis of our understanding of the world, i.e. potentially fruitful problems for a dialogue with theology.

The second part of the book looks at the worldviews of Max Planck, Werner Heisenberg and Heinrich Scholz, in order to show various ways of conceiving of a dialogue between theology and the natural sciences. Planck and Heisenberg are well known names but Scholz is probably unknown outside of German protestant theology and German logic. Scholz was professor of mathematical logic in Münster in the 1940s and 50s and was important for the development of modern German logic. The author shows how each of these three scientists exemplifies a specific approach. Planck exemplifies the idea that natural science and religion will eventually converge (on the terms of natural science), Heisenberg a complementarity view of science and religion, and Scholz a more ambitious approach where theology becomes a necessary contributor to an underlying common metaphysics.

In the third and most novel part of the book the author then proceeds to show how the new developments in the natural sciences have made both Planck's and Heisenberg's ideas implausible. With the distinction between determination and computability introduced by chaos the-

ory and the unresolved problems about the final foundations of mathematics we no longer have any reason to believe that the natural sciences can ever provide us with a complete worldview, as both Planck's and Heisenberg's projects require. This is where theology may again enter the dialogue, not as a filler of the ever decreasing gaps in our knowledge about the world, but as an equal partner in an exploration of those areas where knowledge must be of another kind than that provided by the natural sciences alone.

This is an academic book in the best sense of the word. The author takes his time to lay out his arguments, and makes absolutely sure that all premises are well supported. It is not always an easy read, but it amply rewards the reader who takes the time and effort to read it in the slow and careful way in which it deserves to be read.

The book has a very useful name index, but could have benefited from a general index. The list of references is extensive and provides a good stepping stone for further studies in the German (and English) literature in this area.

Søren Holm is Reader in Bioethics at the Institute of Medicine, Law and Bioethics, University of Manchester, and Professor of Medical Ethics at the Centre for Medical Ethics, University of Oslo

Hugh Ross

Beyond the Cosmos

Colorado Springs, CO: NavPress, 1999.
261 pp. pb. £8.50.
ISBN 1-57683-112-4

This is a 'revised and updated' edition of a book first published in 1996. (No information is given about the nature of the revisions.) It has two sub-titles: 'the extra-dimensionality of God' and 'what recent discoveries in astrophysics reveal about the glory and love of God'. Although the book does give some description of astrophysical work (most of it theoretical speculation from the mid-1990s), it is mainly a biblical exposition of Christian concepts such as the triunity of God, the incarnation, the atonement, free-will, salvation, hell, and the new creation.

The relationship between our world, with its three space dimensions, and an imagined world which has only two space dimensions (such as Flatland in the book with that title by E A Abbott published in 1884) provides an analogy which may help us to understand the relationship between our world and the spiritual world of God and the angels (postulated to have more than four space dimensions – and perhaps more than one time dimension). Ross explores this analogy in detail (without any acknowledgement of the earlier writing on the subject). He presents the use by present-day cosmologists of multi-dimensional mathematics as 'discoveries' which validate the idea. A chapter entitled 'Science breaks through to new realms' concludes that the 'remarkable advance of research reveals a God who lives and operates in the equivalent of at least eleven dimensions of space and time', but one wonders how many of the people whose work Ross cites would accept that revelation.

The book has some useful comments on the difference between contradiction and paradox. Its criticism of the idea of a 'timeless' eternity, with the suggestion that 'timeful' is a better word to use for God's time-related capacities, is helpful. Less acceptable (to this reviewer at least) are its notions of a 'salvation threshold' and a 'blasphemy threshold' for every human being – lines that are crossed during this life either into an eternal heaven or into an eternal hell. There is rather a lot of speculative theology of this sort. For example, it is suggested that the pain of hell (presented as eternal conscious suffering) is to distract those who have to endure it from putting their energy into attacks on their neighbours; the level of torment will be different for different

people (more for Adolf Hitler than for Albert Schweitzer, the book suggests). The interpretation of biblical statements is very literal, as might be expected from the fact that 'Reasons to Believe' – the organisation dealing with faith, science and the Bible that was founded by Hugh Ross in 1986 – adheres to the doctrinal statements of the International Council on Biblical Inerrancy. The literal treatment of the book of *Revelation* leads to some curious results. Did you know that the New Jerusalem will provide each of us who arrives there with 'about forty billion cubic feet of living space (equivalent to a fourteen square mile home with a hundred foot high ceiling)'?

This book may be of interest to a few readers of *Science and Christian Belief* but it is very unlikely to make any lasting contribution to the overall understanding of science/faith issues.

Bennet McInnes is a retired astronomer who was secretary of Christians in Science in the 1990s. [bennet.mcinnes@lineone.net]

Gay Watson, Stephen Batchelor & Guy Claxton

The Psychology of Awakening

London: Rider, 1999. 347 pp. pb. £12.99. ISBN 0-7126-7043-2

Prior to the twentieth century Buddhist scholars developed perhaps the most notable understanding of the human psyche. It was based upon the Four Noble Truths: 1) the truth of suffering, 2) the truth of the origin of suffering, 3) the truth of the cessation of suffering, and 4) the truth of the path that leads to the cessation of suffering. With the emergence of modern Western psychology there has been a growing interaction between Western and Buddhist contributions to their understanding of the human mind and therapy. This book emerged out of two conferences held at Dartington Hall in Devon. The majority of the contributors are Western Buddhists who are leading members of various organisations that represent what can generally be regarded as alternative therapies. They include Christopher Titmuss, the co-founder of Gaia House retreat centre in Devon, David Brazier teacher of the Amida Trust, and Maura Sills who is Programme Director of the Karuna Institute. Two Tibetan lamas also make contributions.

Part one is concerned with philosophical issues. The Buddhist doctrine of non-self (anatta) denies that there is any entity within the human body over and above the process of change present within every phenomenon. This does not imply a nihilistic view of the soul, but sees it as essentially a functioning within the person. This teaching therefore raises the question of how Buddhism can contribute to the therapy of the self. Geshe Thupten Jinpa proposes that while psychoanalysis aims at bringing about a coherent sense of self, Buddhist psychology aims to transcend the very concept of self that is fundamentally positive and compassionate

Part two seeks to show how many of the newer Western ideas of psychology are becoming more in accord with those of Buddhism. Guy Claxton describes how Buddhism and psychology come together to account for everyday 'mystical experiences'. Terence Gaussen is a psychologist working with children and considers the development of personhood and the brain.

Part three considers Buddhism and psychotherapy. John Welwood points out that the paths and goals of Buddhism and psychotherapy while compatible are not the same. Psychological work addresses interpersonal relations, whilst the spiritual is concerned with the trans-human, the domain of emptiness. He argues that these two realms cannot be separated, and should recognise each other as two vitally important limbs of an evolving humanity that is still moving towards realising its potential (p. 166).

The final part is concerned with the application of Buddhism in therapeutic practice, and not surprisingly is the largest section. The first paper is by David Brazier who summarises some of the different forms of practice currently being undertaken. These include the use of ancient Asian therapies, breathing, and totally new therapies that have emerged from the interaction between Buddhism and Western ideas.

This book is about 'the march in the borderland' (p. 220) between two influential philosophies. Time will tell if the people writing here are the pioneers of a new age, or rebels on the fringe of society.

Dr David Burnett is Director of Studies at All Nations Christian College where he teaches Social Anthropology and Asian religions

Noretta Koertge (editor)

A House Built on Sand: Exposing Postmodernist Myths About Science

Oxford: Oxford University Press, 1998, 322 + xi pp. hb.
ISBN 0-19-511725-5.

The predominant metaphor, which was used to describe the relationship of science and religion in the nineteenth century, was that of warfare. Today that metaphor is perhaps better used to describe the relationship between science and science studies! This volume is a product of those so-called 'science wars'. The 'science wars' have set moderns against postmoderns, scientists against social scientists and ontological realists against relativists. Modernism and science has always enjoyed a symbiotic relationship; scientists are keen to refute postmodern arguments, because postmodernism could ultimately topple science from its position as top dog in the epistemological hierarchy. This goes some way to explaining the vehemence of the 'debate'.

This volume, not quite so polemical as other 'science war' contributions, contains 18 chapters, which come in five parts; the contributors include scientists (e.g. Alan Sokal, Allan Franklin, Paul Gross), mathematicians, philosophers (e.g. Philip Kitcher, William McKinney), social scientists (e.g. Margaret Jacob) and historians.

A major shortcoming of the book is that it never fully defines what it means by postmodernism. Often it naively identifies the strong programme and relativism with postmodernism. At times, it gives the impression of playing 'ping' to the science studies 'pong'. Many of its targets are at the extreme end of science studies: Pickering, Latour, the Edinburgh School, and feminists such as Keller and Marchant all come under fierce fire. Occasionally, it sounds like a soccer player shouting 'foul' when a rugby player handles the ball. The 'moderns' in this book criticise the 'postmoderns' (and here I use the term *very* loosely) for not playing by modernist rules. For example, Huth's criticism of Latour is based in part on the fact that Latour misses Einstein's intentions in writing the paper, whereas Latour could merely accuse Huth of committing the intentional fallacy!

What is missing from the book is an 'immanent critique'. The authors, in the main, fail to fully understand the postmodern worldview; this is the problem of the 'science wars': at heart, it is a worldview conflict; and the worldview questions are not addressed here. What we have are pinpoint critiques of the fine detail, such as: erroneous feminist views of the macho sperm and bashful egg (ch 4); the (mis) reading of the cold fusion by Collins and Pinch (ch 8); the (mis) use of Bacon's 'rape' metaphor for science (ch 12); and the false romantic view of the alchemists propounded by some feminists (ch 216). All of which make fascinating reading.

The strength of the book is that it provides a good 'transcendent critique' of the excesses of a relativistic ontology, feminist critiques of science and the strong

programme. It will provide stimulating, though at times infuriating, reading; it is recommended for all those interested/involved in the 'science wars', it is an important addition to the literature.

Steve Bishop has degrees in physics and theology and is a lecturer at Soundwell College, Bristol. e-mail: stevebishop_uk@yahoo.co.uk

Robert T. Pennock

Tower of Babel: The Evidence against the New Creationism

Cambridge, Mass: The MIT Press, 1999, 429 pp. hb. £24.50.
ISBN 0-262-16180-X

Robert Pennock is Assistant Professor of Philosophy at the University of Texas at Austin, and specialises in the philosophy of science. The 'new creationism' of the book's sub-title is what he calls 'intelligent design creationism' (IDC) advocated by such people as Philip Johnson, Michael Behe and William Dembski. The title of the book seems to be prompted by what he refers to as 'a beautiful display of the Tower of Babel' (123) at the Institute for Creation Research's Museum of Creation. However, it is also a symbol of what he sees as a struggle within creationist ranks for prominence in, if not control of, the concept of 'creationism' between various varieties of young-earth creationism (YEC), old-earth creationism (OYC) and IDC.

Pennock certainly has a good knowledge of the varieties of creationism as they appear in the USA. He has read the literature, done the tour in places like the Museum of Creation, and debated publicly with leading creationists. He shows a deeper understanding of the creationist movement than do many of its critics. The opening chapter of the book gives a good, brief survey of the history of creationism in the USA in the twentieth century, in all its many forms. Chapter two is primarily a fairly brief survey of the evidence for evolution. However, it begins with a helpful discussion of what has been, and is, acceptable 'evidence' and 'proof' within modern science. A theme that surfaces from time to time in the book is the fact that many creationists have a different understanding of what these terms mean and so of what is and is not science. Among other things, they put a lot of emphasis on the necessity of 'direct observation'. Since no one (except God) was around to observe the beginning of life or the origin of species these topics cannot be scientific. This would seem to put them beyond the scope of 'creation science' too. However, the creationists then appeal to the witness of God, the biblical creation story, at least as they interpret it.

The much more nuanced claim by the IDCs that appeal to supernaturally given information and supernatural causes is discussed at length in chapter six. Here Pennock shows just how problematic this is. Among the problems he exposes is that of 'supernatural' explanations becoming simply 'super natural' ones. In an earlier chapter he makes the point that it is virtually impossible in practice to distinguish between the claims of the IDCs and those of the Raelian Movement, which began in the 1970s. The Raelians are anti-evolution and claim that there is evidence of intelligent design in life forms on earth. However, they argue, on the basis of the contact of the founder, Rael, with extraterrestrials, that the designers were super scientists from the planet Elohim who used planet earth as a laboratory for genetic experiments (234-236). From a scientific point of view, why should Christian ID explanations be treated any differently from Raelian ID ones?

In a couple of places Pennock engages directly with the work of the biochemist Michael Behe. He shows that in *Darwin's Black Box* Behe works with an understanding of the mechanism of evolution that is not the one held by modern evolutionary biologists, and so much of his cri-

tique of evolution is beside the point (166-172). Taking up the critique of Behe by the biologist Alan Orr he shows a fatal weakness in Behe's claim that systems which are now 'irreducibly complex' could not arise by a gradual process (270).

The protagonist with whom Pennock engages most often, and in most depth, is Philip Johnson. There is not space here to even summarise all the main points of the discussion. One aspect of Johnson's method which Pennock identifies and illustrates is that of facing his readers or hearers with stark either-or alternatives, when there are more options than this. So, for example, they are challenged to choose between atheistic natural selection or theistic IDC. Just on occasion Johnson lets his guard slip, as when in a footnote he admits that natural selection makes atheism *possible* but does not make it *obligatory* (336).

In chapter seven Pennock does something that few critics of creationism do with any sympathetic understanding. He goes behind the scientific debate to the underlying motivation and issues, recognising that, 'The creationism controversy is not just about trying to avoid being descended from apes, it is about trying to avoid an existential crisis' (312). He quotes various YECs, OECs and IDCs to make the point that they each see their version of the creation story as the only sound basis for meaning and values in life. Most Christians, whatever their views on evolution and creation, will probably find the ensuing discussion one of the least satisfactory parts of the book. Pennock asserts that a majority of people in Western societies claim that their lives are meaningful and that they hold to certain values, even though they do not believe in a divine creator. This is no doubt true, but the point at issue is the validity and coherence of these claims. Pennock is not very convincing on this issue. The sad thing is the dogmatism of some creationists who insist that meaning and value only have a basis if *their* creation story is accepted, and will not accept that meaning and value have their basis in belief in the Creator rather than any one creation story.

The final chapter of the book, chapter eight, discusses the issue of teaching science in public schools in the USA. While this might seem to be of little interest to readers outside the USA, it does raise issues about the inter-relationship between education, science and citizenship which are relevant in any society. An unsatisfactory aspect of this chapter is the way Pennock 'privatises' religious truth over against the 'public' nature of scientific truth. Here he seems to be following Johnson's lead in posing stark alternatives.

As far as this reviewer is aware, at the time of its publication this book was the first major critique of IDC. It will not be the last word on the subject, but it makes some telling criticisms which deserve to be widely discussed.

Ernest Lucas, a former research biochemist, is Vice-Principal and Tutor in Biblical Studies at Bristol Baptist College.

Barbara Katz Rothman

Genetic Maps and Human Imaginations: the limits of science in understanding who we are

London and New York: Norton, 1998.
272 pp. hb. £17.95.
ISBN 0-393-04703-2

This book provides a good counterbalance for those who are perhaps too upbeat about the Human Genome Project and should be read by those involved or interested in that field.

The author is well-informed and fully aware of the potential medical progress that gene mapping can bring. However, as a Professor of Sociology she surveys the Genome scene as an outsider with a touch of cynicism for the idealism of research scientists and an even greater

distrust of market forces and the economics of Government.

She focuses on three issues. The first is race. As an American Jewish woman with an adopted black American child her approach is robustly emotive but none the less telling for that. Her review of European and American history shows how ingrained but often illogical are our concepts of race and 'them' and 'us'. Did you realize that the connotation 'black' has different interpretations in Europe and America? She emphasizes the link between knowledge and power and believes that as molecular knowledge accumulates and racial variants are identified, discrimination and exploitation of the vulnerable are all too likely.

The second section is about health. While the author has no quarrel with the use of genetic techniques to improve our understanding and management of serious genetically determined diseases, she is less happy about what she calls the geneticisation of cancer and other common conditions, as gene mapping makes them better understood. Her concern is that as the spotlight falls on genetic predisposition and individual risk, interest and resources will drift away from efforts to address environmental and social disease-predisposing factors. This is a valid point that needs constant re-iteration.

The third section centres on reproduction. The author points out the cultural discrepancies in current pre-natal testing practice and moves on to discuss pre-implantation testing (using *in vitro* fertilization techniques to identify different genes in the fertilized egg). This follows well-trodden paths with scenarios of future parents having the option (if they have the money) of reducing disease risks and selecting advantageous traits in their offspring. The section ends chillingly 'In the hands of the market, the Book of Life becomes a catalogue'.

In the concluding chapters the author grapples with reductionism, starting with an unsatisfactory discussion on the meaning of the self/soul/person. Here Katz' Jewish roots desert her and she has little to offer. This section cries out for some biblical input. However there follows a memorable chapter on community and the various 'we' groups of which we may be members even if only transitorily. Here is a telling reminder that we were not created to be isolated self-sufficient individuals but to flourish within a group even if some with whom we share this are unexpected.

The book is written from an American viewpoint but examples and anecdotes illustrating our common humanity come from all over the world. Although the subject-matter is serious this is by no means a diatribe as the author has a delightfully light touch. Well indexed and referenced this is an enjoyable read giving serious food for thought together with opportunities for laughing out loud. It can be thoroughly recommended.

Caroline Berry is a recently retired Clinical Geneticist and current General Secretary of Christians in Science

Jeffrey Burton Russell
Inventing the Flat Earth

Westport, CT: Praeger, 1997. 117 pp. pb. £13.50.
ISBN: 0-275-95904-X.

The greatest lies can also be the most enduring. The notion that people in medieval times generally believed that the earth was flat is widely assumed. It is one of those beliefs that 'everybody knows' and which therefore requires no discussion. School text-books continue to assure its readers that "Columbus felt he would eventually reach the Indies in the East. Many Europeans still believed that the world was flat. Columbus, they thought, would fall off the earth". In Joseph Chiari's play, *Christopher Columbus*, the bold young rationalist

Columbus confronts the religious obscurantist priests who warn him against the heresy of maintaining that the earth was round.

All this is, of course, pure fantasy without historical foundation, and Russell's survey provides a penetrating insight into the way in which such historical myths can become established by a process of endless repetition and assimilation. Russell draws on a wide range of sources to demonstrate unequivocally that the roundness of the earth was widely known and believed in the medieval era, a view sustained by the passion for circularity inherited from the Greek philosophers. Dante (1265-1321) was so aware of Ptolemaic astronomy that his *Convivio* offers an estimate of the earth's diameter at 6500 miles.

Before Columbus set out on his voyage he consulted Pierre D'Ailly (1350-1420), a theologian and philosopher, who discussed the earth's volume, and thought that if the surface of the earth was only smoother a person could walk round the globe in a few years. The sailors on Columbus' ships may have felt understandably apprehensive about the long voyages of discovery that lay ahead, but the fear of falling off the edge of a flat earth was not one of their concerns.

So how did the modern notion that medieval people believed in a flat earth become established? Russell traces the error to three main 19th century sources, the late 19th century modernist linkage between science and progress subsequently providing a fertile ground in which the error flourished and spread. The first source for the error is found in John Draper's infamous work, 'The History of the Conflict Between Religion and Science' (1874). In his best-selling book Draper portrayed Columbus under attack from the Spanish religious fanatics who drew their arguments from the early Church fathers. The idea of a spherical earth, claimed Draper, was 'as might be expected…received with disfavour by theologians' in medieval Europe. Such claims fitted neatly with Draper's 'warfare' metaphor for the relationship between science and religion, a metaphor which became widely disseminated during the 100 years following the publication of Draper's book. Andrew Dickson White (1832-1918) picked up the metaphor in his 'History of the Warfare of Science with Theology in Christendom' (1896) in which he misrepresented the views of the early Church fathers and repeated the 'Columbus versus the ignorant theologians' account with additional flowery rhetoric. From such works the error filtered into school and university texts and then on in to general culture. The account fitted well with the late Victorian progressivist view that the medieval period had been one of unremitting darkness.

The second main perpetrator of the error was the American historical novelist Washington Irving whose 'History of the Life and Voyages of Christopher Columbus' (1828) made use of original sources in a careless way. The outcome was a work fictional in many respects but with sufficient historical base to make the unwary reader think that all its claims were equally reliable. In one of several sections of pure fiction, Irving has Columbus being "assailed with citations from the Bible" and with "pedantic bigotry".

Russell suggests that the writings of Antoine-Jean Letronne (1787-1848) provide the third main source for the flat earth error. Letronne was a polymath who held a number of different academic positions in French universities. His article "On the Cosmographical Opinions of the Church Fathers" (1834) is highly inaccurate, but became an important source for later writers on the subject who failed to check their original sources.

Russell's work is not the first to demolish the flat earth mythology – others in the 20th century have undertaken the task. Charles Jones, a professor of English at Cornell, was astonished in 1934 that the error still persisted in defiance of

well-established evidence. This is one reason why Russell's work is so important. The mythology of the warfare metaphor lives on in popular culture. Knocking away the flimsy 19th century props of the metaphor is a useful exercise. Apart from anything else, there is really no excuse for the propagation of information which is so poorly supported by the historical material. As Russell robustly states the case: "If we were not so ethnocentrically convinced of the ignorance or the stupidity of the Middle Ages, we would not fall into the Flat Error" (p. 76). 'Inventing the Flat Earth' is a well-written and thoroughly researched account of a fascinating topic. It is strongly recommended.

Denis Alexander is Editor of Science & Christian Belief.

Ruth Conway

Choices at the Heart of Technology

Harrisburg, PA: Trinity Press, 1999, 125 pp., pb. US$12.00.
ISBN 1-56338-287-3

This is an exceptionally thought-provoking and disturbing book, even to a technologist who was in prior agreement with many of the author's conclusions!

In it, Ruth Conway exposes and discusses the basic presuppositions of much Western use of technology. She does not fall into the trap of suggesting that technology is in itself evil. Instead, she shows how its power has bewitched us away from using it to fulfil a dream of helping humanity, into a rigid and materialistic way of thinking in which efficiency and economic criteria are considered the only values to be sought. There is a wealth of research and careful argument presented in her discussion, in which she shows how the limited models used to enable us to understand scientific systems have caused major problems when applied more widely. For example, vital elements have automatically been excluded from our decision-making, so that such major consequences as global ecological disaster and the dispossession of primitive peoples take us by surprise, even though they were never considered in the first place.

The author attempts to apply a number of biblical principles to give us a more balanced view, starting with the basic premise that God is sustainer of the Universe and intimately concerned with all aspects of technology. She shows that a desperate desire for control, rather than humility in the face of God and uncontrollable elements, leads to a rigid framework in which people are treated as interchangeable and disposable units, or even split up into interchangeable and disposable parts. In our society, people are seen as the cause of problems and machines as giving us solutions, and we have lost the recognition that people have a unique ability to see things as a whole and appreciate the moral and emotional dimensions which scientific analysis omits. She argues cogently for more consultation in decision-making with the people who experience at first hand the shadow side of technology, and further, for the decision-makers to be required to experience at first hand the consequences of their own decisions. The wide separation of cause and effect in our society is seen as one of the major causes of our insensitivity. In fact, we need to control not nature, but ourselves: the doctrine of original sin and forgiveness is most appropriately discussed.

Mercifully, the author does give us a number of pointers for the right use of technology, such as judging the success of our communication systems in the light of the improvement they make to truthful and meaningful personal relationships. She favours small, inter-linked concerns and wide consultation with people of differing cultures, rather than multi-national giants. This, she suggests, would provide safeguards against our distancing ourselves from the consequences of our actions. She argues that

women and men often have quite different priorities, and that much greater inclusion of women in technological decision-making would help to prevent some of the more brutal excesses of our competitive society. Everybody, she claims, can have some influence on the gigantic network of our culture, and some people have the power to make crucial decisions affecting many lives. She ends with a most helpful chapter on the education of our children, teaching them to use technology 'to empower all people to improve their own lives, through self-reliance and interdependence, and the enhancement of social and international relationships.' (111-112)

Unfortunately the author does not address the compounding of our problems due to over-population, or the right use of competition and ambition, which undoubtedly motivate a great many people. There is also a need for an entirely different exploration of her arguments based on natural law instead of biblical texts, as in the very non-Christian West, too few people will read a book with so Christian a flavour.

Every Christian in a technologically-oriented profession would benefit from reading this book, although it is not light bed-time reading. There is still much thinking to be done on how the principles discussed should be developed and applied. I also felt that some of those least likely to read it were Design and Technology teachers, and that another book needs to be written for them, in a less indigestible and more practical style. Nonetheless the message of this book is compelling and urgent: it will be ignored at our peril.

Hazel Lucas is a practising secondary school teacher of physics and design technology (electronics), with a doctorate in physics and a diploma in design technology.

J. L. Heilbron

The Sun in the Church: Cathedrals as Solar Observatories

London: Harvard University Press, 1999.
ix + 366 pp. hb. $35; £21.95.
ISBN 0-674-85433-0.

With a dramatic flourish, John Heilbron opens his account of cathedrals as solar observatories with the claim that "The Roman Catholic Church gave more financial and social support to the study of astronomy for over six centuries … than any other, and probably all other, institutions." The basis of this generosity, he immediately adds, was not the love of science, but the administrative problem of establishing the date of Easter.

Although a number of reviewers seem almost fixated on the opening sentence, Heilbron's claim comes as no surprise to anyone familiar with the broad outlines of astronomical history from the late Middle Ages into the Enlightenment. Even Copernicus earned his living as a churchman. Nevertheless, Heilbron's well-informed account of 16th- and 17th-century Italian astronomy goes far to document something quite different from the Church's generous support of astronomy, namely, the suppression of speculative, cosmological astronomy in Catholic countries following the so-called Galileo affair. While the Catholic astronomers pursued the fundamental constants of the solar theory (as it was called even by Copernican astronomers who recognized the relativity of the earth-sun system), they missed out on the grand cosmological changes as the next advances in cosmology moved to the north.

Apart from the flurry of interest in the Y2K bug and the debate over whether the third millennium begins in 2000 or 2001, the arcana of calendar making and Easter prediction is a topic of ages past, though the latter still divides major parts of Christendom. Establishing relatively simple Easter-prediction rules to cope with the incommensurability of lunar and solar periods was a difficult ecclesiastical

task, both astronomically and politically. Heilbron sets the stage for his narrative with a detailed excursion through these calendrical intricacies, and then with an extended lesson on spherical astronomy—his passion for geometry means that his readers will get the full treatment. But without it, the story of the sun in the church would be fuzzy and half-told.

But why the sun in the church? By early in the 16th century Catholic astronomers realized that Easter was coming too late with respect to the seasons. The actual equinox had slowly moved earlier in the calendar, to March 11 instead of March 21. Furthermore, the medieval "fix" for the precession of the equinoxes was no longer working, and presently Copernicus showed that the date of the closest earth-sun distance had changed since antiquity, The traditional length of the year needed fine tuning. For all these calendar-related problems more precise observations, over a period of some years, were crucial. Precision could perhaps be obtained by building larger instruments, if they were sufficiently stable and permanent. Here is where large churches and cathedrals filled the bill, especially because the argument could be made that the observations would be directly linked to refined Easter determinations.

An aperture high in the structure could project a solar image on a calibrated meridian line on the pavement of a large church or cathedral. As Heilbron shows, establishing an accurate *meridiana* was by no means a routine task. The height of aperture had to be known quite exactly in order to use the geometry quantitatively. The pavement had to be level (which could be achieved with a long water trough), and the line oriented precisely north-south. Precautions became more elaborate with each succeeding endeavor.

The most famous of all these projects was the line in the San Petronio church in Bologna. It established the reputation of Giovanni Domenico Cassini, who became Jean-Dominique Cassini when he was lured to Paris by Louis XIV; it had taken the Sun King a direct appeal to the Pope to consummate the invitation. Cassini's accomplishments come midway in Heilbron's story, but none of his successors were as illustrious. Their names are hardly household words: Bianchini, Ximenes, Manfredi, Cesares. Florence, Milan, Paris, Palermo, and even Rome got new *meridiane*. All these technical accounts, lovingly presented by Heilbron, could easily have been a bore except for the wry wit of this master story teller, which keeps the reader alert for the spice of his next editorial aside. For example, he describes how Piazzi's work in constructing a meridian line in the Palermo cathedral was interrupted by the long wait for a new pavement, something that drove him to the use of opium; the delay 'shows that even the most painstaking astronomers are faster than building contractors.'

What Heilbron has done, and elegantly so, is to carve out a little-studied area in the history of science, namely, Italian astronomy in the aftermath of Galileo, and to frame it as a coherent entity around the search for the parameters of the solar theory. With admirable erudition, he has placed an essentially forgotten period back onto the historical map. Those Catholic astronomers, working in a cultural arena of anti-Copernicanism, at times sailed through a narrow strait. The large *meridiana* in San Petronio revealed to Cassini that the sun's distance varied according to Kepler's orbital eccentricity, half of what Ptolemy or Copernicus assumed. Kepler had reasoned that if the sun provided the motive force driving the earth in its orbit, then the earth should move faster when it is closer to the sun, and this effect is precisely what the meridiana showed. Kepler was, as is well-known, an enthusiastic heliocentrist. While Cassini's observations did not prove that the heliocentric view was required, they certainly pointed in that direction. Thus the details of Heilbron's story are not dry as dust; they sparkle

with the insinuations that a traditional world view was crumbling. Jesuit-trained traditionalists like Cassini resisted the winds of reform, but others gradually fell in line with the new cosmology even as they labored on non-controversial observations with continuing support from the Catholic church. *The Sun in the Church* gives a mature and brilliantly organized picture of this hitherto little-explored interrelation of science and the Christian faith.

Owen Gingerich is Research Professor of Astronomy and History of Science at the Harvard-Smithsonian Center for Astrophysics, Cambridge, MA 02138, USA. ginger@cfa.harvard.edu

Johnson, P. E., Lamoureux, D. O. et al

Darwinism Defeated? The Johnson-Lamoureux Debate on Biological Origins

Vancouver: Regent College Publishing, 1999. 174 pp. pb., US$23.95. US
ISBN 1-57383-133-6

The claim that certain biological structures exhibit an *irreducible complexity* which cannot be explained by a natural process like evolution, but necessitates divine intervention, is a central tenet of the Intelligent Design Movement. A key exponent is Phillip Johnson, Professor of Law at the University of California and author of *Defeating Darwinism by Opening Minds* (1997), *Reason in the Balance* (1995) and *Darwin on Trial* (1991).

Denis Lamoureux, a biologist who specialises in the evolution of teeth and jaws and also holds a doctorate in the evangelical response to Darwinism in the first fifty years after publication of the Origin, offers a critique of this Movement. In the first part of the book, he is 'opening batsman' and Johnson responds. Lamoureux contributes another paper in the light of this response and Johnson replies. The second part of the book consists of nine responses to the debate by other writers.

Lamoureux's criticisms are numerous. One is that for an academic lawyer to be justified in taking on the scientific evidence for biological evolution because of his 'speciality in analyzing the logic of arguments and identifying the assumptions that lie behind those arguments' (25) is not enough; 'he must first demonstrate a solid grasp of the fundamentals of biology and the evidence for evolution.' (20) Lamoureux's conclusion, following a detailed examination of Johnson's biological knowledge, is that his 'understanding of biological evolution is seriously flawed', a conclusion echoed by Miller, Caldwell and others. Johnson's reply, for it is not an answer, is disappointing: after expressing doubt that 'the common ancestry theory is true' he says 'I do not consider this issue to be of central importance and do not attempt to argue the question for now, because certain crucial work in progress that bears on common ancestry has yet to be published.' (49) What this 'crucial work' is, where and by whom it is conducted, and when and where it will be published is left a mystery. Later Johnson says 'We have plenty of evidence [for intelligent design] to offer, but the evidence does not matter if intelligent causes are ruled out of consideration on *a priori* philosophical or theological grounds. For this reason I do not think it worthwhile to discuss detailed evidentiary questions with Denis Lamoureux, or with other persons who take the position I call theistic naturalism, whatever they choose to call it.' (52) In this way he sidesteps the extensive and detailed biological challenges. But Lamoureux does *not* deny 'intelligent causes'; he sees divine activity underpinning the whole creation, not just the parts which have no current scientific explanation. Johnson's position, as several writers point out, is a version of Coulson's ubiquitous 'god-of-the-gaps' and it is no defence to say, as Watts does, that 'This multiplicity [of gaps] constitutes one gap and one gap only.' That treats the word 'gaps' as univocal while using it in two

different ways. The gaps, in Coulson's phrase, are phenomena for which there are currently no known scientific explanations. The 'one gap' of Watts is 'our uncovering of the "natural laws" underlying the regularity of the physical universe.' (161)

Johnson's phrase 'theistic naturalism' is an oxymoron, given the usual understanding of 'naturalism'. A quick consultation of five dictionaries of philosophy confirms that 'Naturalism' is generally understood to mean that 'ultimately nothing resists explanation by the methods characteristic of the natural sciences', rendering 'theistic naturalism' a contradiction in terms. 'Methodological naturalism', used uncritically by many of the contributors, is also a misleading term which should be scrapped. The denial implicit in 'naturalism' goes far beyond being the methodological principle, adopted by science, of not referring to First Causes. Maybe I missed something, but I only saw this philosophical point recognised on the very last page of the book, by Wilkinson — 'strictly speaking there can be no "naturalism" at all for one who believes that all things depend upon God for their very existence.' (174) The methodological convention of science in referring only to 'efficient' causes is theologically benign and enables atheists, agnostics and those of different faiths to work together on the scientific enterprise. Although individual scientists may hold a naturalistic view of science, the scientific endeavour itself entails no such denial of divine agency. However, there is no need to refer to the Creator when exploring the mechanisms of creation, any more than there is any need to mention Henry Ford when finding out how the car works. Incidentally, I understand there is no known documentary evidence that Laplace ever said 'I have no need for that hypothesis' (168).

Other criticisms of Johnson's position are directed at his view of the philosophy of science and the problems caused by conflating his three foundational principles. These principles are set out by Lamoureux as '(1) an attack against naturalism and materialism, (2) support for intelligent design in the universe' and (3) 'the complete failure of the modern theory of evolution' (26). The 'first two principles are powerful and clearly welcomed by all Christians' but there is the danger that the third will ride on the back of the first two and not be distinguished as a separate issue. Furthermore, Lamoureux particularly regrets 'Johnson's open and direct attack on Christian theologians and educators [which] inflames an already tense situation in the church'. (42)

To justify my disappointment with Johnson's responses I have cited some of the comments by which he appears to evade the detailed, carefully argued critique by Lamoureux and others. Here are two further examples: It is inappropriate to attribute the length of Lamoureux's essay to 'his passion' as a prelude to writing only about a fifth as much and failing to address many of the criticisms, saying, 'I don't think readers will have the patience to read through an equally long rejoinder, so I'll just reply to the main points.' (49) Lamoureux's second contribution is of eighteen pages and, to avoid the danger that he and Johnson may 'talk past one another' he asks for a direct response to four clearly articulated questions (72f). In reply Johnson furnishes three sides, half of which are taken up with a transcript of a radio interview, and fails to answer any one of Lamoureux's clear questions, claiming that 'The important points are adequately covered in my prior response.' (77)

Many of the papers which continued Lamoureux's critique were perceptive and persuasive in their reasoning. I have to say that those in support of the Intelligent Design position appeared less well argued. It is important that, if this position canvasses scholarly credence, Johnson (and adherents of his position) will need to produce more detailed and satisfactory answers in its defence.

In my copy, p. 47 is blank except for the author's name and the page number. Footnote 8 on p. 144 incorrectly refers to p. 19 and should probably read pp 22f.

Mike Poole, is Visiting Research Fellow in Science and Religion in the School of Education at King's College London.

Niels H Gregersen, Ulf Görman and Christoph Wassermann (eds)

The Interplay between Scientific and Theological Worldviews, Parts I & II

(Studies in Science and Theology, Volume 5, 1997, & Volume 6, 1998)
Geneva: Labor et Fides, Volume 5, 1999, 286 pp, pb
ISBN 2-8309-0915-1; Volume 6, 1999, 208 pp, pb
ISBN 2-8309-0938-0

Studies in Science and Theology is the Yearbook of the *European Society for the Study of Science and Theology*. The papers in these two volumes have been selected from those presented at the *Sixth European Conference on Science and Theology*, held in Cracow in 1996. There were 180 scholars present from around the world and from many different disciplines. The conference was sponsored by *The Templeton Foundation* and consisted of five invited lectures and 92 worshop presentations. These volumes are not 'proceedings' of the conference: only four of the plenary lectures are included and only 37 of the workshop papers. Volume 5 looks at physics, biology, mind and nature and methodological issues; volume 6 at ethical issues, Orthodox perspectives, world views in science, theology and public culture and, finally, natural theology and revelation. With one exception (Henk Kubbinga's paper on atomism and determinism, which is in French) all the papers are in English.

It is a fascinating collection and a rich mine for quotations and perspectives. Familiar positions are expounded by well-known proponents (*e.g.* Willem Drees on naturalism, and Ernan McMullin on evolution to name two writers probably familiar to readers of S&CB), but there is an abundance of other perspectives. In comparison with all the other books on science and religion which I have read in recent years, this stands out in one unanticipated respect: culture shock. The differences of culture are quite striking when reading the contributions from Orthodox and Muslim scholars and even some contributions from the wide range of Western Christian contributions. I would be surprised if most readers do not find at least a few of the essays almost incomprehensible, at least before some sustained reflection. But culture shock is an invaluable experience if it alerts us to our hitherto unquestioned assumptions. Things we take for granted as Western scientists – a certain rationalism and reductionism for example – may be implicitly rejected. I found the Orthodox papers (6, 33-60) particularly difficult. Are they deluded? Or are we?

Another significant culture clash lies in the title. The two volumes are addressing 'worldviews'. To me that means the modern tradition of worldview analysis associated with, e.g., James Sire (*The Universe Next Door*), Brian Walsh (*The Transforming Vision*) and Al Wolters (*Creation Regained*), but that kind of analysis is largely absent. This was a major disappointment. There are many ideologies and worldviews abroad today and, in an age in which general education gives us very few tools of discernment, Christians may imbibe and reflect the dominant pagan perspectives as easily as non-Christians. It can then be very difficult to know where a particular author is coming from and whether my understanding of what they write is really what they intended.

These considerations raise the obvious question: who is the intended audience? Surprisingly, the editors do not address

it. The papers vary widely in style and format. Some are written at a popular level, others are quite technical and some require an advanced understanding of logic or mathematics. Only about 40 per cent of the conference papers are included, but we are given no information on the criteria of selection. We are also given none of the interaction that (presumably) occurred at the conference. Many topics (*e.g.* causation, evolution, holism, naturalism) crop up again and again with different, even contradictory positions being promoted. There is no index to allow collation and we do not know how any of the authors would respond to the criticisms given of their positions. To give one example, several authors (*e.g.* Hubert Hendrichs, Terence Kennedy, Joseph Zycinski), take the related notions of emergence and downward causation for granted, but Dennis Bielfeldt (5, 168-70) critiques these ideas and rejects them. This is a key debate with many implications for our view of origins, so the lack of (recorded) response and debate is frustrating.

It so happens that I have reviewed two other books this year whose authors are associated with *The Templeton Foundation*: Russell Stannard's collection *God for the 21st Century* (SPCK, 2000) and Ian Barbour's *When Science Meets Religion* (SPCK 2000). An unexpected common feature is that in all of them there is very little or no coverage of the vast literature generated by the last half-century's work in the history and philosophy of science. I would have thought these were disciplines that no book on science and theology could possibly ignore. I must admit to being wrong. All of these books do effectively ignore them and are strongly biased in favour of those who accept the essential correctness of the secular scientific accounts. There is little suggestion that pre-scientific commitments might bias the content of science as well as its interpretations. Am I really that unusual in concluding that it should now be unquestionable that faith plays an essential *internal* role in science and that the relationship between science and religion is between two complexes of knowledge and belief? Only Jitse van der Meer (5, 247-256) engages with the historical and philosophical literature. In two volumes supposedly about worldviews it is indeed an astounding omission.

Arthur Jones is Research Consultant for Curriculum Development to the *Christian Schools' Trust*. He has taught science and religion courses at London and Bristol Universities.

David Wilkinson

The Power of the Force: The Spirituality of the Star Wars Films

London: Lion, 2000, 153pp. pb. £7.99.
ISBN 0-7459-4402-7.

This is not a difficult book to read. It romps along with the same ease and enjoyment as the films – and like the films, if it is taken seriously and reflected on, there is a great deal here for thought. In a context where the traditional language of faith, and the traditional ways of appealing for response no longer sound resonances with so many people, how else might we be able to converse with our contemporaries? In a society which believes in anything and nothing, where might we find a language and a series of images which will help us to encourage people to think about the story we have to tell? It is Wilkinson's argument that the Star Wars films, using as they do universal myths and spiritual themes, form one way of rediscovering such a language and images.

He does not argue that the films are a sufficient or complete presentation of the Christian message, but he shows in a detailed but lightly-worn discussion how the films pick up on themes which are present throughout all the stories we tell ourselves, such as exploration, the lone hero, rescue and the little ones against the big power. He shows too how they are

held together in these stories by the spiritual values of transcendence, responsibility and hope.

The book considers the way in which the films were made, the impact they have had on the cinema-going public and the place they have, especially the first one, in the consciousness of a particular generation. Wilkinson, using some of George Lucas' own words shows how he deliberately set out to explore and express spiritual questions. The place of the Force as a spiritual motif is considered, and its shortcomings in Christian terms laid out clearly.

Wilkinson suggests that this series of films, which are packed with "scientific" gadgetry and effects, allows the presentation of ideas which might otherwise be considered too abstruse or ivory-towered to be worth taking seriously. That these questions, of meaning and of place in the world, are not in fact so distant is the rest of his argument, and is demonstrated, he believes, by the overwhelming popularity of the films.

For anybody concerned with communicating the Christian story to those who would not resonate with our traditional language, images or ways of thought, this book offers a new way of beginning such a discussion. More than that, it suggests ways for Christians to interact with the examples of modern culture which are still shared – such as films, or music or novels – and demonstrates that such interaction is not to be feared, but can be extremely fruitful.

The book can be read in less time that it takes to watch one of the films – but, like the films with which it is concerned, it will provide food for thought long after the closing paragraphs.

Ruth Gouldbourne teaches Church History and Doctrine at Bristol Baptist College.

R. L. Numbers
Darwinism Comes to America

London: Harvard University Press, 1998. 219pp. pb £11.95, ISBN 0-674-19312-1, hb £24.95, ISBN 0-674-19311-3.

J. C. Greene
Debating Darwin

Regina Books, Claremont, California: Regina Books, 1999. 288pp. hb $34.95, ISBN 0-941690-85-7

Here are two fascinating and totally different books on the historical relation of evolution and Christianity. The one is a narrative history on how Darwinism was received in America and the other how a theist, who is a historian of science, argues with agnostic evolutionists today. Both writers are of the highest calibre. Ronald Numbers has succeeded in becoming president both of the Church History Society and the History of Science Society and John Greene is the father of the Darwin Industry whose *The Death of Adam* kick-started Darwin studies.

Greene's book is not an easy read and needs considerable chewing. I confess I did not like it at first but on second bite I found it excellent. (If I had not found Greene's previous books so valuable and were this book not a present from an American friend I may have ignored it!) And like a dog with his favourite bone I dig it up to have another chew and rebury it. Greene is an old-fashioned Liberal Protestant but a strong theist and this book is largely his correspondence with Ernst Mayr. As a result it will not satisfy some biblically minded evangelicals – to their loss. The section on the Mayr-Greene dialogue is presented in a raw fashion, containing articles by both and their intermittent correspondence from 1980 to 1997. Despite disagreements the tone is friendly and centres on the possibility of theism. It simply defies a short summary, but Greene robustly parries Mayr's assaults, who can see no place for God. Greene does far more than only "keeping the rumour of God alive". Mayr

has a negative view of belief and regards Darwinism as having put paid to that and considered Greene's approach as appealing "let's get back to God". Greene argued in part that Mayr misunderstood matters historically and like many other evolutionary naturalists today, assumes that Darwin was totally "liberated" from his theistic past. As Darwin himself said, "I am in a hopeless muddle." Greene stresses that Darwin's ideas were far more muddled and inconsistent and ultimately his ideas are not logically consistent. That is no criticism of Darwin, as we all are to some degree.

Darwinism comes to America is a far easier read and is an interpretative history of evolution in America since 1850, covering a broad sweep. He also integrates past events into the present situation of both Creationism and Intelligent Design, enabling the reader to see these recent phenomena in historical context. Though the book is obviously about America, it is equally helpful in understanding the British situation. In the introduction Numbers wrote, 'I hope in the following chapters not only to illuminate some of the dark corners of the history of evolution in America but to dispel a number of myths and misconceptions that still cling to narratives of Darwinism in the United States' (and I will add Britain) and listed nine and commented 'each of these generalisations is dubious if not downright wrong.' These wrong generalisations are as prevalent in Britain as in the States and recur with nauseating frequency in the media, by "pop" scientists, and in Christian writing as well. These mythical generalisations include: that Darwinism created a national religious crisis in the late nineteenth century; the Fundamentalists' dislike (in 1900 to 1940) of science, rejection of the age of the earth etc; and the age of the earth being an issue at the Scopes Trial of 1925. Recently I have come across two church historians from our old universities repeating the first of Numbers "myths and preconceptions" and one is supervising a doctorate which will help perpetuate the myth! (What use is a historical doctorate if it is factually wrong in its history?) It seems that many Church and religious historians simply ignore the history of science, as much as do pop scientists such as Jones and Dawkins. Numbers is well-known for his magisterial *The Creationists* and this work is a collection of related essays put in chronological order from the age of Agassiz to recent Pentecostal responses to Darwinism.

In conclusion *Darwinism in America* ought to be on the shelves of anyone interested in the historical relation of evolution and Christianity. *Debating Darwin* will have a more limited appeal but is a first-rate example of an apologetic with an agnostic evolutionist. It will also give an apologist methods and ideas in engaging with evolutionary naturalists who think God is irrelevant.

Michael. B. Roberts is Vicar of Chirk.

Mehdi Golshani (Editor)

Can Science Dispense With Religion?

Tehran: Institute for Humanities and Cultural Studies, 1998. 205pp.
ISBN 964-426-081-3

This anthology, edited by Mehdi Golshani, Professor of Physics at Tehran's Sharif University of Technology, is compiled from the responses to a set of eight questions that were sent to various scholars (scientists, philosophers and theologians). There is no mention of how the potential contributors were selected.

1. What is your definition of science and religion?
2. Do you see any conflict between your definitions of these two concepts?
3. Where do you think there may be a conflict between these two?
4. What have been the grounds for the development of conflict between these two?

5. What has been the role of religion in the development of science in the West?
6. Can we have a religious science?
7. Can science dispense with religion?
8. Can one separate the domains of activity of science and religion completely?

Responses were received from thirty-two scholars: six Muslims and twenty-six Christians (Catholic, Protestant or Orthodox). Among the respondents, who came from the States, Canada, Russia, Europe, Tehran, India and Australia, there is a bias towards the physical rather than the life sciences. The contributing scholars, all theists, believe that both science and religion are important aspects of our common life and that neither one should be sacrificed for the sake of the other. Historically many believed that a "Theology of Creation" (73) in both Christian and Islamic communities was instrumental in the growth of scientific enterprise and, conversely, scientific endeavour provided a springboard for worship. Furthermore, most saw no conflict between the two if they are properly understood and if the domain of each one is correctly recognized and preserved. Common features of authentic science and theology were recognized: (a) both are based on 'faith commitments', (b) both develop 'evidence based' as opposed to 'proof based' descriptions, (c) both provide important but partial description of reality, and (d) both are able, to a certain extent, to be 'put to the test' (21).

Some of the replies make interesting and insightful reading. Unfortunately there has been no attempt at any synthesis of the views expressed. The fragmentary 'questionnaire structure' of the book makes for disjointed and sometimes repetitive reading, relieved only by the two scholars who responded in a more helpful essay format. Some of the responses (85-97), relying on familiarity with another faith and its writings and traditions, make challenging reading for the Christian. It is unfortunate that numerous spelling mistakes remain in the text.

Interfaith dialogue is high on today's agenda. This anthology, which could be instrumental in encouraging interfaith dialogue and understanding to permeate the multi-ethnic, multi-faith scientific community, is a welcome and bold initiative.

The book may be obtained direct from the Editor: golshani@ihcs.ac.ir.

Marion M. Syms is Senior Lecturer in Pharmacology, University of Portsmouth

ERRATA

In the review of *The Design Inference: Eliminating Chance Through Small Probablilities* by William A. Dembski (*Science & Christian Belief* 12: 180-181, 2000), the number printed as 10150 at line 15 from the end should have read 10^{-150}.

In the Correspondence section of *Science & Christian Belief* 12: 168-171, 2000, Prof. R.J. Berry inadvertently attributed to Dr. P.G. Nelson the suggestion that the Fall is an allegory. However, Dr. Nelson did not make this suggestion in his letter nor does he hold this view which should have been attributed to Dr. H. Russman (cf. the last sentence of Dr. Russman's letter on p. 166).