

Book Reviews

Andrew Brown

The Darwin Wars: The Scientific Battle for the Soul of Man

London: Touchstone, 2000. 241 pp. pb.
£7.99. ISBN 0-684-85145-8

‘The Darwin wars are not between believers and disbelievers in evolution, or in Darwinism,’ writes science writer and journalist Andrew Brown. ‘They are all about the scope and proper limits of Darwinian explanations. All sides in these arguments take for granted that where there is design in nature, it has been produced by Darwinian processes operating for a long time in reasonably stable environments. The question in dispute is not “where does design come from?” but “where does it stop?” and to some extent it is a question to which there can be no definite answer’. For Brown this is a good thing; he provides no definite answer. Instead of an answer, Brown tells a story about the ambiguous line between science and culture.

Some readers of this journal would be interested in a book addressing the question ‘where does design come from?’ That question has been addressed elsewhere. This discussion – the scope and proper limits of Darwinian explanations, *presupposing the truth of Darwinian evolution* – provides plenty of fodder to contemplate the relationship of scientific knowledge to religious belief, and to culture generally. Here is plenty to chew on. It is misleading however to suggest that *The Darwin Wars* is primarily philosophy. It is not. Neither does it contain much science. Rather, Brown employs his journalistic skill to uncover a story about scientists and the culture they labor in. *The Darwin Wars* focuses on the feud between the ‘Dawkinsians’, the entourage of Oxford biologist Richard Dawkins, and the ‘Gouldians’, Harvard paleontologist Stephen J. Gould’s retinue. This framework sets a context for reporting on sci-

entists’ theories and society’s interpretations of those theories. Inasmuch, *The Darwin Wars* is sociology of science dressed in popular garb.

This story of science-as-it-happens reveals that scientists as well as laypersons wrestle with the moral and social implications of scientific theory. For the Christian reader this book does not support the longstanding tradition (of which Paley and Dembski are exemplars) of appropriating biology for apologetics, but raises questions about how we are to view morality from an evolutionary perspective. These questions require thoughtful Christian reflection. Do selfish genes produce selfish persons? Is there such a thing as free will? But these are not really scientific questions after all, a fact that Brown in some ways seems not to take seriously enough.

From a technical vantage point (whether scientific or philosophical), one always wishes that the view espoused was just a bit more subtle, that pet nuances were better appreciated, that a more finely resolved analysis was employed. Brown is no exception. Nonetheless, his writing is far more balanced than that of many of the scientists that he critiques, scientists who very often themselves are popularizers of science and self-designated expositors of evolutionary biology.

Good, popular science writing is indispensable in our culture. As socially responsible participants in this culture, we ought to reflect on both the extent and the limits of science. Where there are scientific questions paramount to understanding our condition as human beings, to understanding what it is to be human, these questions must be bared to general scrutiny, reflection, and disputation. That is, an increasingly technical discourse must be made accessible. For a small piece of this discourse – the dispute

between the 'Dawkinsians' and the 'Gouldians' – Brown makes this possible.

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Celia E. Deane-Drummond

Creation Through Wisdom: Theology and the New Biology

Edinburgh: T & T Clark, 2000. xix + 266 pp. hb. £24.95. ISBN 0 567 08736 0

This book is everything that the dust cover claims it to be. It offers a theology of nature based on a Trinitarian understanding of wisdom. It is not simply an exercise in theology or biblical exegesis. It draws upon a wide range of disciplines, from biological science to feminism, philosophy, ethics and sociology, and is directly addressed to a perceived emphasis in current science and technology on mere information. This robs these disciplines of their much-needed capacity to respond adequately to moral dilemmas arising from our increasing power over nature.

There is, firstly, a careful treatment of wisdom in biblical theology, in both Old and New Testaments. It is immediately apparent that the discussion is not an abstract one: in Chapter 1, after a treatment of wisdom in the Old Testament, there is an engagement with the work of the 17th century scientist John Ray (22ff) and a trenchant discussion of wisdom in science and theology. In Chapter 2 the oft-neglected theme of the wisdom of the cross (1 Cor 1:18ff) is used to apply perceptive criticisms to the use of Lovelock's Gaia hypothesis, and the creation spirituality of Matthew Fox and others. In this chapter I am not yet persuaded of the link between eucharist and the feast of wisdom in the apocryphal Old Testament (Wisdom 9:1-6). Nor am I persuaded by her treatment of Jesus as teacher of wisdom (44ff), because this is not sufficiently integrated with his par-

ticular Jewishness, a necessity ably demonstrated in the work of N.T. Wright. Also, the author's emphasis here is on how others may have understood him, rather than on his own understanding of his ministry.

One of the highlights of the book is the introduction in Chapter 3 of the wisdom theology of the eastern church, with particular emphasis on the convergence between the theology of Sergei Bulgakov (84ff) with the practical wisdom ethic of Thomas Aquinas and the theology of Teilhard de Chardin as one expression of the feminine in God. The author then synthesises these into a Trinitarian theology of wisdom in Chapter 4 by showing how theologians from Irenaeus onwards equated divine wisdom with the work of the Holy Spirit. There will be some New Testament scholars who are not convinced by her assertion that John's Gospel displays a Sophia Christology rather than a Logos Christology (135). But the aim of this chapter is impressive: to demonstrate that wisdom language, incorporating as it does both masculine and feminine images of God, describes the involvement of the whole Trinity in the creative process while distinguishing the particular roles of the Holy Spirit and of Christ. This is also used to apply perceptive criticism to some other theological positions, including the radical feminist theology of Rosemary Radford Ruether.

A further chapter applies her Trinitarian understanding of wisdom to the future of creation, addressing eschatological theologies of Moltmann and others which she finds lacking in clarity at some points. The application of wisdom theology leads to a model in which the new creation will contain the old creation, transformed and dwelling eternally within the wisdom, beauty and glory of God. Here again she is critical of positions taken by theologians such as Ruether, whose understanding seems to be more akin to Hinduism (cycles of eternal return), and scientists such as Tipler

whose idea is of a 'cold image of a detached intelligence' (192).

In Chapter 6 the author turns to 'The Future of Science' and expands at length on what was promised near the beginning of the book – the way that a Christian theology of wisdom confronts some current scientific positions which are merely information-based, and therefore inadequate to deal with the acute moral dilemmas thrown up by recent advances in biological sciences. Of particular note in this chapter is the illustration of her ideas in the approach of the biologist Barbara McClintock (223ff). This was long neglected because of the unorthodoxy of her approach to her work in genetics, but its more recent vindication recognises her ability to 'perceive' in a way that includes but goes beyond reason. I was particularly struck here by two parallels with other fields of modern science and technology: firstly, the temptation introduced by Information Technology to treat problem-solving in terms of access to information, and secondly, the early rejection of revolutionary theories of Plate Tectonics by many geologists.

This final chapter also contains some tantalising nuggets introduced for the first time, and which are related to the wisdom theology that the author has constructed. There is, firstly, the fact of the increasing sophistication of ordinary people who are no longer persuaded that all can be left to scientists (215), and who therefore need to be increasingly drawn into future discussions regarding the role of genetic engineering, and secondly, the failure of the churches to link theology with an appreciation of the issues in such a way as to articulate Christian hope (217).

This is altogether a fine book, which deserves to be carefully and widely read.

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Douglas Groothius
Truth Decay: Defending Christianity
against the Challenges of
Postmodernism

Leicester: IVP, 2000. 303 pp. pb. £8.99
ISBN 0-85111-524-1

There has been a recent resurgence of interest in the Christian press in the concept of truth. Motivated by concerns over the radically deconstructivist nature of post-modernism, a number of authors have issued a clarion call for Christians to resist what is perceived to be a widespread cultural erosion in the concept of truth. The general view seems to be that post-modernism is a grave danger to Christianity: hence the rhetoric of conflict ('defending Christianity', or 'confronting pluralism').

Keeping the military metaphor afloat, how robust is Groothius' defence? It is certainly comprehensive in its scope: a full panoply of post-modern thinkers is called in for dissection. There is creative material on important questions of post-modern ethics, gender issues and aesthetics. It is commendable when Christian thinkers take seriously the many faceted nature of the cultural situation in which we find ourselves. In this respect, Groothius offers a twenty-first century gloss on themes familiar from the work of Francis Schaeffer.

With such a broad ranging approach, it is difficult for the requisite depth to be achieved. As an articulation of what many Christians want to say in response to post-modernism, the book succeeds. There is something deeply frustrating about the relativising tendency of much of modern academic life, with its implication that serious, rational discussion which aims towards an (objectively) true view of things is fundamentally misconceived. Groothius offers a plausible sketch of how this situation has come about, and the book contains a number of helpful points about what may be said in response. Surely the chief argument here, one which the author deploys effec-

tively, is that of self-referential consistency: just what is the status of the claim, 'all truth is relative'? If only relatively true, there is no need for the absolutist to give up their position, but if the claim is intended absolutely, there seems to be a contradiction.

As a serious attempt to rehabilitate a concept of truth as 'objective, universal and absolute', however, the book contains a number of weaknesses. In particular, its defence of the correspondence theory of truth will not convince readers with even a basic grounding in modern philosophy. It is one thing to accept that some truths are objective; it is another to claim that truth can be analysed in terms of correspondence with reality. There have been so many difficulties raised for this latter account of truth that it is surprising that Grootius seems to think that Christianity presupposes it. He seems unaware of the logical problems that philosophers have faced when trying to turn the slogan 'true propositions correspond to the facts' into a satisfactory analysis. If we cannot understand the concept of a 'fact' in any way other than as what a true proposition corresponds to, we can scarcely appeal to the existence of facts, or elements of 'mind-independent reality', in seeking to explain what truth is.

This difficulty is not, though, the chief one: the question of meaning has to be addressed. Take even a simple case such as 'the table is brown'. It is easy to miss the fact that it is only because we are familiar with the application of predicates such as 'is brown' that we can move to assess the truth conditions of the statement. If we didn't know what 'is brown' meant, we would be in no position to assess the truth of the statement (or even whether it is a genuine statement at all). To assess truth, we must grasp meaning. To analyse what is going on when we assess truth, we must therefore analyse how sentences get their meaning. There can be no theory of truth which is not equally a theory of meaning.

Here is where the book contains a glaring omission, for Grootius has very little at all to say about the topic of meaning. Crucial arguments, such as Wittgenstein's considerations of rule-following, get no mention at all. This omission threatens to undermine the positive value of the book's attack on relativism. For there is little gained by asserting that 'God exists' corresponds to the reality that God exists, unless we can give an illuminating account of the meaning of what the sentence claims.

The confused notion of 'relative truth' starts to make sense if we allow that different language games each operate according to their own internal rules, so that what is meant by the term 'God' in one system cannot be compared with its meaning in another. If this is what the post-moderns are really claiming then the need for Christian apologists is not to give book length treatments of the predicate 'is true'. Instead, there must be an engagement with the deeper and thornier issues about how our talk of God, and matters religious, gets its meaning, and what the limitations are on the communication of these concepts.

As a primer for further thought on difficult matters, *Truth Decay* provides an accessible overview of difficult terrain. But readers wanting to know 'the truth about truth', whether in religion or science, will not find the answers here.

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John Medina

The Genetic Inferno: Inside the Seven Deadly Sins

Cambridge, UK: Cambridge University Press, 2000. pp xiii + 341, hb., £17.95/\$24.95. ISBN 0 521 64064 4;

I was initially delighted to receive a review copy of *The Genetic Inferno*. It

seemed that here at last was a popular book that would counter the prevailing and fashionable genetic reductionism. As the author himself states in the Introduction, 'The gap between a gene and a behavior is...vast...even when gene functions have been responsibly (sic) described, one does not find single genes causing identifiable behaviors.' The book description on the dust jacket however suggests some confusion – 'By describing the gap that exists between a human behavior and a human gene, this fascinating book seeks both to clarify and debunk ideas about the genetic roots of behavior, from the genes of divorce to the tendency to eat chocolate. Using Dante's *The Divine Comedy* as an organizing framework, *The Genetic Inferno* explains each of the Seven Deadly Sins, but in terms of twenty-first century understanding of genes and brains. Written by a practising research scientist, this book is not for biologists but literature majors, business people, parents and anyone interested in how our genes work to make us behave the way we do.' Readers will note the contradiction between debunking the reductionist fallacy but nevertheless hinting that genes make us behave the way we do. In starting to read the book, I went with the author rather than the dust jacket and in terms of his approach to reductionism I was not disappointed. He is realistic in his analysis of genetic contributions to behaviour (reverting to the UK spelling), not denying that there is a genetic component but nevertheless admitting all the other factors that influence behaviour.

However, this was one of the very few features of the book that did not disappoint me. If it is indeed aimed at 'literature majors...' then it fails. In many places, the language used might be acceptable in a lecture but in print merely patronises the scientist or the non-scientist or both. The first chapter, *The Power of Physics Envy* typifies the whole approach and, in my view, is also wrong in its fundamental thesis. As a practising biologist I do not envy physi-

cists (although I certainly give them appropriate professional respect) and I certainly would not 'love to inhabit the cut and dried world of the physicist' (and as an aside I wonder how much the author knows about the quantum world). But it gets worse. I doubt whether most literature majors or business people would get very far into the book because the science, although in many places presented as analogy, is at a level well above the understanding of most non-scientists. Indeed, I tried out the scientific content of one chapter on some biology students and found that I had to work quite hard to ensure that they understood, even with appropriate use of visual aids and handouts. As a scientist I found much of the scientific content interesting and informative, notwithstanding the problems that I allude to in the next paragraph. However, most non-scientists would really struggle to get much out of this text.

In the core chapters the author describes scenes from Dante's *The Divine Comedy* in which groups of souls are being punished in purgatory for a particular besetting sin. The particular sin is then used as a starting point for a discussion of a particular facet of human behaviour, physiology or psychology, including the possible relevance of the activity of particular genes. Thus, for example, *Lust* leads into human sexuality, *Gluttony* is discussed in terms of the biochemistry and physiology of appetite, *Avarice* in terms of fear or anxiety and *Sloth* in terms of diurnal rhythms in biological activity. How these activities relate to the concept of sin *per se* is not discussed although to be fair to Medina he does suggest that humans have strong tendencies to mis-use their biological drives and capabilities. However, throughout these chapters, the author tends to blur the distinctions between emotions, behaviours, drives and physiological mechanisms thus lessening much of the impact of what he is trying to say. Further, use as illustrations or analogies of scenes from *The Divine Comedy* comes

over as a gimmick that may have worked if used sparingly but quickly outlives its usefulness, so that it soon seems very contrived and even becomes a barrier to understanding. Indeed, this was true of many of the illustrations, based on scenarios of cosy chats in the offices of history professors, or memories of the author's travels to Europe (including of course Italy, to emphasise his 'cultured side') or anecdotes from his family life. The language is in places very sentimental – 'The first time I ever heard my newborn son cry...' It is also, despite the statement 'Printed in the United Kingdom at the University Press, Cambridge', very American, as is the social setting (notwithstanding the references to Italy and to Dante). I should also say that I have no problems with the American angle but readers who are less familiar with the USA may find some expressions confusing.

In a journal such as this a reviewer may be expected to mention a Christian perspective. The author himself does not do so. There is no clear Christian or religious basis in Medina's analysis although about half-way through the book, in one of his anecdotes of lab life, he declares himself to be 'religious.' Whether this religious profession informs or underpins his life as a scientist is not clear but we must welcome his rejection of sterile reductionism, whatever the shortcomings of the vehicle that carries that rejection.

Finally, I want to emphasise that I am sure that the author's and publisher's objectives were entirely laudable, but they simply have not succeeded. Nevertheless, it is possible to write a book on genes that is understandable by non-scientists. I recently reviewed for another journal, a book on human genetics*, written from a Christian ethical perspective, that was certainly user-friendly to non-specialist readers without being gimmicky or patronising. I only wish I could say the same about *The Genetic Inferno*.

* Peterson, J.C. (2001) *Genetic Turning*

Points, Grand Rapids, USA & Cambridge, UK: Eerdmans; reviewed in *Third Way*, September 2001.

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John Ziman

Real Science: What it is, and what it means

Cambridge: CUP, 2000. 399 pp. hb.
£25.00 ISBN 0-521-77229-X

This recent volume from John Ziman offers a refreshing approach to the nature of scientific knowledge, which recognises how inextricably the philosophy, psychology and sociology of science are intertwined.

In the first three chapters, Ziman outlines what he subsequently refers to as the Legend of academic science. It is worth noting that in using the term 'science', he tends to understand it in a broad Continental sense (as *Wissenschaft*) rather than the narrower British sense. This may irritate those natural scientists who prefer to exclude disciplines such as economics and sociology from the sciences, but it allows him to draw our attention to sometimes unexpected family likenesses and to put greater than usual stress on the importance of hermeneutics. For Ziman, the Legend can be summarised in terms of the Mertonian ideals, which he outlines under the headings of communalism, universalism, disinterestedness, originality and scepticism (CUDOS – an acronym that he uses repeatedly to remind us of his belief that the exchange of information for social esteem is an important social mechanism within academic science).

Chapter 4 moves on to explore the changing social context of science and its impact on the production and communication of scientific knowledge. He suggests science is undergoing a process of

redefinition and new modes of knowledge production are emerging. One factor in these changes has been the steady increase in the cost of scientific research. This has forced academic science to rely more and more upon industry and state patronage. As a result, research has become increasingly industrialised and bureaucratised, with much greater stress placed on utility. In contrast to the Mertonian ideals, Ziman suggests that such research may be characterised as proprietary, local, authoritarian, commissioned and expert (PLACE – alluding to the fact that for many scientists a secure place in the organisation that employs them is now more important than social esteem within the wider scientific community). So extensive are the changes taking place that Ziman feels able to speak of the emergence of post-academic science.

Chapters 5 to 9 offer a critical examination of the Mertonian ideals in light of this changing social context. What Ziman has to say here is sometimes irritating but more often thought-provoking. ‘Community and communication’ highlights the essential humanity of science and the importance of intersubjectivity; and Ziman warns of the potentially corrosive effect of secrecy in post-academic science. In ‘Universalism and unification’ he presents science as a process of mapping the world. While arguing that a single universal map is impossible, he warns against over-specialisation and fragmentation. ‘Disinterestedness and objectivity’ explores the role of social interests in shaping science. ‘Originality and novelty’ argues for a weak constructivism and justifies scientists’ use of induction on the grounds that scientific practice is intuitively Bayesian. Finally, ‘Scepticism and growth of knowledge’ develops an evolutionary argument for the growth of scientific knowledge.

The last chapter draws together various threads from earlier in the book by asking ‘What, then, can we believe?’ This is the only chapter that directly addresses the concerns of this journal.

Ziman stresses the similarities between sciences and religions but reminds us that it is because of these similarities that there is scope for disagreement and conflict.

I have certain doubts about the intended readership of this book. The ‘blurb’ and Ziman’s own preface seem to indicate a non-academic audience. This is surprising, given the level of language used, the complexity of some of the arguments and the presence of an excellent index and extensive internal cross-references. However, most academics will be irritated by the book’s bizarre approach to notes (essentially a set of endnotes containing simplified Harvard references that then have to be located in a separate bibliography). But that is just a quibble. In my opinion, this book is an important contribution to our understanding of real science at the beginning of the twenty-first century.

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

R.L. Hermann (ed.)
God, Science & Humility

Philadelphia & London: Templeton Foundation Press, 2000, 314 pp, pb
£17.50.
ISBN 1-890151-34-3.

The theology of humility recognises a new Renaissance in human knowledge. This concept would suggest a deferential attitude when examining one’s beliefs. This book, in the words of the editor, Robert Hermann, is a collection of the impressions of ten scientists, who, having published extensively in their own fields of study, now aim to show the relevance of their science to theological questions. As the writers’ backgrounds encompass a variety of scientific disciplines their experiences and vision of God can hopefully also expand our understanding in

this area. Humility, in biblical terms, is to have a modest opinion, a humbleness about one's achievements.

This book has an attractive cover, an easily readable typeface and the occasional illustration. The brief resume of each writer is useful as it indicates the comprehensive range of interests covered in their contributions. A summary and notes, usually with an extensive bibliography for further study, concludes each paper. The epilogue draws these themes together. The absence of an index is not a problem.

In the foreword Sir John F. Templeton defines this humble approach in the seeking of truth. He suggests that as we contemplate the vastness of the creation, coupled with an eagerness to learn, we also accept the limits of human knowledge. In chapter 1, Russell Stannard, a physicist, presents a thoughtful paper concerning the methodologies of theology and science including an overview of humility theology. R. J. Russell expands on the theme of the interaction between God and contemporary cosmology where there is an unending process of continuing discovery, leading to the recognition that God is incomprehensible and limitless. The universe, however structured, is the best *evidence* for God in philosophical theology. It is from this perspective that its finitude and historicity is significant. I found the '*cosmological argument for God*', a movement from the world to God, sound, as were his comments on the argument for God from design. The concept of extra-terrestrial life is covered in detail. Francisco Ayala, an evolutionary biologist, expands on the theme of the complexity and potential of the human brain, explaining the ontogenetic issues and the mind-brain problem. David Myers, a psychologist presents an assessment of the common ground between science and religion because, at the heart of theology, there is humility before God; in science, humility before nature, which is an intelligible creation. In ch. 7 Giuseppe Del Re, a theoretical chemist, discusses

the relevance of chemistry to intellectual humility, an understanding of which, as we know, can be hindered by the ego.

Herbert Benson and Patricia Myers explore the difficult issue of spiritual values in health because these should promote healthy life-styles. Based on Benson's work this paper is applicable to medicine. David and Susan Larson, recognising the importance of stress control, focus on the role of spiritual values in health, explaining new findings in terms of old paradigms, but noting the unusual proportion of atheists and agnostics among psychiatrists. Their views regarding HIV, suicide and drug abuse warrant careful reading. Fraser Watts speculates on the emerging science of artificial intelligence where constructive dialogue is needed, because its problems tend to be underestimated. Computers can voice a prayer but they cannot pray. Regarding the future, Owen Gingerich, a historian of science, challenges theologians and scientists to dialogue, especially on the issue of the search for extra-terrestrial life. *Homo sapiens* is unique.

I believe the book achieves its aim because it emphasises the importance of a modest approach and a profound deference towards God in our search for the truth. The Hebrew concept of '*the fear of the LORD*' is relevant to the issues raised by the writers. I enjoyed reading all sections of this interdisciplinary book so other readers, whether from a religious or science background, may gain a similar reward. Is there not a desperate need today for dialogue between theology and science leading hopefully to both working more closely together?

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Prof. C.A. Russell

Michael Faraday: Physics and Faith

New York: OUP, 2000. 124pp. hb. \$24.00.
ISBN 0-19-511763-8

The author of this volume will be justly well known to readers of *Science and Christian Belief*; the provenance of the book is more unexpected; it is one of a series of *Oxford Portraits in Science*, published by Oxford University Press; but this proves to be an American branch of the publishing house, and an enquiry of the Press in Oxford revealed little knowledge of the series, and no distributor has been appointed in this country. The target readership is 'young adults', which really translates into older schoolchildren. With its American origin, the spelling of course is Americanised, and statements such as 'his estimated income was £1,000 a year, maybe up to \$100,000 in today's values' strike an odd chord on this side of the Atlantic.

The author's aim is to provide a readable account of Faraday's life, with a description of the origin and significance of his many and important discoveries, together with an account of his Christian faith and of the relevance of this to his approach to research, to the nature of things, and to the use of his talents and discoveries for the good of his fellows. Colin Russell gives what are on the whole attractive and perspicuous summaries of Faraday's scientific theories and discoveries which should make them clear to thinking youngsters, and others who are not specialists in Physics or Chemistry. At times questionable statements appear – for instance, 'he used a voltmeter to measure the volume of gases...' (92). And I found the thrust of some arguments not wholly clear; for instance, on Faraday's attitude to his income, it seems he felt on one side 'underpaid', yet on the other not interested in worldly wealth (95, 96).

Accounts of Faraday's life abound, and Colin Russell is competing with many others, as he recognises; does he then

succeed in what might be claimed as the particular characteristic of his account – its alliance of faith and science in Faraday's life? (It is significant that the *Encyclopaedia Britannica* (15th edn.) article on Faraday explains that his 'family belonged to a small Christian sect, called the Sandemanians, that provided spiritual sustenance to Faraday throughout his life. It was the single most important influence upon him and strongly affected all the ways in which he approached and interpreted nature.') Colin Russell identifies five main ways in which Faraday's faith shaped his science: firstly, the impetus it gave him to discover things; secondly the conviction that the natural world (particularly in the forces it displays) possesses a fundamental unity; thirdly, his preference for some scientific perspectives against others; fourthly, his reverence for creation; and fifthly, his desire to use his knowledge for the good of mankind. Of course, it is not possible to demonstrate incontrovertibly that Faraday would not have displayed some or all of these features without the impetus of a lively Christian faith; but the author succeeds in interweaving, in an attractive way, the evidence of Faraday's Christian belief at work, with the rigour of his scientific method – shown, for instance, in the way he gave up at length his strongly held *electrotonic* model of the nature of electromagnetic forces because many attempts to support it experimentally gave unconvincing results. Here is a powerful display of scientific genius in no way hampered, but rather impelled and guided, by a profound and working Biblical faith.

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Gregory Stock and John Campbell
(eds)

Engineering the Human Germline

Oxford: OUP, 2000. 169pp. hb. £19.95.

ISBN 0-19-513302-1

This book tackles one of the most contentious areas within modern biomedicine, genetic manipulation of the germline. The result of a meeting, it incorporates a number of papers presented at that time, plus the discussion that followed. These two contributions are enhanced by short essays from a wide range of invited contributors who were asked to address specific issues, such as, whether they would extend the lifespan of a child of theirs if an artificial chromosome was available to do so safely.

Part 1 on the realities of human germline engineering is a helpful and illuminating series of accounts of the up-to-date science (up to 1999) by leading researchers in the field. Almost inevitably, given the format of the book, the chapters tend to cover some of the same ground, while others are much broader than simply germline gene therapy. The chapters by Leroy Hood and Mario Capecchi are particularly useful. Unfortunately, ethical issues are not well handled. The short essays in Part 3 provide a wide array of viewpoints, but are too short to be especially helpful. Nevertheless, they provide a broad perspective.

By far the most valuable section is Part 2, with its interaction between the participants. One gets the feeling that people like James Watson, Leroy Hood, and John Fletcher are less inhibited in this forum and are prepared to speak very frankly. As a result, a number of fascinating issues are raised, issues that should be followed up in depth elsewhere. For instance, some speakers were very critical of attempts by governments and public bodies to devise germline policies ahead of the techniques having been developed, so that in their view the result is an odd mixture of definitions and notions. The perils of advance regulation

need to be taken further, since they are pertinent to many other topics as well as this one. For instance, how far ahead of the science can one take ethical (and theological) debate, and to what degree is the nature of the ethical (and theological) debate determined by the status of the science?

The comparative merits of somatic and germline gene therapy are ardently debated by Watson and French Anderson, with the latter holding a relatively conservative position on the germline direction. On the other hand, Watson, who has no patience of any description with the slippery slope argument, asks why we should not make human beings better by adding genes – on the assumption of course that the major safety factors have been addressed. There may well be good reasons why this position is an inadequate one, but what this debate brings out is that very cogent reasons are required to refute it.

Other fascinating by-ways explored briefly are the concept of universal ownership of our germline (dismissed as misleading), and the potential dangers of germline engineering (these are considered by some of the speakers to be grossly exaggerated). Throughout this discussion, pre-existing genetic inequality is painted as the real enemy, rather than the scientists who study genes.

I have no doubt this discussion is relevant for the Christian reader, because it contains a vigorous defence of the validity of scientific investigation in this demanding and potentially very powerful realm. This is a breath of fresh air in the midst of so much cynicism over science and scientists. One would have liked a fuller treatment of these themes, but for that we will have to look elsewhere.

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John Polkinghorne

Faith, Science and Understanding

London: SPCK, 2000. 208pp. hb. £11.99.
ISBN 0-281-05263-8

This is an interesting and welcome book for those who follow Polkinghorne's development. Polkinghorne describes this book as a 'further thoughts' (xi) volume that picks up on issues raised in his previous four books. He likens it to a subsequent *Reason and Reality* volume, but this is much more a collection of independent articles than *R&R* ever was. I suspect that it also in large part responds to various criticisms of his previous work. However, in taking on this task of response it offers nothing really new.

Faith, Science and Understanding is split into three sections:

1 Issues: This takes up the first half of the book, and covers a wide field from 'theology in the university' to 'quantum cosmology', and 'design in biology' to 'motivations for belief'. This is the most useful section for those wanting a bit more clarity from Polkinghorne's previous work, just don't expect any running thread!

2 Divine Agency: Polkinghorne returns to his favourite topic of God's action in the world. This section offers nothing new in particular but might be a useful exercise in reviewing the subject matter, particularly for new students. Having said that, he does discuss kenosis in relation to divine agency in chapter 6 but it is a shame he does not make more of it. (However SPCK tell me he has a book due out this year called *Kenotic Creation*, so perhaps he's covered it there.)

3 Significant Thinkers: Looks at the work of Wolfhart Pannenberg, Thomas Torrance, and Paul Davies. Given the brevity of these pieces I would have welcomed a sequel to Polkinghorne's *Scientists as Theologians* with these people as the focus. The last chapter of the book is titled "Science and Theology in England" and it sums up the book well in trying to

cover four centuries in 11 pages! Perhaps the budding fruits of something larger and more useful, but on balance you finish the book wondering about the relevance of the final chapter and with it the overall purpose of the book.

This book also seems to be an honest attempt to survey the progress made in the 'faith and science' debate over the last decade, but perhaps too much from Polkinghorne's own point of view and passions. The boom of the science and faith dialogue in recent years would require a focussed and Herculean effort to provide a very useful survey. This is no beginners textbook, though, because it is too thin on too much.

The question is, given the plethora of books flooding the science & faith arena, do you need this one? For those who care about understanding Polkinghorne's own stance then definitely, yes. For those who want a good coverage of the title's intended topics, then perhaps look elsewhere. It is, as always with Polkinghorne, a very good and relaxing read with some thought provoking articles. The book as a whole, though, is perplexing as to its intent.

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James E. Strick

Sparks of Life: Darwinism and the Victorian Debate over Spontaneous Generation

Cambridge, Mass. and London: Harvard University Press, 2000. 283 pp. hb.
£32.95. ISBN 0-674-00292-X

The doctrine of spontaneous generation – the emergence of living organisms from dead or inorganic matter – was almost universally accepted until modern times. The first serious challenge came in the 17th century, when Redi showed that

meat protected from flies produced no maggots. On the traditional account, the doctrine then suffered a long retreat until its final elimination by Pasteur in the 1860s.

Historians have known for some time that this is an oversimplification. Spontaneous generation of micro-organisms remained tenable long into the 19th century, and had defenders even after Pasteur's onslaughts. James Strick's book traces the fortunes of the doctrine in mid-Victorian Britain. He shows convincingly that it was accepted by many scientists until the 1870s, attracting such respectable supporters as the anatomist Richard Owen.

The central figure of the story is Charles Bastian, a promising young biologist who claimed in 1870 to have generated life in carefully sterilised apparatus. Bastian eloquently promoted his findings, arguing that spontaneous generation was a necessary complement to Darwinian evolution. His claims were enthusiastically accepted by evolutionists like Wallace in Britain and Haeckel in Germany, and by many in the medical community who opposed Pasteur's germ theory of disease.

Bastian's findings were strongly challenged by T. H. Huxley and the physicist John Tyndall. Tyndall devised ingenious methods to detect and remove floating organic matter from the air. When this was done, he claimed, sterilised solutions never produced life. Bastian's positive results must have been due to error. There remained one doubt: perhaps some bacteria could survive immersion in boiling water? Following the discovery of bacterial spores by Cohn in 1876, Tyndall found that they survived prolonged boiling. But intermittent heating, to kill bacteria emerging from their resistant state, provided an effective new method of sterilisation. After Tyndall's discoveries, support for spontaneous generation rapidly declined.

Strick's book will be essential reading

for students of Victorian biology and science generally. It has already been warmly praised, and indeed has many merits. It is well-written and rich in detail. Its greatest strength is its treatment of the intellectual background to the debate, which lucidly covers a wide range of topics, from Brownian motion to the theory of disease. Nevertheless, it has some serious weaknesses.

First, despite its declared aim (1) of relating the debate on spontaneous generation to British natural theology, the book's treatment of religious issues is disappointing. Strick suggests that the views of some key figures – notably Wallace (114), Carpenter (130), and the microscopist Dallinger (80) – were influenced by their religious beliefs, but these claims are vague and poorly documented. Strick's coverage of the evolutionary implications of the debate is also superficial. We learn little, for example, of the position of Herbert Spencer, a major influence on Bastian, but a critic of spontaneous generation. More surprisingly, Bastian's own views are inadequately described. We are told that he was a 'mainstream Darwinian evolutionist' (64), and that he 'fully embraced Darwin's evolutionary theory' (159), but this is only partly true. Bastian believed that micro-organisms (including multicellular animals like nematodes and rotifers) had originated not by natural selection, but by recurring chemical processes. Organisms had inherent tendencies to 'progressive development', and even the vertebrate level of evolution might have been reached on more than one occasion. Species therefore had multiple origins throughout geological time; a doctrine which Bastian recognised had radical implications for evolutionary theory. None of this is mentioned by Strick.

Most seriously, Strick's treatment of the Bastian-Tyndall conflict is unacceptably one-sided. Bastian, it seems, had both logic and experimental evidence on his side, and Tyndall triumphed as much by 'network building' (158) and 'an active

campaign to undermine Bastian's reputation' (186) as by the merits of his work. Strick even speculates, without evidence, that Tyndall may have suppressed inconvenient results (177). He implies (187) that Bastian's erroneous claims can all be explained by those troublesome bacterial spores. This really won't do. Bastian's test tubes swarmed with algae, fungi, protozoa, rotifers, and nematodes, all mutating into each other before his very eyes! Strick overcomes these embarrassing aspects of his hero's work by the simple expedient of ignoring them.

If Bastian's more extravagant claims are airbrushed out of the picture, it becomes a puzzle why he was so strongly attacked. Strick's solution is to interpret the controversy as a 'power struggle' over the image of Darwinism, which Huxley and Tyndall were anxious to protect against the disreputable associations of spontaneous generation (185). But if, as Strick has shown, spontaneous generation was acceptable even to such conservative figures as Owen, why should they be so anxious?

The fact is that Bastian was, in Huxley's words, 'a clumsy experimenter and an uncritical reasoner'. Huxley and his friends did indeed wish to protect the image of Darwinism, but only against association with error and incompetence. In this they showed sound judgement. Some may find this a 'whiggish' view, but it is better to be whiggish than to make a mystery where none exists.

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Nikos Prantzos

Our Cosmic Future: Humanity's Fate in the Universe

Cambridge: Cambridge University Press, 2000. 288pp. hb £17.95, US\$24.95.

ISBN 0 521 77098 X

In this volume, translated from the origi-

nal French edition of 1998, Nikos Prantzos, a researcher at the Paris Institute of Astrophysics, makes a substantial contribution to the growing literature of futurology. The book, engaging both scientific and science-fiction literature, is organized into four parts: "Near Futures," describing scenarios in which the solar system is explored and colonized; "Route to the Stars" and "Star Makers," in which man's voyage to the stars is envisioned; and "Ultimate Futures", probing the question of humanity's fate in the most distant imaginable reaches of cosmic time.

The first section, "Near Futures," discussing lunar exploration, mining the asteroids, and colonizing the moon and Mars, presents scenarios which would appear to be within the present or conceivable ranges of existing science and technology. These scenarios, for the most part, do not raise profound theological or ethical questions. One exception is the possibility of "terraforming" (75), e.g., the human alteration of the Martian landscape and atmosphere to make it suitable for colonization, which would extend the terrestrial debates on environmental stewardship and wilderness preservation to our neighboring planets in the solar system. Does the Genesis mandate to "subdue the earth" imply a mandate to "subdue" the other planets? Nikos mentions these theological and ethical questions, but does not attempt to resolve them.

The second and third sections, which envisage human exploration of the stars and the galaxies, touch upon issues of substantial theological significance. Prantzos acknowledges that such voyages beyond our own solar system are highly unlikely to occur in the next several centuries, given the three-fold restraints of the speed of light, the enormous distances involved, and the limitations of the human life-span. The author ably reviews the current debate about the existence of extraterrestrial life, noting the quasi-religious motivations of some leading SETI proponents such as

Carl Sagan and Frank Drake. As Frank Tipler has observed, these SETI advocates seem to hope that "... extraterrestrial intervention will save us from ourselves." Readers who wish to pursue in greater depth the theological issues raised by the search for extraterrestrial intelligence are referred to this reviewer's article, "The Search for Extraterrestrial Intelligence and the Christian Doctrine of Redemption," published in this journal [*S&CB*, 9:1 (1997) 21-34].

Writing in 1998, Prantzos was not aware of newer evidence from astronomy and geophysics, presented in Peter Ward and Donald Brownlee, *Rare Earth: Why Complex Life Is Uncommon in the Universe* (Springer-Verlag, 2000), that would appear to make the odds against the existence of intelligent life elsewhere in the universe even longer. The physicist Enrico Fermi as early as 1950 raised the simple question, if there are so many intelligent civilizations out there, then *where are they?* Why have we not encountered them, or they discovered or communicated with us? A half-century later, SETI optimists have yet to give a compelling answer to Fermi's question.

It is in the final section of the book, "Ultimate Futures", that the most profound theological and philosophical questions are raised. Prantzos seems to realize that in an open, ever-expanding universe, "... sentient beings cannot live eternally ..." (272). This pessimistic conclusion, anticipated in the nineteenth century as the "heat death of the universe," recognizes that in the most remote stretches of cosmic time, the second law of thermodynamics prevails, and no useable energy is available to support sentient life. The author realizes that scientific "eschatologies" proposed by physicists such as Freeman Dyson and Frank Tipler are modern, scientific myths "... of all-powerful humans who, through science, are able to raise themselves above nature and become masters of their own destiny." Such myths are ultimately

doomed to failure, given the known laws of physics. If the proton is unstable and decays over the longest reaches of time, then only electrons, positrons, neutrinos, and photons will be left in an expanding universe, and there is no plausible way under such conditions of sustaining the stable structures needed for sentient life and information processing. Even if the proton proves to be stable, over the longest reaches of time the quantum-mechanical effect known as "tunneling" disorganizes all material structures, and the final evaporation of remaining black holes again leads to a universe in which only electrons, positrons, neutrinos, and photons are left. (For more detailed discussion of these issues, see this reviewer's article, "Cosmic Endgame: Theological Reflections on Recent Scientific Speculations on the Ultimate Fate of the Universe," *S&CB*, 11:1 [1999] 15-27).

Prantzos does not seem to face squarely these harsh implications, suggesting, in an optimistic vein, that even if we are the only sentient beings in the galaxy, "it will be our duty to preserve nature's uniquely successful experiment and spread it across the whole Universe" (275). The fact seems to be, however, that the known laws of physics, chemistry, and biology, in and of themselves – i.e., *scientific naturalism* – offer no hope for the ultimate preservation of human life and meaning in the most distant future of an open universe. The upshot of such discussion is the profoundly important point that science alone cannot provide a basis for enduring hope or meaning for the human race. These sobering implications of "scientific eschatologies" have yet to trickle into the consciousness of the general public.

There are several minor errors of fact. The San Francisco earthquake (189) occurred in 1906, not 1902. The American physicist who did pioneering work in the area of inflationary cosmology is Alan Guth, not "Paul" Guth (239). These details, however, do little to detract from a fine work that will stimulate and

inform any reader who has serious interests in the areas of astronomy, cosmology, space exploration, or scientific eschatologies.

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Matthew Chapman

Trials of the Monkey – An Accidental Memoir

London: Duckworth, 2000. 337 pp. hb.
£14.99 ISBN 0-7156-3002-4

This is not the kind of book normally reviewed in these pages, but I believe that many of the readers of this journal would find it fascinating, enjoyable, informative and thought-provoking. With the caveats and warnings included below, I warmly recommend it.

Matthew Chapman is a direct descendant of Charles Darwin (and, this reviewer was delighted to discover, the grandson of Sidney Chapman, the eminent geophysicist); he makes his money as a writer of film scripts; he has an astonishing gift for evocative and pithy prose. This book arose out of a suggestion that he should visit Dayton, Tennessee, the location of the “Scopes” trial about whether evolution could be taught in American schools, and where a re-enactment of the trial takes place each year, to report on what happened then, and what Dayton is like now.

What he has written as a result has at least three threads running through it. First of all, it is a sharply recorded report of his visits to Dayton, giving a vivid picture of society and religion in small town America as seen through the eyes of a sceptical but not unsympathetic atheist. Secondly, there is an account of why the original trial took place, and the extraordinary way in which it developed. Did you know that the whole thing was put on as a successful attempt to attract

trade and interest to a depressed area? Did you know that John Scopes really taught football, not biology? Did you know that it was the first trial to be broadcast live, to Europe as well as to the USA? Did you know that William Jennings Bryan, the chief counsel for the prosecution, died in Dayton just days after the trial, but that a Christian college named after him was founded soon after? The book is full of remarkable and interesting details, together with further references for those who want to study the original trial in more detail.

The third thread of the story, intertwined with the others, is an account of his own life and development, his sexual and spiritual explorations, and of the stressful and dysfunctional family he grew up in. Be warned that parts of this are quite explicit, and not suitable for reading aloud in Sunday School! But this reader found it an exquisite, tragic, beautifully expressed evocation of the lostness and searching typical of our age. The book is worth reading simply to understand a little more the angst of a successful modern man, and why he finds faith so attractive and Christianity so repulsive.

Apart from the account of the original Scopes trial, this book has particular value for readers of this journal because of the account it gives of creationism and creationists, of those who teach it and of students who believe it (who both quite impressed him). For those of us who take both Biblical faith and science seriously, and are embarrassed by the writings of our brothers and sisters who have made it difficult for us to use the word “creation” without a lot of preamble, this perceptive portrait is helpful. Read it, and be prepared to laugh and weep.

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Giuseppe Del Re

***The Cosmic Dance: Science Discovers
the Mysterious Harmony of the
Universe***

Philadelphia & London: Templeton
Foundation Press, 2000. 415 pp, hb,
£21.99, ISBN 1-890151-25-4

Del Re is a theoretical chemist with a strong interest in the history and philosophy of science. He seeks to reconcile theism and modern science by reconceiving the latter in a holistic way. To achieve this he utilizes the ancient image of the Great Dance: every thing is related to everything else (15, 164-5), every thing has its own individual role to play (74) and physical reality is open to another, spiritual dimension inaccessible to science, but whose presence is signalled in diverse ways (347). The early chapters deal with a number of issues: information and communication, order and organization, time and becoming, chaos and complexity, determinism and finalism. A major aim is to show that science poses questions which point beyond the realm accessible to its methods. In the later chapters Del Re shifts focus to human beings and on the almost universal belief that there is a dimension of reality inaccessible to the senses. At over four hundred pages, it is a long read and also, as the author warns (xiii), a difficult read.

Del Re rejects modern scientism and mechanism and several of his discussions are helpful in that regard. For example, throughout he highlights the importance of worldviews and argues that all our knowledge is based on beliefs that may not be open to either proof or disproof. Thus he notes several times that many well-accepted scientific ideas are far from proven (174, 354, 362). He emphasises that our worldviews must cohere all our knowledge, making sense of both inner and outer experience (375). Worldviews are a matter of personal commitment, but Del Re urges that a worldview open to spiritual reality is the only reasonable choice.

Clearly there is much here which is congenial to Christian faith and in his Foreword the theologian Thomas Torrance welcomes the book for that reason. However, for all its good details, the overall approach left me feeling decidedly uneasy. Del Re ranges much more widely than science. Within the first few pages he is already drawing in Eastern religions, Tarot, Plotinus and modern Western poetry (6) and later he brings in magic and alchemy as well (ch 9). That is his personal choice (381), but it raises the critical question of *authority*: by what standard do we weigh and evaluate evidence and the possible sources of evidence? There is no appeal to Revelation, so it is difficult to see that Del Re has any real authority beyond his own subjective choice.

Any critique of wide-ranging theories of science must focus on worldviews as much as on the data. It can be all too easy to conclude that a particular theoretical approach has strong empirical support. Yet when seen within an opposing worldview – for all such evaluation is comparative – that support may appear irrelevant, or even non-existent. Thus Del Re refers to '(phase) transition' (21), 'complexification' (287), 'downward causation' (321), 'emergence' (70, 127, 224) 'self-organisation' (136) and 'self-assemblage' (129). But if we are considering – as we must – the origin of novelty, then the empirical evidence for the efficacy of these phenomena would appear to be as non-existent as for the traditional Darwinian process of random mutation plus natural selection. Consider, as one example, the evolution of novel proteins. We know that active proteins can evolve to only a limited extent before becoming non-folding and non-functional. We also know that, even for a simple protein, the islands of function are miniscule in comparison with the surrounding ocean of non-function. No known mechanism, Darwinian or otherwise comes near dealing with travel across these oceans. To say this is not to prejudice future findings, but simply to note that all these

grand ideas are at present simply that – and no more.

Overall, I can only regard Del Re's book as a mystical expansion of a metaphor over an unnecessarily large number of pages without the provision of any compelling support for its use.

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Ian Barbour

When Science Meets Religion: Enemies, Strangers or Partners?

London: SPCK, 2000. 205pp, pb. £12.99
ISBN 0-281-05364-2

Compared with some of Barbour's previous substantial works, this book is relatively brief, but that does not mean it is a lightweight read. Barbour covers the major issues in five chapters on astronomy and creation, quantum physics, evolution, human nature and God's interaction with nature. These are preceded by an introductory chapter in which Barbour describes four main approaches to the relationship of science and religion, namely conflict, independence, dialogue and integration. The conflict category would include both special creationists and atheist evolutionists. The complementary approach often reflected in this journal is placed within the independence category by Barbour. The categories of dialogue and integration are portrayed as being open to interaction between science and religion, with the likely modification of theology in the light of scientific developments. Each of the issues mentioned above is discussed in terms of these categories (recognising that there is enormous variety within each category).

The structure of the book is therefore admirably clear and Barbour states (3) that his own sympathies lie with the dialogue and integration approaches. How-

ever, I found the book was uneven in places, with a rather superficial introduction being given to the background to a particular issue (for example evolutionary theory) before Barbour launches into a high-speed tour of the current arguments of a variety of authors within each of his categories. Clearly it would be impossible to include every contributor to a particular argument. However, Barbour does provide helpful extensive references to works that he can only describe in a couple of sentences in the main text. One difficulty with the brevity of the arguments is that the credentials of the theological and scientific contributors to the relationship are not always apparent. Is Barbour integrating mavericks with mainstream contributors? The mainstream contribution of the Bible to this relationship receives little coverage in this book. The popular arguments of scientific creationists are also largely ignored.

Towards the end of the book, Barbour gives particular attention to the contribution of process philosophy to his own thinking. Whilst I find this particular philosophy unhelpful, Barbour's introduction to it in this context is a valuable resource for those wanting to explore the variety of approaches to relating science and faith. The clear structure of the book lends itself to re-reading for views on a particular issue or on a particular approach. This is not a book to introduce a novice to the issues of science and religion debate, but for those of us with some grounding in the field it provides a valuable overview of the approach of one of the most distinguished contributors to the debate.

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Mario Artigas

The Mind of the Universe: Understanding Science and Religion
Philadelphia and London: Templeton
Foundation Press, 2000. 342pp. £14.95.
ISBN 1-890151-32-7

Those who find philosophical arguments helpful and valid in handling the relationship between science and religion will find this an excellent book – comprehensive, up-to-date, written in a direct, forceful style, with the rigour and completeness of the classical Thomist tradition. All 342 pages are packed with close, careful argument, and there is a comprehensive bibliography replete with the philosophers of science.

The book is divided into four parts: (1) Science Transcends Itself, (2) Self Organisation and Divine Action, (3) Scientific Creativity and Human Singularity, (4) Science and Values. An ordained Catholic priest, author of 10 books and 150 articles on science and religion, Mario Artigas is Professor of Natural Science at the University of Navara, Spain. This latest book by him is a good read and my copy is mutilated by numerous annotations and underlinings. I could not find any typographical errors in this well-published text and I do like the fact that references are given at the bottom of each page so that they can be seen at a glance.

Artigas comes clean at the outset in claiming that only philosophy can bridge the gap (and the gap ‘really exists’) between science and religion (12). ‘The methodological gap between empirical science and natural theology is broad and deep’ (20). His entire thesis rests on ‘recognising that empirical science on one side and metaphysics and theology on the other, are separated by a methodological gap that can only be bridged by using philosophical reflection’ (313). The book sets about a consideration of the philosophical structures that go to make such a bridge. Artigas kicks off by homing in on the *presuppositions of science* and he asks, are these ontological or pragmatic,

epistemological, even ethical, or nothing more than the assumptions of the methodology of science? (43–6) He accepts the logic ‘If A is a necessary condition for B to exist, then the existence of B shows that A is true’ (24), where, in this case, A equals the presuppositions and B the success of the scientific enterprise. This logic is encapsulated in the word *retrojustification*: that science works ‘unreasonably well’, so its assumptions are justified by this alone. In fact the whole argument of the book, in its attempt to bridge the gap, ‘centres on the feedback of scientific progress on its general presuppositions’ (314).

For Artigas, one major presupposition is the existence of a natural order. He quotes Rescher: ‘We do not learn or discover that there is a mind-independent physical reality, we *presume or postulate it*.’ (45) This ontological assumption he labels as ‘metaphysical realism’. Artigas proposes three such general presuppositions on which the scientific enterprise is built: (1) *scientific goals*, (2) *human abilities*, (3) *natural order* (51).

Natural order suggests intelligibility; the ‘success of the scientific enterprise provides us with new knowledge about the rationality of nature’ (118f) – a good example of retrojustification. In this regard we note the remarkable ‘propensity of matter and energy to self-organise – “against the odds” and Davies’ suggestion that we should be looking for a TOO (a general Theory of Organisation) as ardently as Hawkins is for his TOE (Theory of Everything).

Inevitably, talk of a self-organising universe raises questions about cosmic programming, plans, blueprints, goals and talk of *teleology* – bringing the phantoms of causality and design back onto the agenda. This worldview may be the ‘most coherent with the view that divine action on the world carefully respects the agency of created causes and uses them to achieve the plans of divine providence’ (315). If so, we have here evidence of the *immanence of God* (329) whose moment

by moment involvement guarantees its existence.

There is a debate too (with theological overtones) between determinism and predeterminism – the inevitability of one outcome versus a probability distribution of many possible outcomes. ‘The natural order should not be seen as a rigid, pre-determined collection of events but rather a story that includes real novelty’ (148). He likes McMillen’s idea of truth as a ‘horizon concept’ (274) rather than a dead certainty.

With regard to the important matter of transcendence, Artigas believes that ‘scientific progress shows that we transcend the natural world’ in that we can represent it ‘as an object...build up idealised models...conjecture the existence of unobserved features...even though we are natural beings, we also transcend the natural level’ through the singularly human gifts of creativity and interpretation (235). There is also the ‘underdetermination of theories’, which means we are ‘grounded in the uses of constructions that transcend the realm of experience...’ (201f).

Creativity and interpretation are *emergent properties* that enable us to transcend nature, just as the ‘existence of emergent levels of organisation’ (320) and complexity culminate in the appearance of human beings.

In the final section of the book we consider science as a *goal-directed activity* which must involve evaluative, even ethical presuppositions in the consideration of what is meant by scientific progress.

In summary, Artigas argues for a multidisciplinary approach with five closely related approaches to the natural world: empirical science, epistemology, metaphysics, ethics and theology. ‘Science prevails in the case of the worldview, epistemology in the case of scientific realism, metaphysics in the case of human singularity, ethics in the case of scientific values, and theology in the case of divine action’ (323). These five components, he

believes, help to make the bridge which philosophy is building to span the gap between empirical science, metaphysics and theology.

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Jensine Andresen (ed.)

Religion in Mind

Cambridge: CUP, 2001. 294 pp. hb.
£40.00 ISBN 0-521-80152-4

Religion in Mind aims to contribute to the birth of a new area of study, namely the cognitive science of religion. It is written by a group of academics whose contributions emanate from an international meeting entitled ‘Cognitive Science and the Study of Religious Experience’ held at the University of Vermont in 1999. The whole book is very heavy with citations and uses highly technical language; it is clearly written for the academy and will therefore not make light reading for the non-specialist.

The central objective of the work is to interpret religious belief and experience within a naturalistic worldview within the constraints of empirical data, whilst at the same time respecting such beliefs and experiences. It is the ‘interpretative’ approach of the work rather than an ‘explanatory’ approach that helps the book escape the question of reduction.

Some of the theoretical material, given a naturalistic worldview, is certainly plausible. Ilkka Pyysiasen, for example, holds that religious experience is an emotional response to ‘counterintuitive representations’ such as gods, spirits, or in the case of Christianity, the resurrection of Christ. These representations produce strong emotional effects in us because, as Pyysiasen says, such counterintuitiveness ‘is a threat to our cognitive control over the world’ (85).

Similarly, some of the contributors hold that any cognitive explanation of religious belief must include the tendency to anthropomorphise the inanimate. As Guthrie explains, evolution has taught us to identify agency where no agency exists because 'if these interpretations are right, they are invaluable, and if they are wrong, they are relatively harmless' (95). For example, if an ape or early human ancestor saw a twig, it was more beneficial to fear the worst and respond as if confronted with a snake, and so on. This, it is believed, has produced a side effect whereby we see agency and meaning in an otherwise meaningless universe, or as Guthrie puts it, a world that has 'no ultimate ground' (99); so although the evolutionary benefit or 'intention' was basic survival, the upshot is the acquiring of cognitive processes that offer humans existential meaning and a moral structure (99). It is when certain of these counterintuitive representations become widespread, or are believed by a whole community, that we can say we have a religion.

If these hypotheses are correct, religious beliefs cannot remain intact. The book aims to be non-reductive, but reduction often follows closely on the heels of naturalism; as one of their own contributors points out, 'The cognitive approach...is reductive, holding that religious thought and action are based on more fundamental mechanisms' (98). More specifically, if my belief that there is a God is a result of my inherent evolutionary tendency to anthropomorphise nature or is a residue of childhood naïveté, however meaningful this may be to me, I am at best misguided, if not completely deluded.

The book has a strong anti-metaphysical bias. Indeed, it is stated explicitly that the intention is to free religion from philosophy and metaphysical speculation; we might even say that it is an attempt to free religion from religion. Such chapter headings as 'Why Gods?' and 'Religion in the Flesh' also hint at

the naturalistic commitment of the authors. But naturalism is itself a metaphysical doctrine and is not entirely free from philosophical commitments. A philosophy that is critical of other philosophies should be sufficiently self-critical to see and perhaps reveal its own ontological assumptions.

A cognitive approach to religious belief and experience is, of course, going to have very little to say about the historical truth claims of a religion like Christianity. *Religion in Mind* is only concerned with the 'counterintuitiveness' or cognitive aspects of such claims. Christians will readily accept that there are cognitive processes at work when they pray or exercise their belief in some way, but this will not have much bearing on the question of whether or not their religion is true, which it might in fact be.

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Michael Ranken

How God Looks If You Don't Start in Church: A Technologist's View

Sheffield: Cairns Publications, 2001.
85pp. pb. £8.00. ISBN 1-870652-32-0

From the title one might guess that this is a book written from a rationalist scientific perspective and is not one that discusses generally accepted Christian doctrine. You would be quite right. Michael Ranken presents us with his very personal view of God, a very holistic view of creation and a faith that is greatly influenced by his scientific experience, but his worldview is certainly not reductionist.

This is not a congenial read for a traditionalist or an evangelical Christian but even from that perspective its value is that it probably expresses the thinking of 95% of the post-Christian population out there in the world around us, even though most of them couldn't say with Ranken's clarity that that is where they

are. For that reason, if for no other, it deserves a place on our bookshelves.

The style of this book is deceptively simple. It reads like a fireside chat or a lunchtime discussion over a pint in your local. But very quickly we realise that there is a hidden agenda and we are being led to consider questions such as: what do we actually mean by truth, is there a difference between knowing and believing, what can I be sure of knowing? It is Everyman's introduction to a philosophy of life.

This leads us on to consider the importance of metaphors in the communication of ideas and their extended use in myths and stories. There are some excellent examples of how this works out in practice both in the rational aspects of life in our technological and scientific culture and also in the more metaphysical aspects of life in our religious experiences. But, as Ranken points out, the grounds for belief in the truth of the story are different in the two cases. 'In science it is essential that the surface features of every story or theory must be true before we can believe the inner truth. What matters for a religious story is that the inner meanings must be felt to be true even if the surface features seem to be fanciful (31).' This, I think, in Part 1 of the book sums up the author's spiritual journey, a search for truth which, for him, must be consistent with his understanding of the way the world is.

Part 2 looks at some specifically Christian stories, their surface details and inner truths, and their interpretation consistent with the author's scientific understanding. The subheading of this part of the book is 'What I believe' and it is an intensely personal understanding of God as Spirit, interacting with us in the world through our emotions and our activities – including the author's experience as a food technologist. The topics include: the practice of prayer and what is actually happening then; traditional models or metaphors of God as Creator, Father, Mother, Trinity.

In discussing some of the traditional models of God, Ranken says, 'I think I can see some way through the surface meaning of the words used to the inner realities which I believe the writers were trying to express. But I don't believe that exercise should be necessary for every other modern-day questioner... I do believe that the need is urgent for the Church as a whole in her worship and proclamations but also in her thinking to relax the, largely automatic, use of the ancient formulae and replace them with more meaningful modern ones (36).'

Finally, and more controversially, Ranken addresses what many of us would regard as the core issues of the Christian Faith: the person of Jesus and his resurrection, the need for repentance and new birth, sin, guilt and forgiveness, the sacrifice of Christ on the cross.

On all of these topics the book has some provocative things to say and, whether we agree with Ranken or not, we will be challenged to think through these familiar issues afresh. For example, on the crucifixion we read, 'Many Christians and others have difficulty with the notion that Christ's suffering and sacrifice are supposed to have *done* something for us. But the notion and difficulties, I believe, arise from inadequate images of what God may be like – such as that terrible image of a father with an only son requiring recompense for all the sins which people other than the son have committed' (69).

This is not a book for the faint-hearted, or perhaps for anyone with a fragile faith, but personally I found it a very stimulating and challenging read.

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James C. Peterson

Genetic Turning Points: The ethics of human genetic intervention

Cambridge: William B. Eerdmans, 2001.
xvi + 364 pp pb. £15.99; US\$22.00. ISBN
0-8028-4920-2

The author is Associate Professor of Ethics at Wingate University, North Carolina and holds another position in theology and ethics at a seminary in Charlotte. He has approached his writing with care and reviewing his book has been a delightful task. In this work he has made a significant contribution to an often confusing area of medicine: science and ethics. His undoubted expertise in molecular and clinical genetics and subsequent education in the field of ethics provide the tools to express his views factually and offer in-depth guidelines for those less skilled in this area. His subject affects each one of us.

The author, when necessary, submitted parts of this work to other specialists in the fields covered. This preparation before editing is evident as it contributes to the book's value as a whole. It is assumed that some readers may have no prior knowledge of genetics or ethics. He develops his arguments thoughtfully throughout the book, showing how research, therapy, ethics, the individual in society, insurance agencies, employers and governmental management are all involved in the issues concerned with genetics and the inter-related focus on ethics. These arguments therefore have value because they are dealing with the contemporary advancing edge of genetic technology. A new age has dawned to help us understand and shape our world.

There is an adequate, carefully constructed Table of Contents and a concluding Author and Subject Index. Between these is an exciting story of our genes and what they do for us. There is an excellent and comprehensive set of footnotes for reference. His style is easy to follow and the print is clear.

The book is set out in four parts, out-

lining genetic research, testing, development of drugs for therapeutic applications and how genetic surgery can change the human body. In the initial three chapters he provides the essential background information, rightly showing that there is no battle between this scientific perspective and the Christian approach to the study of nature. He explores this Christian tradition and its contribution to science, which, according to the philosopher Stanley Jaki, is not accidental as science did arise in a Judeo-Christian culture. They have been allies in times past as each affirms one reality, which both theology and the scientific method seek to explore. Any conflict is therefore temporary until one side or the other adjusts to a better approximation to the truth. Theism amongst scientists has never withered. God has made our world and it seems it was made for us.

Part 1 has a brief description of DNA and the human genotype. It then opens with the first type of intervention, genetic research. Many I think would benefit from reading this section as it deals with choices and their implication for the individual's family and community. Part 2 explains what is involved in genetic testing, showing why genes are of such importance to life – but really are only a part of living. Questions raised concern such matters as the ethics of testing children for adult-onset diseases or what is involved in the choice of a mate. Peterson introduces examples of the use of testing, identifying those with the gene for a disease which often can be detected long before the onset of symptoms and signs of the impending fatal outcome. Some of these would be genetic disorders like Huntington's disease, the variable gene in some families with Alzheimer's disease or in Tay Sach's disease. Immediately the question then arises as to whether the individual with one of these genes wishes to be told. Yet this knowledge may influence the couple's moral choice not to have children. The story is somewhat different in fibrocystic disease because here gamete selec-

tion of the unaffected zygote (1:4 of the fertilised ova) by genetic screening permits re-implantation by IVF procedures. Haemochromatosis, the most common genetic abnormality in those of European descent, is readily treated provided diagnosis is made before complications of the disease appear. Peterson then raises a concern of many as to how this information may influence availability of health insurance and access to medical care or employment. Its use in investigating criminal activities is now established.

The author describes the early stages of pregnancy and fetal development in simple language that is informative. He states that about two-thirds of embryos do not survive. Many issues are raised which could provide interesting topics in discussion groups. This section I found of excellent value.

In Part 3 the reader is introduced to genetically designed pharmaceuticals, which is a rapidly expanding area of research. Humilin, human insulin, and growth hormone are now widely used. Here is an informative exploratory discussion of the current situation. In Part 4 we learn what genetic surgery has to offer the individual, her/his family and the community. The transfer of genetic material via bone marrow cells is explained and the difference between somatic and germ-line therapy. Is this distinction relevant today when gamete selection is a superior technique? Change in our genotype may not necessarily make us better, so much as more capable, increasing our abilities and choices. The issue of eugenics and ethics is discussed in detail. Should we make choices affecting the autonomy of future generations? This section provides excellent resource material for counsellors, doctors and other healthcare workers and anyone who wants guidance in these decisions.

For those interested in the policies of Germany in the Nazi era we should reflect on the earlier eugenic measures of Galton, or perhaps even the Taskegee study in the United States. The conclud-

ing chapter again raises the contribution of the Christian tradition to this ethical debate, because to use this new technology responsibly we should have some idea where we are going with it.

In conclusion, this book shows why genes are important even though they are only a part of being human. Society should perhaps remember not to neglect the protection of 'good' genes in 'good' people. Our genes influence choices, having implications for the individual, the family and the community. Even now, results of tests may suggest the need to ban procreation of a lethal gene. This book therefore has a significant contribution to make in the area of molecular biology and genetic engineering. The issues are clearly expressed by an informative writer and will provide a base for further reflection. As I read I came to a deeper understanding of difficult technological matters and choices. I can now recommend this book for university and college libraries, health workers and study groups. Every medical student would benefit from reading it. Human genetic intervention has an unrealised potential for good or harm.

Dr K.N.P. Mickleson is a paediatrician with experience in some of the areas covered in this book.

Fraser Watts

Perspectives on Prayer

London: SPCK, 2001. 111pp. pb. £9.99.
ISBN 0-281-05367-7

There is a great temptation to seek rational answers to questions of how and why prayer works, not because we want to explain away the mystery of answered prayer, but because we want to understand more fully the means by which God acts in the world. Indeed, we find intriguing the discoveries in recent years that prayer and meditation quieten down certain regions of the brain, lower blood pressure and heart rate, stimulate the

immune system and increase resistance to disease. But prayer takes many forms – besides more worshipful and meditative forms of prayer, there is petitionary and intercessory prayer, sometimes spoken in great anguish of spirit and under extreme conditions, and here the answers to these questions are more complex. Although we may argue that prayer helps us to see more clearly, motivates us to do something, changes our perception of the externals, ‘...if the sole effect of the prayer to God were to make the petitioner redouble his efforts...then prayer would be nothing more than talking to oneself’ (Paul Helm, *The Providence of God*, SPCK, 1993). This observation does not escape Fraser Watts (50) in his own contribution to *Perspectives on Prayer*, a compilation of short essays based on a public lecture series that he organised. However unsatisfactory from the scientific point of view, it is necessary to fall back on the inescapable truth that ‘the God of our Christian faith is a personal God’ (28) and that trying to explain mechanism in this case is rather like trying to explain scientifically why we love our neighbour, our spouse or our children; even if such explanations were possible, they are beside the point.

Two other contributors to the book, John Polkinghorne and Charles Elliott, ask the question whether prayer is an attempt to change the world or change God’s mind about the world (17-18, 36-37). For Elliott ‘prayer changes the externals, makes things happen, in a way that is qualitatively different from changing the mental or spiritual states of some of the actors’ (18); for Polkinghorne, ‘God’s action will always be hidden within the cloudy unpredictabilities of chaotic regimes. Providence may be discernible by faith, but it will not be demonstrable by experiment. It will have the character of benign coincidence’ (34). While both these views are helpful, intercessory prayer from a distance is more problematic. It is a pity that Elliott is the only contributor to this volume to try and tackle this issue, citing the experience of

people in desperate and isolated situations feeling ‘supported, encouraged, enabled...as though [by] an invisible force’ (19) at times when others have been praying for them. Struggling on within the limits of language and human understanding, he muses about the possibility of prayer making a difference to the functioning of the ‘social pathways of the corporate body’ (19), that perhaps there is a kind of ‘psychic energy’ which changes the balance of good and ill in the world.

This brief volume is an easy introduction to different ways of thinking about prayer, and also includes interesting and informative chapters from theology and the arts. The reading list at the end of each chapter provides a useful starting point for deeper study.

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Russell W. Howell and W. James Bradley (eds.)

Mathematics in a Postmodern Age: A Christian Perspective

Grand Rapids, MI: Eerdmans, 2001. 399 pp. pb. £17.99/US\$28.00. ISBN 0-8028-4910-5

How can we be sure of scientific knowledge? The ‘modernist’ view that humans can and do attain knowledge that is objectively true has been under attack for some time by ‘postmodernists’ who emphasise the provisional and transitory nature of what scientists actually do in practice. But surely in mathematics, of all the sciences, standards of rigour and objectivity – even infallibility – can be maintained? Do we discover mathematical truth, or do we construct it ourselves? Do abstract mathematical objects (like numbers) exist eternally and necessarily?

This book gives serious consideration to such questions. It is a co-operative

venture by 10 individual mathematicians, but integrated so well that you might not suspect it. The first part (4 chapters) reflects on the nature of mathematics today. A historical perspective is provided by contrasting the logician Frege (modernist), who wished to make logic the foundation of all mathematics, with the modern-day educational philosopher Paul Ernest (postmodernist), who stresses the human, cultural and sociological dimensions of mathematical thought. Cultural aspects are also highlighted by a brief survey of mathematics in ancient Greece, medieval Islam and pre-modern China, which makes clear that there is nonetheless a certain universal 'core' of mathematical knowledge independent of culture.

Menzel (ch.3) proposes a way of modifying modernism in order to establish the objective status of abstract mathematical objects, one that he derives from Augustine's doctrine of divine ideas. This is a tough chapter, but the first in which the book's subtitle – a *Christian* perspective – really justifies itself. However, while Dembski (Ch.4) writes lucidly on the pragmatic side of mathematics, beginning with Gödel's famous incompleteness theorem, there is no discernible Christian stance until the last paragraph. Nevertheless, his main points are eminently sensible: any mathematician who has ever proved a theorem knows that the process is nothing like its description in the final published article! Likewise, working mathematicians are well aware that some of the things they do are based on unproven conjectures rather than rigorously proven theorems. (This reviewer's research – and that of many in his field – assumes the truth of an unproven conjecture in the mathematics of computation.)

The key viewpoint is now emerging: a Christian perspective is not bound to either side of the argument. While God's knowledge of mathematical truth guarantees its objectivity, our finite (and sinful) natures mean that our grasp of this

truth is always incomplete and provisional. However, we trust in God's faithfulness and consistency, so that our constructions bear a substantial, if partial, correspondence to the truth.

Part II considers mathematics in its wider context: its historical development within other scientific disciplines, and the way its impact has gone beyond science to pervade modern Western culture. The Enlightenment's influence is seen as decisive for this 'mathematisation' of culture, which has encountered little opposition (barring the transient resistance movement that we call Romanticism) until the postmodern critiques of today. The authors see mathematisation as positive in some ways, yet disturbing in its arrogant assumption of human autonomy from God, and in its capacity for dehumanisation of our culture. The examples used are primarily American, but the principles are universal. (British academics might consider how ideals such as duty, public service and professionalism in education are being replaced by a process that claims to quantify 'quality', for example.) While similar critiques have been made before (by Ellul, for example, in his well-known analysis of modernist culture's reliance on 'technique'), they have rarely been extended all the way to mathematics – certainly not as in Bradley's depiction of the process as idolatry.

Part III introduces some case studies that suggest how a Christian perspective might affect our attitudes to mathematical knowledge. How does mathematics relate to values? Can computers 'think'? Can we detect 'intelligent design' (ID)? How should we teach and learn mathematics?

That the values that shape mathematical development are somewhat less than pure and objective (Ch.8) is perhaps uncontroversial. Likewise, many previous writers have effectively critiqued the 'strong AI' viewpoint – that human intelligence can be reduced to computation (ch.9). Nevertheless, the Christian per-

spective developed here, based squarely on the doctrine of our creation in God's image, needs to be maintained. Dembski's ideas on ID (Ch.10) have been aired before (and reviewed in *Science and Christian Belief*); suffice it to say that, although imperfect, his is a genuine attempt to apply mathematics to a difficult problem, and those who have sought to counter his approach by inventing just-so stories fail to treat his arguments with due seriousness.

The final chapters relate to an area where postmodern thinking has made significant headway – educational theory. Some psychological investigations appear to show that mathematical knowledge is context-dependent, while others suggest the possibility of the transfer of learned patterns between different domains. Educational theorists have pushed strongly the notion of constructivism, which largely opposes traditional (modernist) ideas of transferring objective knowledge directly from teacher to student in favour of a model where learning is constructed from experience alone rather than on some form of instruction. Some would even argue that anything constructed is valid – error (and therefore truth) is impossible. Again, while the discussion is informed by the American experience, UK teachers who have been asked to adopt the role of 'learning facilitators' will find much of it familiar. A Christian perspective on these matters, it is suggested, should be aware of the in-built biases of the different psychological models, and should found its own position on God's sovereign government of all things, and humanity as creatures made in His image, charged with the stewardship of the rest of creation. Consequently, we may find ourselves agreeing with some aspects of both sides in the modern/postmodern debate, but for different reasons.

The concluding chapter reflects on the analysis and ideas that have preceded it, closing with an interesting speculation on Gödel's theorem as a paradigm of the

impossibility of human systems of thought ever being both consistent and complete.

The wide sweep of this book means that the depth of coverage is sometimes limited and uneven, but little has been published on this subject. Kline (*Mathematics: The Loss of Certainty*, New York: OUP, 1980) has covered some of the technical background that would be needed by non-mathematicians. There are echoes from some contributors of the Reformed epistemology of van Til (*A Christian Theory of Knowledge*, Nutley, NJ: Presbyterian and Reformed Press, 1969) and of Poythress's *Philosophy, Science and the Sovereignty of God* (Nutley, NJ: Presbyterian and Reformed Press, 1976). However, nothing of this scope has been attempted before for mathematics. It also has an important message for science generally: if modernistic science is idolatry (and the arguments in Ch.7 are compelling), we need to ask whether as Christians in science (and perhaps also as *Christians in Science!*) we have really distinguished ourselves sufficiently from it. This book is not the last word on its subject, but it provides a significant contribution to our continued reflection on the Christian's place in science.

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Del Ratzsch

Nature, Design and Science: The Status of Design in Natural Science

Albany, NY: State University of New York Press, 2001, 220 + x pp. pb. \$18.95/£10.50, ISBN 0-7914-4894-0.

Del Ratzsch will be familiar to most readers as the author of *The Battle of the Beginnings* and the excellent introduction *Philosophy of Science*, which has

now been revised and updated as *Science and its Limits*. In fact, *Nature, Design and Science (NDS)* is a book length version of one of the chapters from *Science and its Limits*.

NDS deals, from a philosophical perspective, with the status of design in science: it seeks to examine the question of whether or not design is legitimate in scientific contexts. It does so in four parts. The first deals with 'Design basics'. Here Ratzsch takes care to define and distinguish between important concepts such as design, pattern, order, counterflow and artifactuality. At times I found this a little hard going, but the distinctions are important and crucial to the book's argument.

With the preliminaries out of the way, Part II deals with 'Supernatural design'. Here Ratzsch looks at possible ways of identifying design in nature; he concludes, 'design explanations of structures and phenomena in nature *can* be rationally legitimate' (75). The 'Boundaries of scientific legitimacy' come under scrutiny in Part III. Here he ably undermines the notion that the empirical, or what is 'natural', can provide a demarcation between legitimacy and illegitimacy in science. In the final part 'The permissibility question' is examined. In Chapter 9, Ratzsch examines several reasons for adopting methodological naturalism, and he finds them all wanting: 'there are no completely compelling cases for an unannounced policy of banning from science the ideas of design or of a supernatural activity in nature' (127). Chapter 10 examines the 'positive considerations in favour of permitting [design and supernatural] concepts in science'; he finds that they 'can in principle be of scientific, empirical, explanatory relevance' (136). He also concludes that there are 'at least some positive payoffs from permitting discussion of design in science' (147). Not only is design legitimate, it is also useful.

There is an Appendix, which has a critical evaluation of William Dembski's *The Design Inference*. It also contains thirty-

nine pages of notes, a seven-page bibliography and a five-page index.

Nature, Design and Science is an important book; it will need to be read by both proponents of and objectors to design in science. Proponents will find that it will help to refine their position; objectors will need to refute the arguments if the current methodological naturalism is to remain the consensus. Neutrals reading it will find it hard to remain neutral, as the arguments are persuasive!

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Cornelius G. Hunter
Darwin's God: Evolution and the problem of evil

Grand Rapids, MI: Brazos Press, 2001.
192pp.hb US\$17.99. ISBN 1-58743-011-8

The debate over special creation versus evolution continues, but the ground has shifted. Various authors in the debate have claimed that 'young Earth creation' is science and that evolution is religion. There is a second strand to the debate as well. The language of popular science and of scientists forced onto the defensive is much more emphatic and dogmatic than it has any right to be and scientists are also guilty of self-aggrandisement when their theories or experiments are in the limelight. The polarisation of evolutionists under sustained attack from the young Earth creationists, a lack of philosophical grounding for most scientists and the advance of evolutionism/materialism has led to a retaliation where scientific postulate becomes dogma and the language of propaganda becomes used in the public forum. Humility on all sides would go some way to remedy this, but that seems, in large part, to be a rare virtue.

The term 'evolutionism', the philosophical stance that arises from evolution, is not mentioned in this book, but there is some distinction made between evolution and materialism. Often, evolution has been cast as the great hope of atheism because it provides universal mechanisms to account for organic complexity. This book endeavours, first of all, to question some of the evolutionary evidence, and second, to examine the metaphysical arguments that attend the origin of the theory first proposed by Darwin and augmented by many others since then. Hunter is concerned to uncover the underlying theological presuppositions that informed Darwin who, he claims, used evolution as a means of distancing God from the creation in order to retain God's inherent goodness and power in the face of the data coming from the studies of natural historians. Evolution, Hunter claims, is a child of nineteenth-century sensibilities.

The problem of the unpleasantness of nature that exercised Victorian naturalists can be encapsulated in the observation of ichneumonid wasps. These insects are parasitoids that overpower and paralyse target species such as spiders or caterpillars, bury them and lay their eggs in them. The eggs hatch and the larvae carefully consume the fat stores and internal organs, being careful not to destroy any system vital to their hosts' survival. Eventually the hosts die (often horribly) as the parasitoids complete their pupation and emerge. This life history was offensive to many Victorians as they attempted to reconcile such a discovery to the biblical revelation of God's character and with the natural theology that informed their scientific studies. The notion of an 'absent landlord' God, who put in place mechanisms by which such a system could come about but not be held directly responsible for such a system would, Hunter argues, be a relief to those vexed by such an apparently cruel lifecycle in a world full of horror and inefficiency. God would not have made this world as it now is.

In effect this volume contains two books. The first (and weaker one) is a rebuttal of several lines of evidence for evolution in nature grouped into three chapters. These begin with the limits of homology and analogy in comparative anatomy and make the case that the term vestigial is a value-laden tag. Next, 'small scale evolution' (once termed micro-evolution) is analysed. This would permit variation and adaptation up to a point, but disallow any large-scale changes. This chapter keeps on returning to the problem of species, a concept that is introduced without proper discussion of its definition (though several possible definitions are listed in a throwaway line (59)) and yet the species concept is a yardstick by which all things are measured. By not exploring this notion and viewing it as an artificial construct imposed upon nature (which is quite unhelpful in parts of the bacterial protistan kingdoms), a lot of the argument gets lost. Third, there is the chapter on the fossil record, the ambiguity of dates and forms coupled with the lack of major transitional forms. But what evidence would be sufficient? At one point Hunter uses Darwin's argument for gradualism to refute Eldridge and Gould's punctuated equilibrium theory despite the accumulation of more than a century's worth of data. Hunter suggests that evolutionary theory performs acrobatics to encompass whatever data emerges whereas someone else might argue that a theory is modified as new data is added to the old model. Granted, there are problems with evolution's myriad lines of evidence, some of which is quirky and some of which is fragmentary and some of which, *at this point in time*, appears either contradictory or incredibly unlikely, but surely this is what science is about: the replacement or enlargement of theories as new data is collected and interpreted? One of the strengths of the scientific method that has helped it become a dominant thought form is that even when there is fierce opposition against new data from the scientific community, the

truth eventually emerges. Evolution is, at present, the most successful of a number of theories that link all life on Earth, extinct and extant.

The second part of the book is a critique of the cultural *zeitgeist* that enabled Darwin to formulate his theory, combining observations and a mechanism. Hunter's thesis is that evolutionary theory rests on theological (or philosophical) presuppositions that are held uncritically (and are therefore unscientific). Does this make evolution unscientific? He contends that the answer is 'yes'. This stance, however, generates further problems when you push the critique a bit further. It is not only evolution that is supported by untestable assumptions, but the whole of science, as its reliance on the universe being open for rational investigation rests on revealed Christian foundations about the nature of God, and hence His universe. At the end of the book, in the chapter entitled 'Blind presuppositionalism', Hunter quotes from the National Academy of Sciences' document on *Science And Creationism* and points out, quite rightly, that when they say '*No body of beliefs that has its origin in doctrinal material rather than scientific observation, interpretation and experimentation should be admissible as science in any science course*', they do not take into account evolution's metaphysical presuppositions; but this is true of all science or any other human endeavour. Biological investigations occur within a culture and scientists, as human beings, have a cultural bias to contend with. The study of evolution is a study full of metaphor and imagery (discussed in Michael Ruse, *Mystery of Mysteries: Is evolution a social construct?* Harvard University Press, 1999) and whether science is independent of other areas of human thought (i.e. the question of objectivity) is vital to this discussion. The acknowledgement of this can prompt profound shifts in people's worldviews. Hunter has no deep engagement with theistic evolution except at the extremes of Dobzhansky (practically

deist) and Warfield (God-guided). Gould's ideas of non-overlapping magisteria are dismissed as modern gnosticism but Polanyi's concept of a nested hierarchy of levels all informing one another is not mentioned.

In the end, this book raises interesting and pertinent questions about evolution as science and as an outworking of human endeavour, and while some may be swayed to the author's point of view, the answers that he demands from evolution, particularly to the question of the problem of evil, must also be asked of any explanation that seeks to replace it. Here, as far as I can tell, there is only silence.

Tom Hartman is a geneticist and a member of the Court Oak Gospel and Culture Forum.

Randal Keynes

Annie's Box

London: Fourth Estate, 2001. 331pp. hb. £16.99. ISBN 1-84115-060-6

Of the making of books there is no end, particularly on Darwin! This book gives the short life and tragic death of Darwin's favourite daughter, who died aged ten in 1851. Annie is mentioned in most biographies and Jim Moore argued that her death caused the demise of Darwin's faith.

The material on Annie's life is sparse and is limited to family letters from 1841 until 1851 and to 'Annie's Box', which was her writing case, kept and treasured by her mother. The vignette given is excellent on both the Darwins' family life and Annie's brief life. It gives a superb portrait of mid-Victorian family life, which appears very 'un-Victorian'. Images abound – of Darwin humming the hymn-tune *All Through the Night*, of the children using the living-room furniture as an express train. On Annie, Keynes has drawn out as much as anyone could, and having been to Annie's grave in Malvern

I felt the poignancy of his account.

Keynes then tries to show how Annie's death influenced the writing of *The Origin of Species* but he is unconvincing. He reiterates the hackneyed story of the mental turmoil caused to Darwin by his theories. This is compounded by his poor understanding of Victorian Christianity, as he assumes that most Christians had problems with the age of the Earth. They did not. In the early chapters, Keynes narrates Darwin's scientific development, but fails to see that Darwin was first a geologist, and only after 1840 a biologist. In assessing Darwin's religious questioning in 1838 – the most important year in relation to Darwin's faith – he goes far beyond the evidence from Darwin's notes and *Autobiography* (which was written 40 years later and contains many inaccurate memories). He says, 'After rejecting a literal reading of the Genesis account of the Creation as he learnt about the vastness of geological time, Charles questioned other historical parts of the Hebrew Bible.'⁽⁴³⁾ Charles *did* question the latter, but there is no evidence that he ever took Genesis literally, despite a reference in his unreliable *Autobiography*. While at university he was taught 'old earth' ways, by Grant and Jameson in Edinburgh and Henslow and Sedgwick in Cambridge. He did not need Lyell to tell him, as is often claimed! Keynes' poor grasp of Christianity is also demonstrated by his stating that Emma's 'liberal Unitarian views ... was also the message of the Evangelical movement' (50). This type of inaccurate understanding of Christianity past and present is a common feature of much recent popular history of science and occurs frequently in works by writers like Steve Jones, Simon Winchester and John Gribbin. The cause seems to be a prejudice that all Christians were literalists until the heroic Darwin made them submit! It is also manifest in much Christian writing, whether by creationists or liberals. Examples of the latter are John Spong, Don Cupitt and Paul Badham, yet they berate evangelicals for poor scholarship.

Keynes subscribes to the unproven view that Darwin's illness was caused by angst over evolution, but fails to give references (135). If religious concerns over evolution made Darwin ill, then why are there no other recorded instances of this, either by agnostics such as Huxley and Hooker, or by Christians (whether 'evolutionists' such as Tristram, Temple, Church, Gray, Babington or Kingsley, or 'anti-evolutionists' such as Wilberforce, Sedgwick, Rorison, Birks or Hodge – to cite just a few)? At times Keynes becomes too sweeping, for example when he says that in Malvern in 1849, Charles went out for long walks on his own 'on the great hill above the house'. Writing to his cousin Fox in April 1849, Darwin said that '... in four walks I managed seven miles!' For someone just turned 40 that is a feeble effort and is a far cry from the 25 miles he walked in a day in the Highlands in 1838. Unless, of course, Darwin suffered from a physical illness overlooked by post-evolutionary psychologists.

Is this book worth reading? Yes, as it gives a good insight into Victorian family life and the tragically short life of a Victorian child. No, as it is typical of much recent popular Darwin writing in being badly researched and referenced and dependent on a very negative view of Victorian Christianity. It is another example of the false perspective given by Andrew White's *The Warfare of Science and Theology*, which passes from generation to generation like a rogue gene. However, the book is worth reading just for its presentation of Darwin as a delightful person – which he was – and to understand some of the joys and sorrows of his life. I did not feel, though, that there was enough new material to warrant a full-length book.

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John C. Avise

The Genetic Gods: Evolution and Belief in Human Affairs

Cambridge, Mass: Harvard University Press, 2001. 279pp. pb £12.50. ISBN 0-674-00533-3

This is a readable and informative book, originally published in hardback in 1998, that raises recurring questions about human nature to which today's Christians need to have a ready answer. John Avise is a distinguished evolutionary biologist who teaches at the University of Georgia. He provides a lucid introduction to molecular biology and evolutionary mechanisms, most of which will be familiar to biologists, but he has a light touch and some lively analogies which could be useful for teachers. These include the spoof Y chromosome map published in 1993, with its ANTI-NAG and Refuse-to-ask-directions loci!

The early chapters describe the basics of transcription, translation and mutation with emphasis on the close relation between human genes and those of lower organisms. A chapter on 'Genetic Maladies' focuses on genetic errors which give rise to human disease and explains the 'camouflaging' of harmful mutations and the equilibrium between mutation rate and allele loss through natural selection. The next chapter, 'Genetic Beneficence', elaborates the main theme of the book – the way that natural selection has moulded the development of organisms to adapt them to their particular environments, culminating in the appearance of humans.

There follows a graphic account of 'selfish gene' strategies: ways in which some genes act 'communally' to maintain the integrity of the whole organism, while others, such as the T locus, seem driven to promote their own interests. Transposons, cytoplasmic inheritance and the phenomena of sexual reproduction and ageing are all covered. Then in a chapter titled 'Genetic Sovereignty' we see where all this is leading and the rationale of the

book's title. Essentially this is a chapter on the evolution of behaviour. Avise debunks behaviorists' more extreme suggestions (babies cry at night to prevent the conception of rival sibs!) but emphasises gene-environment interactions and the way culture could have arisen through natural selection. He stresses the uniqueness of humans in their capacity for choice but prevaricates as to whether this is 'free-will', 'active adaptability' or 'plastic pliability'. For him, 'belief in God' arises as a product of natural selection, promoting survival of the tribe or group.

Thus to Avise, our genes are our creator. He finds the idea of a divine creator producing humans as unique distinct creatures but with a DNA complement 98.4% identical to that of a chimpanzee, even including the same genetic glitches, too outrageous to contemplate. This is where Christians are likely to part company with him. For many Christians, the concept of God guiding the process of natural selection and using 'rags and bones' is awe-inspiring rather than unbelievable. The in-built capacity for error, the pain and suffering associated with natural selection, are to Avise quite incompatible with a loving Creator's care. He is not alone in this; many Christians also struggle with this aspect of the creation and it is a recurring theme in Christian literature. But Avise leaves issues both unanswered and unexamined. He looks only on the biological plane and ignores the possibility of non-physical events such as the resurrection of Christ. If this indeed occurred, and Christians find the evidence overwhelming, then there is a dimension to life on Earth that complements and makes sense of the biological creation and all that arises from natural selection. Why should not the genetic gods be subject to a greater God?

Avise does not wish to denigrate theists (though he clearly finds a 'special creationism' quite untenable). He states clearly that although science may explain the origins of moral behaviour it

has no ability to discriminate right from wrong. He believes scientists and theologians should work together to foster 'enlightened deliberations' on the human condition, including problems relating to the environment and genetic technology.

The Genetic Gods continues the long tradition of biologists seeking to understand 'humanness' in a scientifically rigorous way; a tradition which stretches

from Alfred Russel Wallace, through the Huxleys, to Richard Dawkins and E.O.Wilson. It draws on concerns about disease and suffering which Christians too easily debase by spiritualising them and whose challenge we must learn to confront with boldness and wisdom.

Caroline Berry is a retired Consultant Clinical Geneticist and currently General Secretary of Christians in Science.

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